REFERENCES

Note: ASCE = American Society of Civil Engineers.

ICSMFE = Internation Conference on Soil Mechanics and Foundation Engineering.

J-SMFD = Journal of the Soil Mechanics and Foundation Division.

Aas, G. "A Study of the Effect of Vane shape and Rate of Strain on the Measured Values of In situ shear-strength of Clay", Proc. 6th Int. ICSMFE, Montreal, Vol. 1, 1965, pp. 141-145.

Anagnosptopoulos, A. "Evaluation of the Undrained Shear Strength from Static Cone Penetration Tests of a Soft Silty Clay in Patras", Proc. European Sysp. Penetration Testing, Stockholm, 1973.

Andreson, A. and Bjerrum, L., Vane Testing in Norway NGI Publication No. 28, Norwegian Geotechnical Institute, Oslo, 1957.

Amar, S., Baguelin, F., Jezequel, J.F. and Le Mehaute, A., "In Situ Shear Resistance of Clays", Proc. ASCE Spec. Conf. on In Situ Measurement of Soil Properties, Releigh, Vol. 1, 1975, pp. 22-45.

Baligh, M.M., "Theory of Deep Site Static Cone Penetration Resistance", Res. Report R75-56, No. 517, Depth. of Civil Eng. Mass. Inst. of Technolog, 1975, 133 p.

Begemann, H.K.S., Ph. "The Use of the Static Soil Penetromenter in Holland", New Zealand Engineering. Vol. 18, No. 2, 1963, pp. 41-49.

Begemann, H.K.S., "The Dutch Static Penetration Test with the Adhesion Jacket Cone", LGM. Mcdedelingen, Publications Delft Laboratory for Soil Mechanics, Vol. 12, No. 4, April, 1969, and Vol. 13, No. 1, July, 1969.

Begemann, H.K.S., Ph., The Friction Jacket as an Aid in Determining the Soil Profile, Proc. 6th ICSMFE, Montreal, Vol. 1, 1965, pp. 1-20.

Bjerrum, L., "Embankments on Soft Ground", State of-the-Art Report, Proc. ASCE Spec. Conf. on Performance of Earth and Earth-Supported Structures, Lafayette, Vol. 2, 1972, pp. 1-54.

Bjerrum, L., "Problems of Soil Mechanics and Construction on Soft Clay", State-of-the-Art Report to Session IV, 8th ICSMFE, Moscow, Vol. 3, p. 111.

Brand, E.W., Moh, Z.C. and Wirojanagud, P., "Interpretation of Dutch Cone Tests in Soft Bangkok Clay", Proc. European Sysmp. Penetration Testing, Stockholm, 1974.

Brooker, E.W. and Ireland, H.O., "Earth Pressures at Rest Related to Stress History", Canadian Geotechnical Journal, Vol. 2, No. 1, 1965, pp. 1-15.

Burmister, D.M., "The Application of Controlled Test Methods in Consolidation Testing", Symp. on Consolidation Testing of Soils. ASTM Special Technical Publication 126, 1952.

Cadling, L. and Odenstad, S., "The Vane Borer", Proc. No. 2, Swedish Geotechnical Institute, Stockholm, 1950.

Coulomb, C.A., Essai Sur une Application des Regles de Maximis et Minimis a Quelques Problemes de Statiques Relatifs a L Architecture, Memoirs, Academie Royale des Sciences, Paris, Vo. 3, 1776, pp. 38.

De Beer, E., Donnees Concemant la Resistance au Cisaillemont Deduites des Essais de Penetration eu Profondur, Geotechnique, Vol. 1, 1948, pp. 22-29.

De Beer, E., "The scale Effects in the Transmission of the Result of Deep Soundings Tests on the Ultimate Bearing Capacity of Piles and Caisson Foundations", Geotechnique, Vol. 13, 1963, pp. 39-75.

Eide O., "Geotechnical Problems with Soft Bangkok Clay on the Nakorn Sawan Highway Project", Conf. Eng. Inst. of Thailand, Bangkok, and, Pub. No. 78, Norwegian Geotechnical Institute, Oslo, 1968.

Flaate, L., "Factors Influencing the Results of Vane Tests", Canadian Geotechnical Journal, Vol. 3, No. 1, 1966, pp. 18-31.

Hansen, J.B. and Gibson, R.E., "Undrained Shear Strength of Anisotropically consolidated Soil, Geotechnique, Vol. 1, No. 3, 1949, pp. 189-204.

Holmberg, S.,,"Load Testing in The Bangkok Region of Piles Embedded in Clay", Journal of the Southeast Asian Society of Soil Engineering, Vol. 1, No. 2, 1970, pp. 61-78.

Janbu, N., "Discussion to ESOPT, Stockholm on the Correlation Between Static Cone Resistance and Vane Shear Strength in Clay", Vol.3, 1974.

Ladanyi, B. and Eden, W.J.,"Use of Deep Sounding Penetration Tests in Sensitive Clay", Proc. 7th ICSMFE, Mexico City, Vol. 2, 1969, pp. 225-230.

Ladanyi, B., "In Situ Determination of Undrained Stress-Strain behavior of Sensitive Clays with the Pressuremeter", Technical Note, Canadian Geotechnical Journal, Vol. 9, No. 3, 1972, pp. 313-319.

Ladd, C.C. and Lambe, T.W., "The Strength of 'Undist bed' Clay Determined from Undrained Tests", ASTM, STP 36, 1963, pp. 342-371.

Ladd, C.C., Footte, R., Ishihara, K., Poulos, H.G. and Schlosser, F., "Stress Deformation and Strength Characteristics", State-of-Art Report for Session I, 9th ICSMFE, Tokyo, 1977, 74 p.

Lambe, T.W. and Whitman, R.V., "Soil Mechanics", John Wiley & Sons, New York, 1969, 553 p.

La Rochelle, Pl, Roy, M. and Tavenas, F.A., "Field Measurements of Cohesion in Champlain Clays", Proc. 8th ICSMFE, Mascow Vol. 1.1, 1973, pp. 229-236.

Mohr, O.,"Die Elastizitatsgrenze und Fruch eines Materials", Zeitschrift Vereins Dentsche Ingenieure, Vol. 44, 1900, pp. 1524.

Muhs, H. and K. Weiss, "Untersuchung Van Grentztragfahigkeit und Setzungsverhalten flachgegrundeter Einzelfundamente im Ungleichforrigen nichtbindigen Boden", Degebo Heft 26, 1971.

Nottingham, L.C., "Use of Quasi-Static Friction Cone Penetrometer Data to Predict load Capacity of Displacement Piles", Ph.D. disserfation to the Dept. of Civil Eng., Univ. of Florida, 1975.

Pham, T.N., "Application of the Dutch Cone in the Bangkok Area", AIT Thesis No. 377, Asian Institute of Technology, Bangkok, Thailand, 1972.

Phuong, T.H., "Size effects on Undrained Shear Strength of Bangkok Clay", AIT Thesis No. 514, Asian Institute of Technology, Bangkok, Thailand, 1973.

Prandtl, L., "Ueber die Haerte Plastischer Koerper", 1921.

Rsissner, H., "Zum Erddruckproblem", Proceedings, 1st Int. Congress of Applied Mechanics, Delft, 1924, pp. 295-311.

Sangariyavanich, S., "Undrained Direct Shear Strength Characteristics of Bangkok Clay at Rangsit", AIT Thesis 513, Asian Institute of Technology, Bangkok, Thailand, 1973.

Sanglerate, G., "The Penetrometer and Soil Exploration", Elserier Publishing Company, Amsterdam, 1972.

Schmertmann, J.H., "Static Cone Penetrometers for Soil Exploration", Civil Engineering, Vol. 37, No. 6, 1966, pp. 71-73.

Schmertmann, J., "Static Cone Penetration Tests", Canadian National Research Council, Civ. Building Research, Ottawa, Project G-1, Internal report 1, 1972 b.

Schmertmann, J.H.C., "The Measurement of In Situ Shear Strength", State-of-Art Report, Proc. ASCE. Specialty Conference on In Situ Measurement of Soil Properties, Raleigh, Vol. II, 1975, pp. 57-138.

Schmidt, B., Discussion of "Earth Pressure at Rest Related to Stress History", Canadian Geotechnical Journal, Vol. 3, No. 4, 1966, pp. 239-242.

Skempton, A.W., "Vane Test in the Alluvial Plain of the River Forth near Grangementh", Geotechnique, Vol. 1, No. 2, 1948, pp. 111-124.

Terzaghi, K., "Theoretical Soil Mechanics", Wiley, New York, 1943.

Thomas, D., "Static Penetration Tests in London Clay", Geotchnique, Vol. 15, No. 2, 1965, pp. 174-179.

Trofimenkov, J.B., "Penetration Testing in USSR"State-of-the-Art Report, Proc. of the Eur. Symp. on Penetration Testing, Stockholm, Vol. 1, 1974, pp. 147-154.

Vesic, A.S., "Expansion of Cavities in Infinite Soil Mass", ASCE, J-SMFD, Vol. 98, SM-3, March, 1972, pp. 265-290.

Vey, E. and Schlesinger, L., "Soil Shear Tests by Means of Rotating Vanes", Highway Research Board Proc., Vol. 29, 1953, pp. 544-552.

Wang, E.S., "Direct Shear Strength of Nong Ngoo Hao Clay", AIT Thesis No. 707, Asian Institute of Technology, Bangkok, Thailand, 1974.

Wiesel, C.E., "Some Factors Influencing In Situ Vane Test Results", Proc. 8th ICSMFE, Moscow, Vol. 1.2, 1973, pp. 475-479.

Wirojanagud, P., "Interpretation of Dutch Cone and Vane Shear Tests in Soft Bangkok Clays", AIT Thesis, No. 709, Asian Institute of Technology, Bangkok, Thailand, 1974.

FIGURE

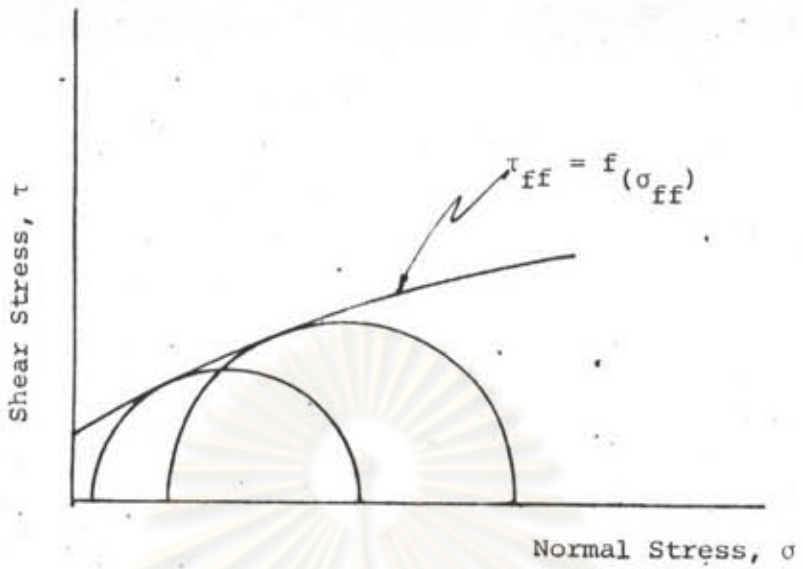


Fig. 2.1 Mohr Envelope

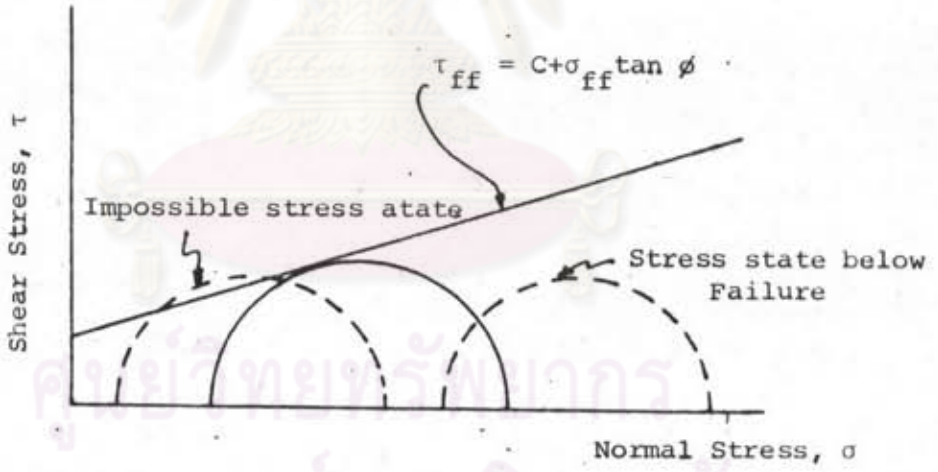
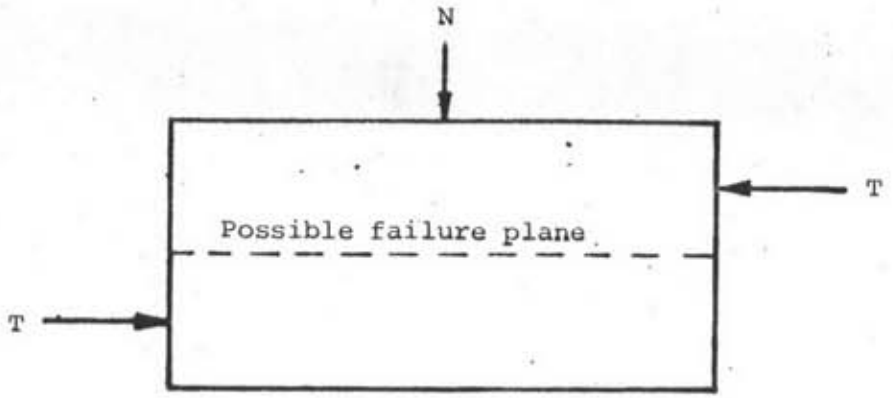


Fig. 2.2 Mohr-Coulomb Envelope



N Constant as T applied

Fig. 2.3 Basic Condition in Direct Shear Test

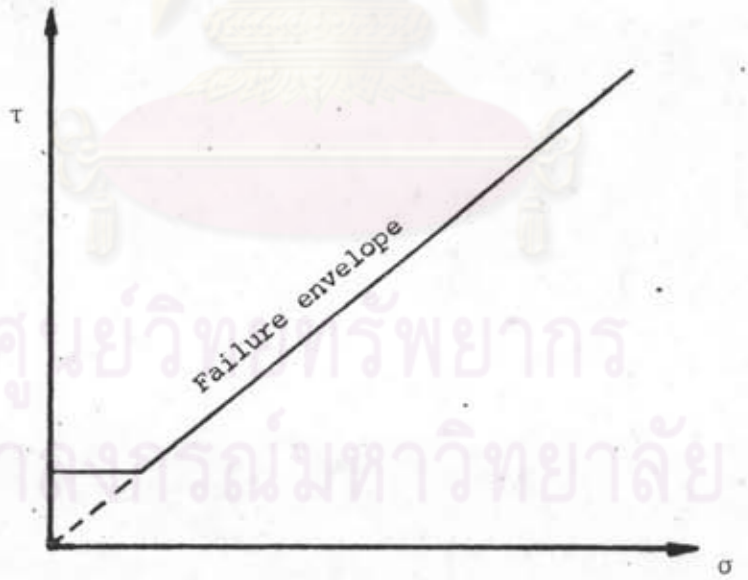


Fig. 2.4 Failure envelope of cohesive soil

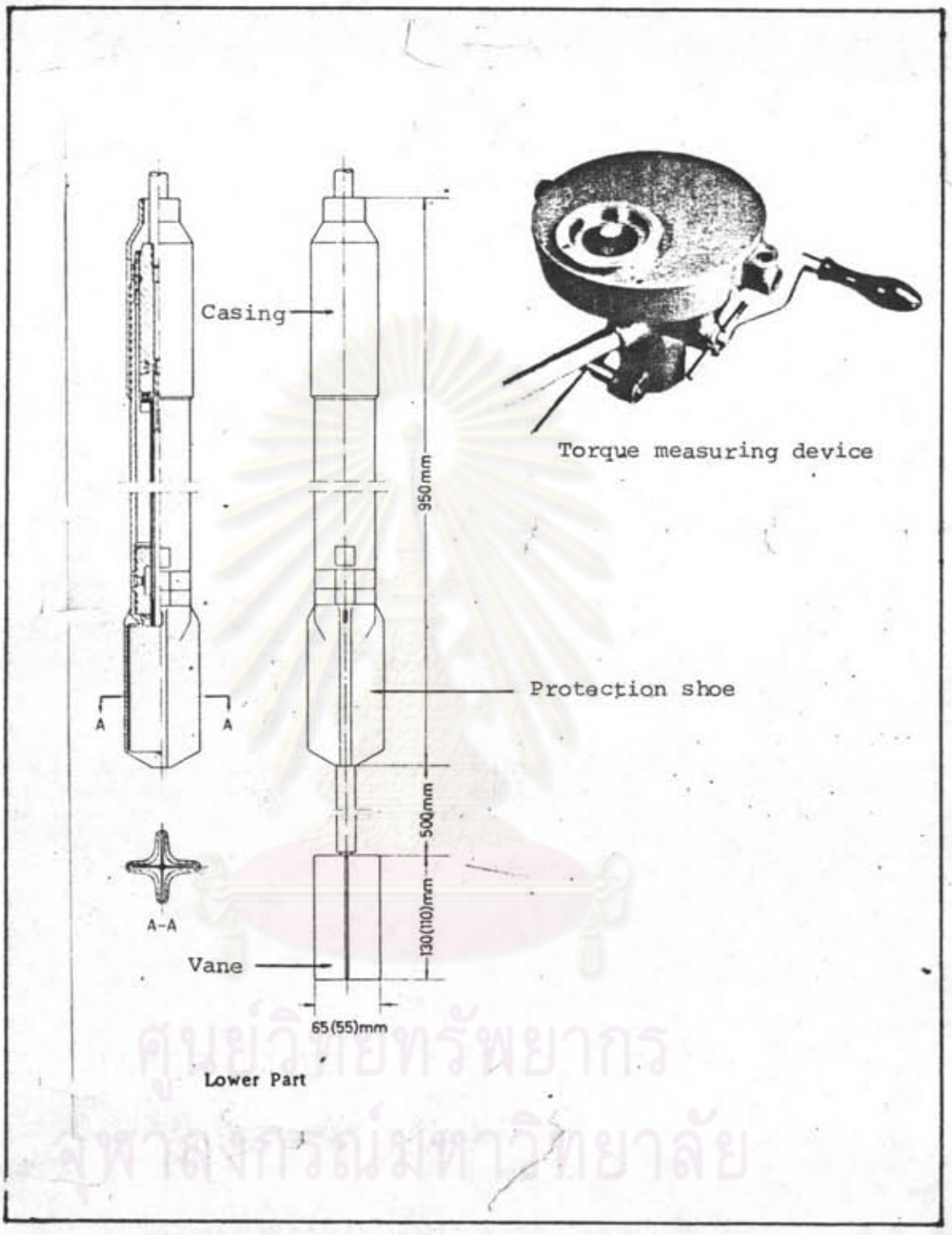


Fig. 2.5 "Geonor" Vane Borer

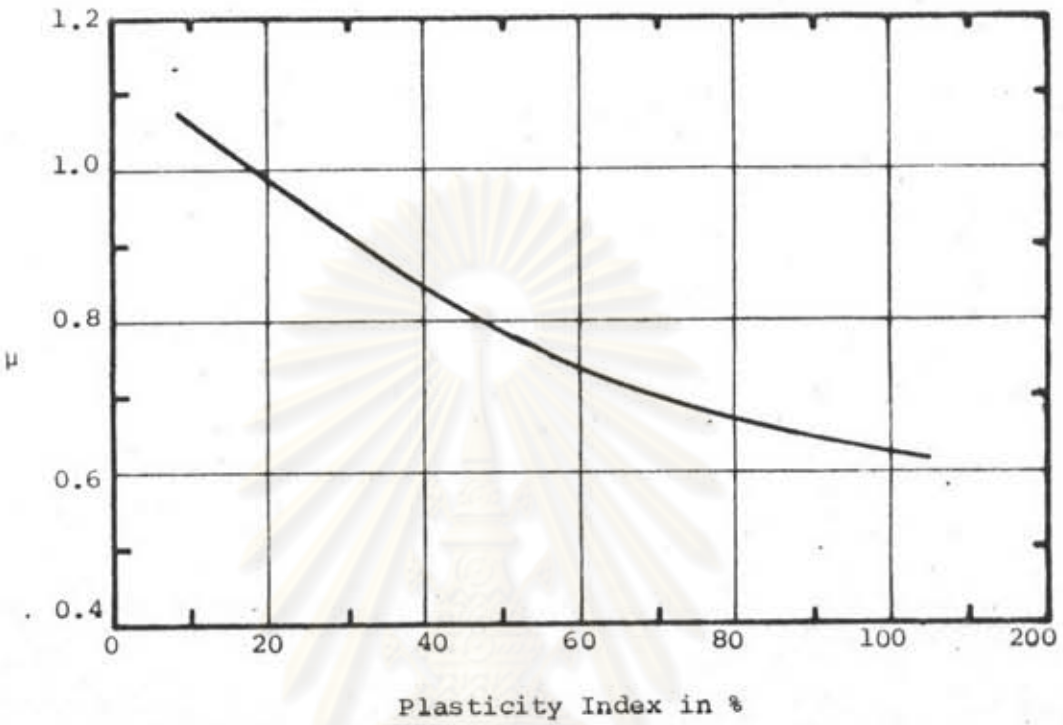
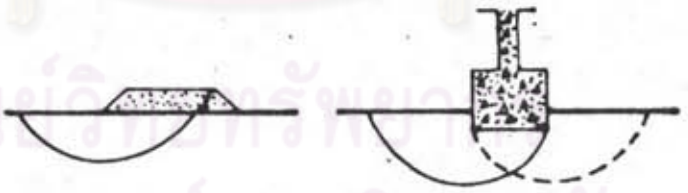
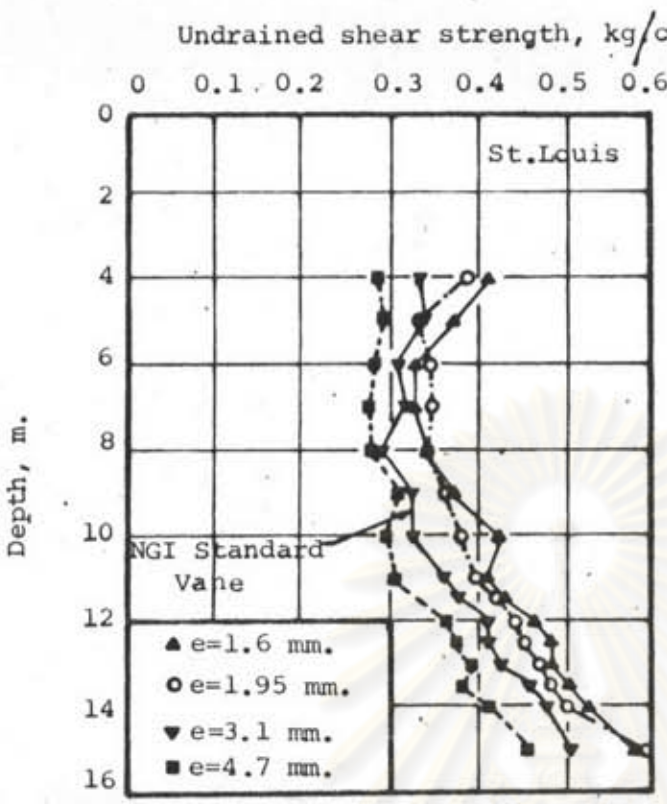
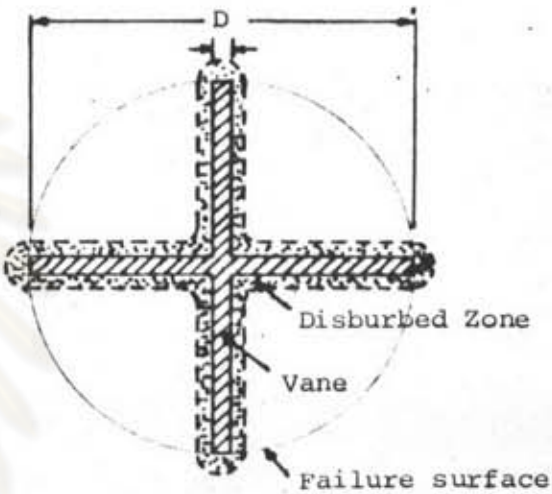


Fig. 2.6 Bjerrum's (1972) Vane Strength Correction Factors and some of their Empirical Bases





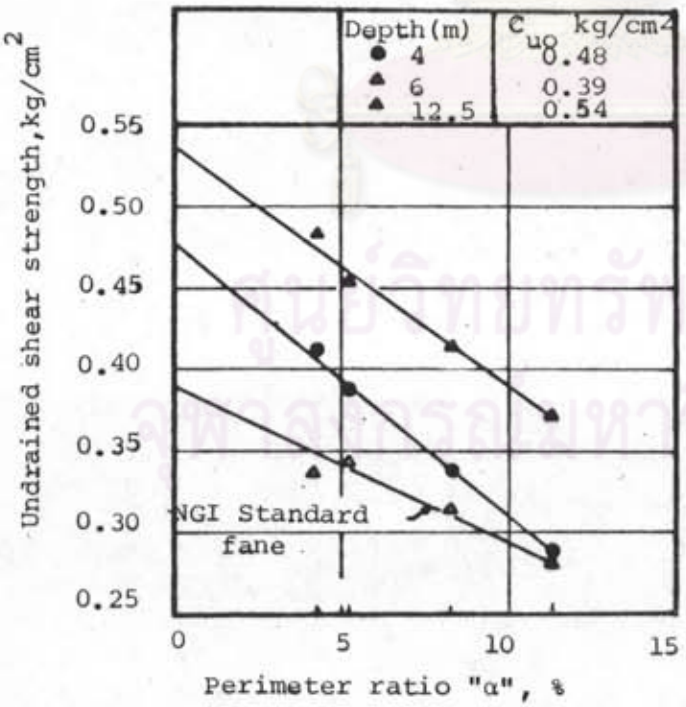
1. Results of Field Vane Tests with Different Blade Thicknesses



Perimeter ratio $\alpha = \frac{A_e}{\pi D}$

(after Coding and Odenstad, 1950)

2. Disturbance Around the Vane Blades



3. Extrapolation of Vane Strength for Zero Brade Thicknesses (C_{uo})

Fig. 2.7 Example of the Effect of Vane Blade Disturbance in Sensitive Clays (LaRochelle, et. al. 1973)

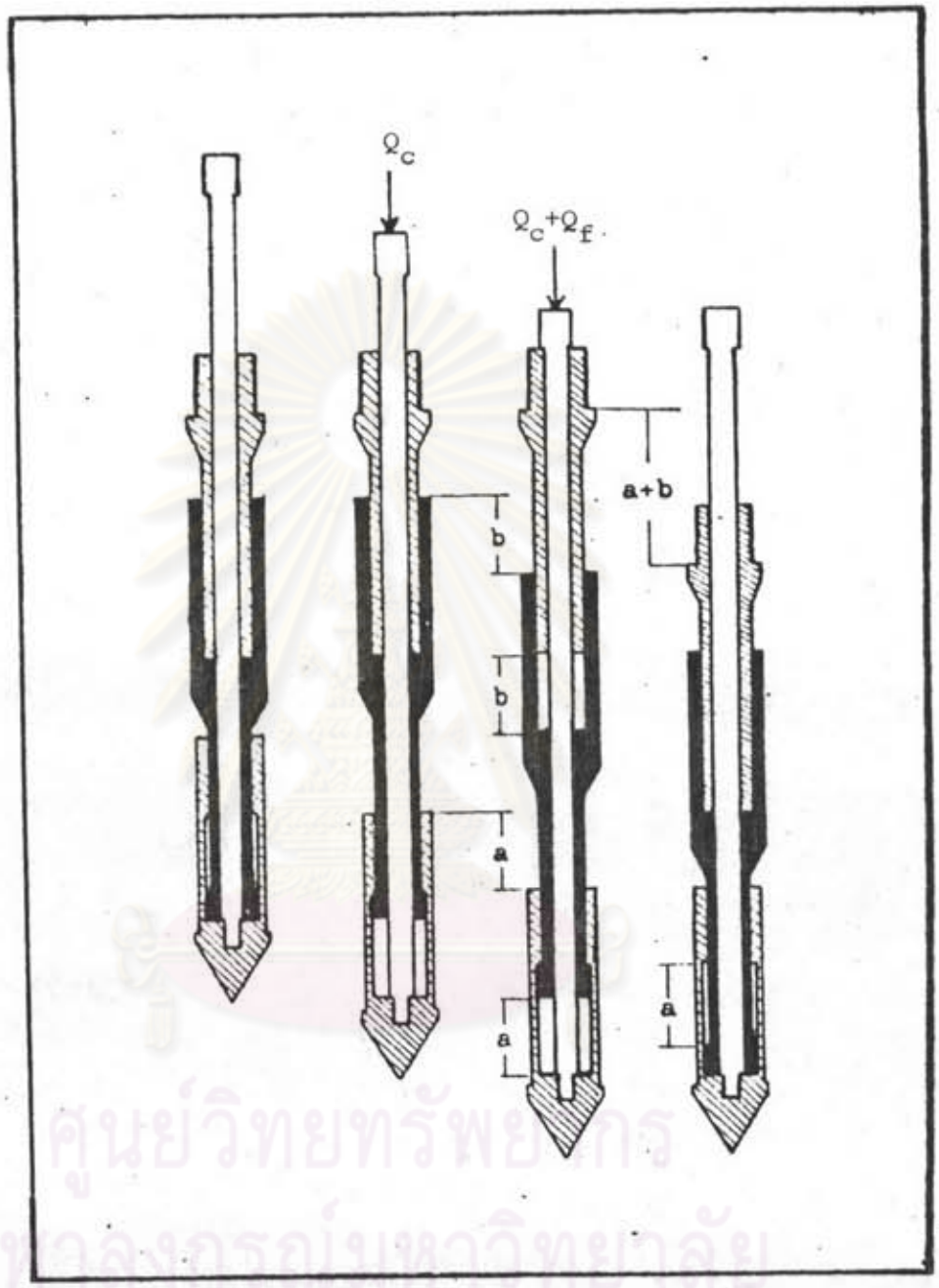


Fig. 2.8 The Adhesion Jacket Cone

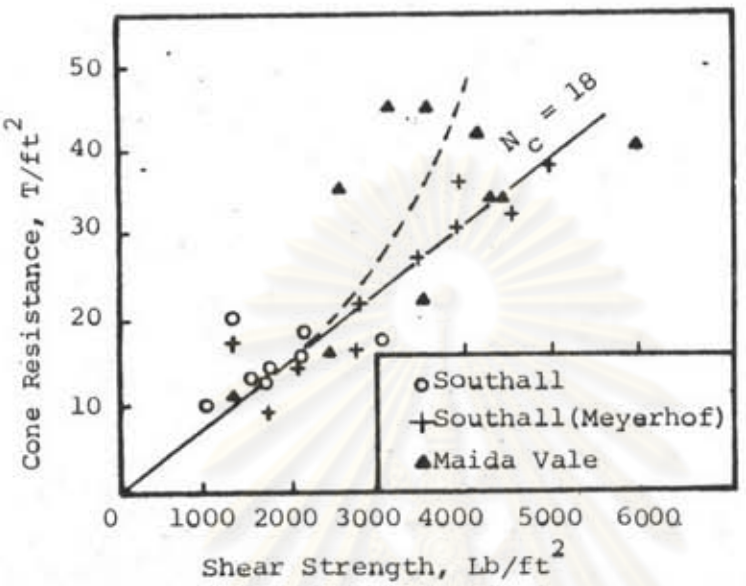


Fig. 2.9 Cone Resistance and Shear Strength Relationship (Thomas, 1965)

