

## SUMMARY OF SOIL TEST RESULTS

Project Name : Yangon River Survey Project								
Borehole No.			Location :					
Sample No.			Pasundaung Creek	Bago River	Near Monkey Point	Upstream of Yangon River	Thilawa Area	
Depth (m)			~	~	~	~	~	
Moisture Content			w %	81.36	73.28	25.74	28.98	24.52
Bulk Density			$\rho_t$ g/cm <sup>3</sup>	-	-	-	-	-
Atterberg's Limit	Liquid Limit		WL %	52.70	45.80	-	-	-
	Plastic Limit		WP %	24.76	23.55	-	-	-
	Plasticity Index		IP	27.94	22.25	-	-	-
Grain Size Analysis	Gravel, (76.20 ~ 4.75) mm		%	-	-	2.31	0.55	-
	Sand, (4.75 ~ 0.075) mm		%	9.38	2.28	92.42	97.17	98.10
	Silt, (0.075 ~ 0.005) mm		%	64.63	71.73	5.27	2.28	1.90
	Clay, (< 0.005 mm)		%	26.00	26.00			
Specific Gravity of Soil			G <sub>s</sub> (20°C)	2.715	2.699	2.669	2.668	2.672
Unconfined Compression	Unconfined Compressive Strength		q <sub>u</sub> kN/m <sup>2</sup>	-	-	-	-	-
	Failure Strain		$\epsilon_f$ %	-	-	-	-	-
	E <sub>50</sub>		kN/m <sup>2</sup>	-	-	-	-	-
	Sensitivity Ratio			-	-	-	-	-
Direct Shear Test	Cohesion		C <sub>UU</sub> kN/m <sup>2</sup>	-	-	-	-	-
	Phi Angle		$\phi_{UU}$ Degree	-	-	-	-	-
Unconsolidated Undrained Triaxial Compression Test	Cohesion		C <sub>UU</sub> kN/m <sup>2</sup>	-	-	-	-	-
	Phi Angle		$\phi_{UU}$ Degree	-	-	-	-	-
Consolidated Undrained Triaxial Compression Test ( Measurement of Pore Pressure)	Cohesion		C' kN/m <sup>2</sup>	-	-	-	-	-
	Phi Angle		$\phi'$ Degree	-	-	-	-	-
	Cohesion		C kN/m <sup>2</sup>	-	-	-	-	-
	Phi Angle		$\phi$ Degree	-	-	-	-	-
Consolidation	Initial Void Ratio		e <sub>0</sub>	-	-	-	-	-
	Conso. Yield Stress		P <sub>y</sub> kN/m <sup>2</sup>	-	-	-	-	-
	Compression Index		C <sub>c</sub>	-	-	-	-	-
Soil Classification ( ASTM D 2487 - 06 )			Group Symbol	CH	CL	SP-SM (or) SP-SC	SP	SP
			Group Name	Fat clay	Lean clay	Poorly graded sand with silt (or) Poorly graded sand with clay (or silty clay)	Poorly graded sand	Poorly graded sand
<b>NOTE</b>								
Data used for reference are shown by red color.								

