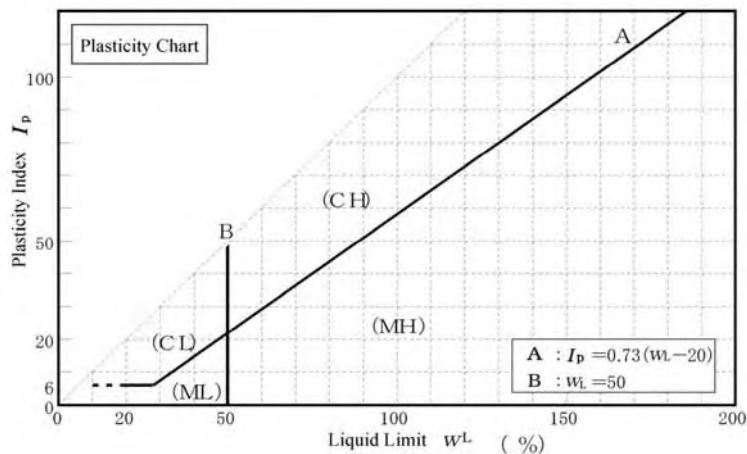
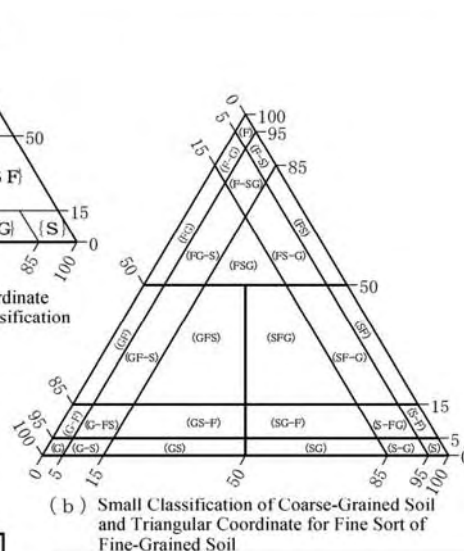
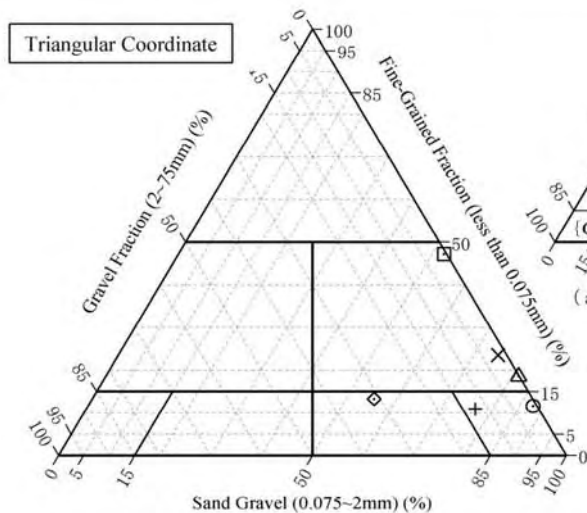