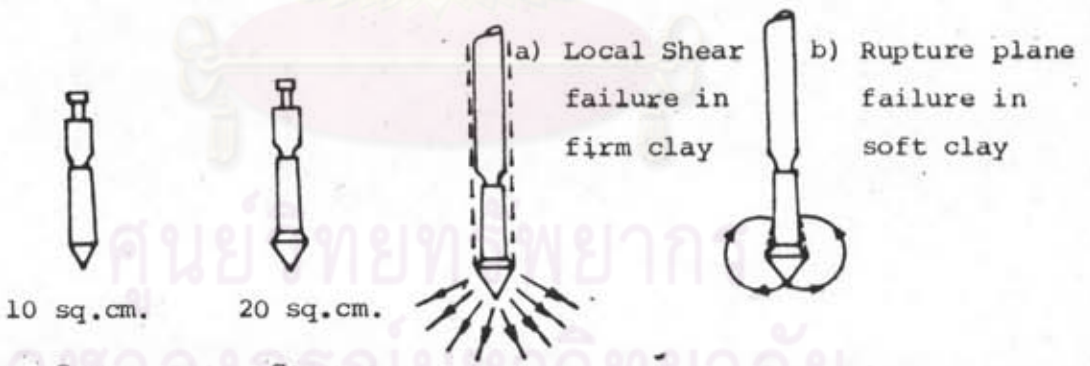


Fig. 2.10 Mechanics of Failure and Details of Cones (Thomas, 1965)

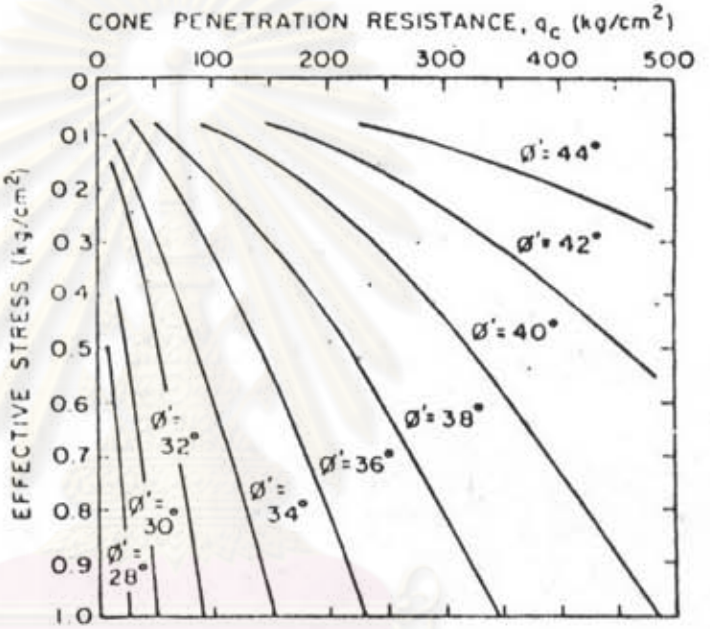


Fig. 2.11 Method used in USSR to estimate ϕ' from q_c (Trofimenkov, 1974).

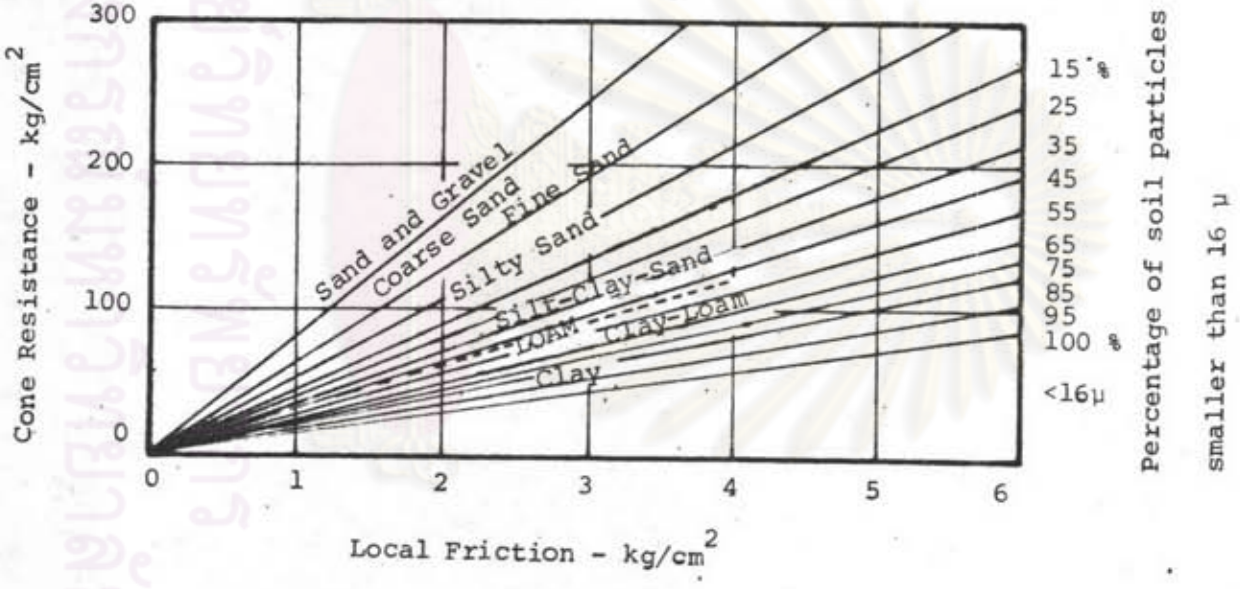


Fig. 2.12 Relationship between Cone Resistance, Local Friction and Soil Type (From Begemann, 1969)

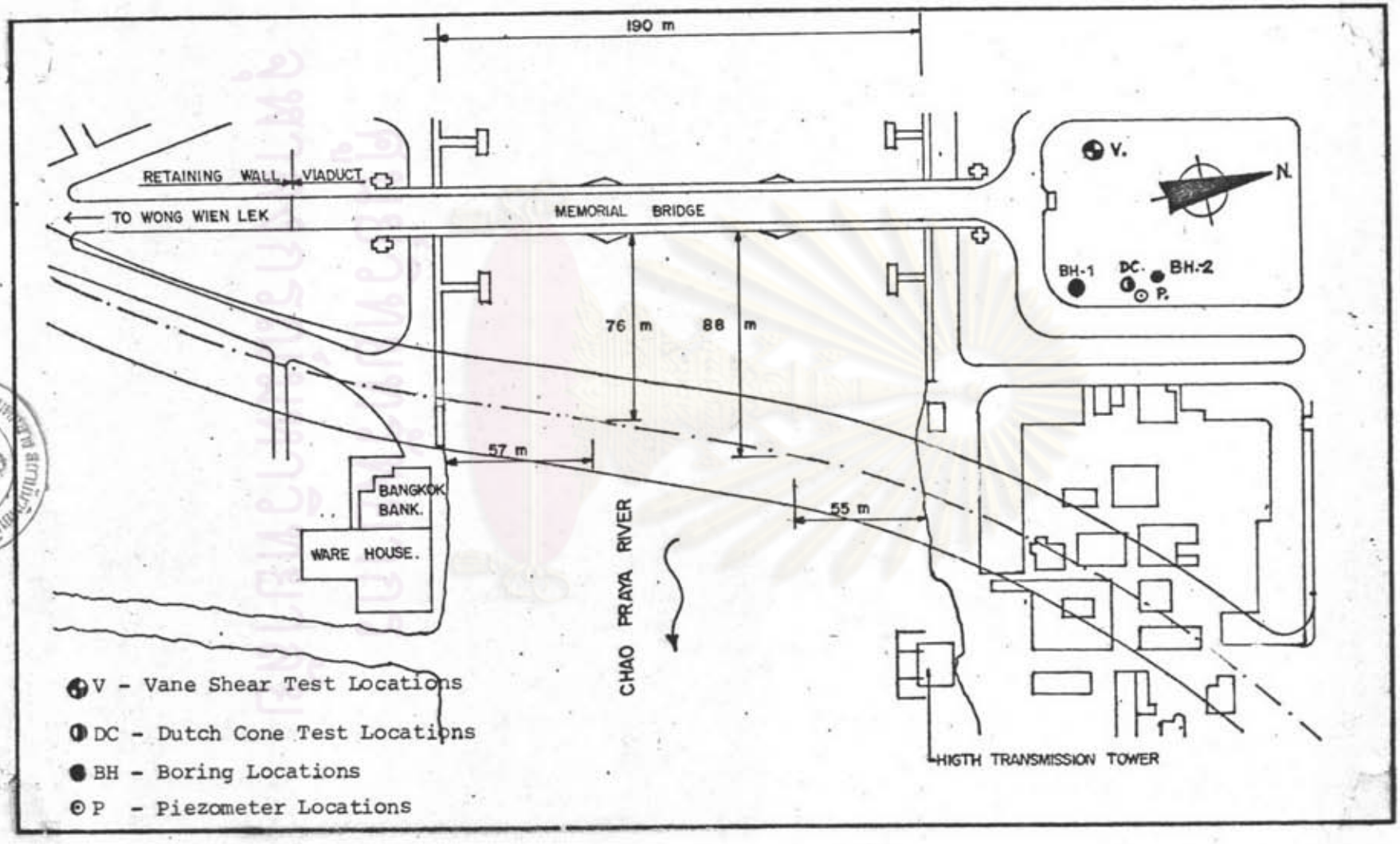


Fig. 3.1 Location Map of Bore Holes at Memorial Bridge

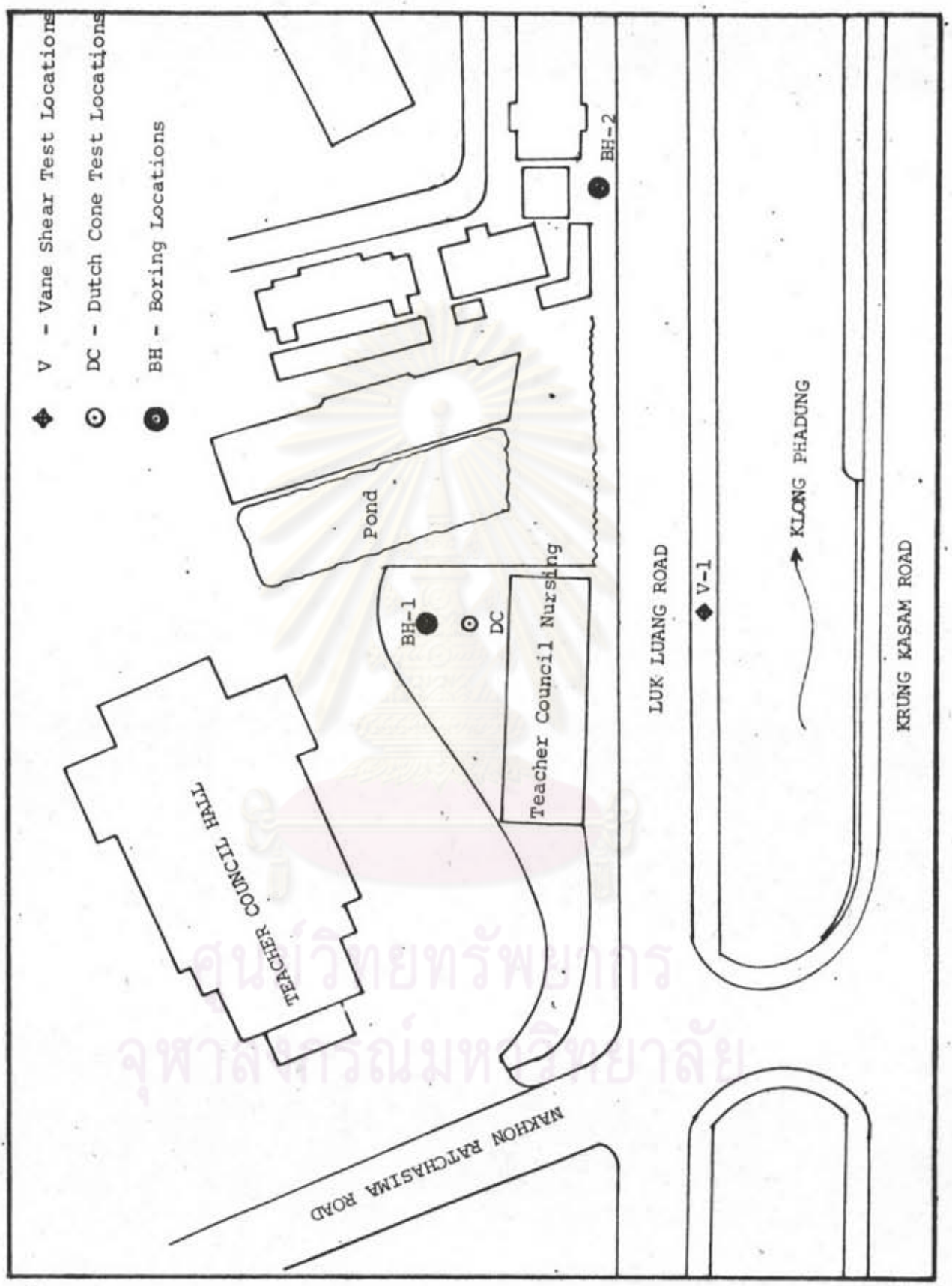


Fig. 3.2 Location Map of Bore Holes at Teves

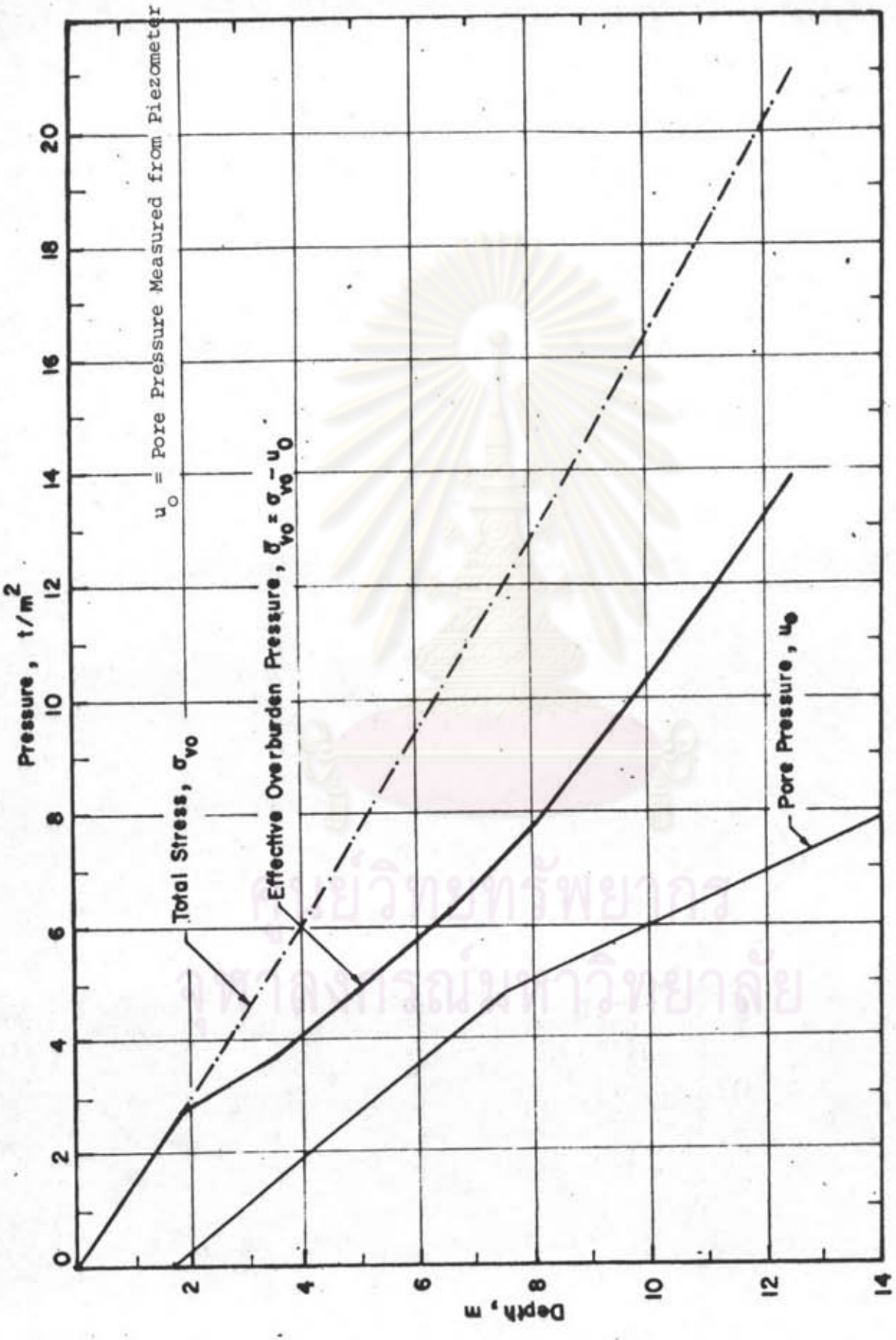


Fig. 3.3 Variation of Pore Pressure, Total and Effective Overburden Pressure with Depth at Memorial Bridge

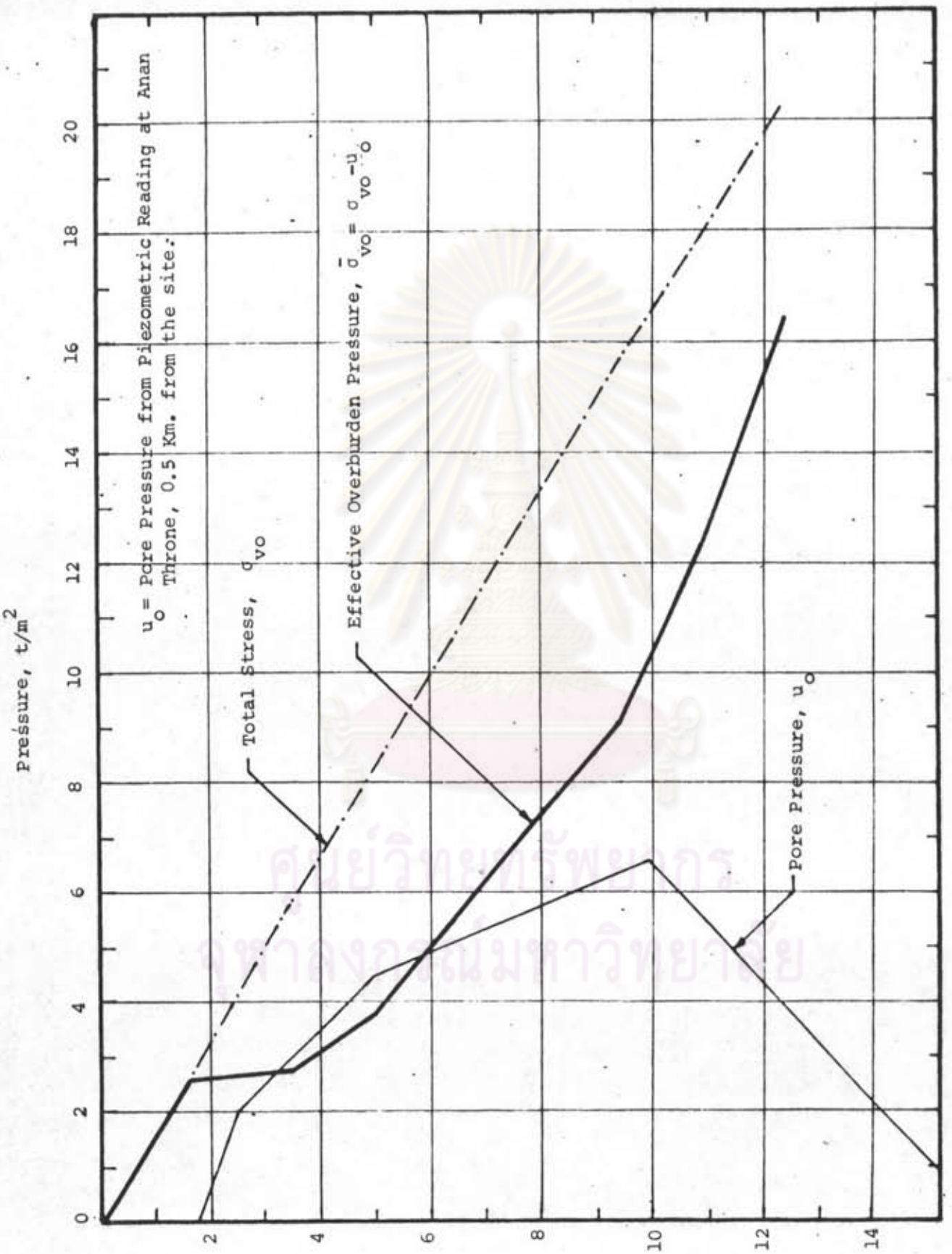


Fig. 3.4 Variation of Pore Pressure, Total and Effective Overburden Pressure with Depth at Teves .

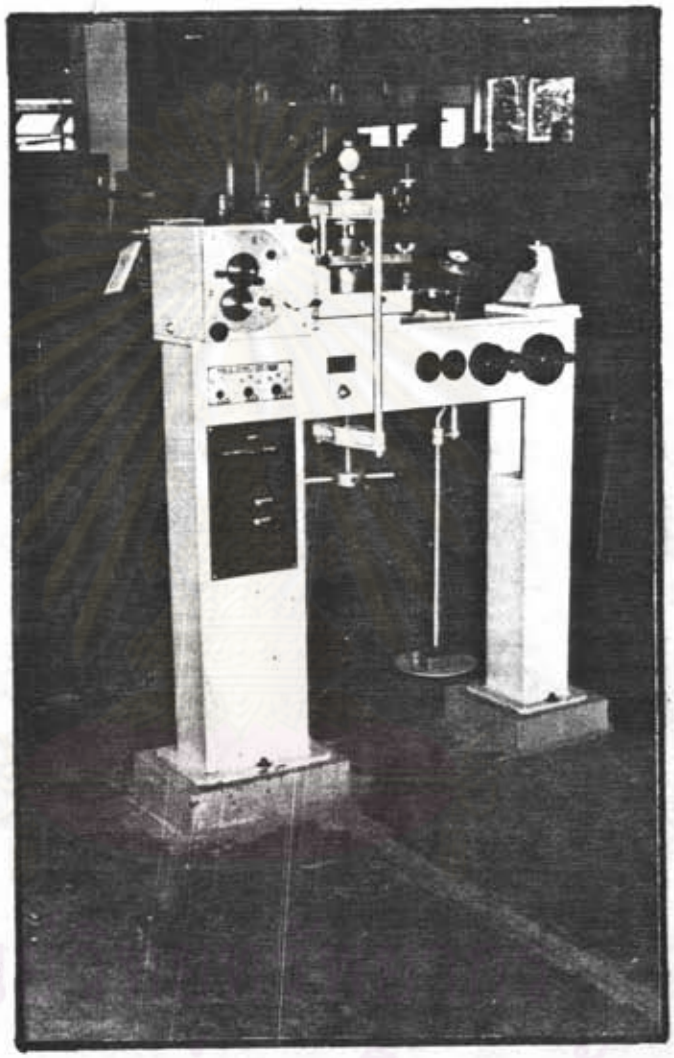


Fig. 3.5 The Direct Shear Apparatus

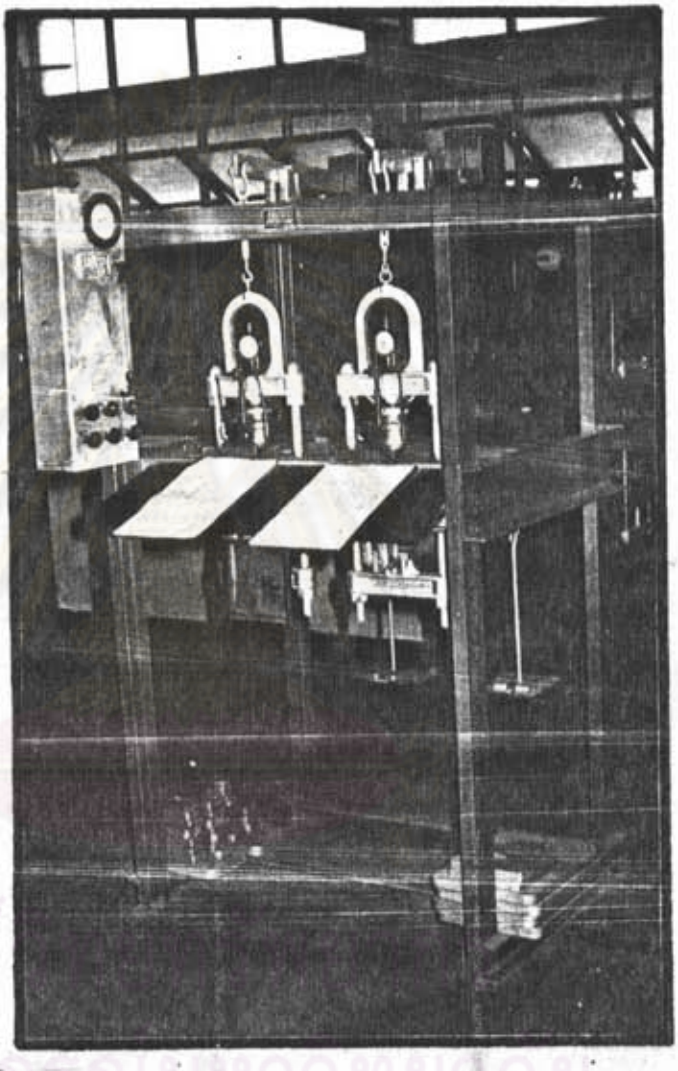


Fig. 3.6 The Consolidation Apparatus

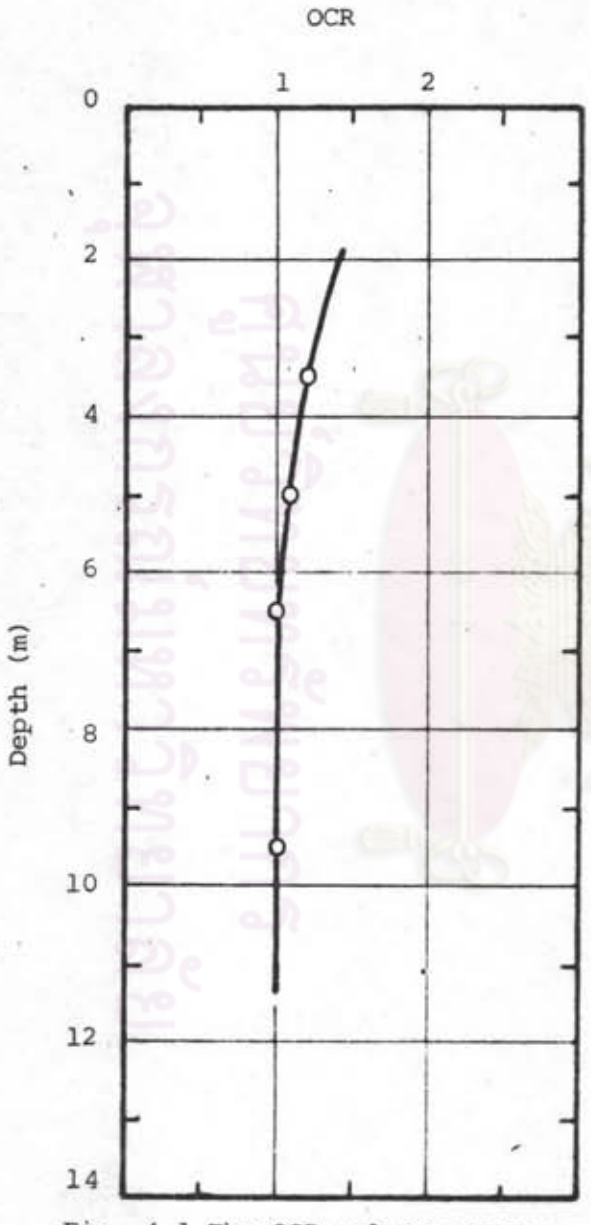


Fig. 4.1 The OCR values versus depth at Memorial Bridge site.
(Considered the Declined in Pore Water Pressure)