## SUMMARY OF SOIL TEST RESULTS

Project Name : Yangon River Survey Project						
Borehole No.		Location :				
Sample No.		Elephant Point	Elephant Point Upper			
Depth (m)		( 10 km ) ~	( 4.80 km ) ~	~	~	~
Moisture Content		w %	47.34	34.25		
Bulk Density		$\rho_t$ g/cm <sup>3</sup>	-	-		
Atterberg's Limit	Liquid Limit	WL %	29	-		
	Plastic Limit	WP %	23.93	-		
	Plasticity Index	IP	5.07	-		
Grain Size Analysis	Gravel, (76.20 ~ 4.75) mm	%	-	-		
	Sand, (4.75 ~ 0.075) mm	%	55.10	82.32		
	Silt, (0.075 ~ 0.005) mm	%	36.40	13.48		
	Clay, (< 0.005 mm)	%	8.50	4.20		
Specific Gravity of Soil		G <sub>s</sub> (20°C)	2.694	2.918		
Unconfined Compression	Unconfined Compressive Strength	q <sub>u</sub> kN/m <sup>2</sup>	-	-		
	Failure Strain	$\epsilon_f$ %	-	-		
	E <sub>50</sub>	kN/m <sup>2</sup>	-	-		
	Sensitivity Ratio		-	-		
Direct Shear Test	Cohesion	C <sub>UU</sub> kN/m <sup>2</sup>	-	-		
	Phi Angle	$\phi_{UU}$ Degree	-	-		
Unconsolidated Undrained Triaxial Compression Test	Cohesion	C <sub>UU</sub> kN/m <sup>2</sup>	-	-		
	Phi Angle	$\phi_{UU}$ Degree	-	-		
Consolidated Undrained Triaxial Compression Test ( Measurement of Pore Pressure)	Cohesion	C' kN/m <sup>2</sup>	-	-		
	Phi Angle	$\phi'$ Degree	-	-		
	Cohesion	C kN/m <sup>2</sup>	-	-		
	Phi Angle	$\phi$ Degree	-	-		
Consolidation	Initial Void Ratio	e <sub>0</sub>	-	-		
	Conso. Yield Stress	P <sub>y</sub> kN/m <sup>2</sup>	-	-		
	Compression Index	C <sub>c</sub>	-	-		
Soil Classification ( ASTM D 2487 - 06 )	Group Symbol		SM	SM (or) SC		
	Group Name		Silty sand	Silty sand (or) Clayey sand		
<b>NOTE</b>						
Data used for reference are shown by red color.						



## SPECIFIC GRAVITY TEST

Project Name	Yangon River Survey Project	Date	14.08.15
Location		Operator	H M A
Borehole No.			

### I Calibration of Pycnometer

Number of measurement		1	2	3	1	2	3
Number of Pycnometer		2	4	193	69	94	189
Mass of Pycnometer	$m_f$ g	47.316	47.241	48.904	46.685	53.042	57.784
Mass of (distilled water + pycnometer)	$m_a'$ g	150.097	150.604	144.150	149.707	158.067	154.500
Temperature of water	$T'$ °C	26.0	26.5	26.0	26.0	26.0	26.0
Density of water at $T'$ °C	$G_T^{(Table)}$	1.00013	1.00027	1.00026	1.00013	1.00013	1.00013
Density of water at $T$ °C	$G_T$						
$m_a' - m_f$	g	102.781	103.363	95.246	103.022	105.026	96.717
(1) $\frac{G_T}{G_T'} \times (m_a' - m_f)$	g	102.794	103.391	95.271	103.035	105.039	96.729
Convert mass of (water + pycnometer) at $T'$ °C	$m_a = (1) + m_f$ g	150.110	150.632	144.175	149.720	158.081	154.513

### II Specific Gravity Test

Sample No. & Depth		Elephant Point (10 km)			Elephant Point Upper (4.8 km)			
		1	2	3	1	2	3	
Number of measurement		2	4	193	69	94	189	
Number of pycnometer								
Mass of (oven-dried or wet soil + water + pycnometer)		$m_b$ g	160.996	164.290	155.991	167.121	175.170	170.274
Temperature of contents in pycnometer		$T$ °C	25.5	25.5	25.0	25.5	25.5	25.5
Mass of oven-dried soil in pycnometer	No. of container		B-304	B-305	B-374	B-301	B-355	B-393
	Mass of (oven-dried soil + container) g		53.276	59.988	55.640	62.700	62.187	60.077
	Mass of container		35.963	38.286	36.875	36.254	36.212	36.105
	$m_s$ g		17.313	21.702	18.765	26.446	25.975	23.972
Converted mass of (water + pycnometer) at $T'$ °C		$m_a$ g	150.110	150.632	144.175	149.720	158.081	154.513
$m_s + (m_a - m_b)$		g	6.427	8.044	6.949	9.045	8.886	8.211
Gs at $T$ °C ,								
$G_s (T \text{ °C} / T \text{ °C}) = \frac{m_s}{m_s + (m_a - m_b)}$			2.694	2.698	2.700	2.924	2.923	2.920
Correction factor (Table) K			0.99780	0.99780	0.99790	0.99780	0.99780	0.99780
Gs at 15 °C								
$G_s (T \text{ °C} / 15 \text{ °C}) = K \cdot G_s (T \text{ °C} / T \text{ °C})$			2.688	2.692	2.695	2.917	2.917	2.913
Mean Value			$G_s (T \text{ °C} / 15 \text{ °C}) = 2.692$			$G_s (T \text{ °C} / 15 \text{ °C}) = 2.916$		
Correction factor 20 °C (Table) K'			0.99871	0.99871	0.99884	0.99871	0.99871	0.99871
Gs at 20 °C								
$G_s (T \text{ °C} / 20 \text{ °C}) = K' \cdot G_s (T \text{ °C} / T \text{ °C})$			2.690	2.695	2.697	2.920	2.919	2.916
Mean Value			$G_s (T \text{ °C} / 20 \text{ °C}) = 2.694$			$G_s (T \text{ °C} / 20 \text{ °C}) = 2.918$		