## 4. Geotechnical Classifications

JGS		0051		Geotechnical Classifications				
Project Title	THE STUDY FOR ASSESSMENT OF ECOSYSTEM, COASTAL EROSION AND PROTECTION/REHABILITATION OF DAMAGED AREA IN TUVALU			Date	September 22, 2010			
				Trier	Hideaki Tsuge			
Sample Number (Depth)	DS-1	DS-2	DS-3	DS-4	DS-5	DS-6		
Stone Fraction (more than 75mm)	%	0.0	0.0	0.0	0.0	0.0	0.0	
Gravel Fraction (2~75mm)	%	0.7	1.7	12.5	0.5	0.1	31.2	
Sand Fraction (0.075~2mm)	%	87.7	74.8	76.6	52.4	81.3	55.5	
Fine-Grained Fraction (less than 0.075mm)	%	11.6	23.5	10.9	47.1	18.6	13.3	
Silt Fraction (0.005~0.075mm)	%	7.7	18.4	8.5	36.2	12.6	9.9	
Clay Fraction (less than 0.005mm)	%	3.9	5.1	2.4	10.9	6.0	3.4	
Maximum Particle Size	mm	4.75	9.50	9.50	4.75	4.75	9.50	
Uniformity Coefficient $U_c$		8.74	17.12	12.53	30.81	27.58	51.20	
Liquid Limit $w_L$	%	NP	NP	NP	NP	NP	NP	
Plastic Limit $w_p$	%	NP	NP	NP	NP	NP	NP	
Plastic Index $I_p$		—	—	—	—	—	—	
Class Name of Ground Materials		Sand with some Fine fraction	Sand and Fine fraction	Sand with some Fine fraction and Gravel	Sand and Fine fraction	Sand and Fine fraction	Sand and Gravel with some Fine fraction	
Class Symbol		(S-F)	(SF)	(S-FG)	(SF)	(SF)	(SG-F)	
Legend Symbol		○	×	+	□	△	◇	