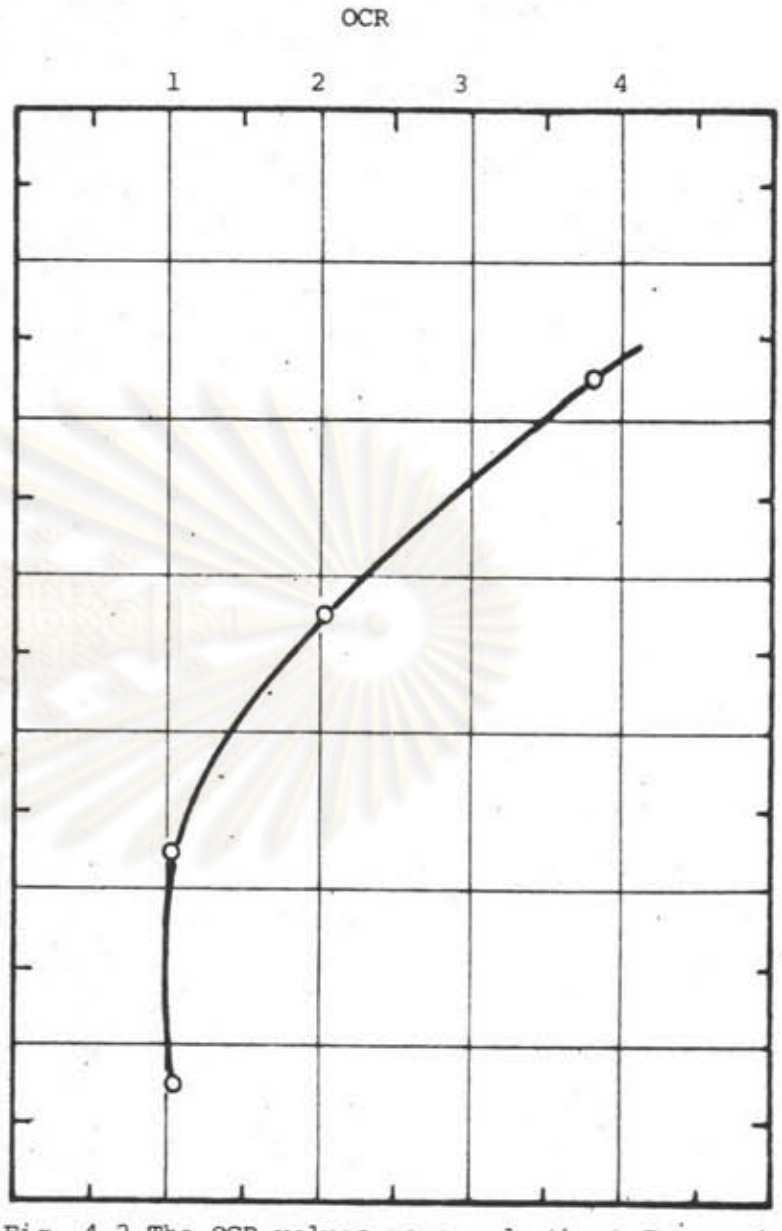


Fig. 4.2 The OCR values versus depth at Teves site (Considered the Declinedin Pore Water Pressure)

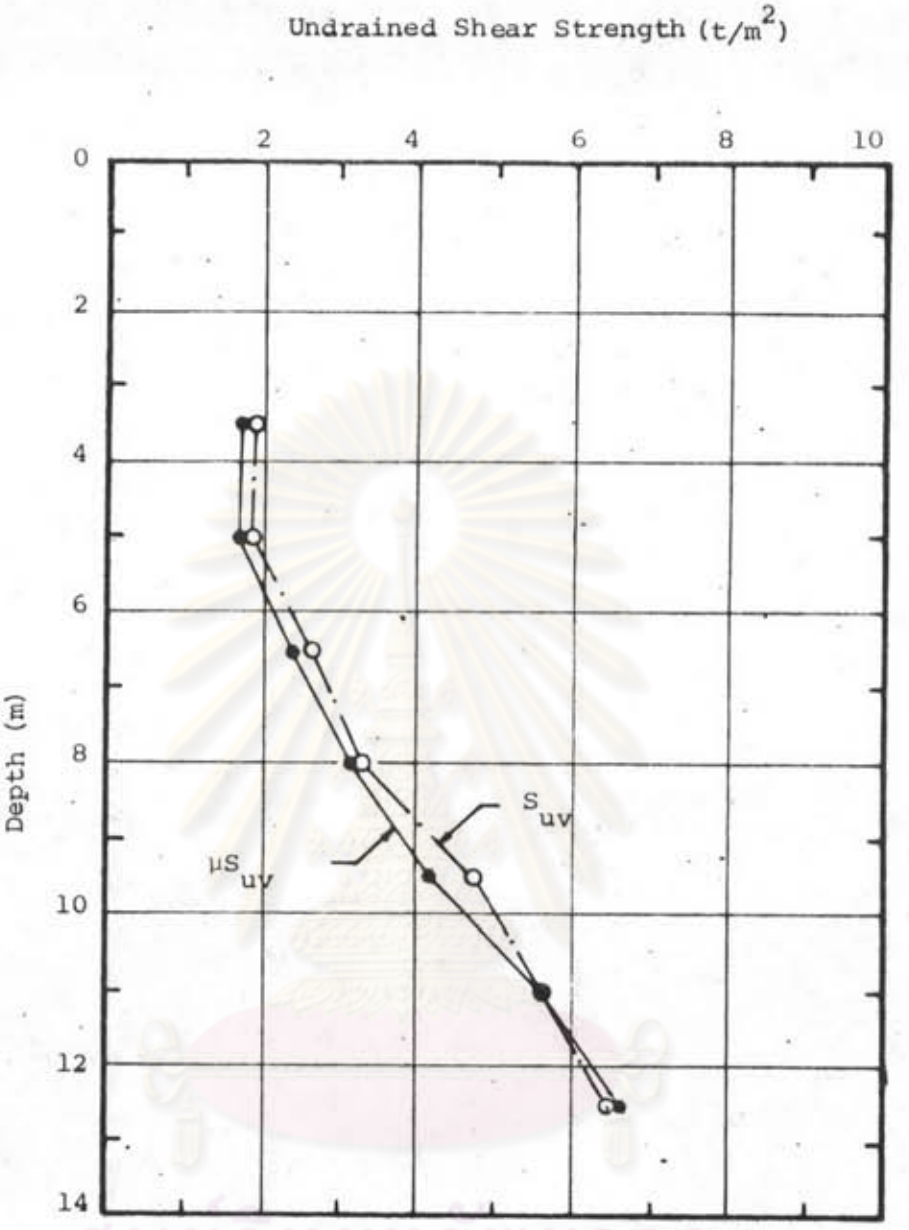


Fig. 4.3 Vane Shear Test Results at Memorial Bridge

(Test Data were from THENCO and Submitted to Norconsult PAE-MEC Joint Venture)

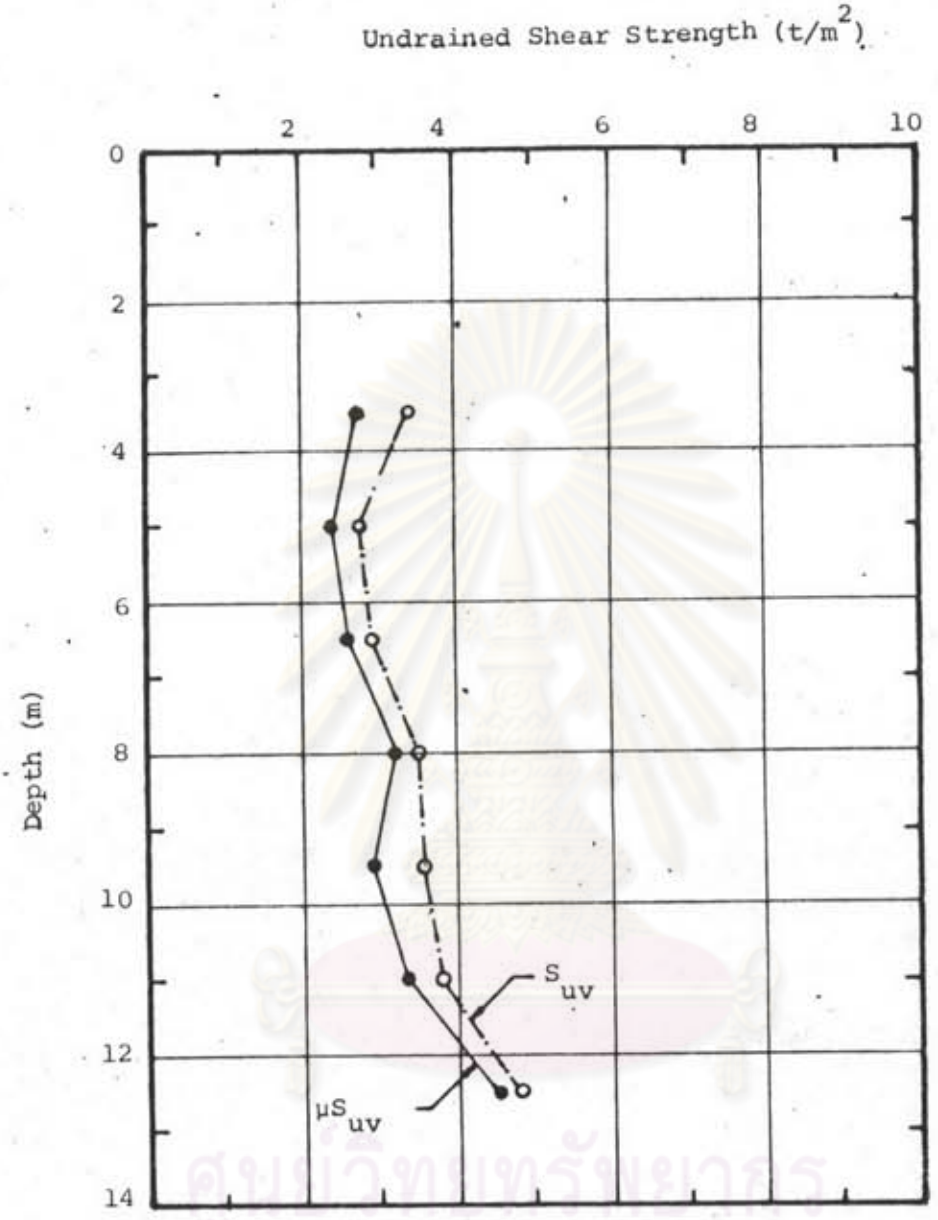


Fig. 4.4 Vane Shear Test Results at Teves
(Test Data were from KEC)

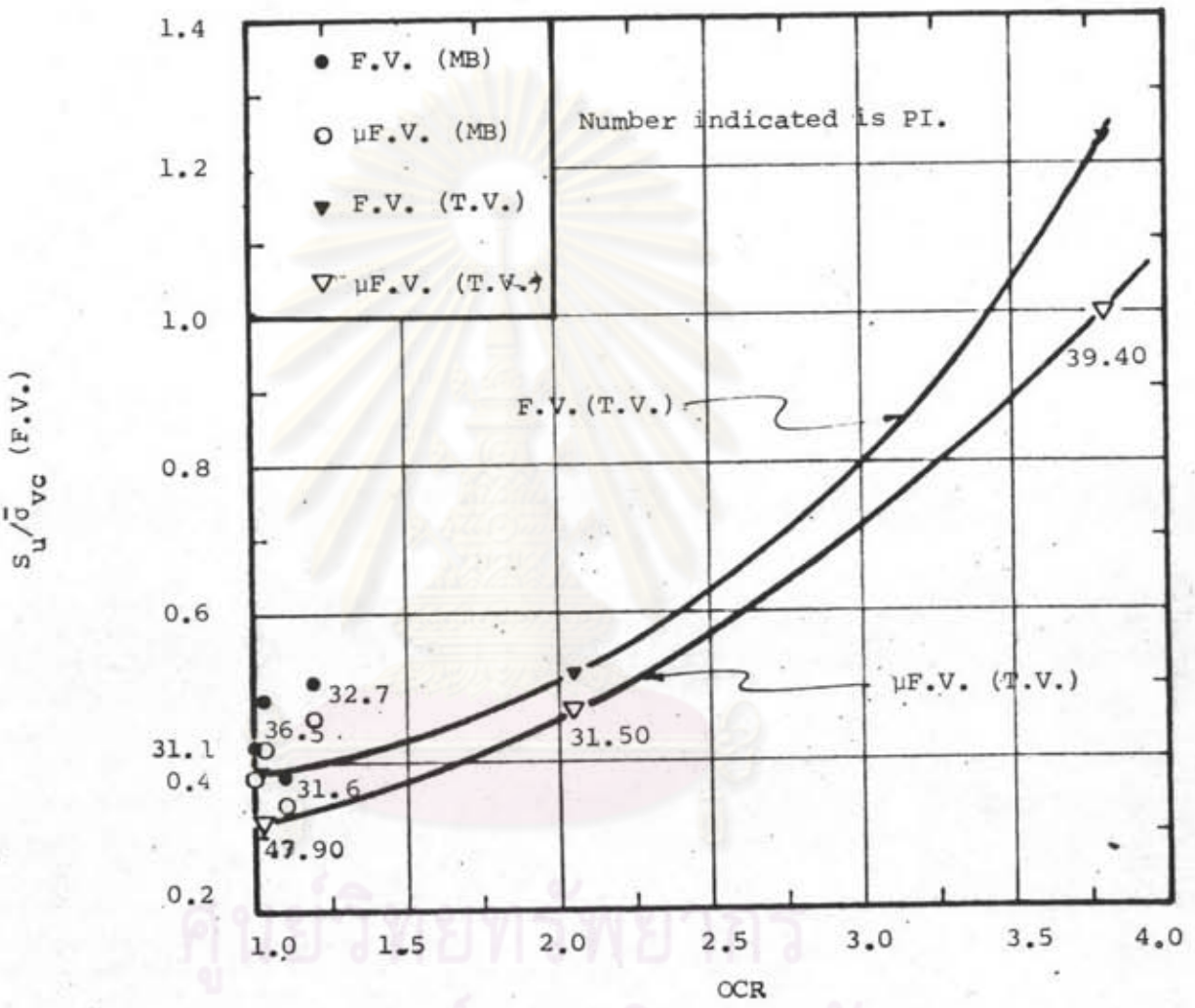


Fig. 45 Normalized Field Vane and Corrected Field Vane Shear Strength Versus OCR.

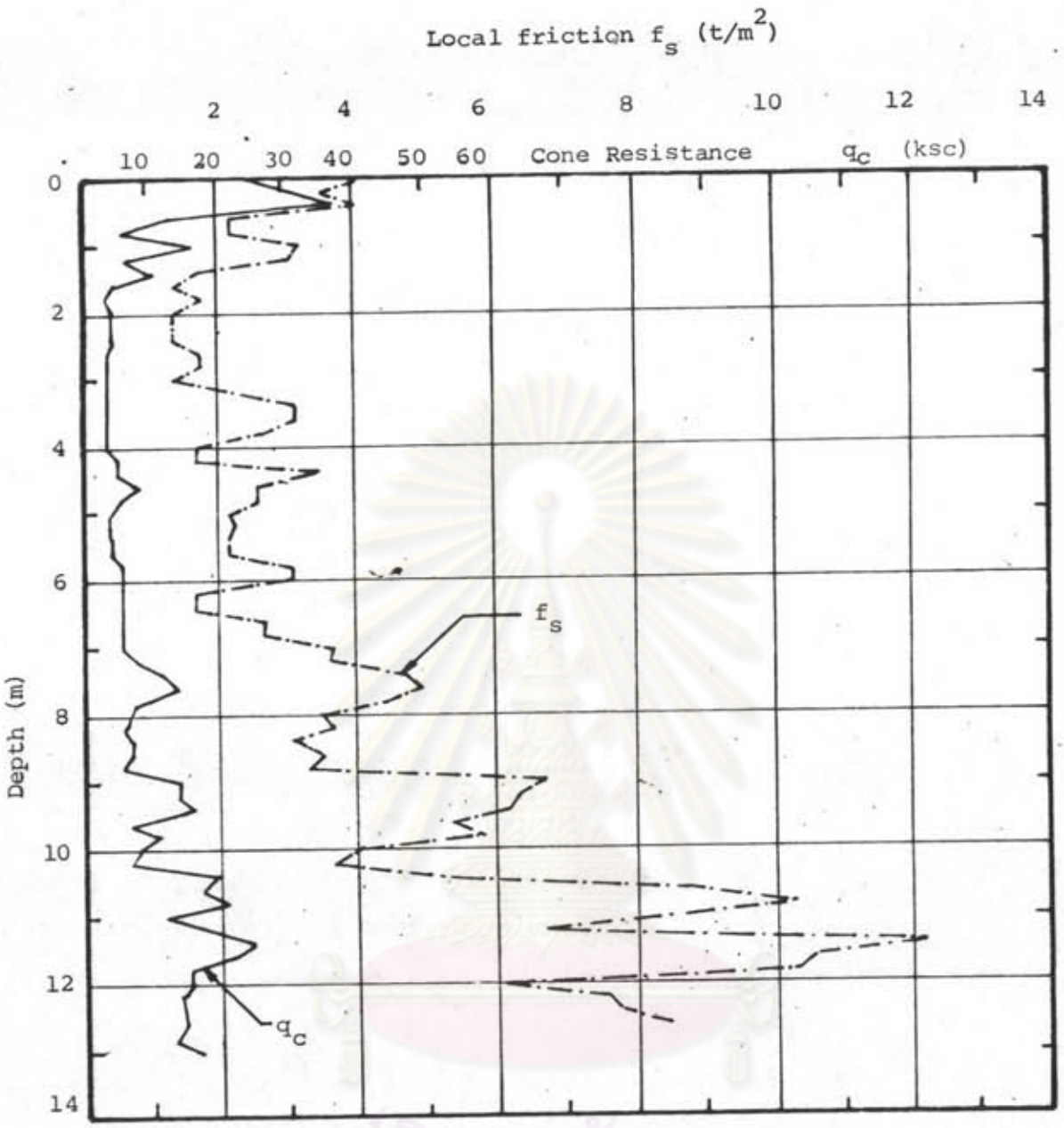


Fig. 4.6 Dutch Cone Test Results at Memorial Bridge

(Test Data were from THENCO and Submitted to Norconsult PAE-MEC Joint Venture)

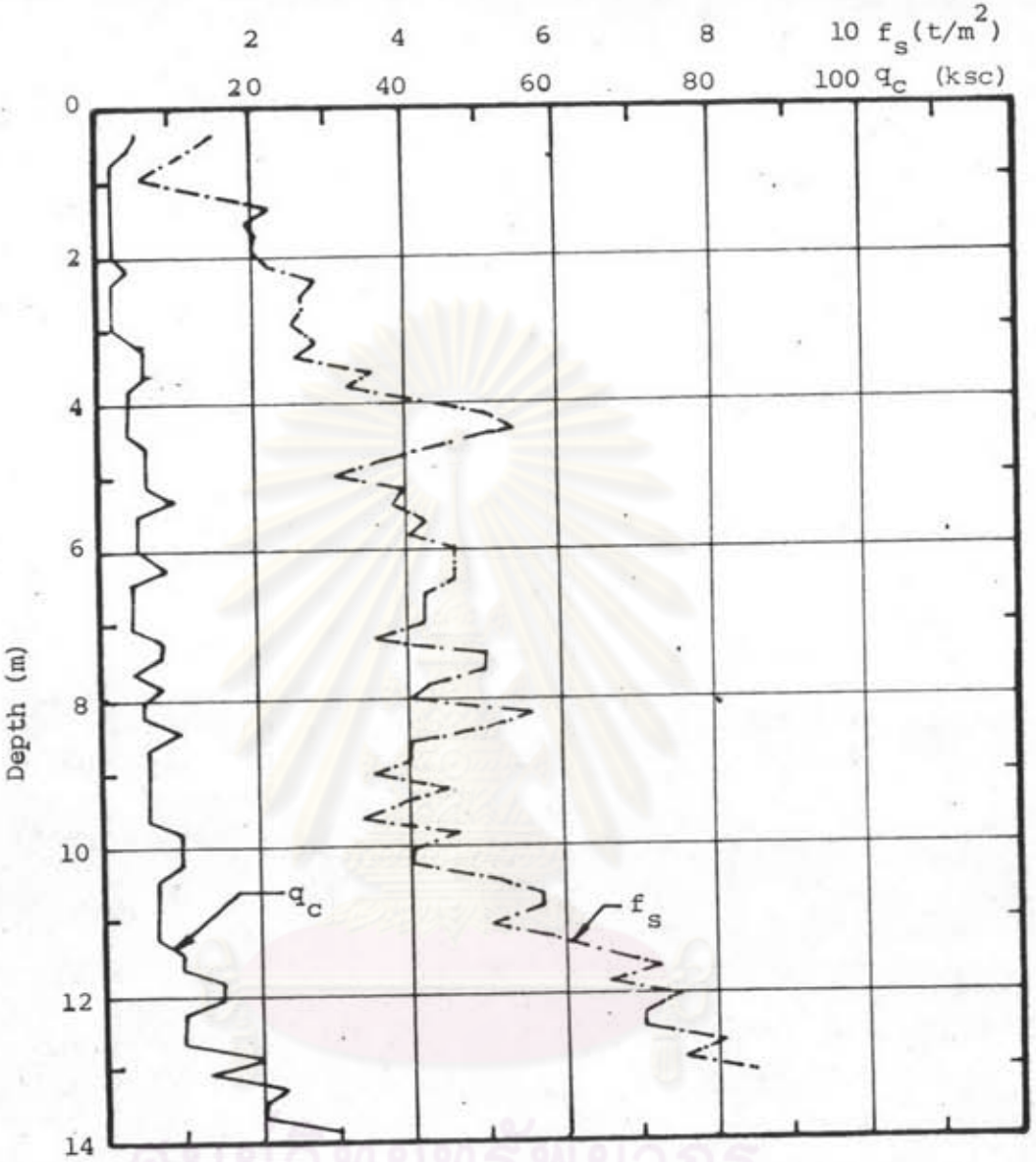


Fig. 4.7 Dutch Cone Test Results at Teves

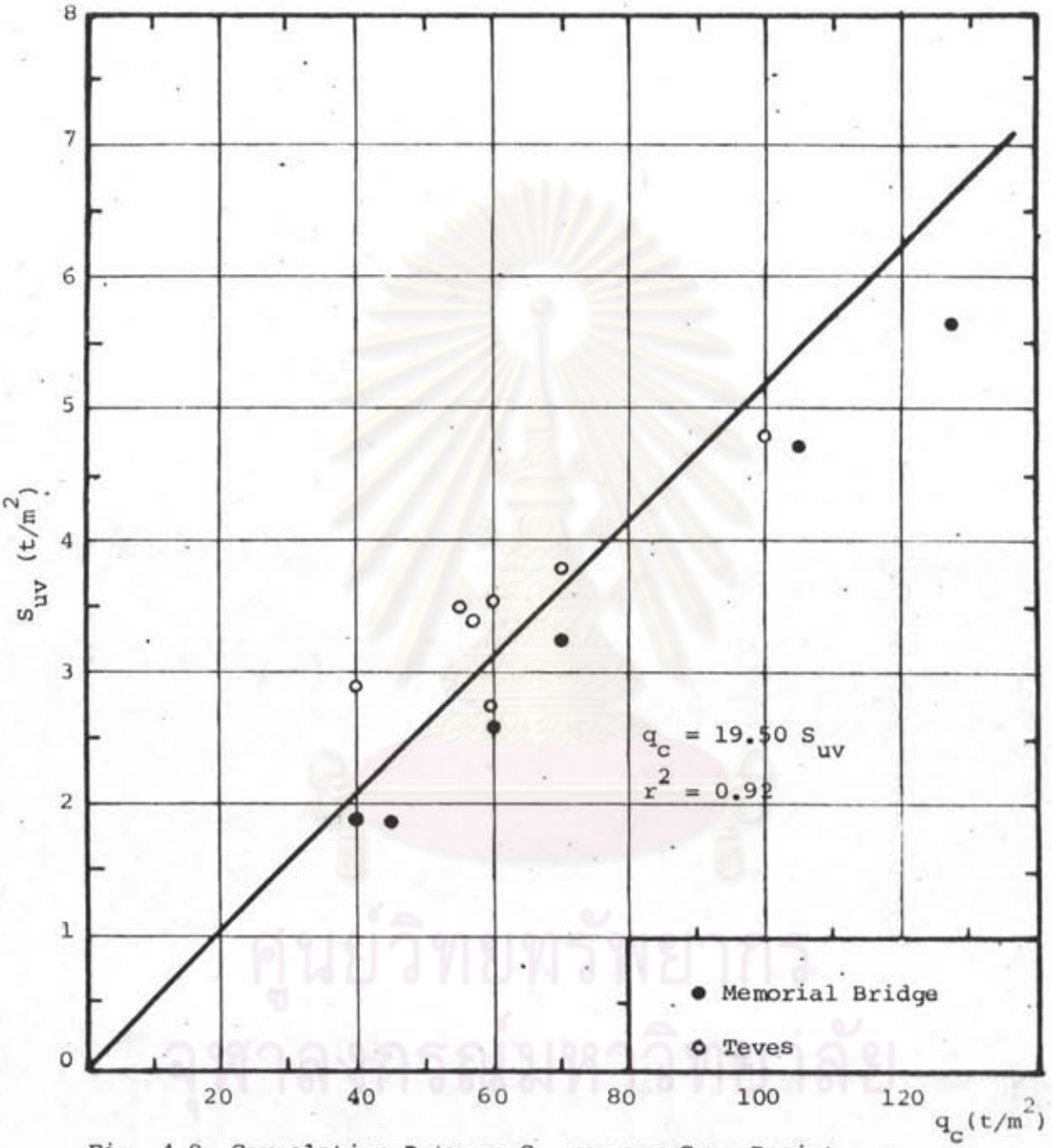


Fig. 4.8 Correlation Between S_{uv} versus Cone Resistance

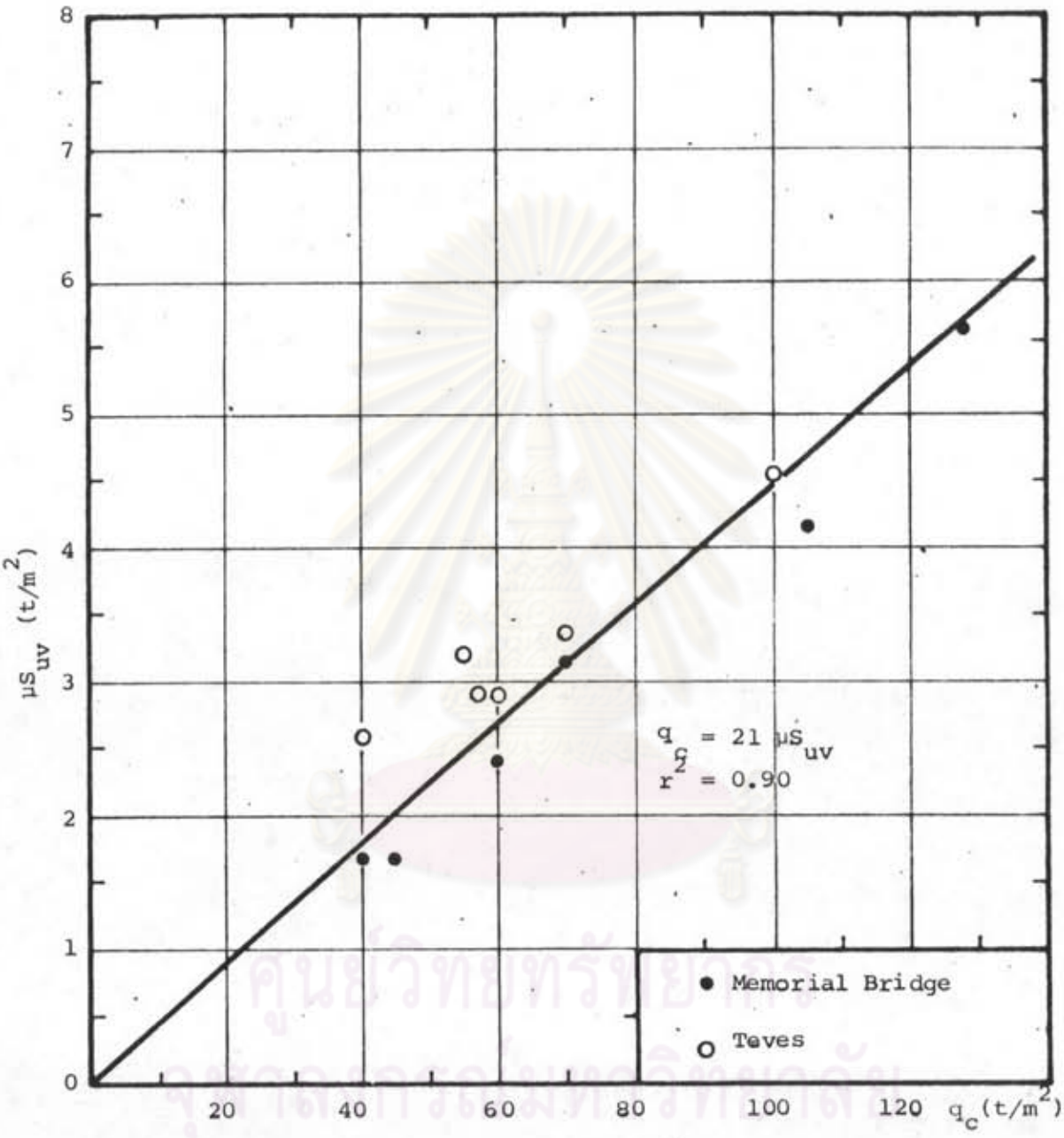


Fig. 4.9 Correlation Between Corrected Field Vane Shear Strength Versus Cone Resistance