Remarks :

## SPECIFIC GRAVITY TEST

Project Name	Yangon River Survey Project	Date	14.08.15
Location		Operator	H M A
Borehole No.			

### I Calibration of Pycnometer

Number of measurement	1	2	3	1	2	3
Number of Pycnometer	198	199	200	80	112	113
Mass of Pycnometer $m_f$ g	42.792	56.970	48.673	46.477	50.093	48.473
Mass of (distilled water + pycnometer) $m_a'$ g	136.701	154.035	149.185	149.195	155.484	150.528
Temperature of water $T'$ °C	26.0	26.0	26.0	26.0	26.0	26.0
Density of water at $T'$ °C $= \frac{G_T^{(Table)}}{G_{T'}}$	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
Density of water at $T$ °C						
$m_a' - m_f$ g	93.909	97.066	100.513	102.718	105.391	102.055
(1) $\frac{G_T \times (m_a' - m_f)}{G_{T'}}$ g	93.909	97.066	100.513	102.718	105.391	102.055
Convert mass of (water + pycnometer) at $T'$ °C $m_a = (1) + m_f$ g	136.701	154.035	149.185	149.195	155.484	150.528

### II Specific Gravity Test

Sample No. & Depth	Near Monkey Point			Upstream of Yangon River			
Number of measurement	1	2	3	1	2	3	
Number of pycnometer	198	199	200	80	112	113	
Mass of (oven-dried or wet soil + water + pycnometer) $m_b$ g	153.070	170.476	165.738	166.083	172.202	168.821	
Temperature of contents in pycnometer $T$ °C	26.0	26.0	26.0	26.0	26.0	26.0	
Mass of oven - dried soil in pycnometer $m_s$ g	No. of container	B-326	B-337	B-349	B-308	B-348	B-359
	Mass of (oven-dried soil + container) g	63.067	64.324	63.978	64.831	64.641	66.076
	Mass of container	36.910	38.056	37.527	37.830	37.931	36.852
	$m_s$ g	26.157	26.268	26.451	27.001	26.710	29.224
Converted mass of (water + pycnometer) at $T'$ °C $m_a$ g	136.701	154.035	149.185	149.195	155.484	150.528	
$m_s + (m_a - m_b)$ g	9.787	9.827	9.898	10.113	9.992	10.931	
Gs at $T$ °C , $G_s (T \text{ °C} / T \text{ °C}) = \frac{m_s}{m_s + (m_a - m_b)}$	2.672	2.673	2.672	2.670	2.673	2.673	
Correction factor ( Table ) K	0.99770	0.99770	0.99770	0.99770	0.99770	0.99770	
Gs at 15 °C $G_s (T \text{ °C} / 15 \text{ °C}) = K \cdot G_s (T \text{ °C} / T \text{ °C})$	2.666	2.667	2.666	2.664	2.667	2.667	
Mean Value	$G_s (T \text{ °C} / 15 \text{ °C}) = 2.666$			$G_s (T \text{ °C} / 15 \text{ °C}) = 2.666$			
Correction factor 20 °C ( Table ) K'	0.99858	0.99858	0.99858	0.99858	0.99858	0.99858	
Gs at 20 °C $G_s (T \text{ °C} / 20 \text{ °C}) = K' \cdot G_s (T \text{ °C} / T \text{ °C})$	2.669	2.669	2.669	2.666	2.669	2.670	
Mean Value	$G_s (T \text{ °C} / 20 \text{ °C}) = 2.669$			$G_s (T \text{ °C} / 20 \text{ °C}) = 2.668$			

**Remarks :**

## SPECIFIC GRAVITY TEST

Project Name	Yangon River Survey Project	Date	14.08.15
Location		Operator	H M A
Borehole No.			