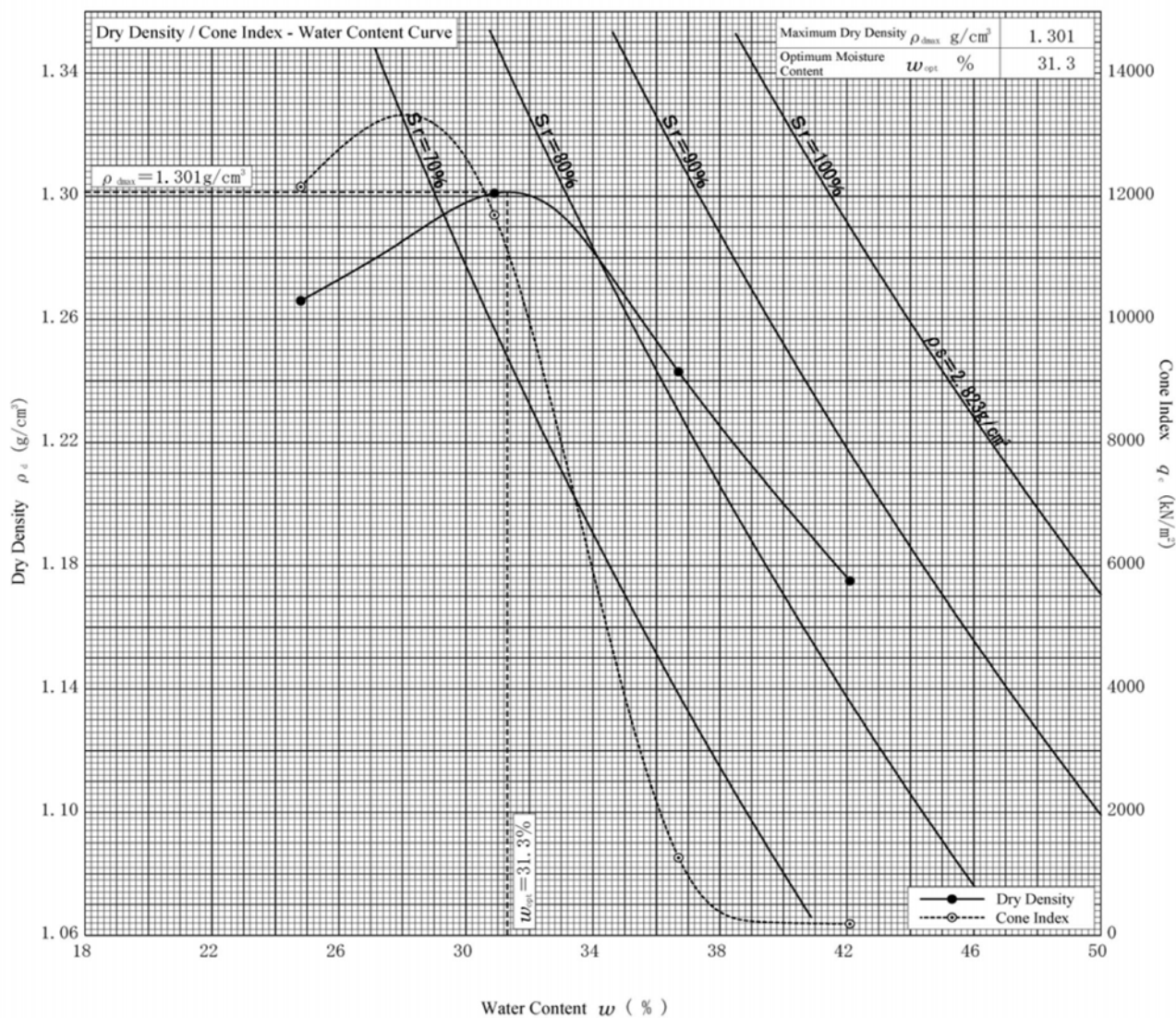


Special Instruction

1) It is mainly classified and distinguished by observation and plasticity chart.

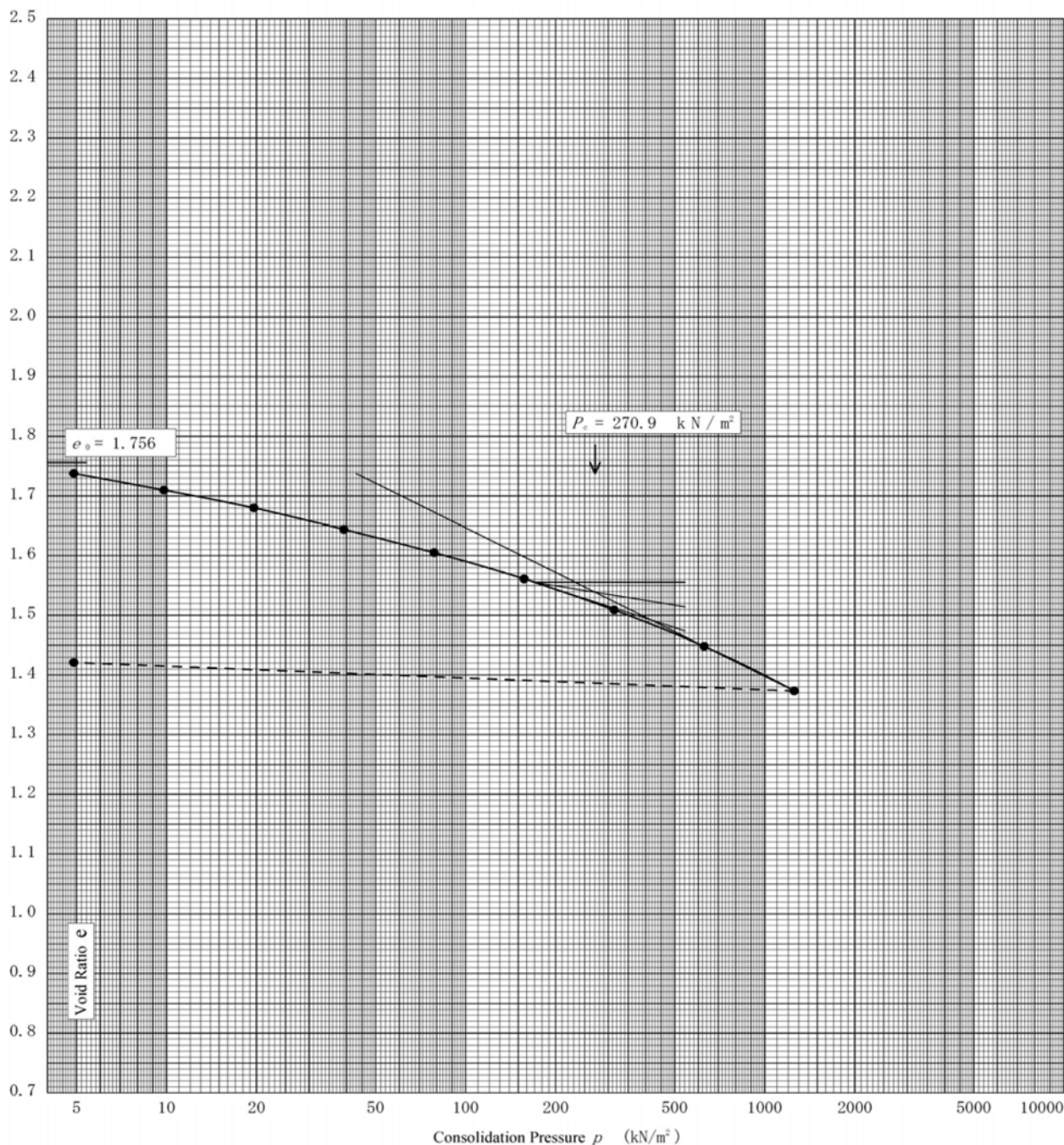
## 5. Soil compaction Test and Corn Index Test