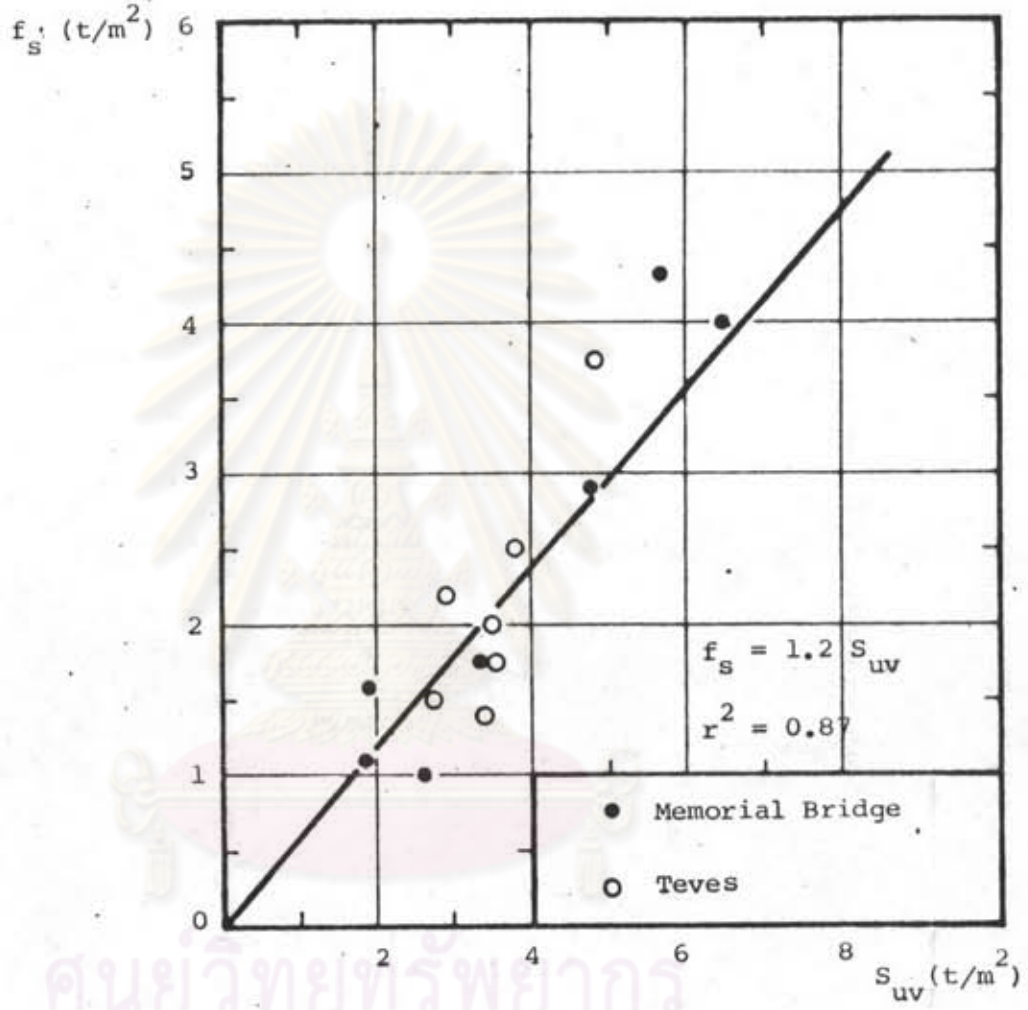


Fig. 4.10 Correlation Between f_s Versus S_{uv}

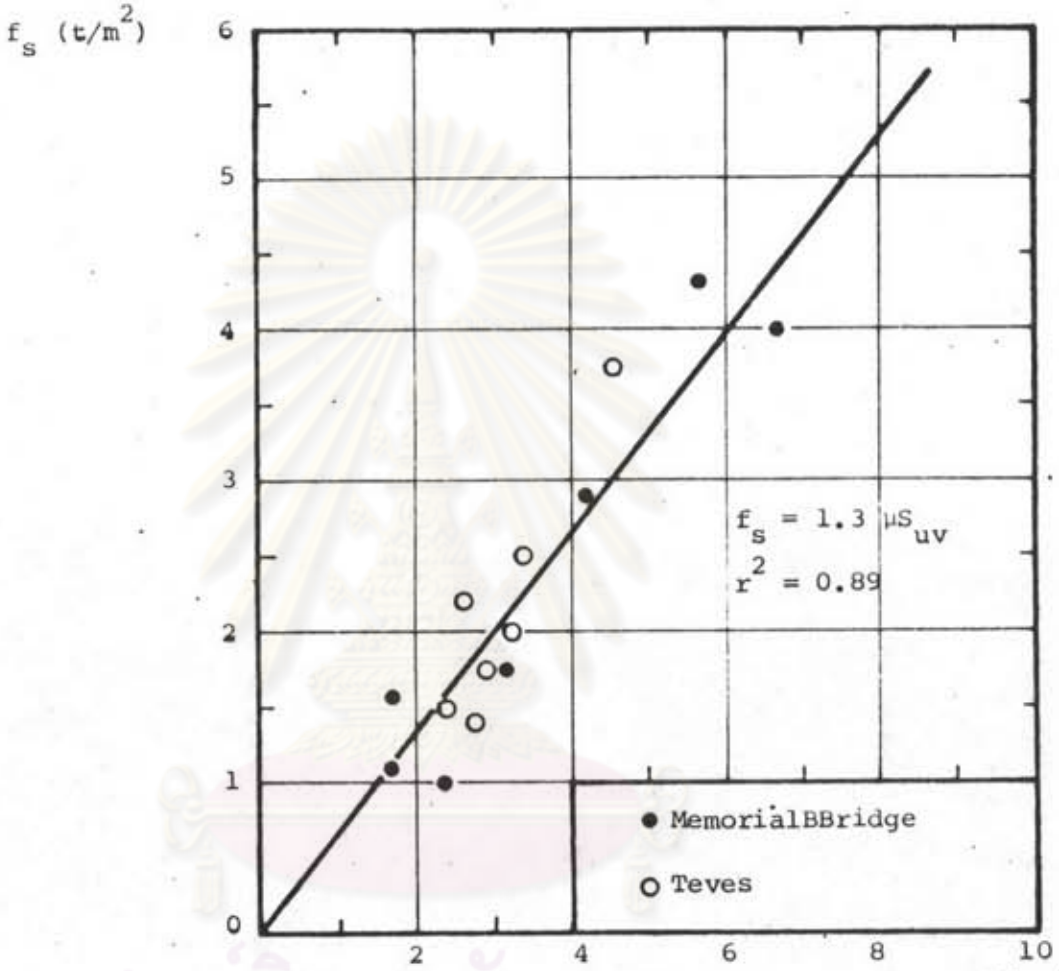


Fig. 4.11 Correlation Between f_s Versus μS_{uv} μS_{uv} (t/m^2)

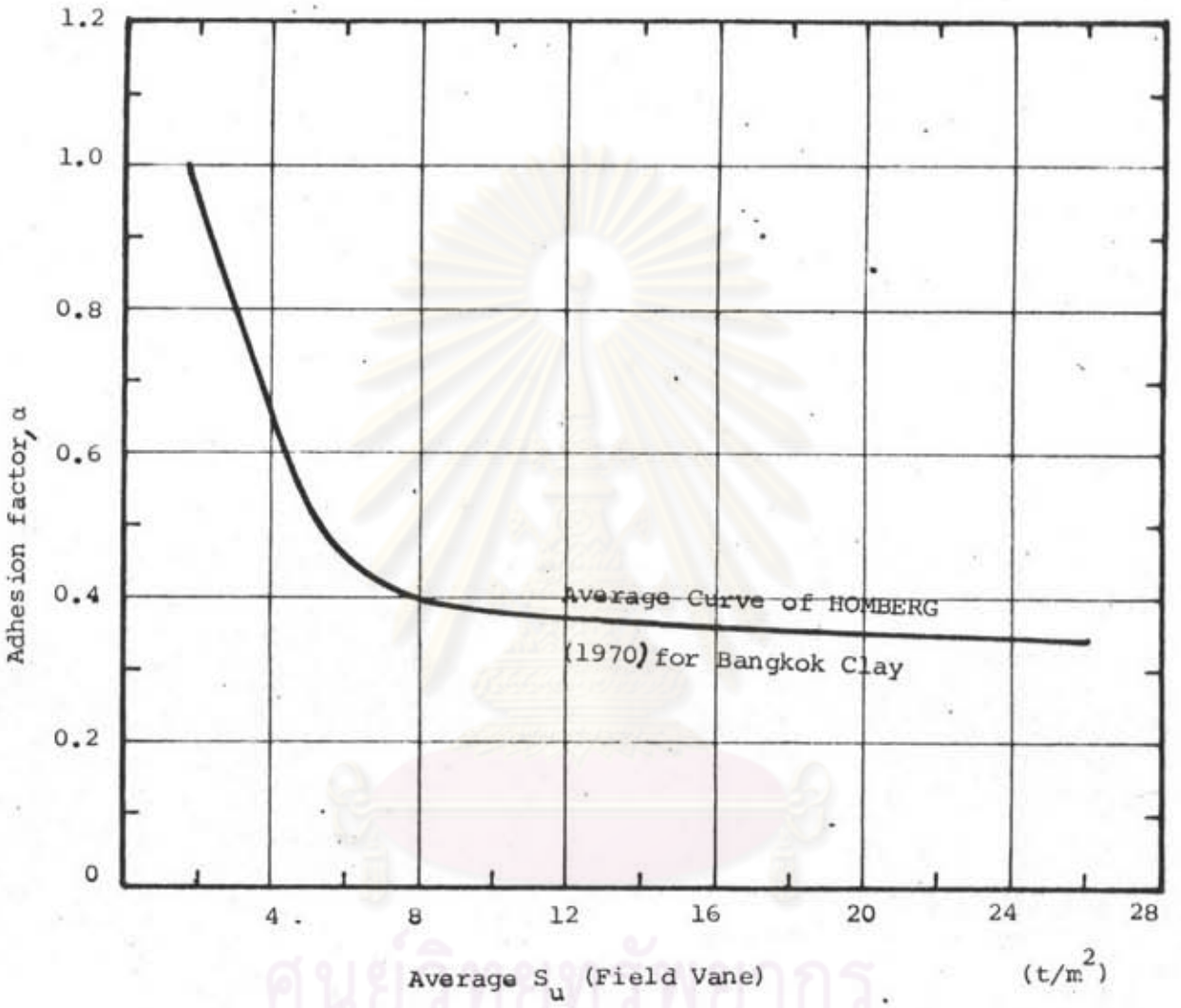


Fig. 4.12 Relationship Between adhesion factor and field vane shear Strength of the clay.

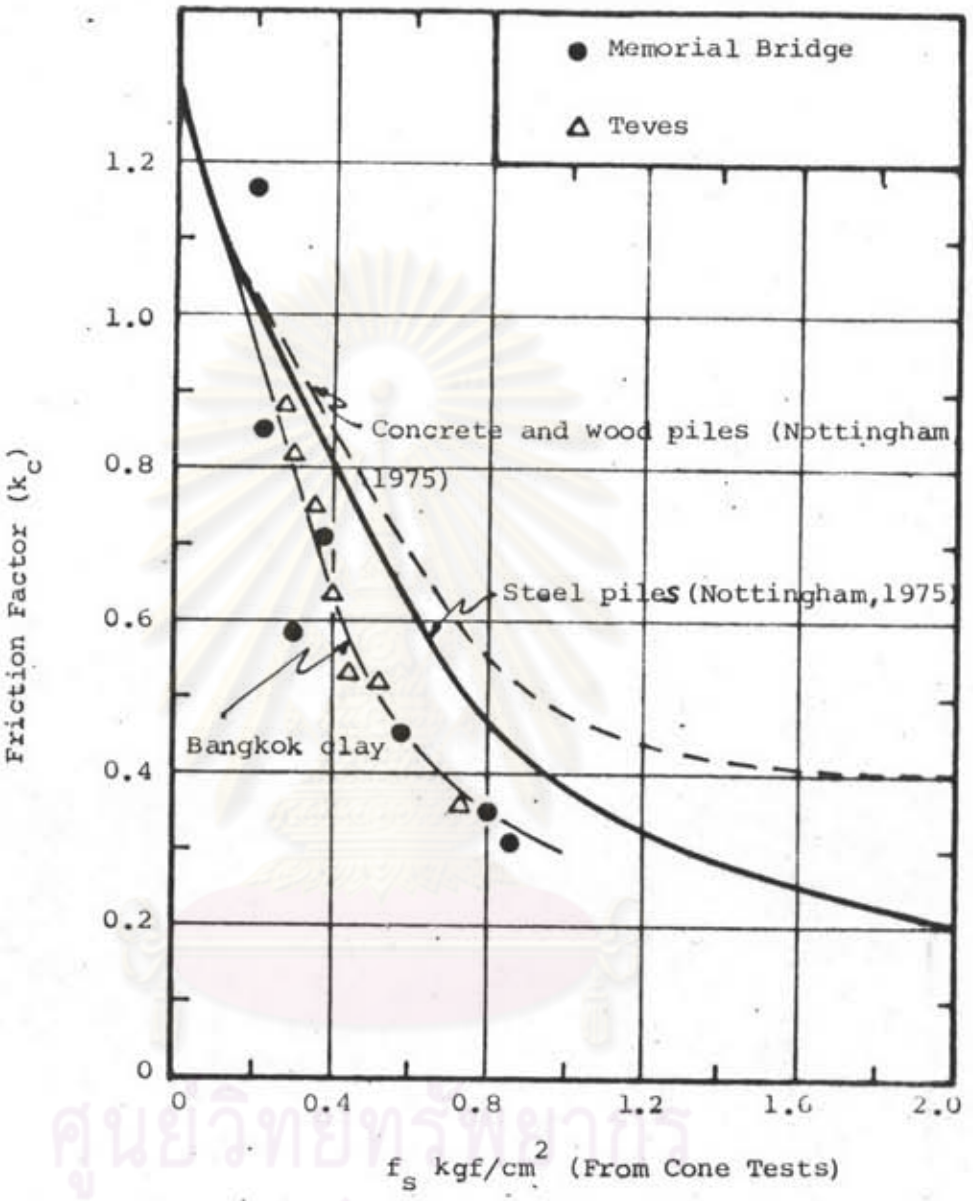


Fig. 4.13 Comparison Between Friction Factor.
Used only in Soft and Medium Clay.

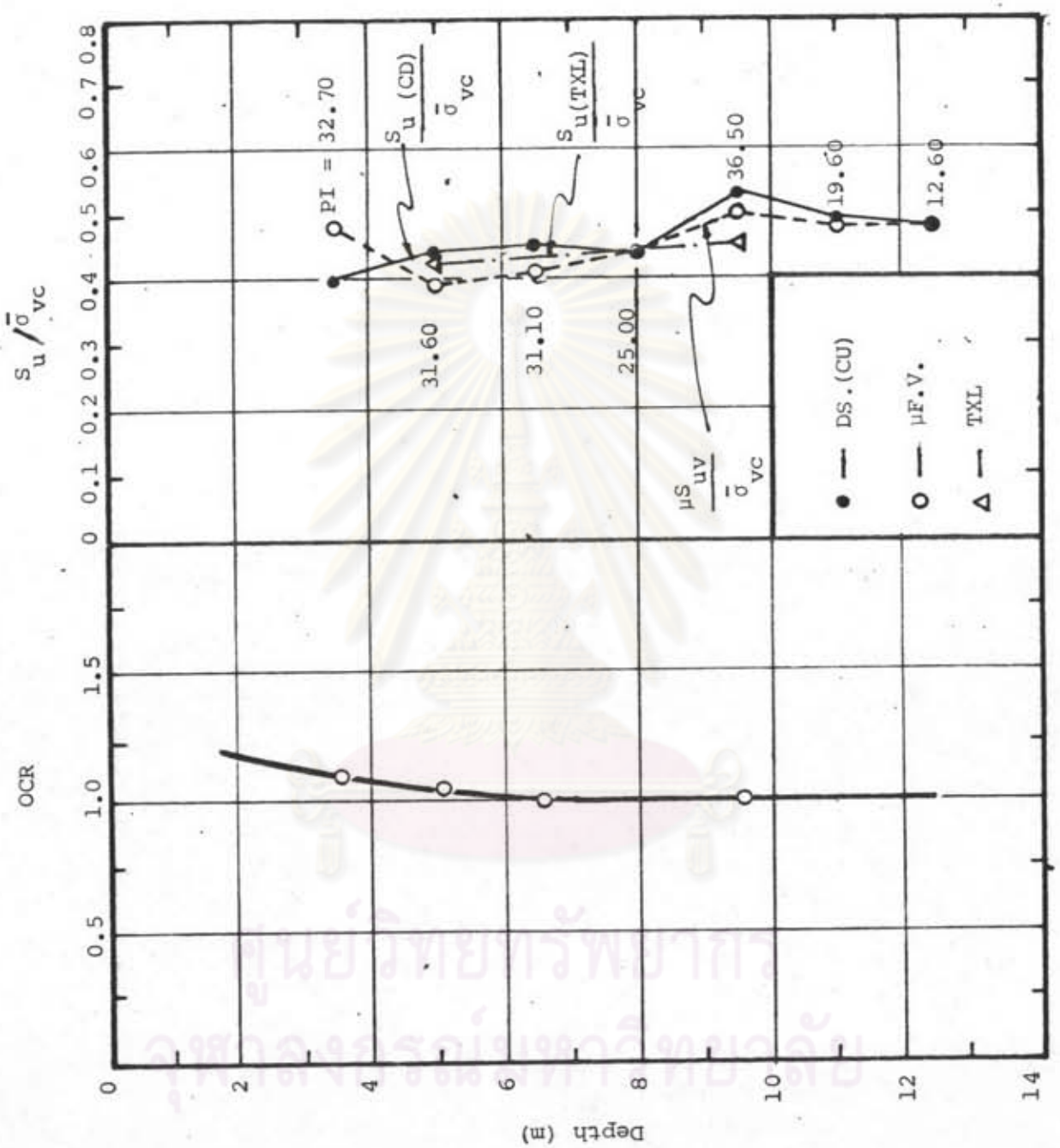


Fig. 4.14 Variation of OCR and Normalized with depth at Memorial Bridge

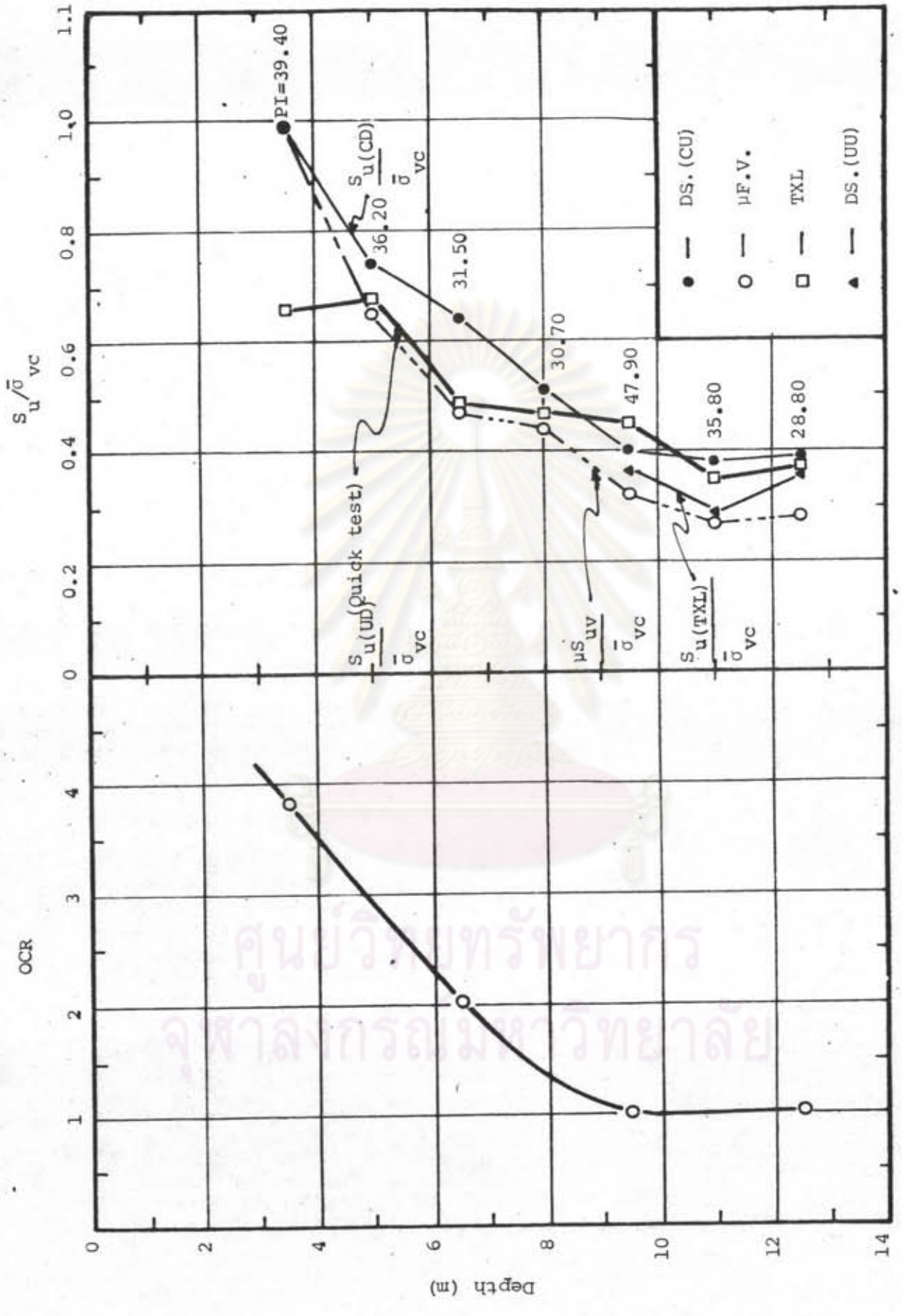


Fig. 4.15 Variation of OCR and Normalized with depth at Teves

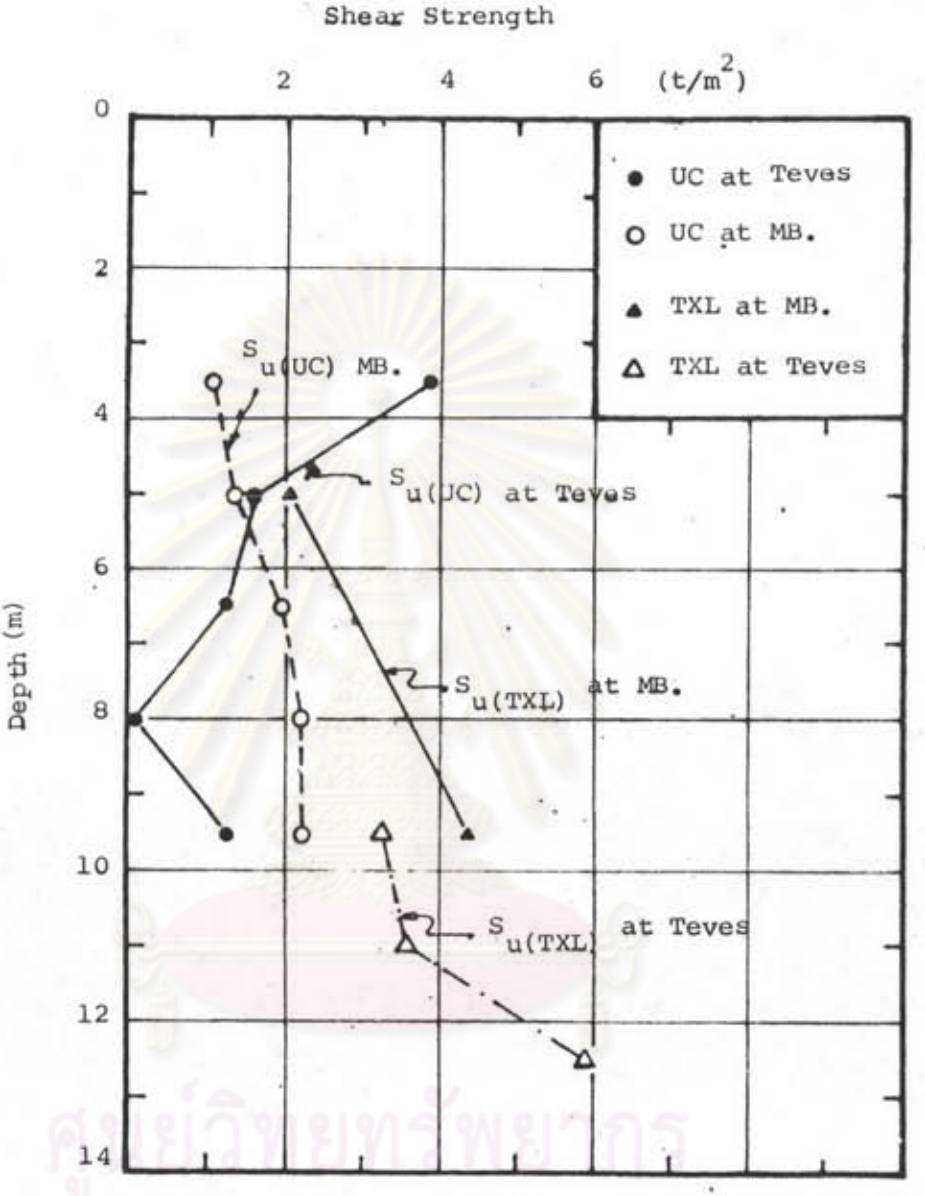


Fig. 4.16 Comparison of Shear Strength from $\bar{CAU}$ Triaxial and Unconfined compression tests.