### I Calibration of Pycnometer

Number of measurement		1	2	3	1	2	3
Number of Pycnometer		1	3	5	90	103	119
Mass of Pycnometer	$m_f$ g	45.785	46.403	45.594	53.487	43.238	44.505
Mass of (distilled water + pycnometer)	$m_a'$ g	149.038	150.302	141.043	157.712	146.186	149.179
Temperature of water	$T'$ °C	27.0	27.0	27.0	27.0	27.0	27.0
Density of water at $T'$ °C	$G_T^{(Table)}$	1.00027	1.00027	1.00040	1.00027	1.00027	1.00027
Density of water at $T$ °C	$G_T$						
$m_a' - m_f$	g	103.254	103.899	95.450	104.225	102.948	104.674
(1) $\frac{G_T}{G_T'} \times (m_a' - m_f)$	g	103.281	103.927	95.488	104.253	102.976	104.702
Convert mass of (water + pycnometer) at $T'$ °C	$m_a = (1) + m_f$ g	149.066	150.330	141.081	157.740	146.213	149.207

### II Specific Gravity Test

Sample No. & Depth	Pasundaung Creek			Bago River			
Number of measurement	1	2	3	1	2	3	
Number of pycnometer	1	3	5	90	103	119	
Mass of (oven-dried or wet soil + water + pycnometer)	$m_b$ g	156.946	159.320	150.479	167.276	156.220	158.853
Temperature of contents in pycnometer	$T$ °C	26.0	26.0	25.5	26.0	26.0	26.0
Mass of oven - dried soil in pycnometer  $m_s$ g	No. of container	B-331	B-370	B-371	B-322	B-324	B-354
	Mass of (oven-dried soil + container) g	48.828	50.521	51.328	51.949	52.821	52.275
	Mass of container	36.363	36.296	36.463	36.808	36.940	36.964
	$m_s$ g	12.465	14.225	14.865	15.141	15.881	15.311
Converted mass of (water + pycnometer) at $T'$ °C	$m_a$ g	149.066	150.330	141.081	157.740	146.213	149.207
$m_s + (m_a - m_b)$	g	4.585	5.235	5.467	5.605	5.874	5.665
Gs at $T$ °C ,  $G_s (T \text{ °C} / T \text{ °C}) = \frac{m_s}{m_s + (m_a - m_b)}$		2.719	2.717	2.719	2.701	2.703	2.703
Correction factor (Table) K		0.99770	0.99770	0.99780	0.99770	0.99770	0.99770
Gs at 15 °C  $G_s (T \text{ °C} / 15 \text{ °C}) = K \cdot G_s (T \text{ °C} / T \text{ °C})$		2.712	2.711	2.713	2.695	2.697	2.696
Mean Value		$G_s (T \text{ °C} / 15 \text{ °C}) = 2.712$			$G_s (T \text{ °C} / 15 \text{ °C}) = 2.696$		
Correction factor 20 °C (Table) K'		0.99858	0.99858	0.99871	0.99858	0.99858	0.99858
Gs at 20 °C  $G_s (T \text{ °C} / 20 \text{ °C}) = K' \cdot G_s (T \text{ °C} / T \text{ °C})$		2.715	2.714	2.715	2.698	2.700	2.699
Mean Value		$G_s (T \text{ °C} / 20 \text{ °C}) = 2.715$			$G_s (T \text{ °C} / 20 \text{ °C}) = 2.699$		

**Remarks :**

## SPECIFIC GRAVITY TEST

Project Name Yangon River Survey Project Date 14.08.15  
 Location ..... Operator HMA  
 Borehole No. .....