Soil Compaction Test and Cone Index Test										
Project Title		THE STUDY FOR ASSESSMENT OF ECOSYSTEM, COASTAL EROSION AND PROTECTION/REHABILITATION OF DAMAGED AREA IN TUVALU				Date		September 30, 2010		
Sample Number (Depth) DS-4						Trier		Minoru Sato		
Soil Style		A-c				Density of Soil Particle $\rho_s$ g/cm <sup>3</sup>		2.823		
Compaction Test	Test Method	A-c				Rammer Mass kg	2.5	Mold	Bore Diameter cm	10.00
	Preparation Method of Sample	Dry Method • Wet Method				Tamping Number of Times	25		Height cm	12.73
	Usage Method of Sample	Iterate Approach • Not Iterate Approach				Tamping Layer Number Layer	3		Area of Base of Cone cm <sup>2</sup>	3.24
Measurement No.		①	②	③	④	⑤	⑥	⑦	⑧	
Cone Index Test	Resistance Force	Penetration Amount	Penetration Resistance Force	Penetration Resistance Force	Penetration Resistance Force	Penetration Resistance Force	Penetration Resistance Force	Penetration Resistance Force	Penetration Resistance Force	
		5.0 cm	2867	2236	291	56				
		7.5 cm	4118	3865	421	62				
	N	10.0 cm	4828	5265	515	65				
Average Penetration Resistance Force		N	3938	3789	409	61				
Average Water Content w		%	24.8	30.9	36.7	42.1				
Dry Density $\rho_d$		g/cm <sup>3</sup>	1.266	1.301	1.243	1.175				
Cone Index $q_c$		kN/m <sup>2</sup>	12154	11694	1262	188				