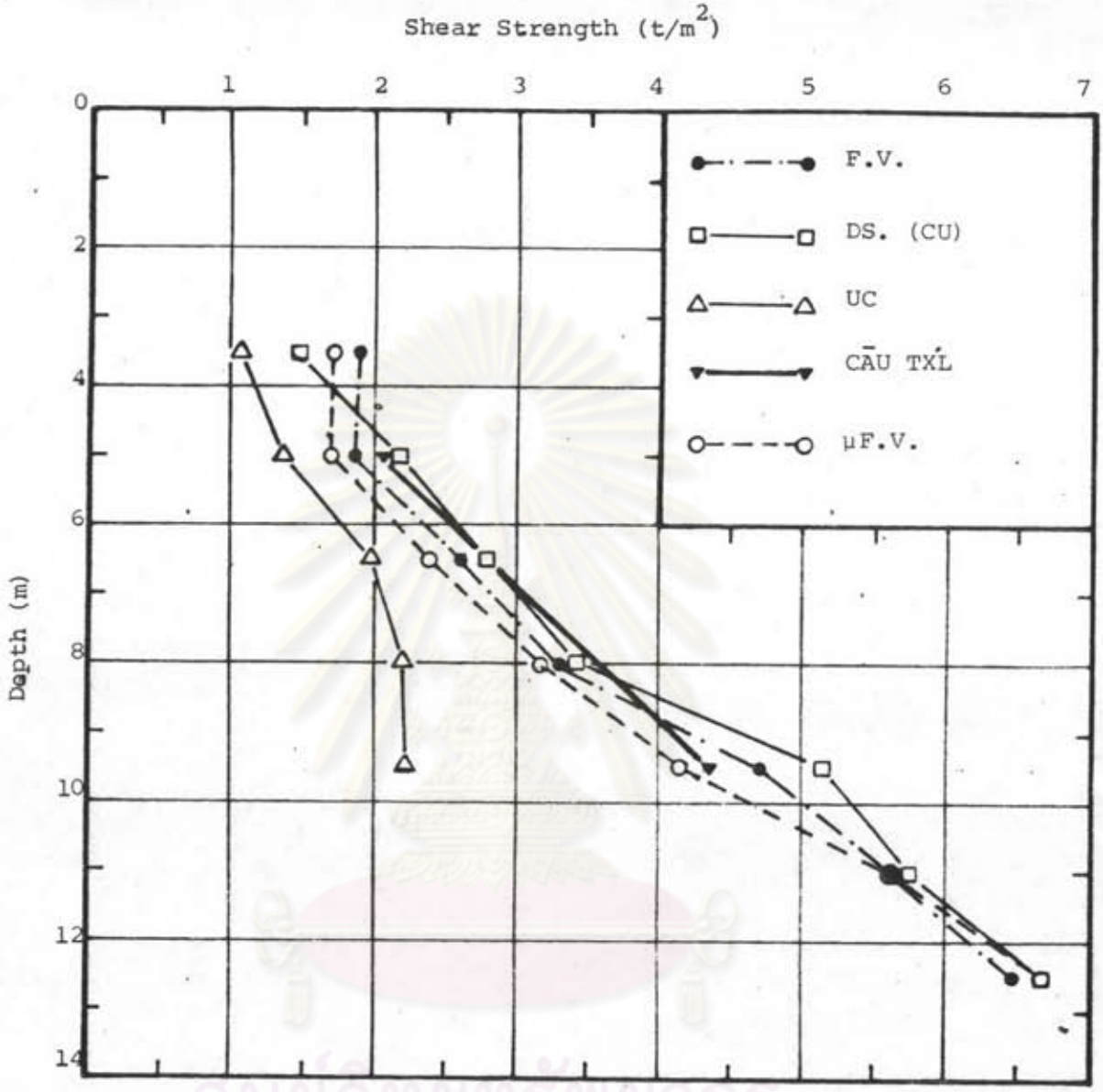


Fig. 4.17 Comparison of Shear Strength at Memorial Bridge

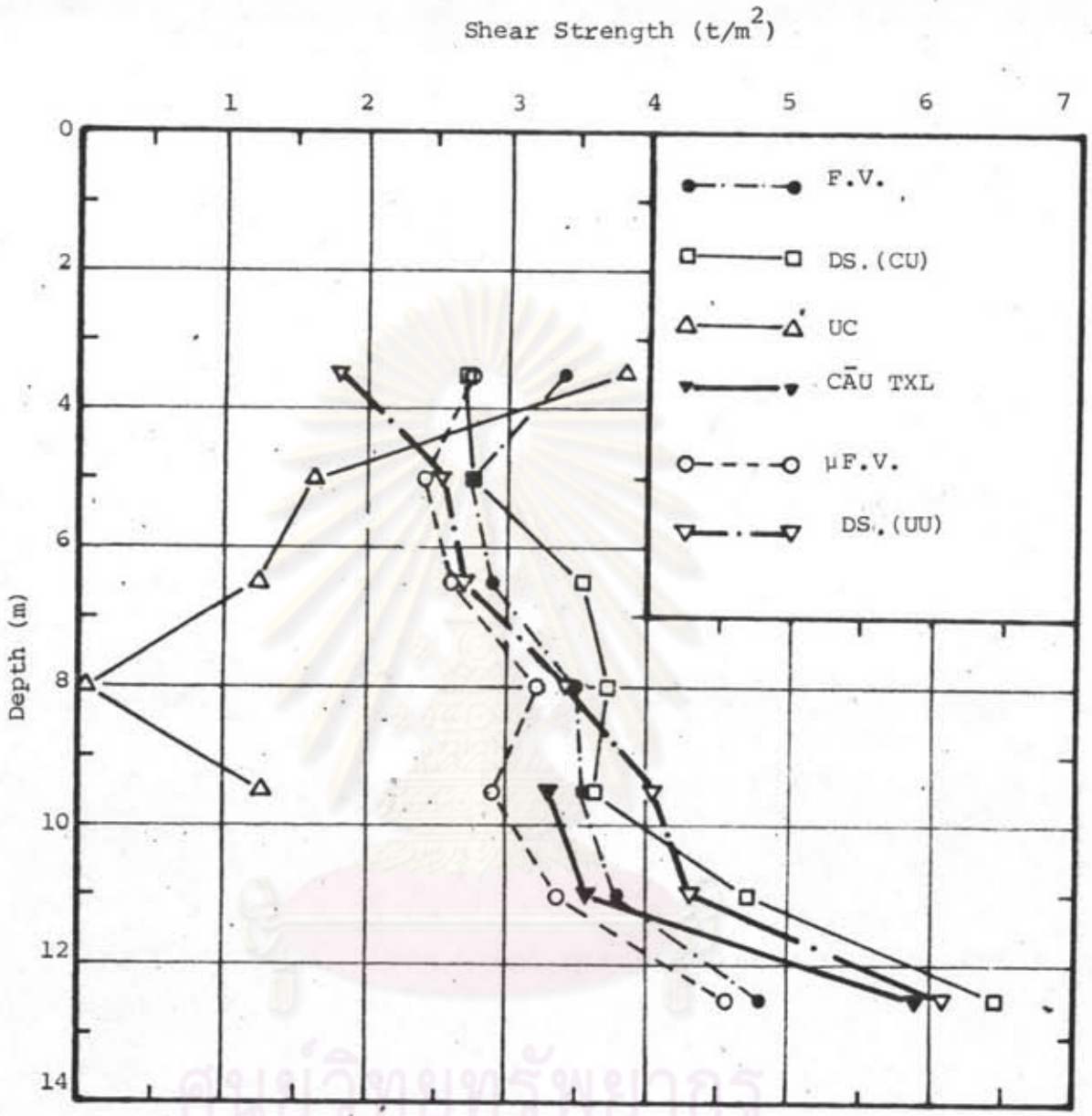


Fig. 4.18 Comparison of Shear Strength at Teves

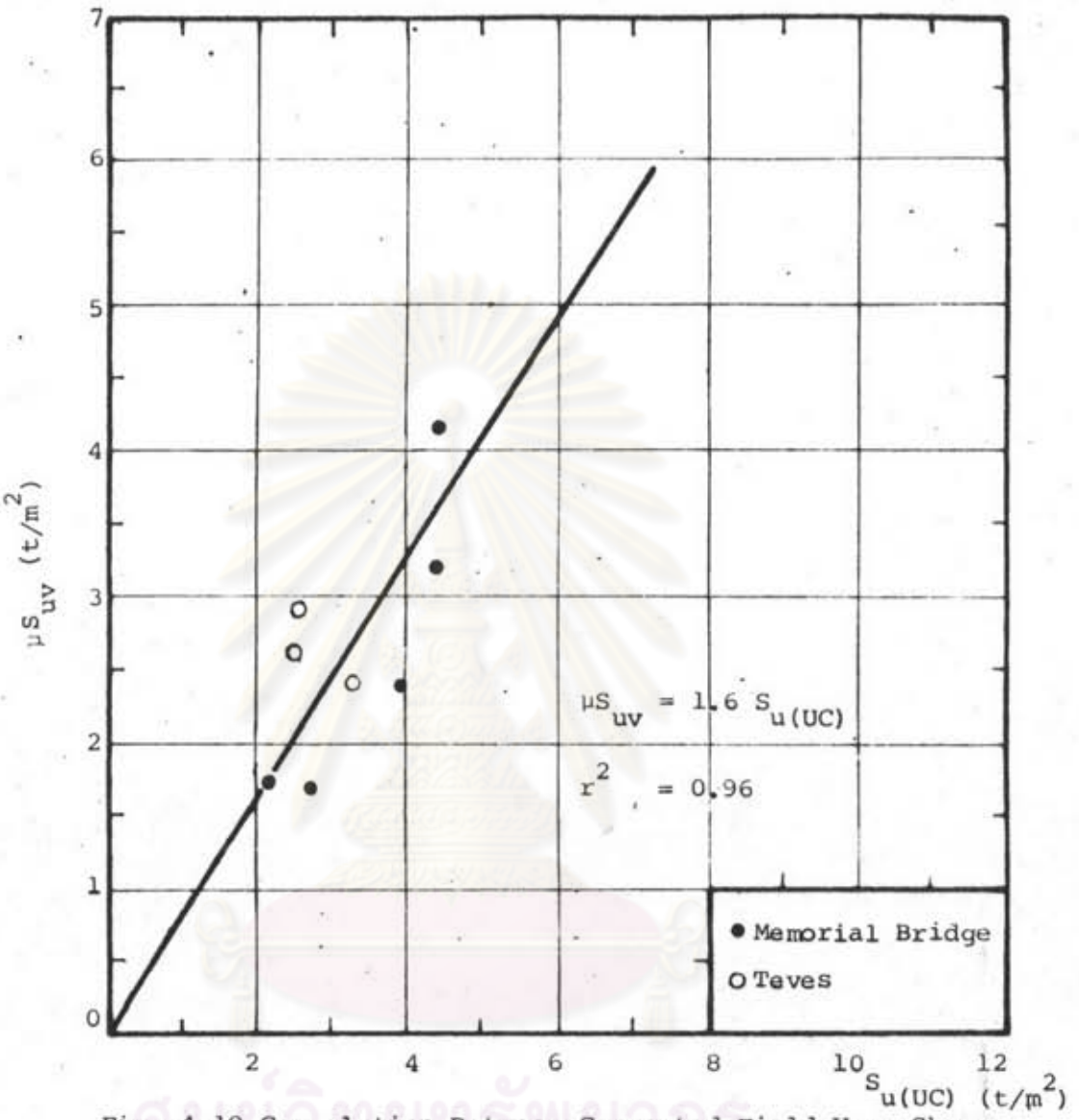


Fig. 4.19 Correlation Between Corrected Field Vane Shear Strength Versus Unconfined Compressive Strength