### I Calibration of Pycnometer

Number of measurement		1	2	3	1	2	3
Number of Pycnometer		109	110	111			
Mass of Pycnometer	$m_f$ g	47.520	46.471	47.681			
Mass of ( distilled water + pycnometer )	$m_{a'}$ g	151.196	148.194	149.070			
Temperature of water	$T'$ °C	26.0	26.0	26.0			
Density of water at $T'$ °C	$\frac{G_T^{(Table)}}{G_{T'}}$	1.00000	1.00000	1.00000			
Density of water at $T$ °C	$\frac{m_{a'} - m_f}{G_{T'}}$						
	$m_{a'} - m_f$ g	103.676	101.723	101.389			
(1) $\frac{G_T}{G_{T'}} \times (m_{a'} - m_f)$	g	103.676	101.723	101.389			
Convert mass of ( water + pycnometer ) at $T'$ °C	$m_a = (1) + m_f$ g	151.196	148.194	149.070			

### II Specific Gravity Test

Sample No. & Depth		Thilawa Area			1	2	3
		1	2	3	1	2	3
Number of measurement		109	110	111			
Number of pycnometer							
Mass of (oven-dried or wet soil + water + pycnometer )		$m_b$ g	167.056	164.616	165.167		
Temperature of contents in pycnometer		$T$ °C	26.0	26.0	26.0		
Mass of oven - dried soil in pycnometer  $m_s$ g	No. of container		B-380	B-394	B-399		
	Mass of (oven-dried soil + container ) g		62.386	63.662	61.942		
	Mass of container		37.047	37.456	36.242		
	$m_s$ g		25.339	26.206	25.700		
Converted mass of ( water + pycnometer ) at $T'$ °C		$m_a$ g	151.196	148.194	149.070		
$m_s + (m_a - m_b)$		g	9.479	9.783	9.603		
Gs at $T$ °C ,  $G_s (T \text{ °C} / T \text{ °C}) = \frac{m_s}{m_s + (m_a - m_b)}$			2.673	2.679	2.676		
Correction factor ( Table )		K	0.99770	0.99770	0.99770		
Gs at 15 °C  $G_s (T \text{ °C} / 15 \text{ °C}) = K .G_s (T \text{ °C} / T \text{ °C})$			2.667	2.672	2.670		
Mean Value			$G_s (T \text{ °C} / 15 \text{ °C}) = 2.670$			$G_s (T \text{ °C} / 15 \text{ °C}) =$	
Correction factor 20 °C ( Table )		K'	0.99858	0.99858	0.99858		
Gs at 20 °C  $G_s (T \text{ °C} / 20 \text{ °C}) = K'.G_s (T \text{ °C} / T \text{ °C})$			2.669	2.675	2.673		
Mean Value			$G_s (T \text{ °C} / 20 \text{ °C}) = 2.672$			$G_s (T \text{ °C} / 20 \text{ °C}) =$	

**Remarks :**

## TEST FOR MOISTURE CONTENT OF SOIL

Project Name Yangon River Survey Project Date 13.08.15  
 Location Operator E E W, Y L L M  
 Borehole No. .....