## 6. Consolidation Test by stage loading of soil

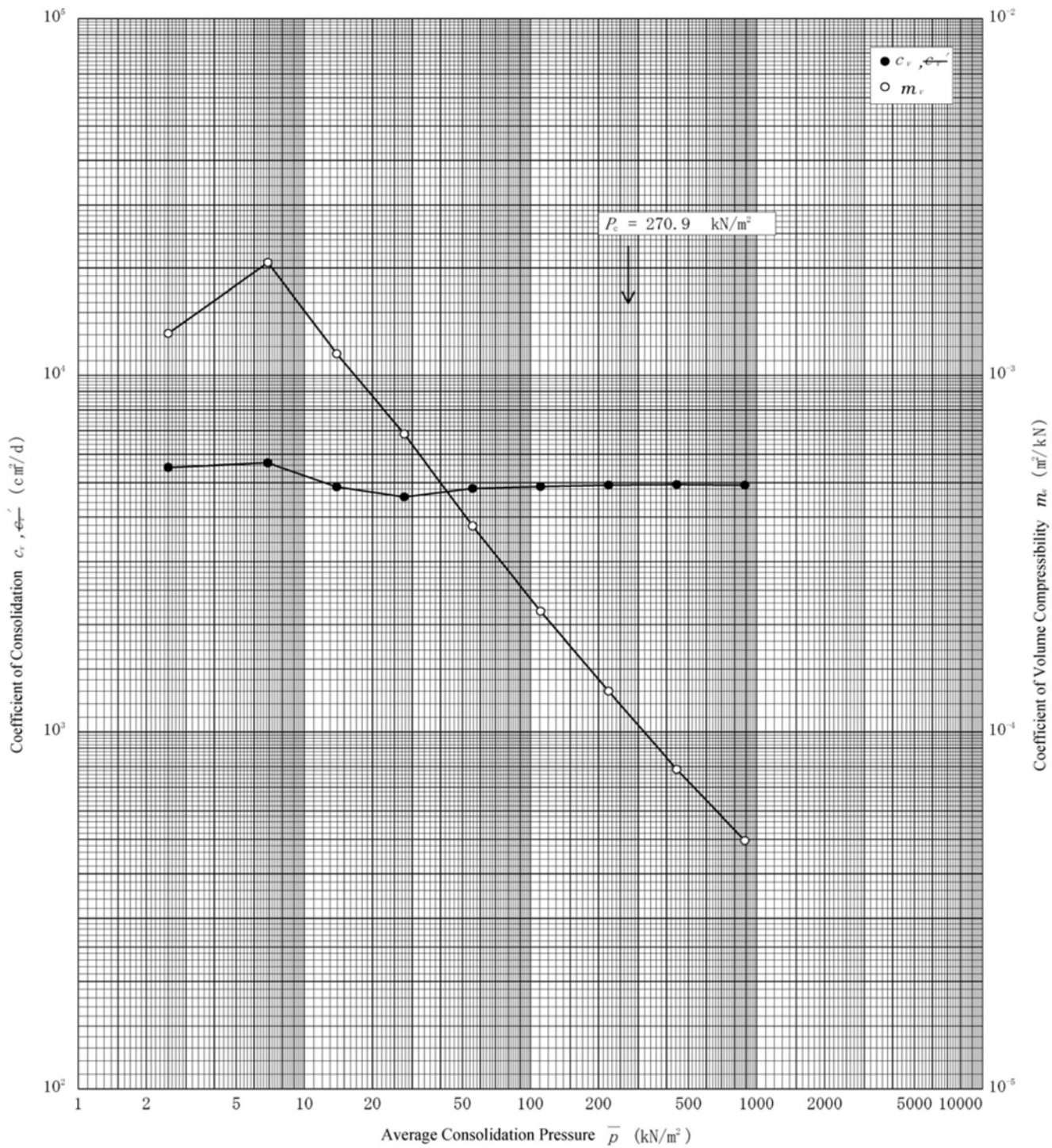
JIS A	1217	Consolidation Test by Stage Loading of Soil (Compression Curve)					
JGS	0411						
Project Title	THE STUDY FOR ASSESSMENT OF ECOSYSTEM, COASTAL EROSION AND PROTECTION/REHABILITATION OF DAMAGED AREA IN TUVALU		Date September 30, 2010				
Sample Number (Depth)	DS-4		Trier Mitsuaki Kondo				
Density of Soil Particle $\rho_s$ g/cm <sup>3</sup>	Liquid Limit $w_L$ %	Plastic Limit $w_P$ %	Initial Water Content $w_0$ %	Initial Void Ratio $e_0$ Initial Volume Ratio $f_0$	Compression Index $C_c$	Compressive Yield Stress $p_c$ kN/m <sup>2</sup>	Strain Speed <sup>1)</sup> %/min
2.823	NP	NP	40.6	1.756	0.249	270.9	



Special Instruction

1) It is filled in only the consolidation test concerning constant strain speed stage loading .