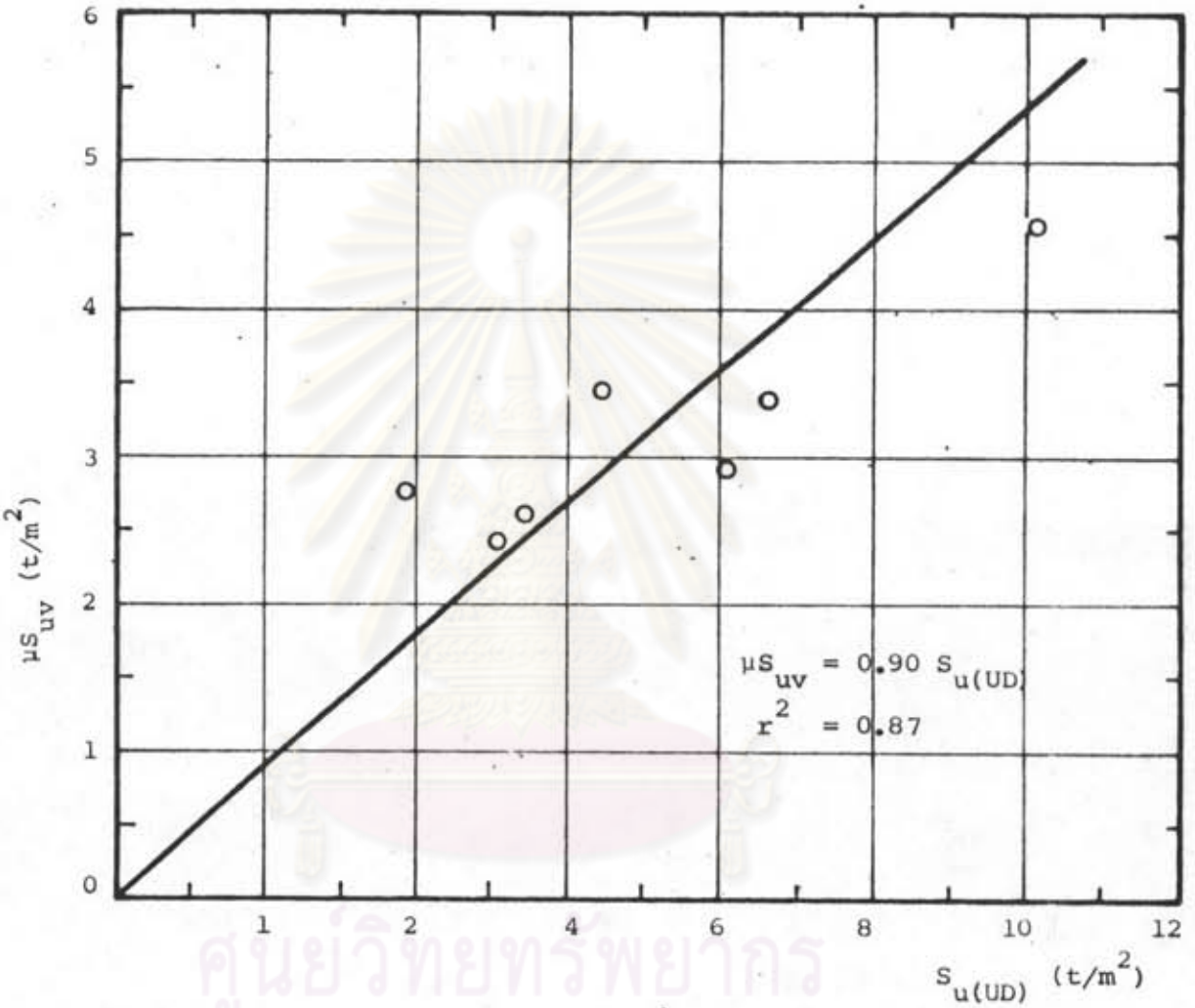


Fig. 4.20 Correlation Between S_{uv} Versus $S_{u(UD)}$ at Teves

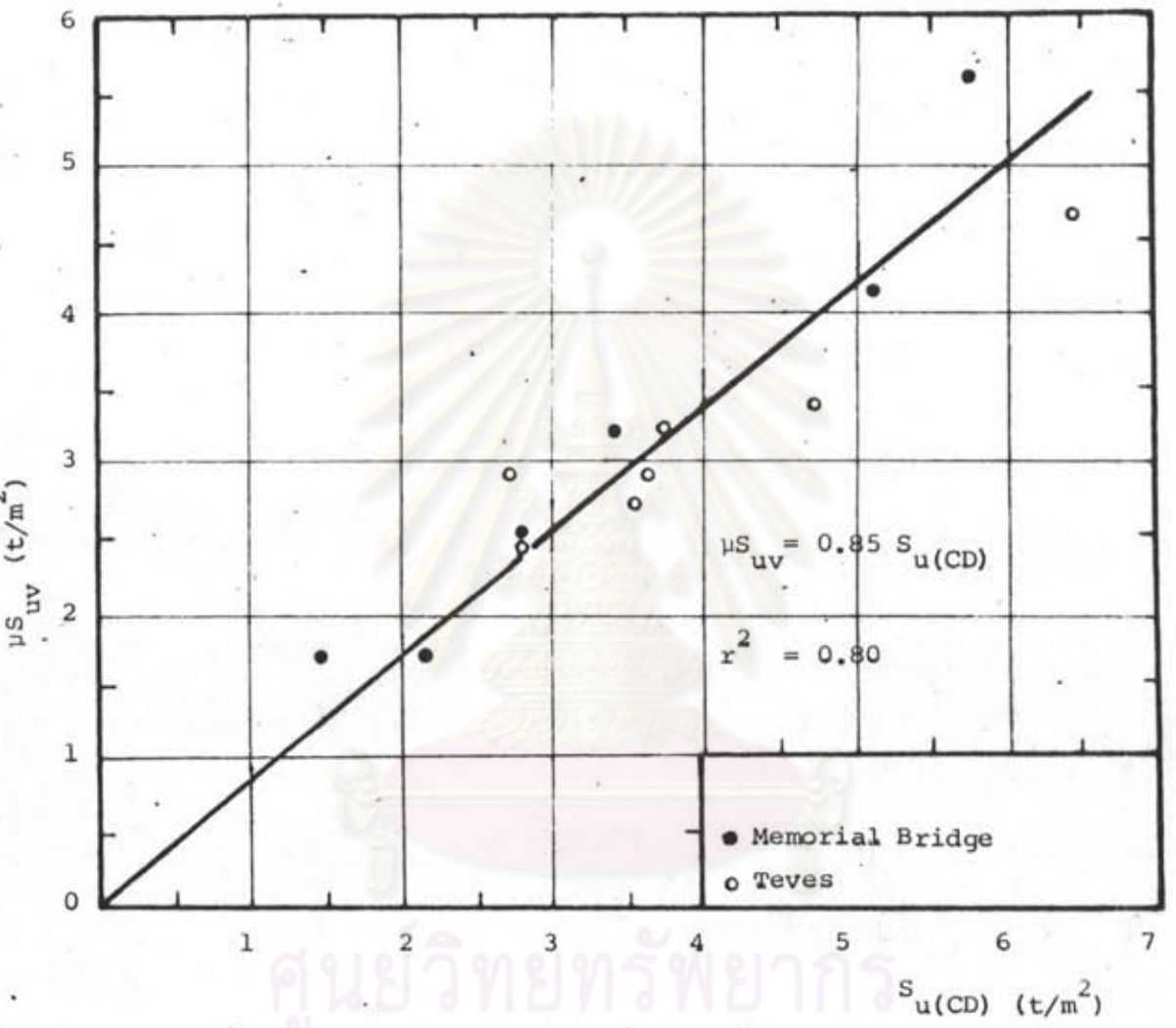


Fig. 4.21 Correlation Between μS_{uv} Versus $S_{u(CD)}$

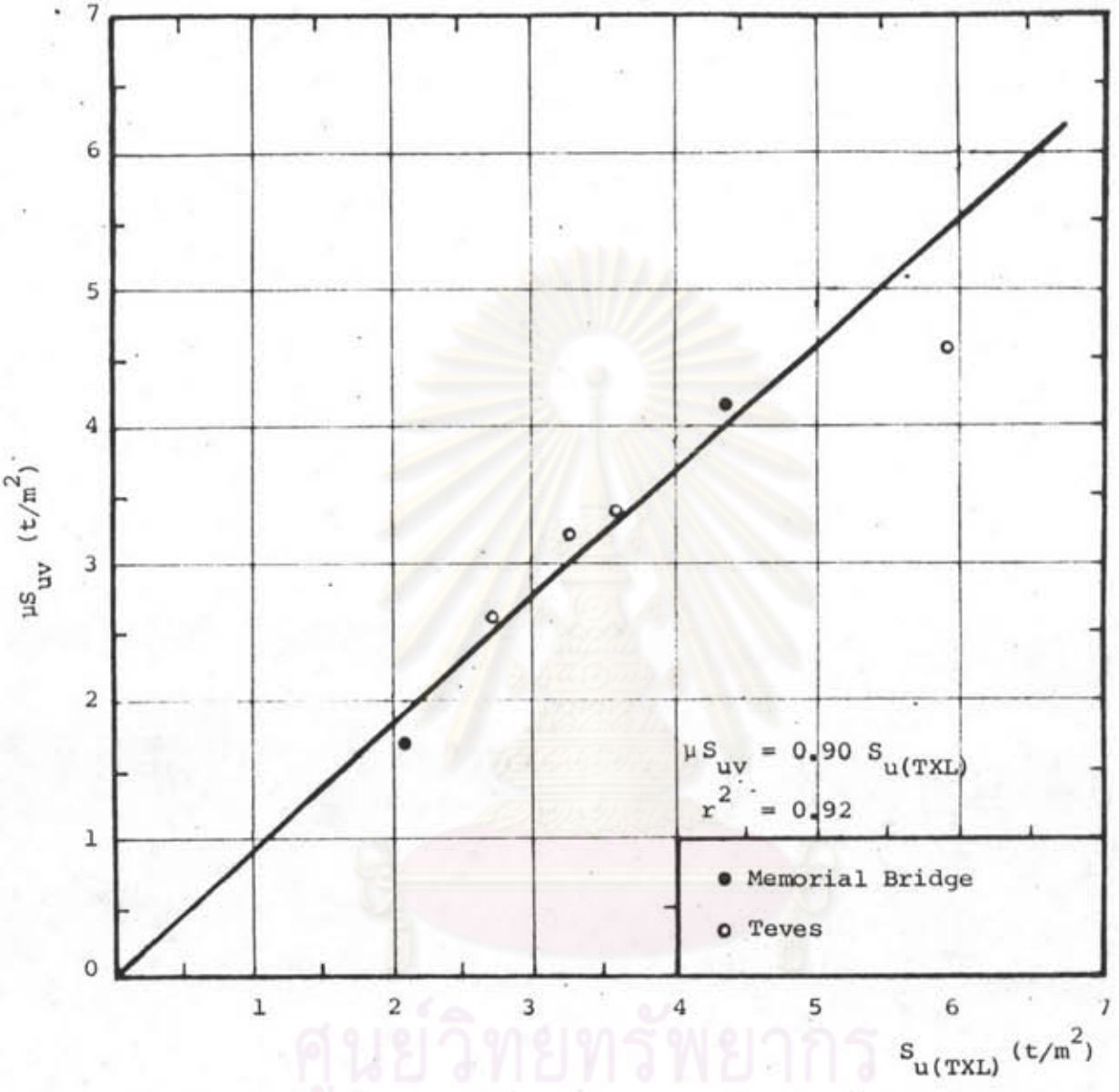


Fig. 4.22 Correlation Between μS_{uv} Versus $S_{u(TXL)}$

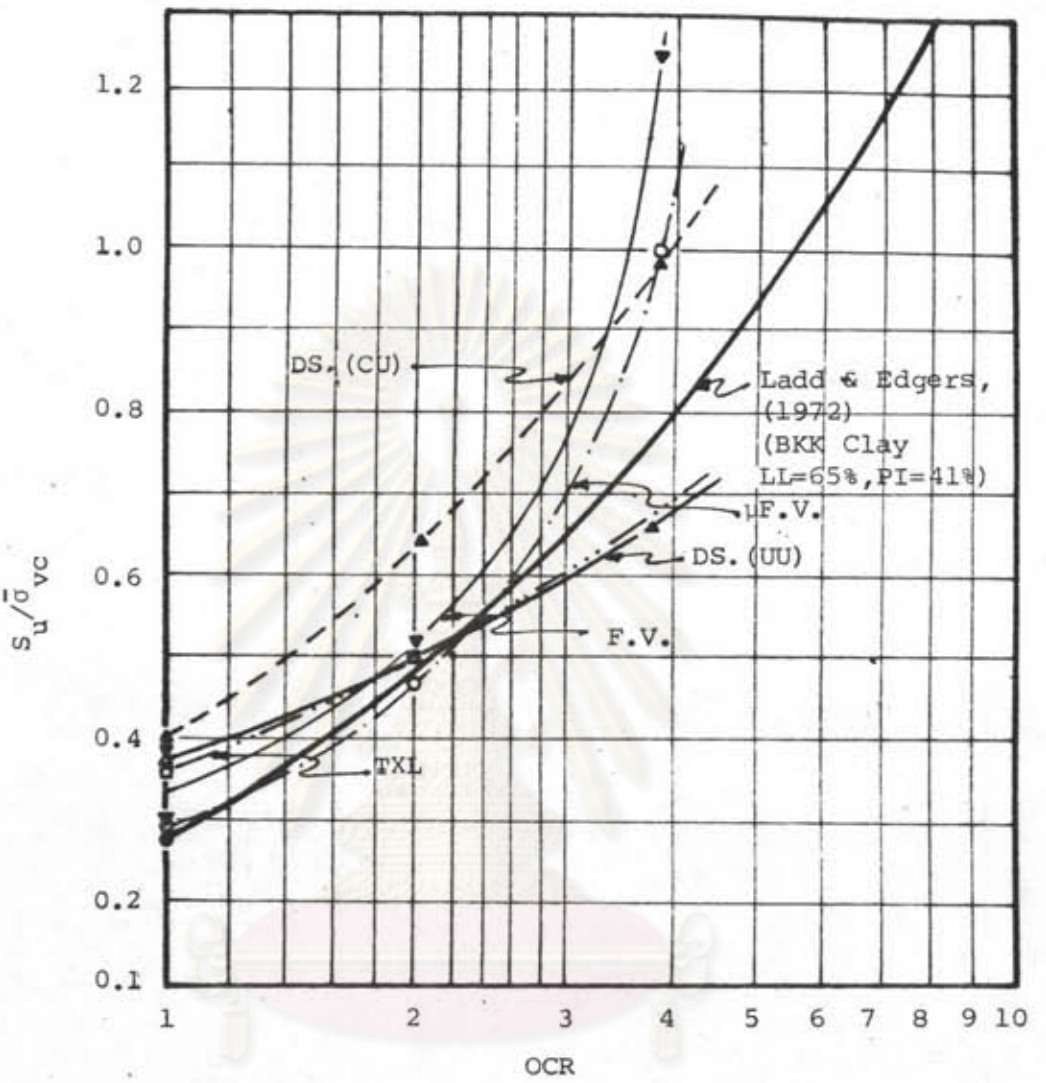


Fig. 4.23 Normalized Shear Strength Versus log.OCR

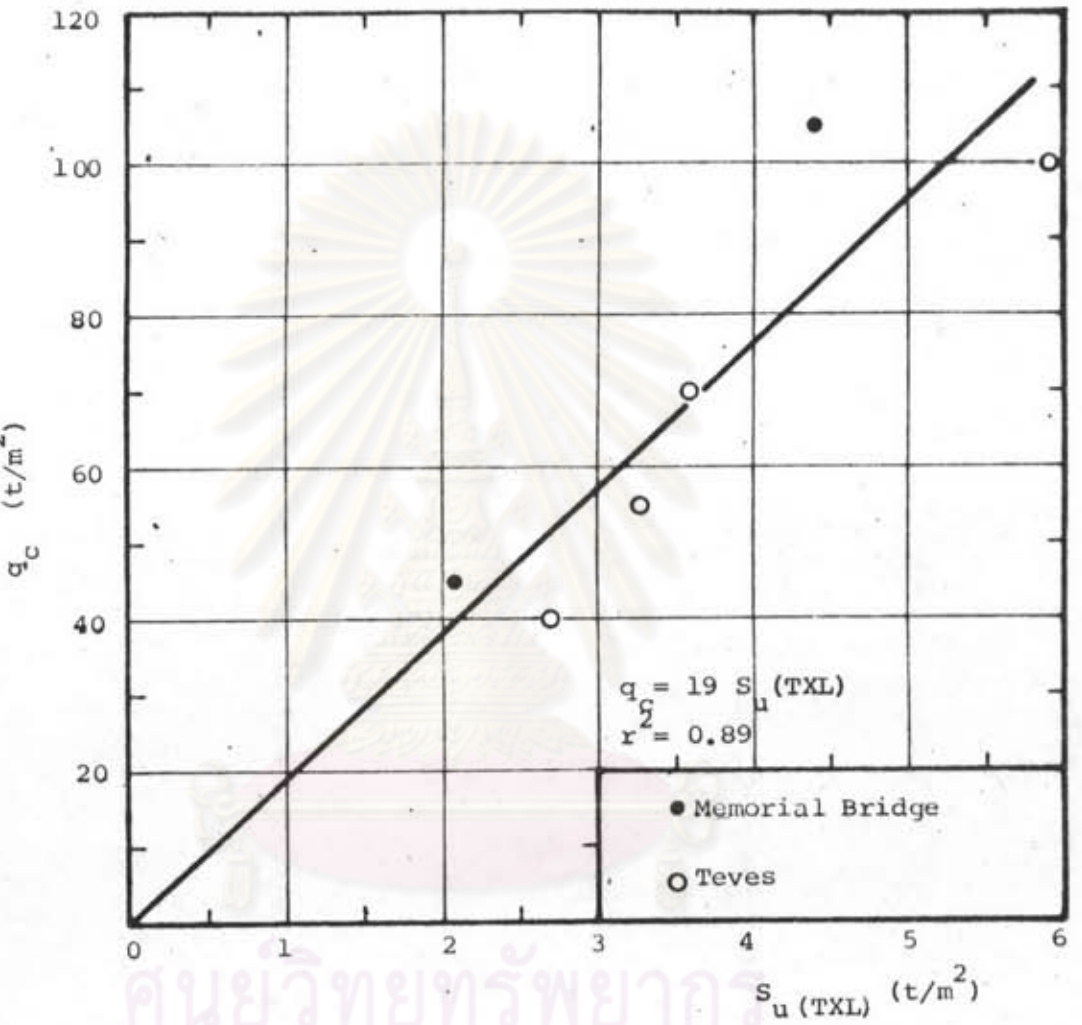


Fig. 4.24 Correlation Between Cone Resistance Versus $S_{u\,(TXL)}$

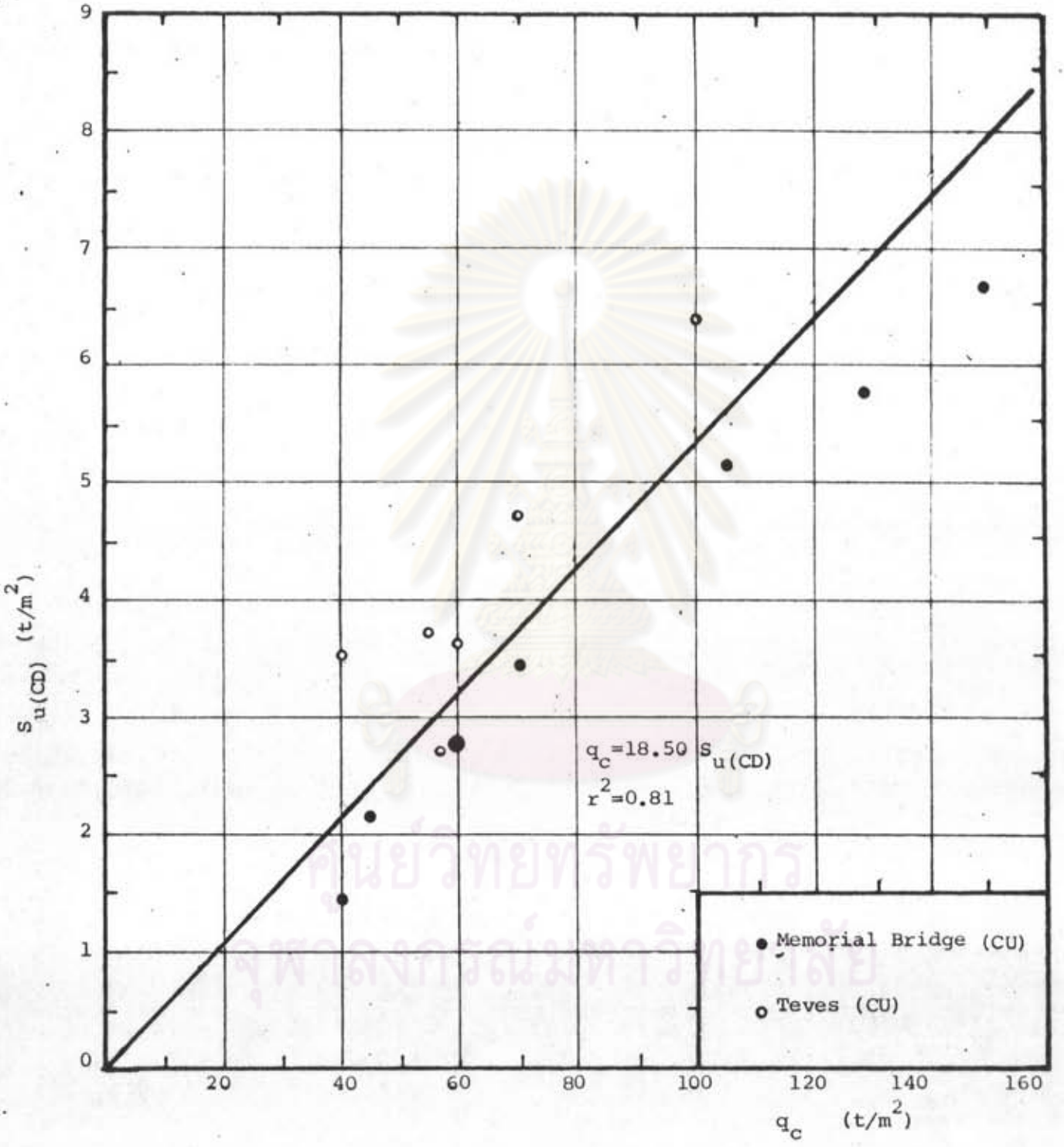


Fig. 4.25 Correlation Between $S_{u(CD)}$ Versus q_c

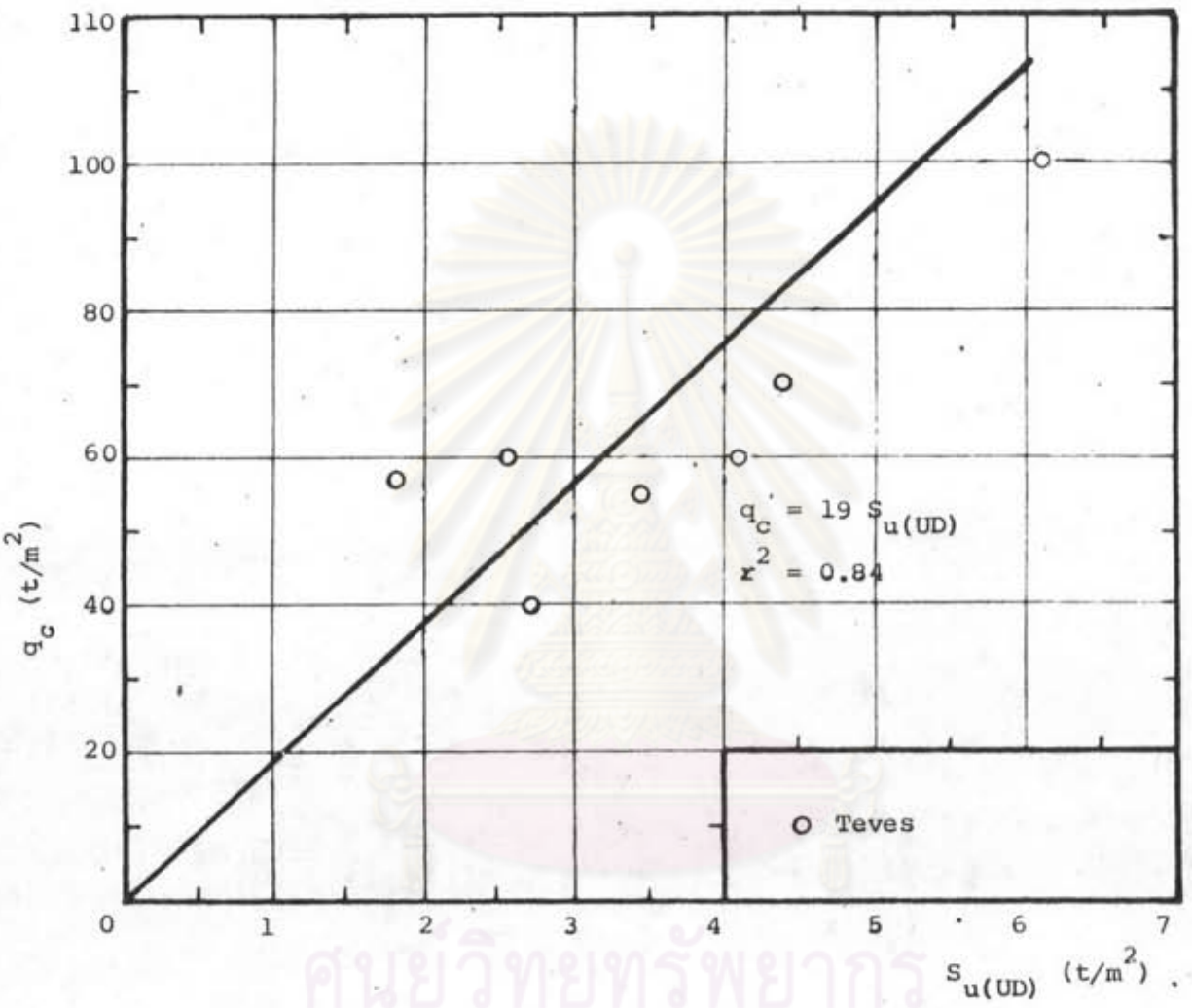


Fig. 4.26 Correlation Between Cone Resistance Versus Quick Direct Shear Tests.

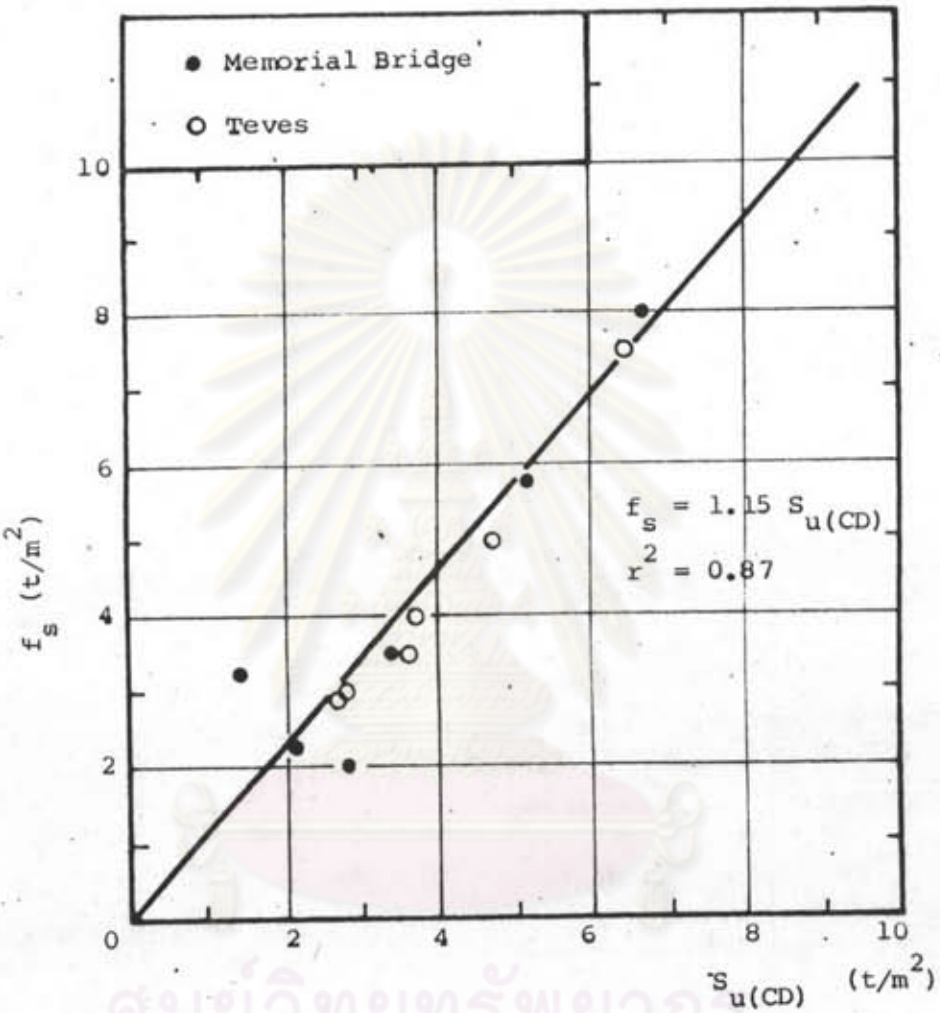


Fig. 4.27 Correlation Between f_s Versus $S_{c(CD)}$

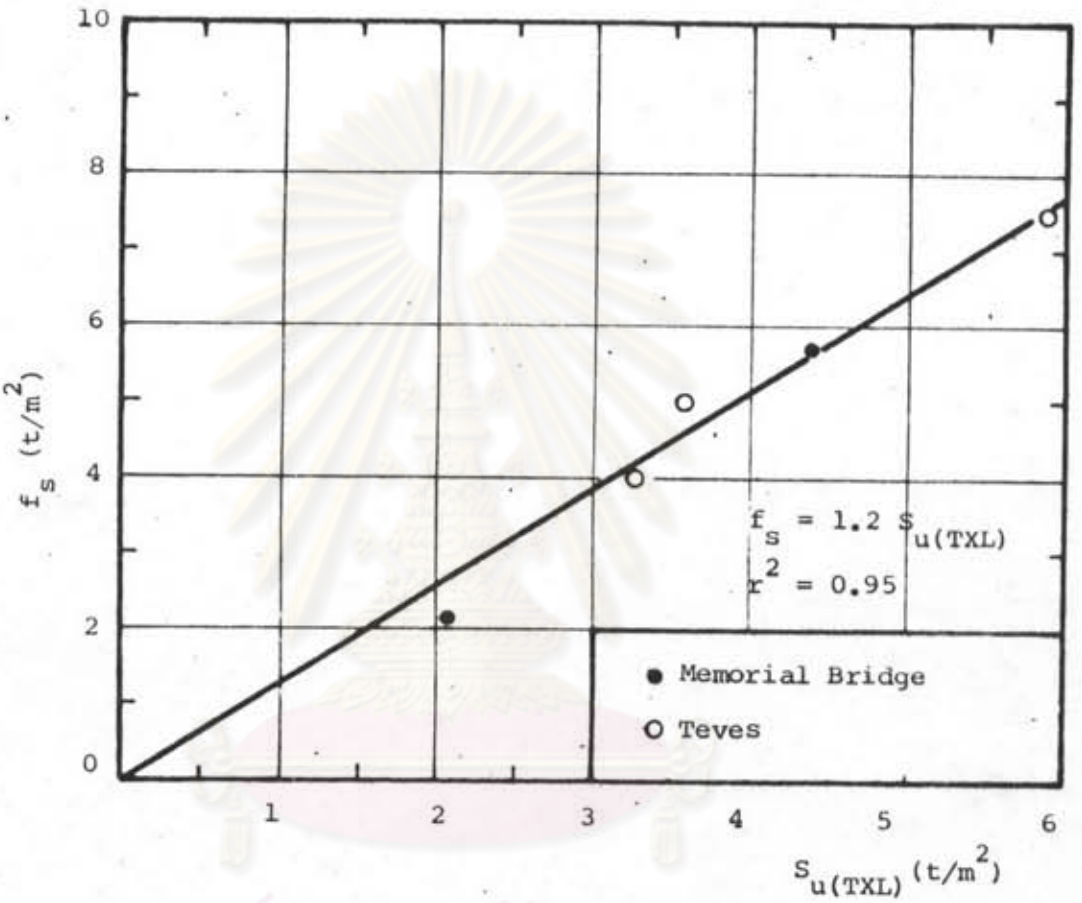


Fig. 4.28 Correlation Between f_s Versus $S_{u(TXL)}$

4.9t

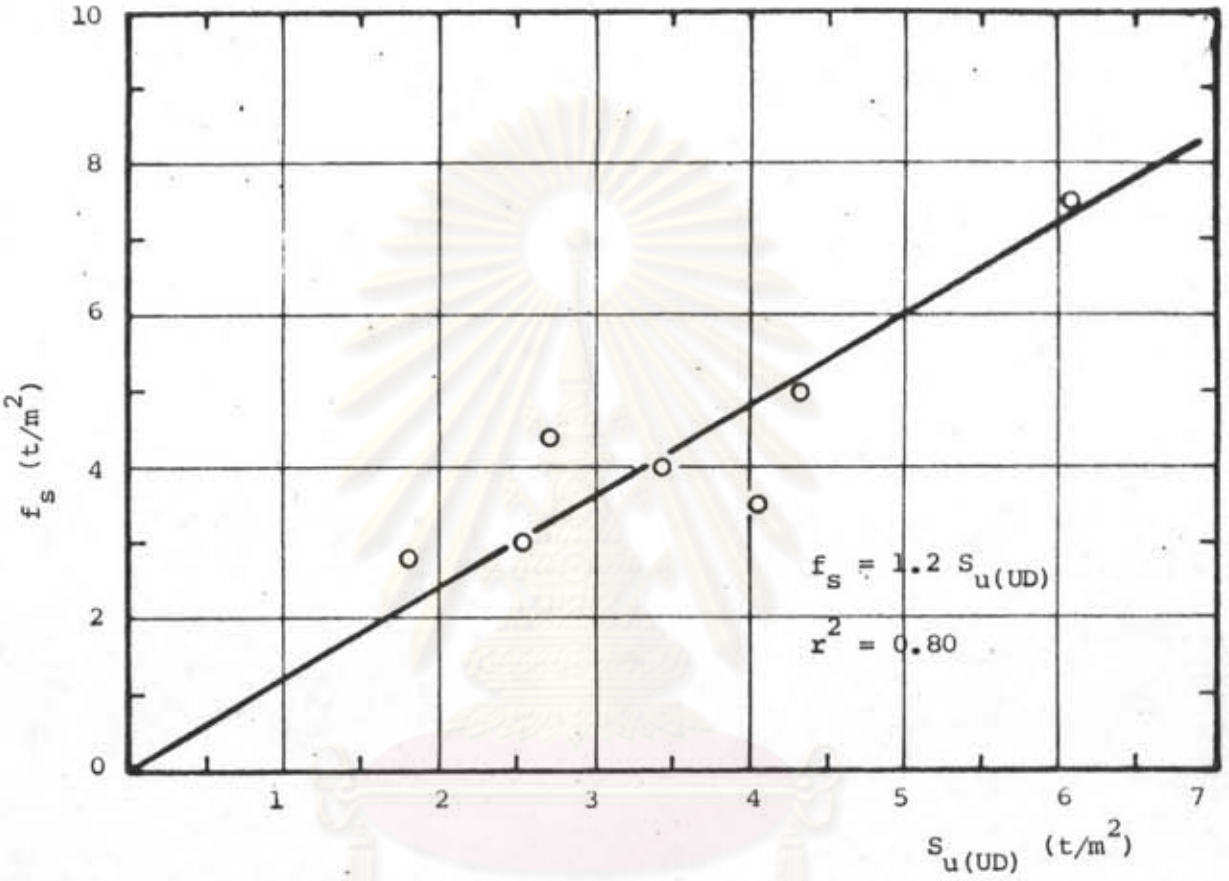


Fig. 4.29 Correlation Between f_s Versus $S_{u(UD)}$

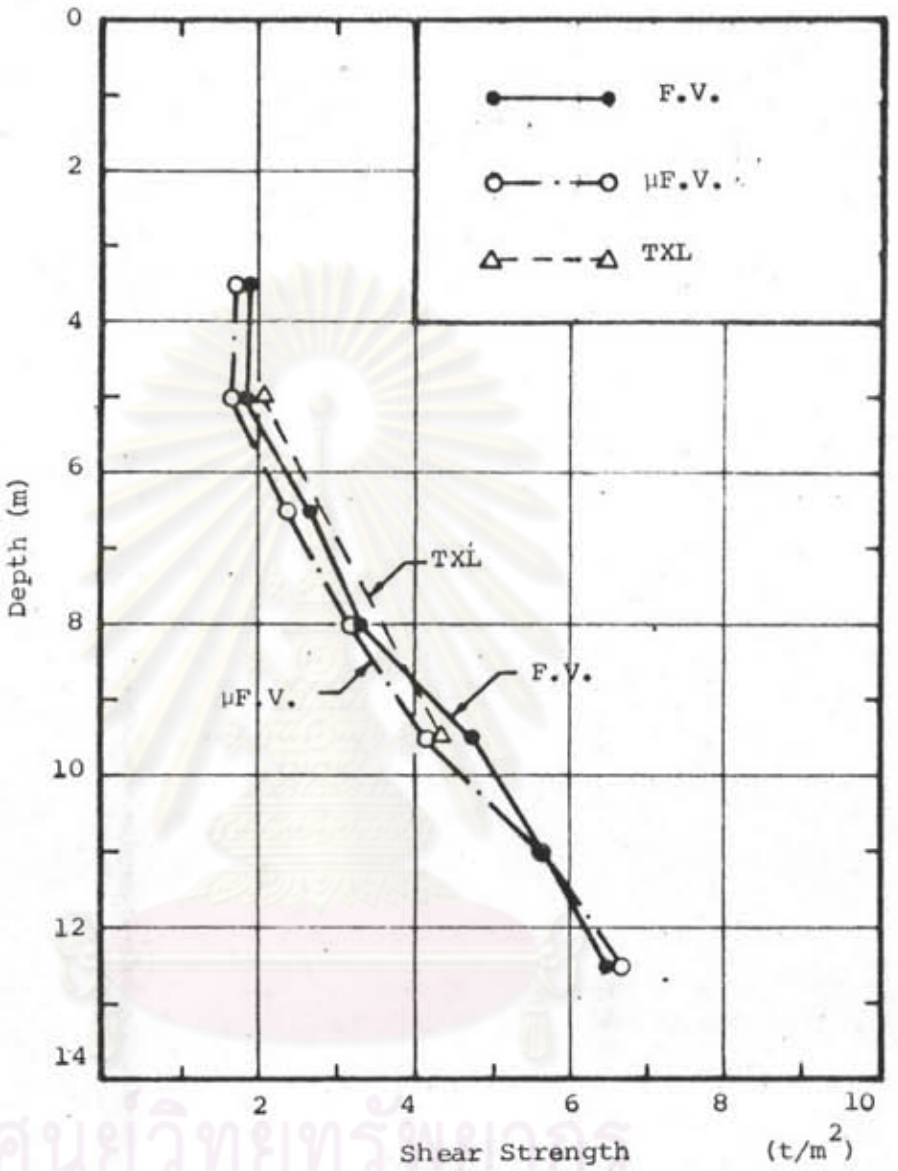


Fig. 4.30 Comparison of Undrained Shear Strength from Field Vane Tests and Triaxial Tests at Memorial Bridge

4.30

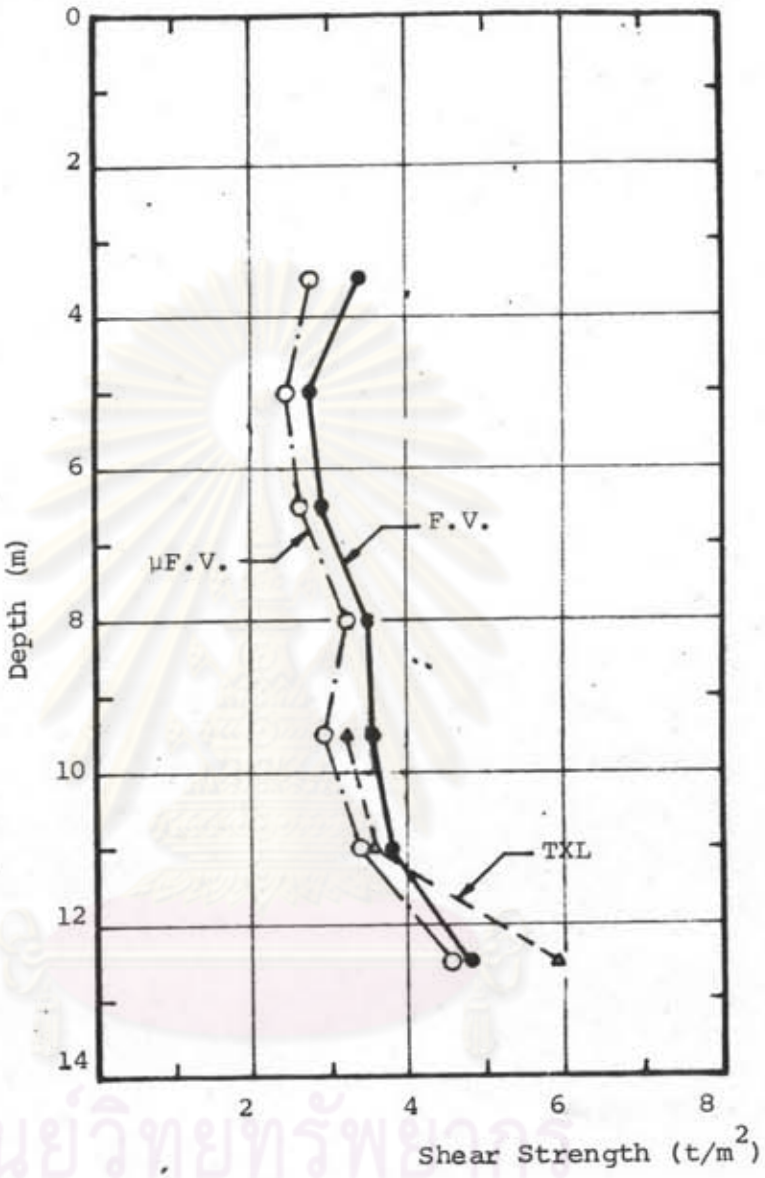


Fig. 4.31 Comparison of Undrained Shear Strength from Field Vane Tests and Triaxial Test at Teves

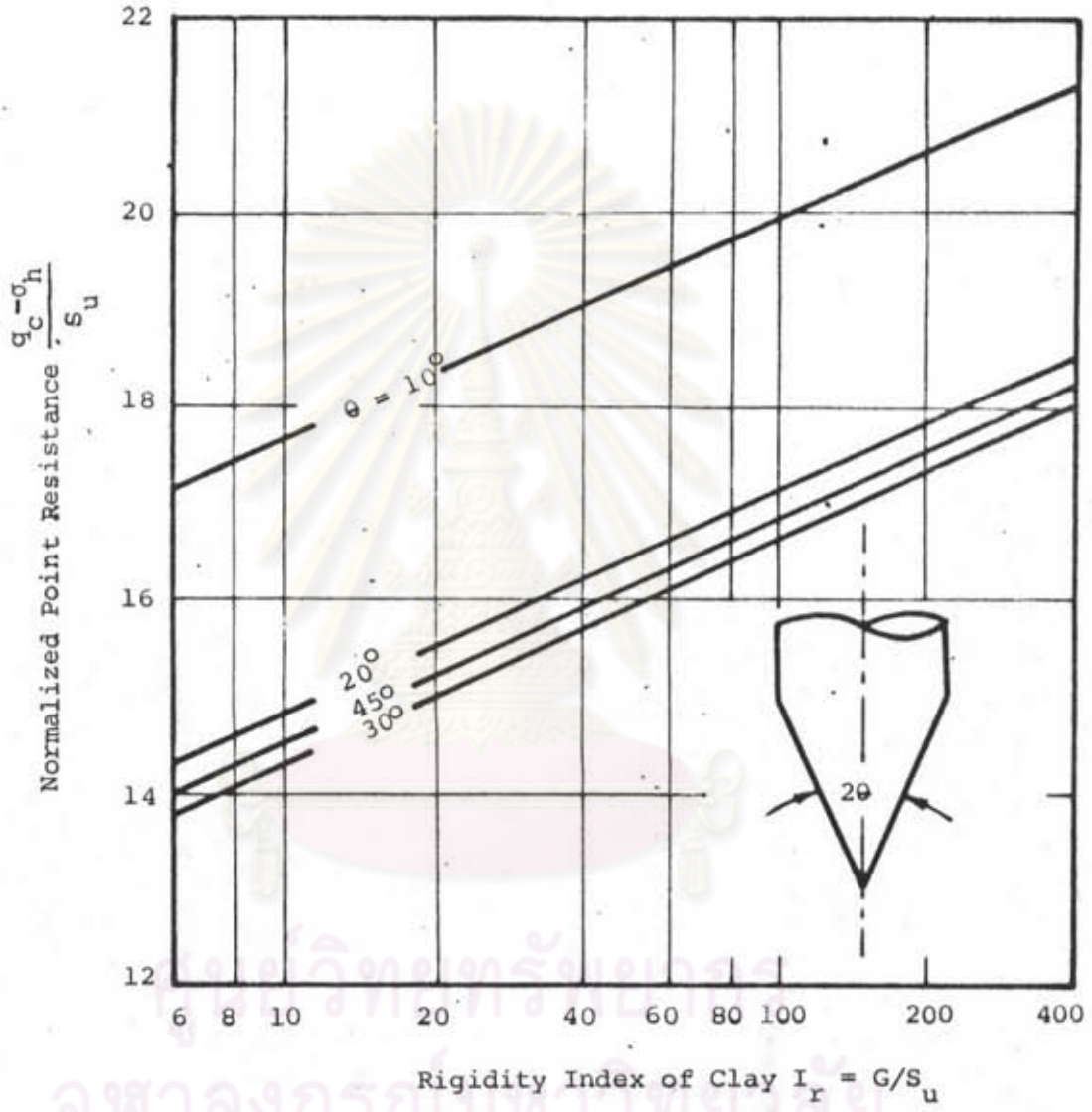


Fig. 4.32 Effect of the Clay Rigidity Index, I_r, and the Cone Angle, 2θ, on Penetration resistance.