JIS A	1217	Consolidation Test by Stage Loading of Soil (Relation of $c_v, m_v - \bar{p}$ )	
JGS	0411		
Project Title	THE STUDY FOR ASSESSMENT OF ECOSYSTEM, COASTAL EROSION AND PROTECTION/REHABILITATION OF DAMAGED AREA IN TUVALU		Date September 30, 2010
Sample Number (Depth)	DS-4		Trier Mitsuaki Kondo



Special Instruction

[  $1 \text{ kN/m}^2 \approx 0.0102 \text{ kgf/cm}^2$  ]

## 7. Specific Gravity Test / Water Absorption Test of Coral Gravel



JHS	108	Specific Gravity Test / Water Absorption Test of Coral Gravel			
Project Title	THE STUDY FOR ASSESSMENT OF ECOSYSTEM, COASTAL EROSION AND PROTECTION/REHABILITATION OF DAMAGED AREA IN TUVALU			Date	September 24, 2010
				Trier	Keiichi Fukuda
Sample Number	CR-1				
Particle Size	75.0mm ~ 37.5mm				
Measurement Number	1	2	3		
Container No,	341	366	389		
① Container Mass g	109.6	109.1	120.8		
② Mass of (Container + Sample of Surface Dry) g	528.7	563.6	527.0		
③ Mass of Surface Dry B (② - ①) g	419.1	454.5	406.2		
④ Mass in Water of (Gauze Cage + Sample) g	247.4	282.0	244.0		
⑤ Mass in Water of Gauze Cage g	0.0	0.0	0.0		
⑥ Mass in Water C (④ - ⑤) g	247.4	282.0	244.0		
⑦ Mass of (Container + Dry Sample) g	502.4	554.0	518.3		
⑧ Dry Mass A(⑦ - ①) g	392.8	444.9	397.5		
Amount of Water Absorption Wa [100 (③ - ⑥) / ⑧] %	6.70	2.16	2.19		
Specific Gravity Gb [⑧ / (③ - ⑥)]	2.288	2.579	2.451		
Average Amount	Wa=	3.7%	Gb=	2.44	

Remarks :  $Wa = \frac{B - A}{A} \times 100(\%)$        $Gb = \frac{A}{B - C}$

B - A : Mass of absorbed water (g)

B - C : Mass of water of total volume and same volume indicated by saturated surface dry of Coral Gravel (g)

Mass in water of gauze cage of ⑤ is adjusted to "0" after hanged in water (in net weight) .

## 8. Passing Through Test for Geofabric and Dredged Sand

Passing Through Test for Geofabric and Dredged Sand			
		Date	October 1, 2010
		Trier	Hideaki Tsuge
Project Title:	THE STUDY FOR ASSESSMENT OF ECOSYSTEM, COASTAL EROSION AND PROTECTION/REHABILITATION OF DAMAGED AREA IN TUVALU		
The Guide used as the stopper of the geotextile : 9.50mm sieve			
Sample No, DS-4			
Water Content	Container No,	112	113
	ma (g)	22.43	22.23
	mb (g)	15.97	15.89
	w (%)	40.5	39.9
Average w (%)		40.1	
Wet Mass of Sample (g) 100.0		Fire Pit Dry Mass of Sample (g) 71.4	
		Bonded Textile	Textile Fabric
(Container + Fire Pit Dry Sample of GTX Passing Fraction) Mass (g)		841.1	819.4
Container Mass (g)		838.0	805.0
Fire Pit Dry Sample Mass (GTX Passing Fraction) (g)		3.1	14.4
GTX Passing Percentage (%)		4.3	20.2
GTX Mass (g)		51.8	58.4
Fire Pit Dry Sample Mass (GTX + Residual Fraction of GTX) (g)		119.4	115.3
Residual Fraction Mass of GTX (g)		67.6	56.9
Residual Percentage of GTX (%)		94.7	79.7
Time spent passing through GTX (Minutes)		5	39
Remarks			
<ul style="list-style-type: none"> <li>• GTX=Geotextile</li> <li>• The result of gradation test is used as water content(w).</li> </ul>			

Passing Through Test for Geofabric and Dredged Sand			
		Date	September 24, 2010
		Trier	Hideaki Tsuge
Project Title:	THE STUDY FOR ASSESSMENT OF ECOSYSTEM, COASTAL EROSION AND PROTECTION/REHABILITATION OF DAMAGED AREA IN TUVALU		
The Guide used as the stopper of the geotextile : 0.075mm sieve			
Sample No, DS-4			
Water Content	Container No,	112	113
	ma (g)	22.43	22.23
	mb (g)	15.97	15.89
	w (%)	40.5	39.9
Average w (%)		40.1	
Wet Mass of Sample (g) 100.0		Fire Pit Dry Mass of Sample (g) 71.4	
		Bonded Textile	Textile Fabric
(Container + Fire Pit Dry Sample of GTX Passing Fraction) Mass (g)		810.1	805.9
Container Mass (g)		806.0	798.0
Fire Pit Dry Sample Mass (GTX Passing Fraction) (g)		4.1	7.9
GTX Passing Percentage (%)		5.7	11.1
Fire Pit Dry Mass of Sample (Residual Fraction of 0.075mm Sieve) (g)		0.0	1.9
Residual Fraction of 0.075mm Sieve in GTX Passing percentage (g)		0.0	2.7
Remarks			
<ul style="list-style-type: none"> <li>• GTX=Geotextile</li> <li>• The result of gradation test is used as water content (w).</li> </ul>			

Passing Through Test for Geofabric (Spun bond fabric and Woven Textile) and Dredged Sand



Murky well mixed water consisting of one liter of water and dredged sand (100g) was spilled onto geofabric (5mm thickness) laid over 0.074mm test sieve.

Photo-1 : Passing Through Test for Geofabric (5mm Thk. spun bond fabric) and Dredged Sand



Just after having spilled onto geofabric (5mm thickness) laid over 0.074mm test sieve. Water penetrated smoothly. It took 4 minutes until water disappeared from the surface.

Photo-2 : Passing Through Test for Geofabric (5mm Thk. spun bond fabric) and Dredged Sand



No soil observed on the back of spun bond fabric after water penetrates. There was no remain on the 0.074mm test sieve

Photo-3 : Passing Through Test for Geofabric (5mm Thk. spun bond fabric) and Dredged Sand

Passing Through Test for Geofabric (Spun bond fabric and Woven Textile) and Dredged Sand



The section was observed cutting the spun bond fabric after water had penetrated. The soil particle soaks only up to about 1mm of the surface.

Photo-4 : Passing Through Test for Geofabric (5mm Thk. spun bond fabric) and Dredged Sand



The same above-mentioned test was done with woven textile. Water doesn't penetrate easily. It took 40 minutes until water disappeared from the surface.

Photo-5 : Passing Through Test for Geofabric (1mm Thk. woven textile) and Dredged Sand



When the woven textile after water penetrated was raised, some soil particles remained in test sieve of 0.074mm.

Photo-6 : Passing Through Test for Geofabric (1mm Thk. woven textile) and Dredged Sand

Passing Through Test for Geofabric (Spun bond fabric and Woven Textile) and Dredged Sand



Test Result;  
Left: Spun Bond showed;  
- Excellent water permeability,  
- Excellent soil particle trapping performance  
Right: Woven Textile showed;  
- Very Poor water permeability,  
- Poor soil particle trapping performance

Photo-7 : Right: 5mm Thk. spun bond fabric, Left: 1mm Thk. woven textile