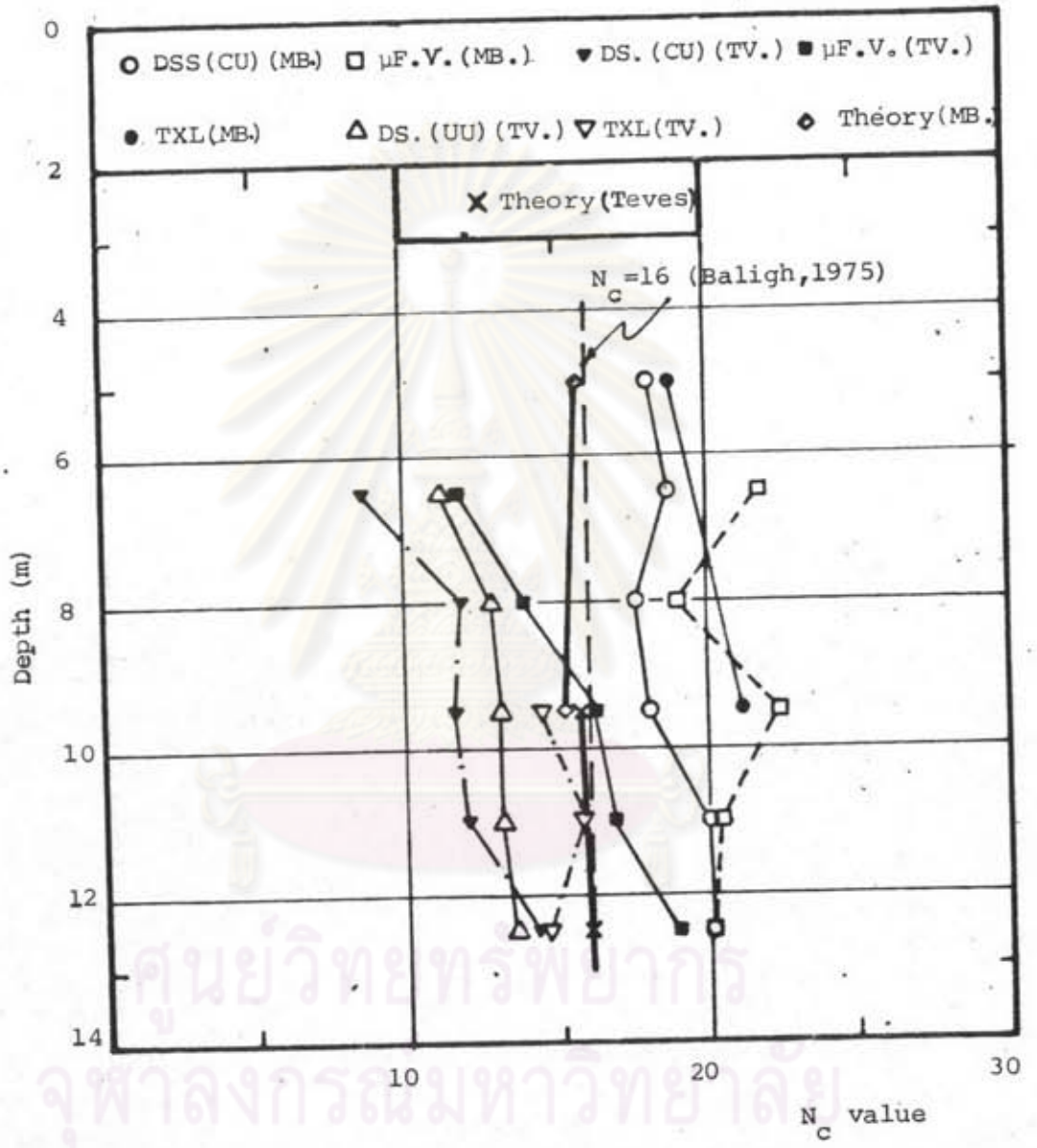


Fig. 4.33 N_c value Versus Depth

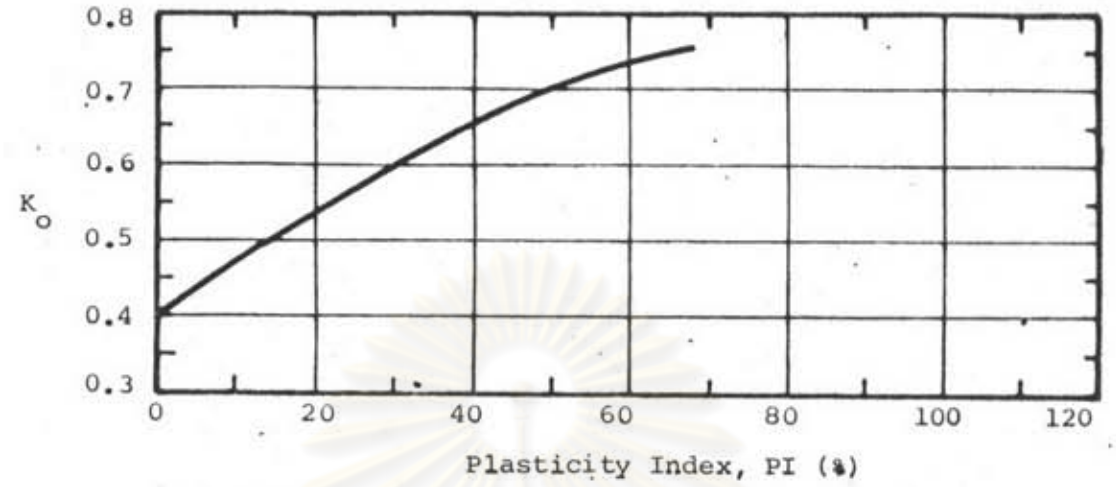


Fig. 4.34 K_o of normally consolidated clays Versus Plasticity Index (From Ladd, 1977)

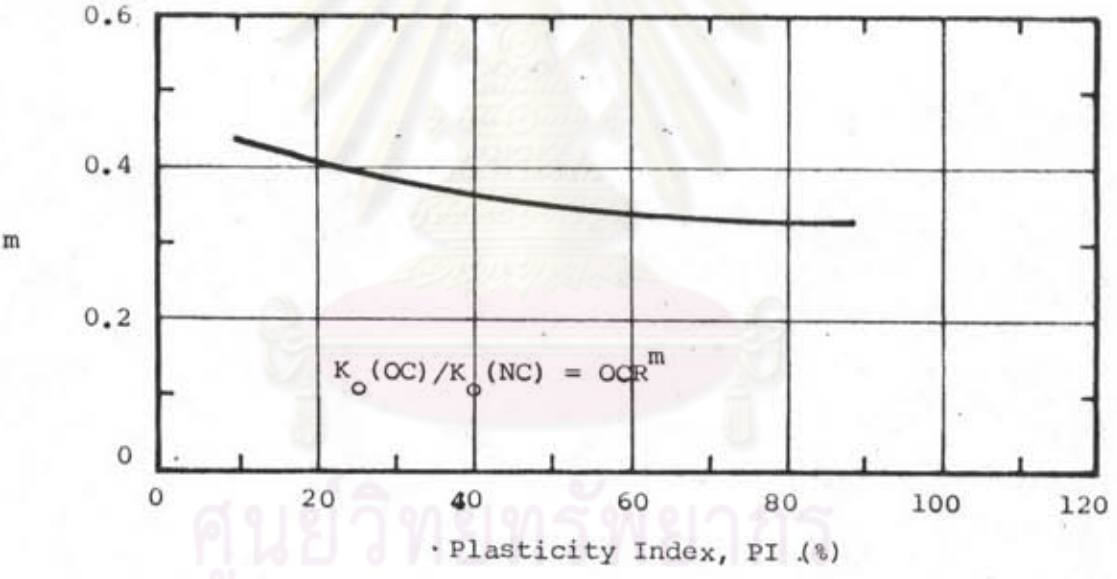


Fig. 4.35 Coefficient m relating K_o and OCR Versus Plasticity Index (From Ladd, 1977)

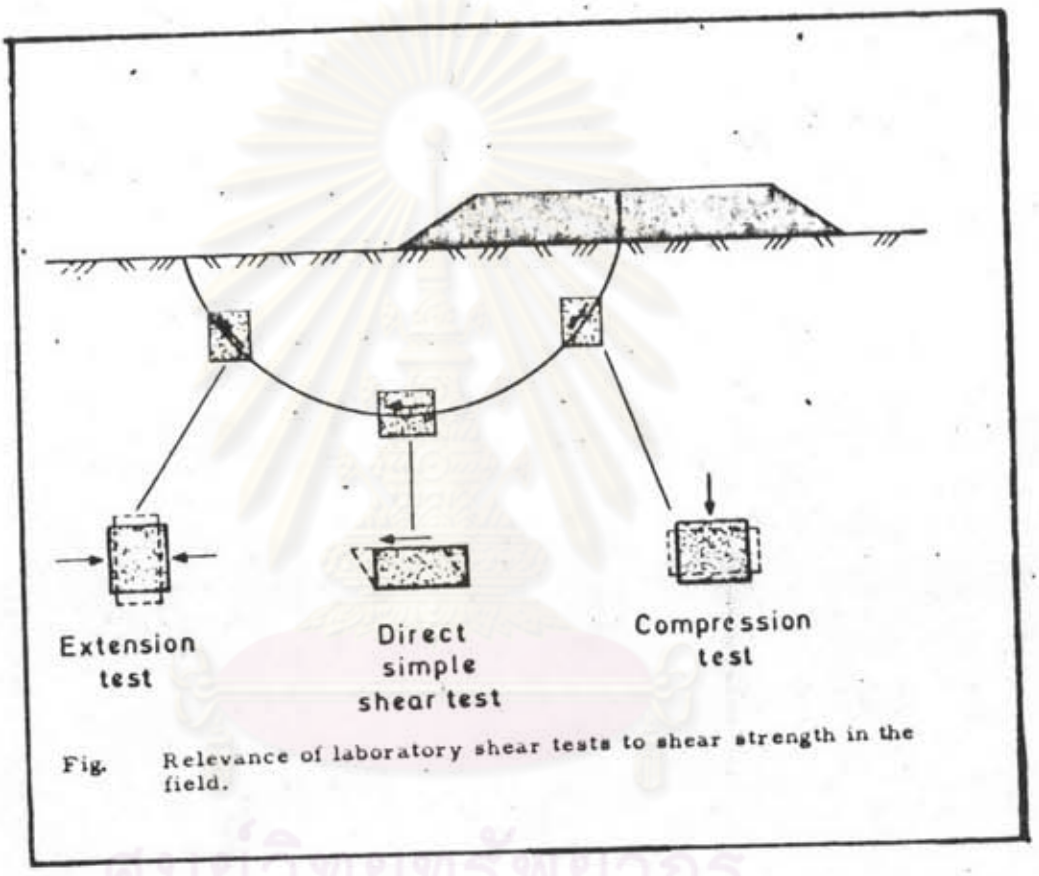


Fig. Relevance of laboratory shear tests to shear strength in the field.

Fig. 4.36 Relavance of laboratory shear tests to shear strength in the field.

APPENDIX A.

Table A-1 Results from Direct shear tests at Memorial Bridge

Depth (m)	γ_T (t/m^3)	$\bar{\sigma}_{vc}$ (t/m^2)	Water content, %		$\frac{S_{u(CD)}}{\bar{\sigma}_{vc}}$	$S_{u(CD)}$ (t/m^2)
			Initial	Final		
3.50	1.50	3.70	61.00	58.10	0.40	1.46
5.00	1.66	4.90	56.45	50.45	0.44	2.16
6.50	1.75	6.20	51.48	51.80	0.45	2.79
8.00	1.67	7.77	40.34	40.15	0.44	3.42
9.50	1.69	9.70	42.99	41.80	0.53	5.14
11.00	1.70	11.73	36.81	31.15	0.49	5.75
12.50	1.87	13.90	33.44	29.81	0.48	6.67

Table A-2 Results from Direct shear tests at Teves

Depth (m)	γ_T (t/m^3)	$\bar{\sigma}_{vc}$ (t/m^2)	Consolidated quick direct shear test				Quick direct shear test			
			Water Content, %		$\frac{S_{u(UD)}}{\bar{\sigma}_{vc}}$	$S_{u(CD)}$ (t/m^2)	Water Content, %		$\frac{S_{u(UD)}}{\bar{\sigma}_{vc}}$	$S_{u(CD)}$ (t/m^2)
			Initial	Final			Initial	Final		
3.50	1.70	2.75	66.65	65.65	0.99	2.72	59.86	55.48	0.66	1.82
5.00	1.60	3.75	67.25	61.01	0.74	2.78	60.90	57.30	0.68	2.55
6.50	1.64	5.53	60.25	57.87	0.64	3.54	56.76	51.45	0.49	2.71
8.00	1.65	7.32	58.73	58.60	0.51	3.73	58.60	56.70	0.47	3.44
9.50	1.54	9.09	78.82	78.24	0.40	3.64	78.92	74.30	0.45	4.05
11.00	1.64	12.40	51.40	46.72	0.38	4.71	56.94	53.10	0.35	4.32
12.50	1.70	16.44	55.19	41.67	0.39	6.41	51.29	47.46	0.37	6.08

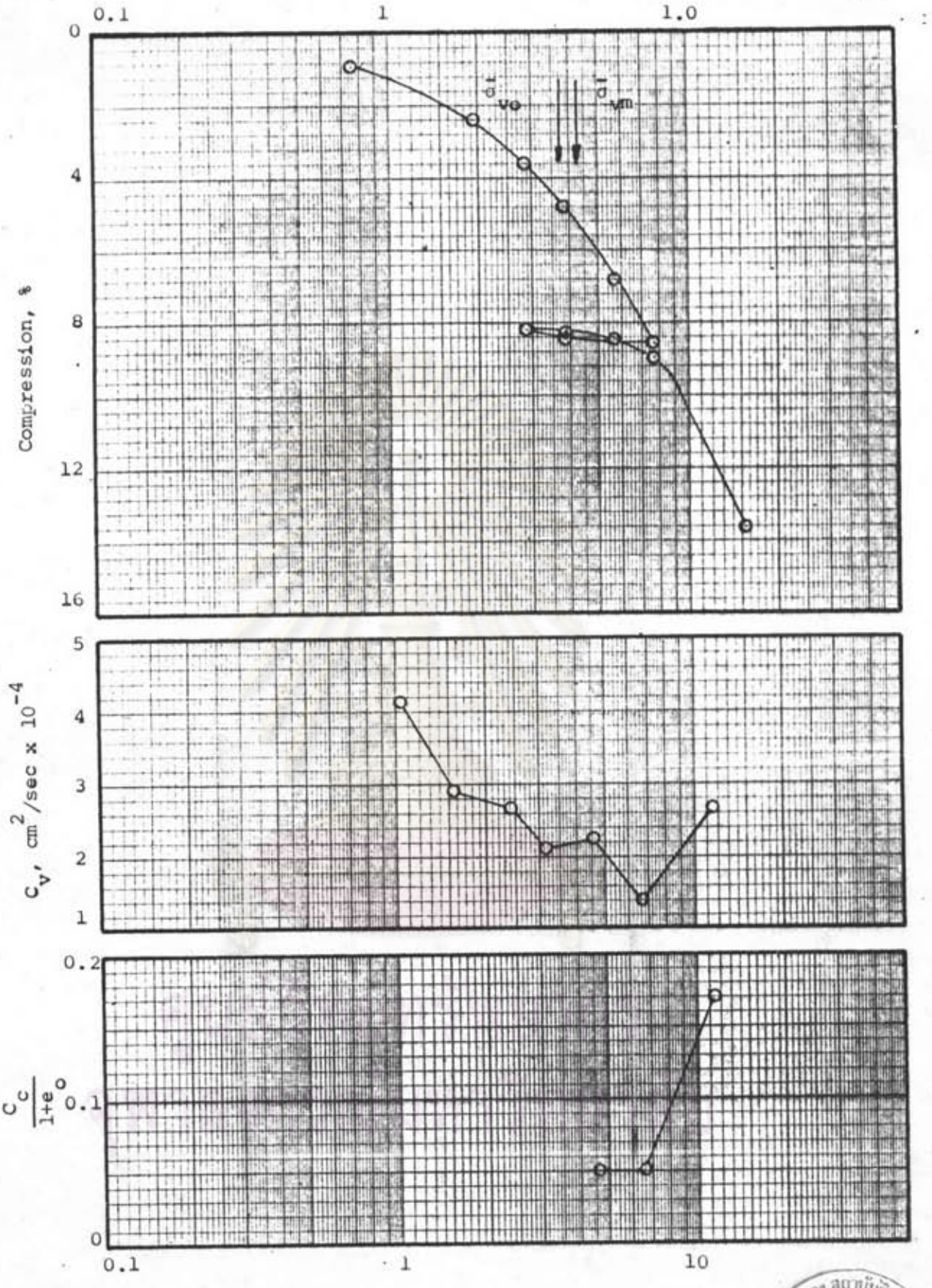


Fig. A-1 Consolidation Test Results at Memorial Bridge,

Depth 3.50-4.10 m.

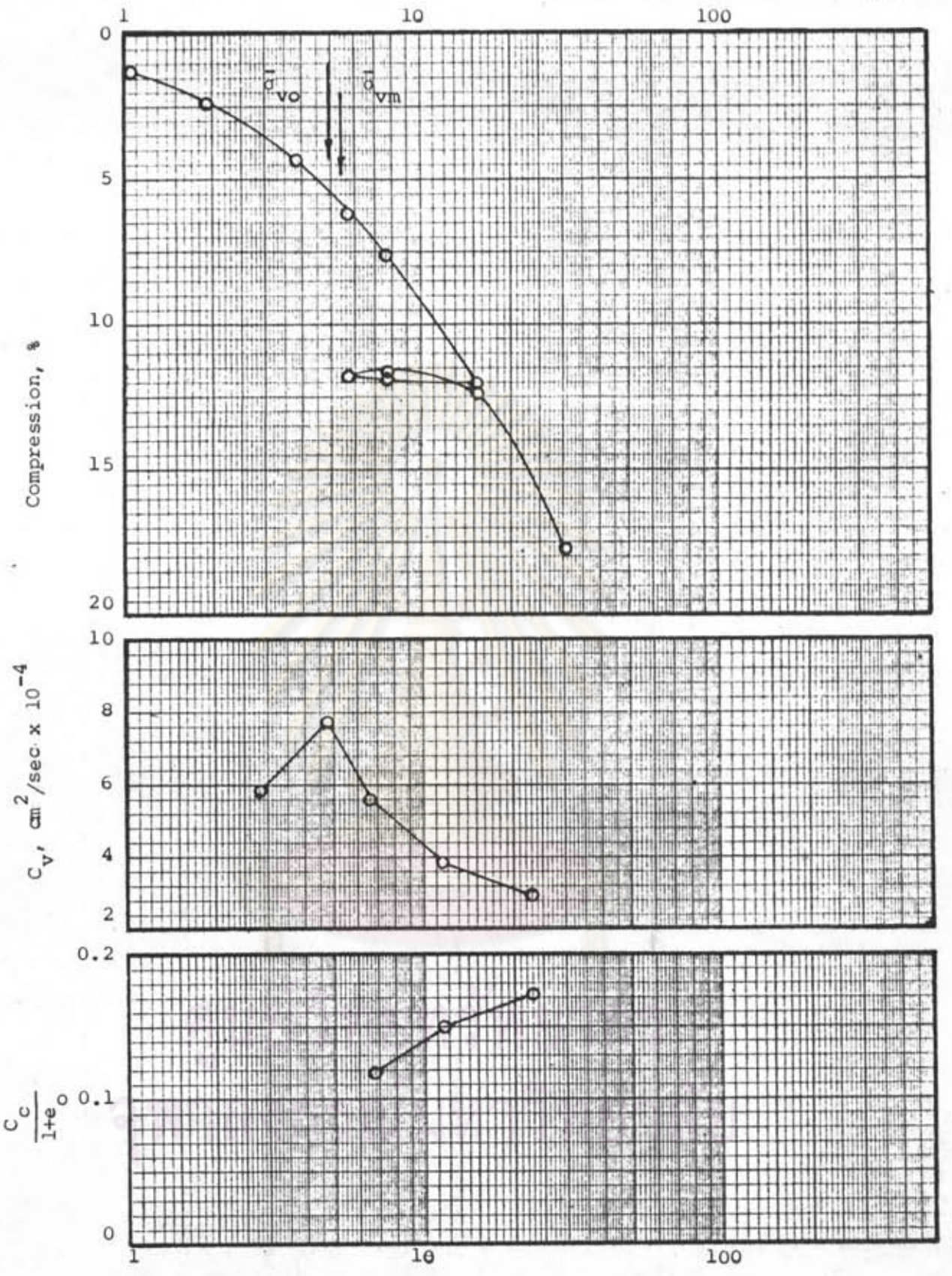


Fig. A-2 Consolidation Test Results at Memorial Bridge

Depth 5.0-5.60 m.

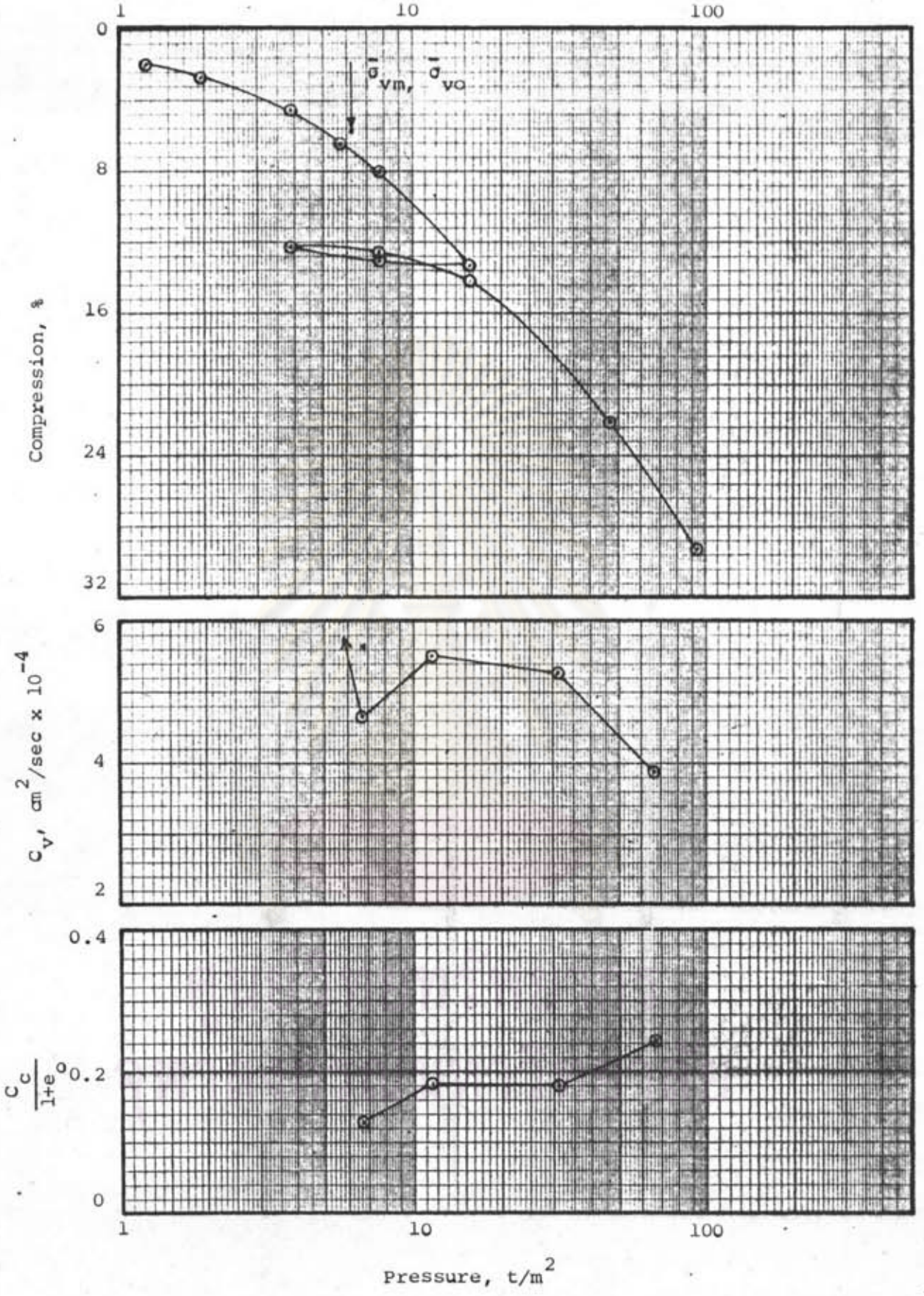


Fig. A-3 Consolidation Test Results at Memorial Bridge, Depth 6.50-7.10 m.

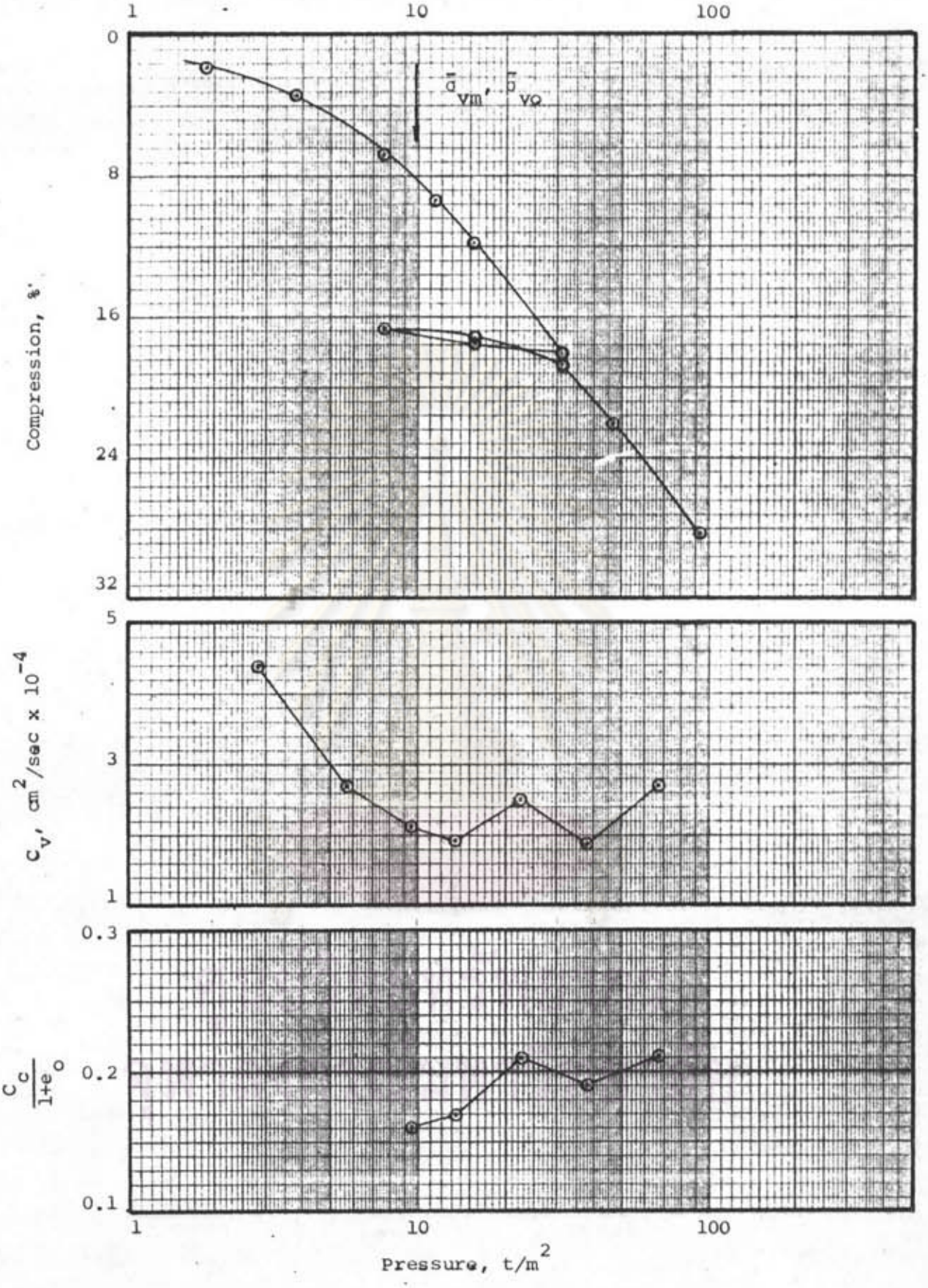


Fig. A-4 Consolidation Test Results at Memorial Bridge, Depth 9.50-10.10 m.

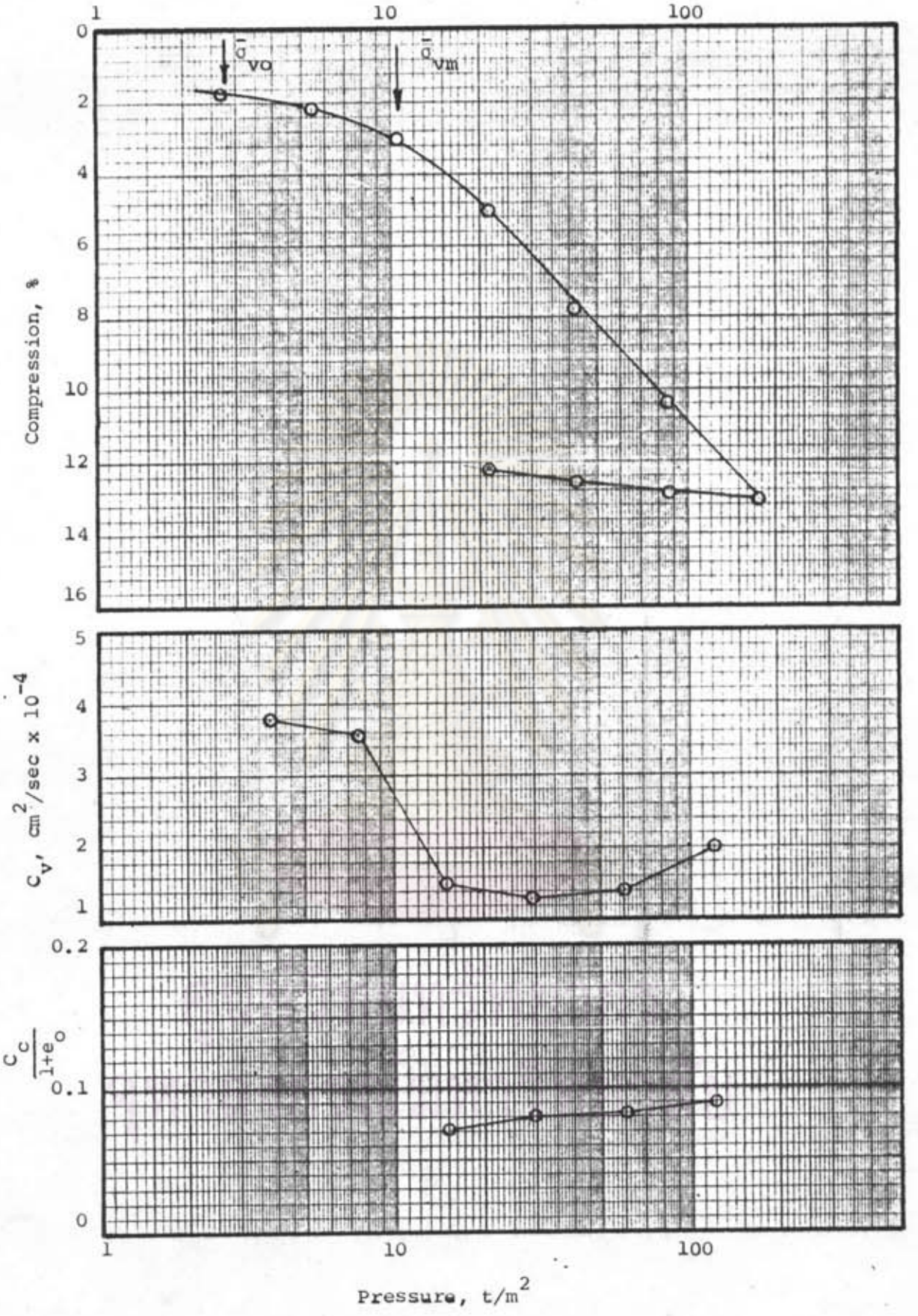


Fig. A-5 Consolidation Test Results at Teves, Depth 3.50-4.10 m.

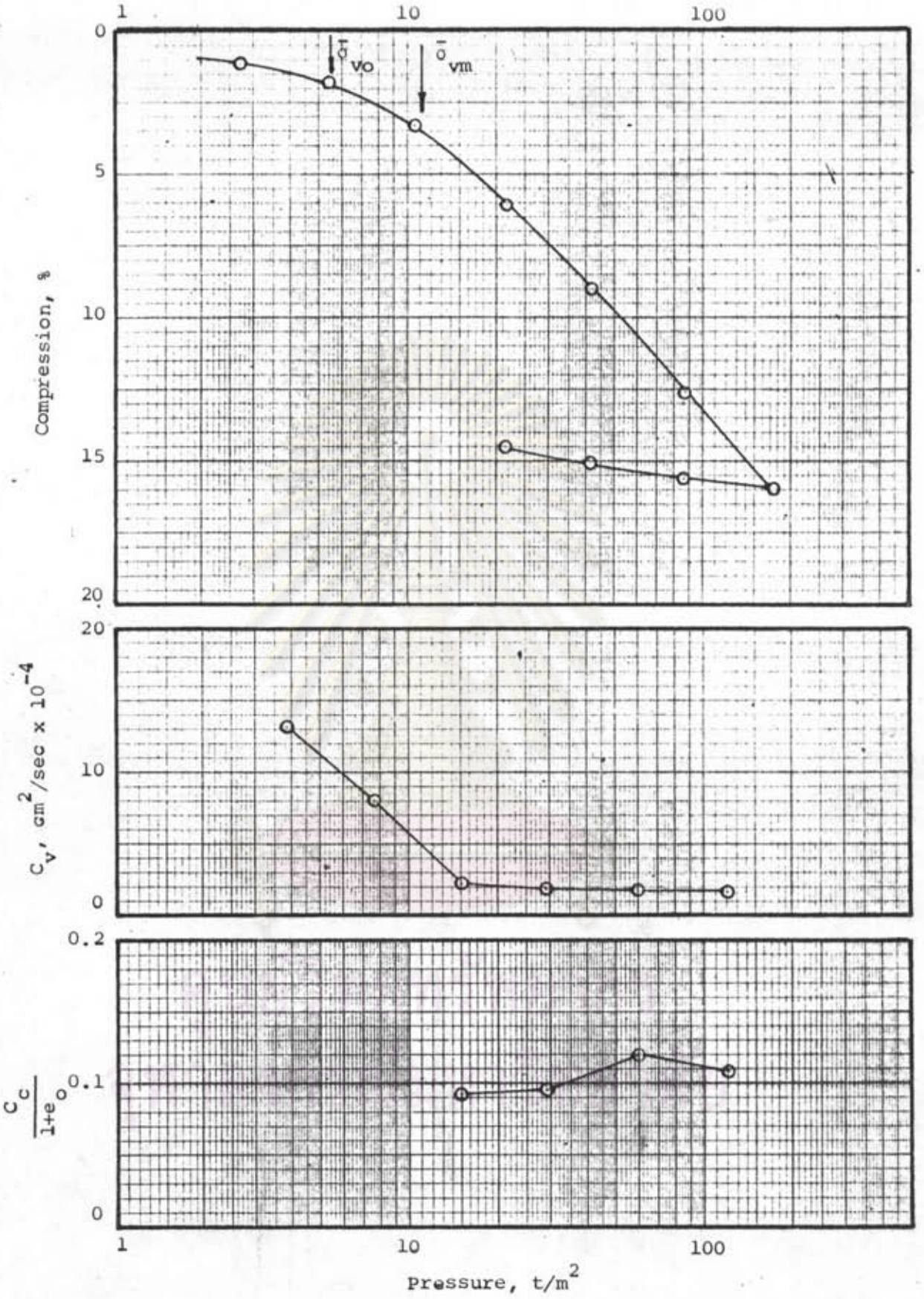


Fig. A-6 Consolidation Test Results at Teves, Depth 6.50-7.10 m.

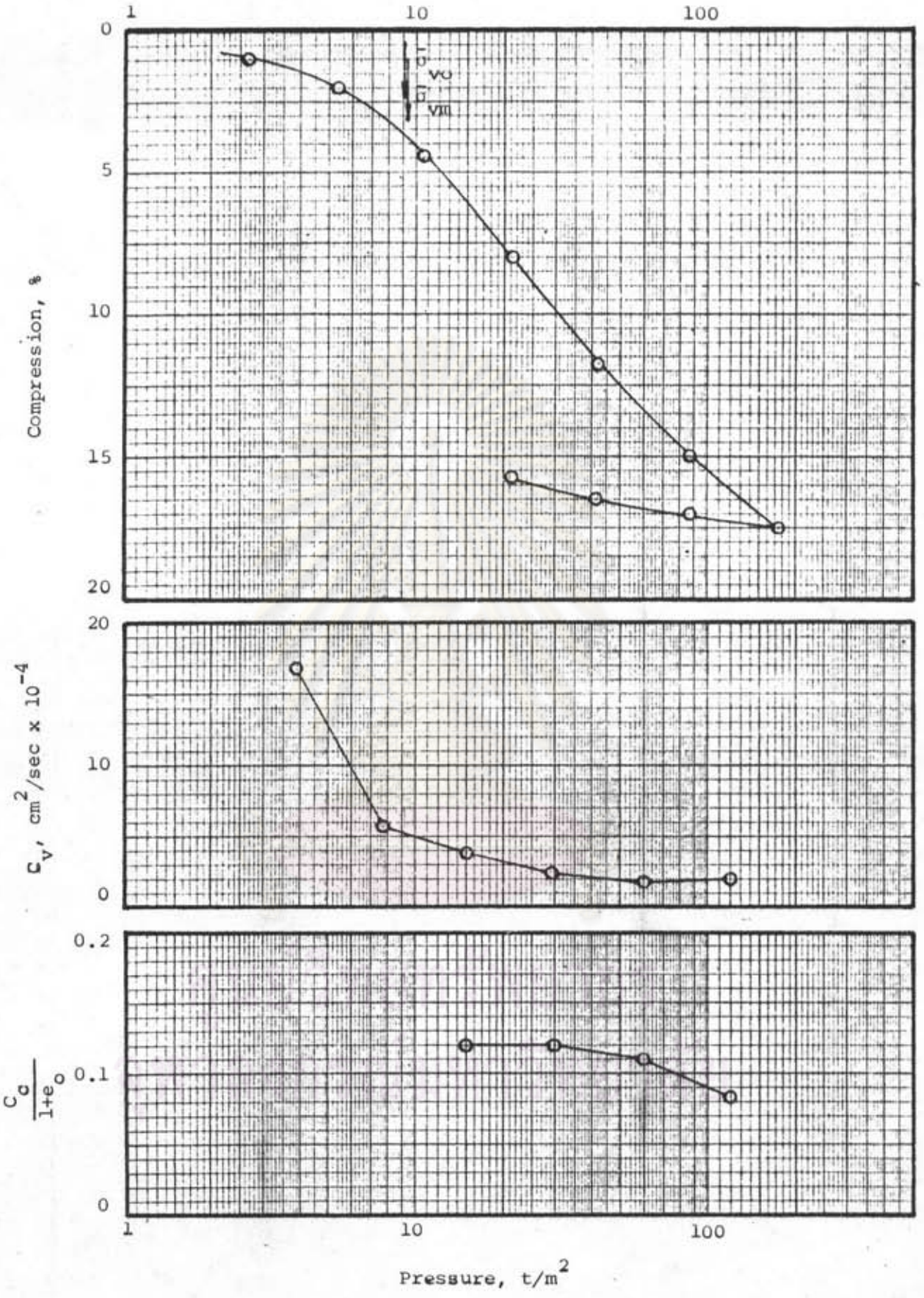


Fig. A-7 Consolidation Test Results at Teves, Depth 9.50-10.10 m.

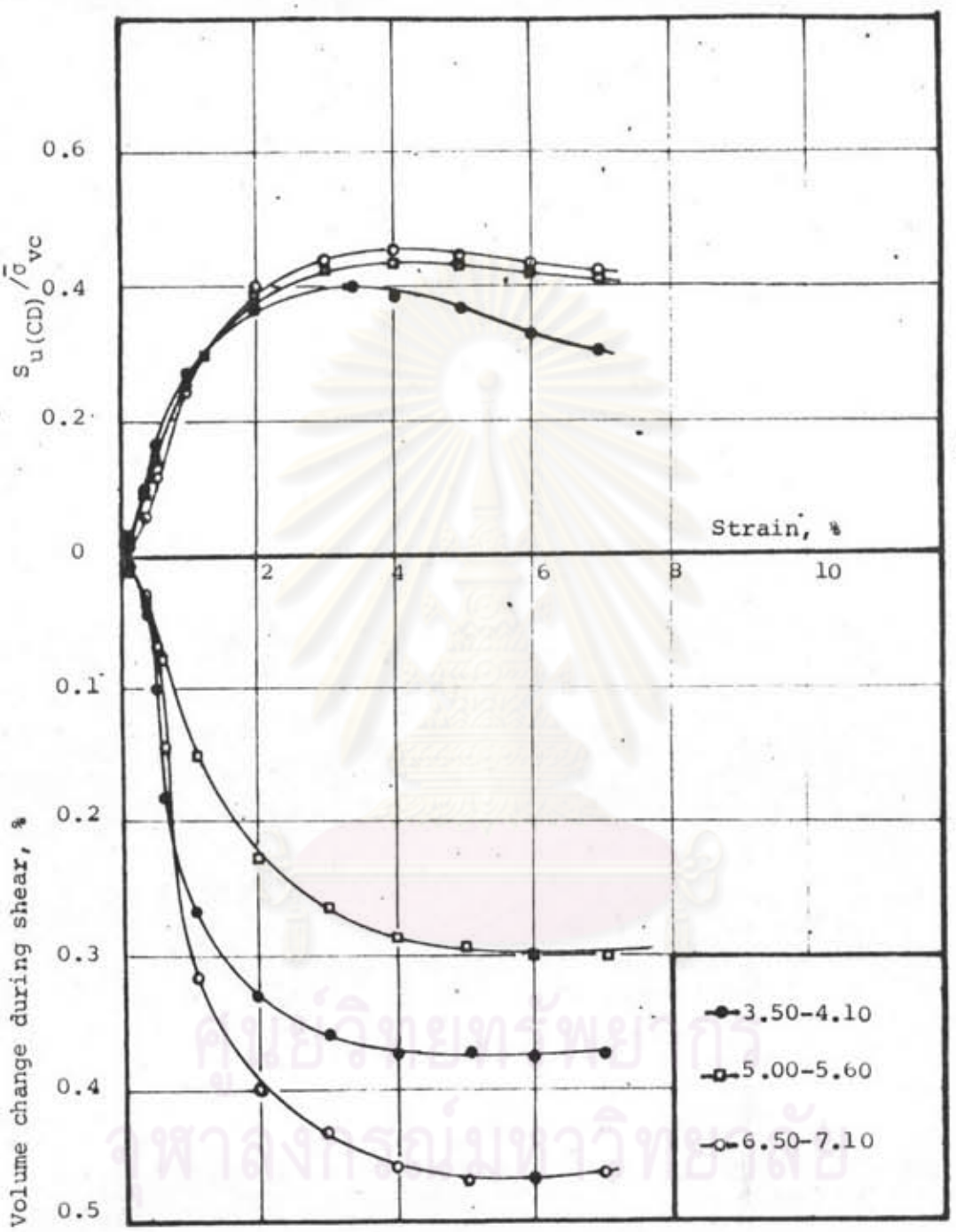


Fig. A-8 Normalized Stress-Strain Relationship at Memorial Bridge (Consolidated Quick Direct Shear Tests)

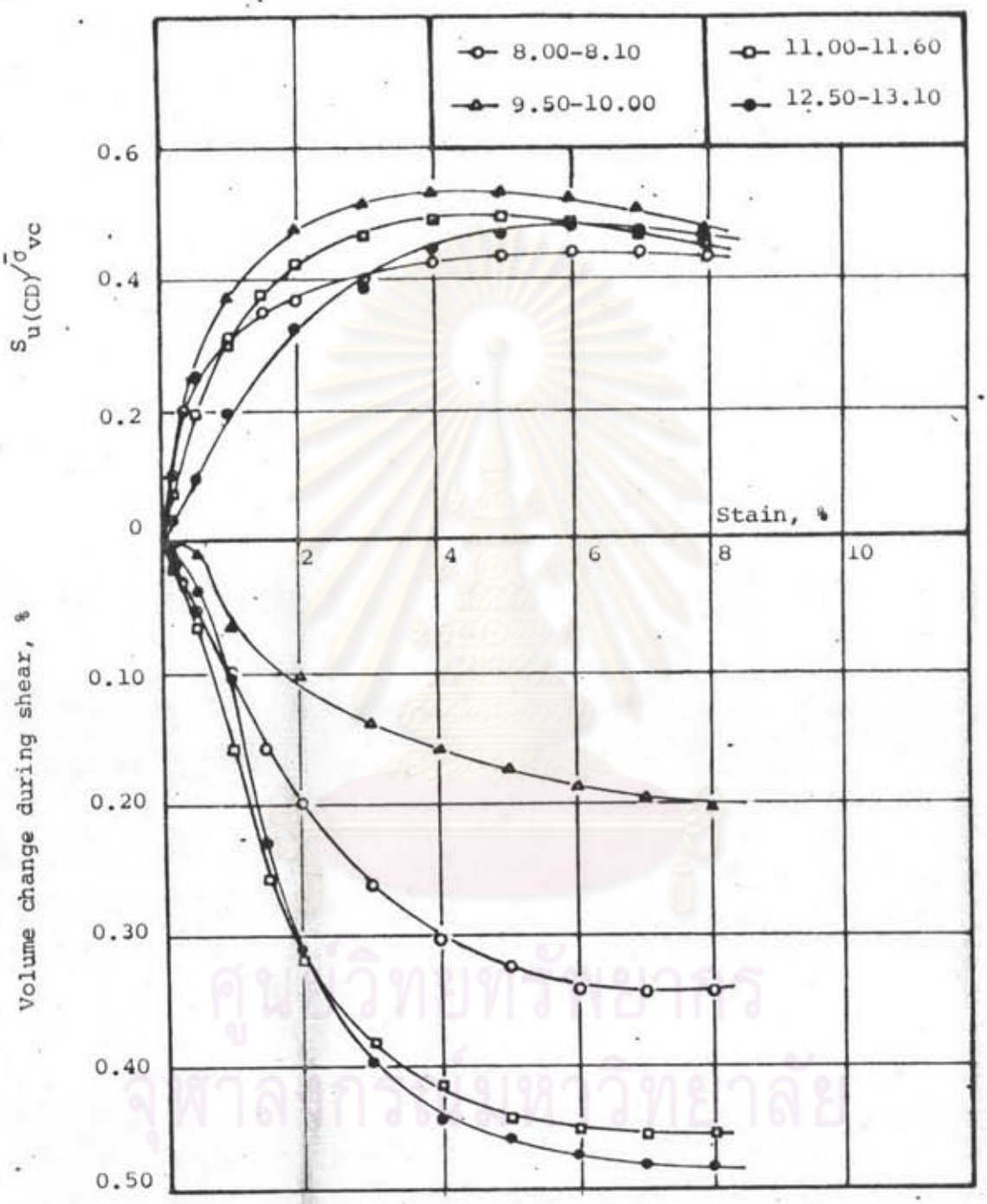


Fig. A-9 Normalized Stress-Strain Relationship at Memorial Bridge (Consolidated Quick Direct Shear Tests)

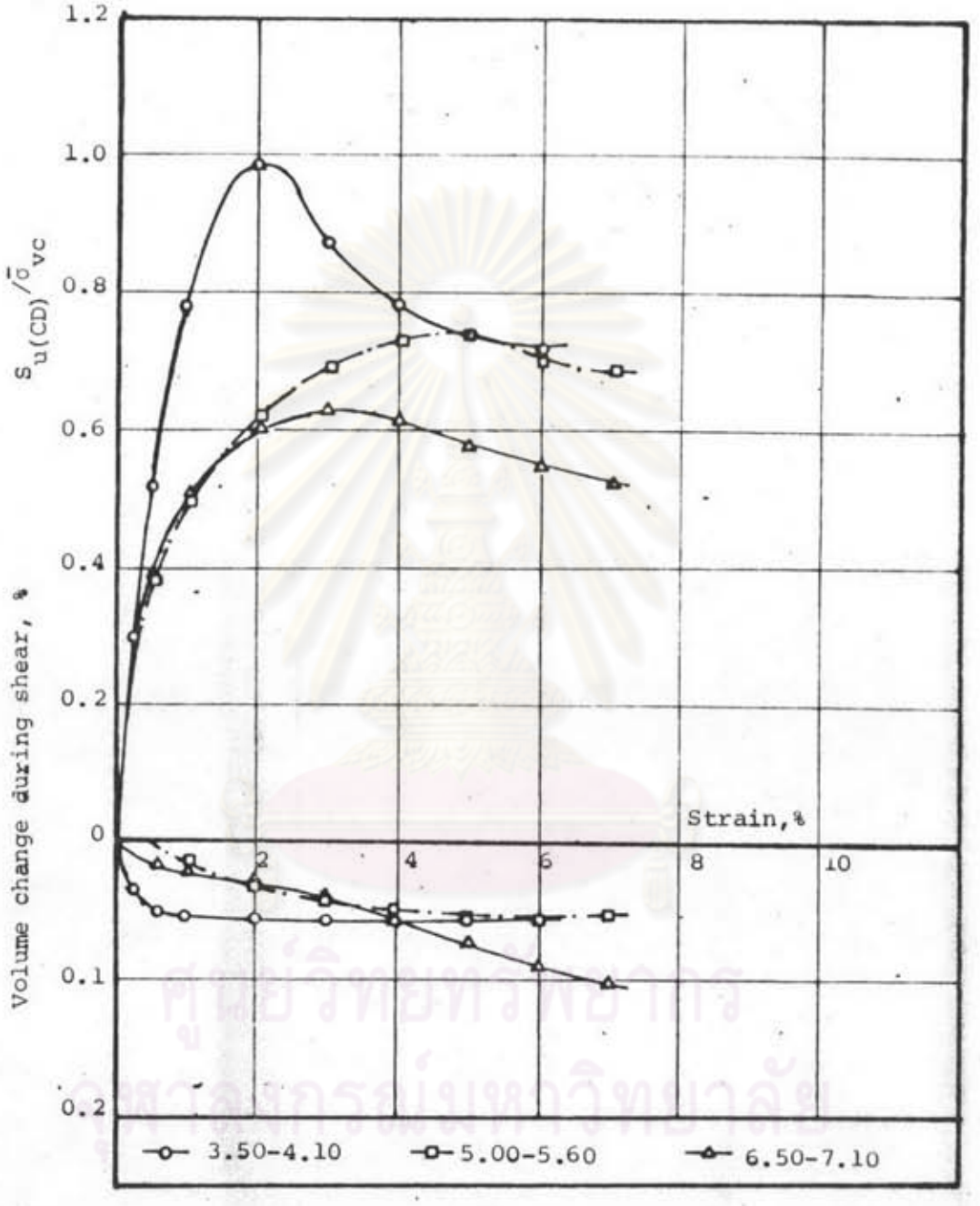


Fig. A-10 Normalized Stress-Strain Relationship at Teves (Consolidated Quick Direct Shear Tests)

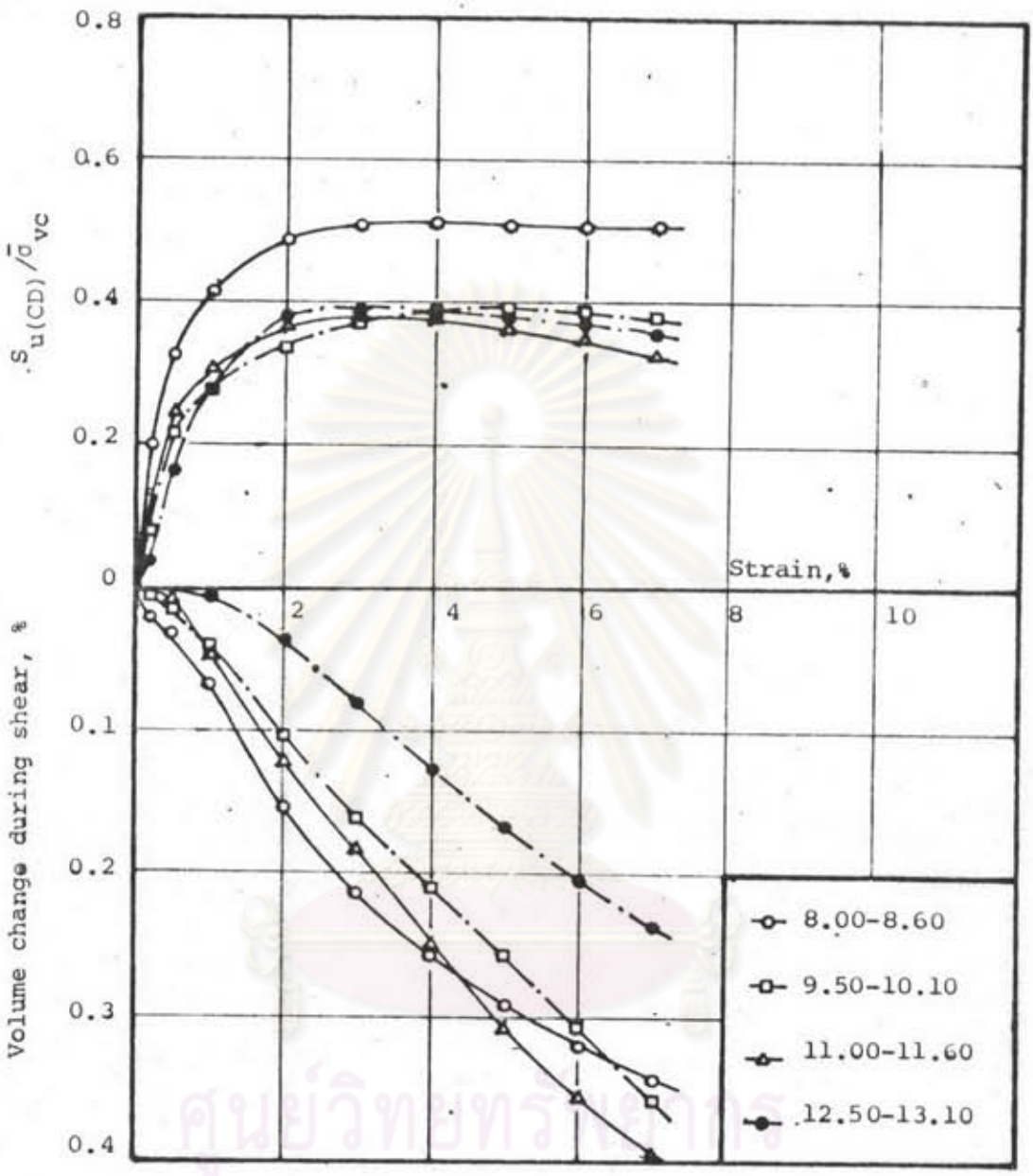


Fig. A-11 Normalized Stress-Strain Relationship at Teves
(Consolidated Quick Direct Shear Tests)

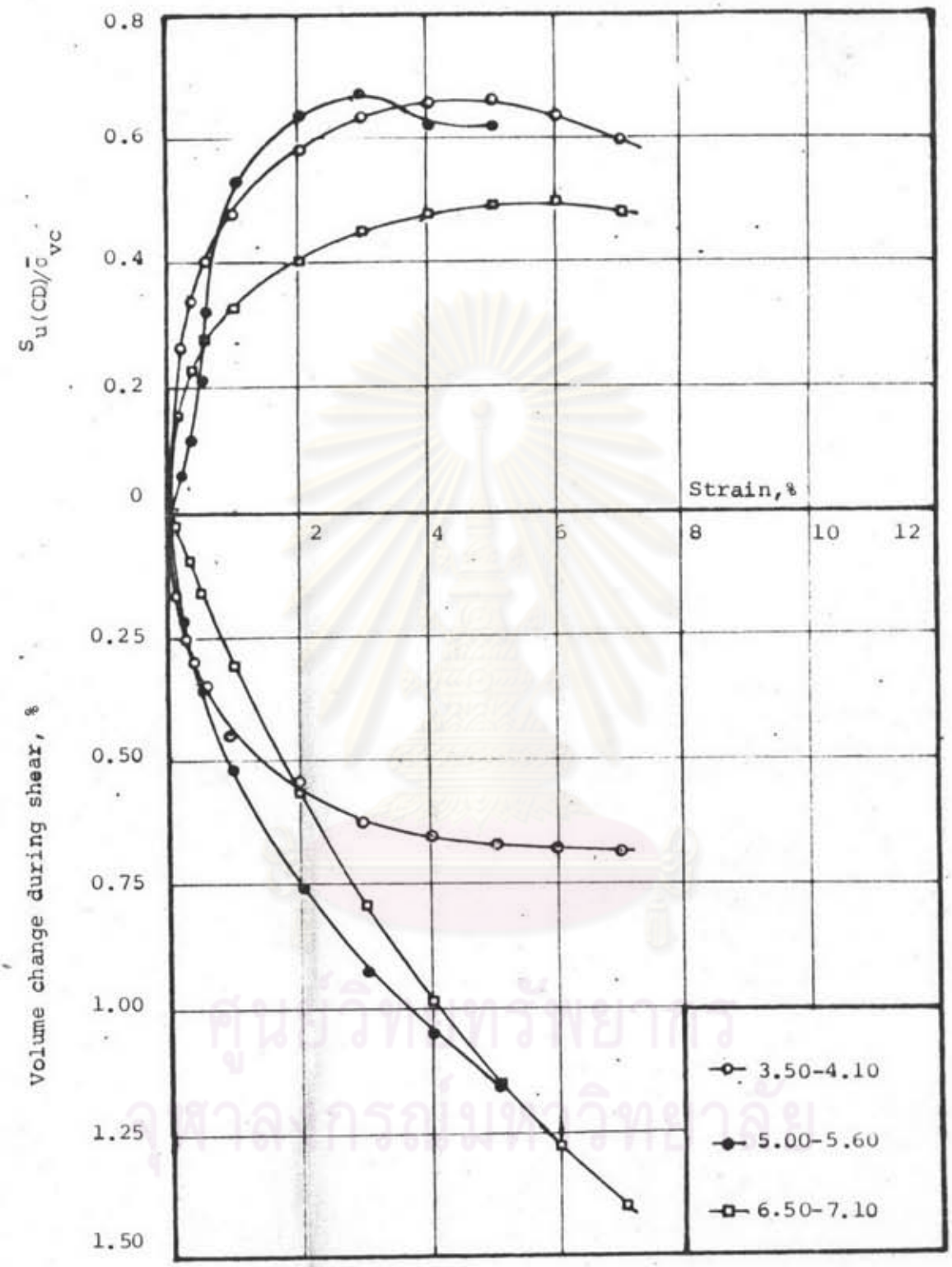


Fig. A-12 Normalized Stress-Strain Relationship at Teves (Quick Direct Shear Tests)

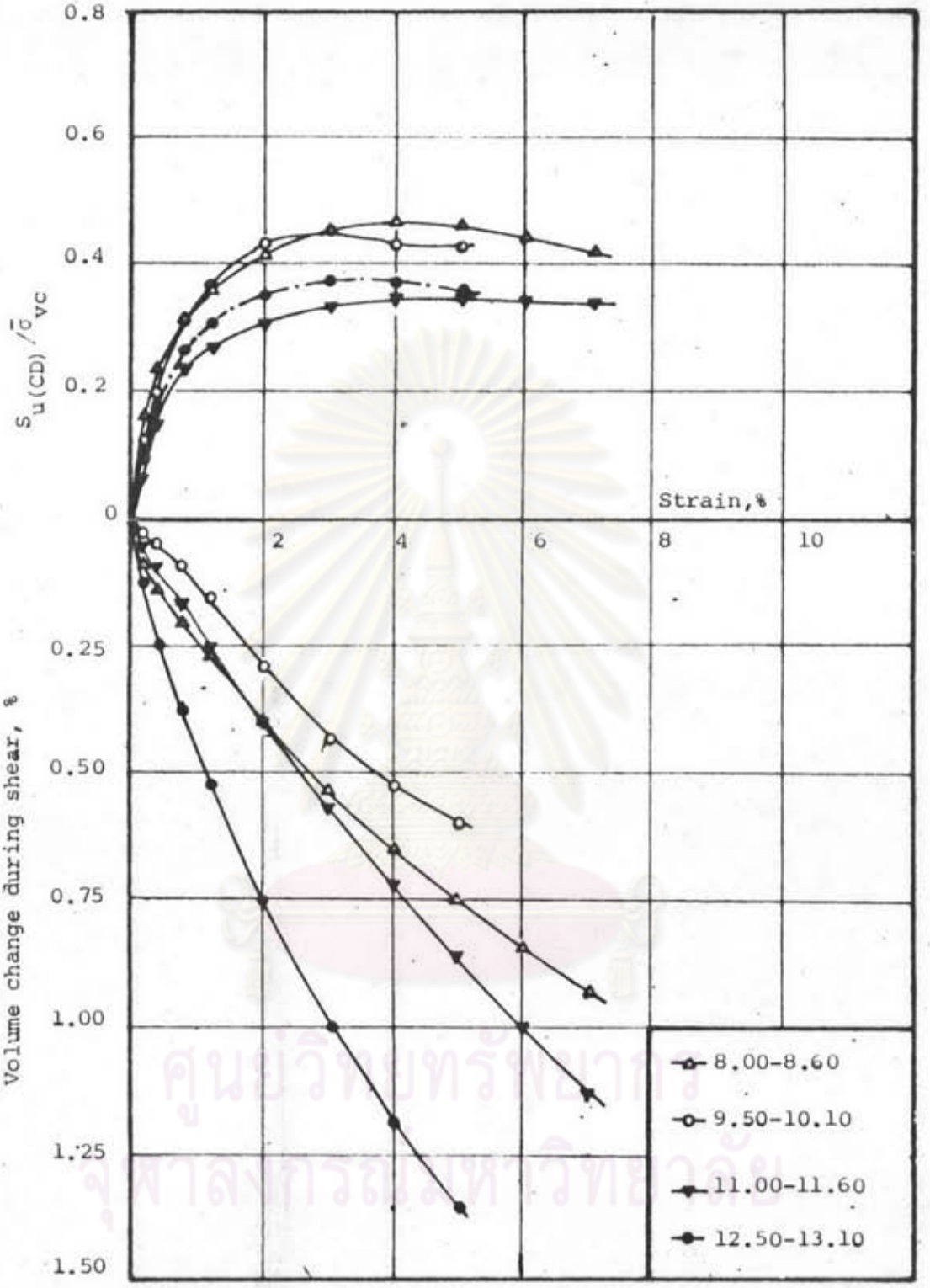


Fig. A-13 Normalized Stress-Strain Relationship at Teves

(Quick Direct Shear Tests)

VITA

Mr. Theeraphol Trivachirangkul was awarded the Bachelor's degree in Civil Engineering from KhonKaen University in 1973, he was admitted to the Graduate School of Chulalongkorn University in 1978. He is, at present, working at Chantaburi Municipality, Local Administration Department, Ministry of Interior.