Sample No. & Depth	Measurement of Moisture Content						Mean moisture content
Pasundaung Creek	No. L-168		No. L-134		No. L-54		w = 81.36 %
	m <sub>a</sub> 74.35	m <sub>b</sub> 44.84	m <sub>a</sub> 76.04	m <sub>b</sub> 46.13	m <sub>a</sub> 76.54	m <sub>b</sub> 46.46	
	m <sub>b</sub> 44.84	m <sub>c</sub> 8.68	m <sub>b</sub> 46.13	m <sub>c</sub> 9.16	m <sub>b</sub> 46.46	m <sub>c</sub> 9.58	
	m <sub>w</sub> 29.51	m <sub>s</sub> 36.16	m <sub>w</sub> 29.91	m <sub>s</sub> 36.97	m <sub>w</sub> 30.08	m <sub>s</sub> 36.88	
	w = 81.61 %	w = 80.90 %	w = 81.56 %				
Bago River	No. L-224		No. L-243		No. L-31		w = 73.28 %
	m <sub>a</sub> 73.74	m <sub>b</sub> 46.65	m <sub>a</sub> 72.08	m <sub>b</sub> 45.61	m <sub>a</sub> 74.79	m <sub>b</sub> 46.51	
	m <sub>b</sub> 46.65	m <sub>c</sub> 9.68	m <sub>b</sub> 45.61	m <sub>c</sub> 9.51	m <sub>b</sub> 46.51	m <sub>c</sub> 7.90	
	m <sub>w</sub> 27.09	m <sub>s</sub> 36.97	m <sub>w</sub> 26.47	m <sub>s</sub> 36.10	m <sub>w</sub> 28.28	m <sub>s</sub> 38.61	
	w = 73.28 %	w = 73.32 %	w = 73.25 %				
Near Monkey Point	No. L-47		No. L-5		No. L-115		w = 25.74 %
	m <sub>a</sub> 79.25	m <sub>b</sub> 64.54	m <sub>a</sub> 81.09	m <sub>b</sub> 66.45	m <sub>a</sub> 81.75	m <sub>b</sub> 66.95	
	m <sub>b</sub> 64.54	m <sub>c</sub> 8.16	m <sub>b</sub> 66.45	m <sub>c</sub> 9.19	m <sub>b</sub> 66.95	m <sub>c</sub> 9.07	
	m <sub>w</sub> 14.71	m <sub>s</sub> 56.38	m <sub>w</sub> 14.64	m <sub>s</sub> 57.26	m <sub>w</sub> 14.80	m <sub>s</sub> 57.88	
	w = 26.09 %	w = 25.57 %	w = 25.57 %				
Upstream of Yangon River	No. L-52		No. L-173		No. L-179		w = 28.98 %
	m <sub>a</sub> 66.34	m <sub>b</sub> 53.25	m <sub>a</sub> 65.61	m <sub>b</sub> 52.92	m <sub>a</sub> 65.29	m <sub>b</sub> 52.54	
	m <sub>b</sub> 53.25	m <sub>c</sub> 8.81	m <sub>b</sub> 52.92	m <sub>c</sub> 8.57	m <sub>b</sub> 52.54	m <sub>c</sub> 8.37	
	m <sub>w</sub> 13.09	m <sub>s</sub> 44.44	m <sub>w</sub> 12.69	m <sub>s</sub> 44.35	m <sub>w</sub> 12.75	m <sub>s</sub> 44.17	
	w = 29.46 %	w = 28.61 %	w = 28.87 %				
Thilawa Area	No. L-177		No. L-175		No. L-247		w = 24.52 %
	m <sub>a</sub> 53.50	m <sub>b</sub> 44.73	m <sub>a</sub> 49.78	m <sub>b</sub> 41.71	m <sub>a</sub> 51.66	m <sub>b</sub> 43.08	
	m <sub>b</sub> 44.73	m <sub>c</sub> 8.88	m <sub>b</sub> 41.71	m <sub>c</sub> 8.49	m <sub>b</sub> 43.08	m <sub>c</sub> 8.49	
	m <sub>w</sub> 8.77	m <sub>s</sub> 35.85	m <sub>w</sub> 8.07	m <sub>s</sub> 33.22	m <sub>w</sub> 8.58	m <sub>s</sub> 34.59	
	w = 24.46 %	w = 24.29 %	w = 24.80 %				
Elephant Point ( 10km )	No. L-171		No. L-178		No. L-271		w = 47.34 %
	m <sub>a</sub> 97.07	m <sub>b</sub> 68.59	m <sub>a</sub> 100.43	m <sub>b</sub> 71.36	m <sub>a</sub> 101.73	m <sub>b</sub> 72.10	
	m <sub>b</sub> 68.59	m <sub>c</sub> 8.54	m <sub>b</sub> 71.36	m <sub>c</sub> 9.97	m <sub>b</sub> 72.10	m <sub>c</sub> 9.36	
	m <sub>w</sub> 28.48	m <sub>s</sub> 60.05	m <sub>w</sub> 29.07	m <sub>s</sub> 61.39	m <sub>w</sub> 29.63	m <sub>s</sub> 62.74	
	w = 47.43 %	w = 47.35 %	w = 47.23 %				
Elephant Point Upper (4.8km)	No. L-78		No. L-166		No. L-249		w = 34.25 %
	m <sub>a</sub> 83.83	m <sub>b</sub> 64.48	m <sub>a</sub> 81.86	m <sub>b</sub> 63.33	m <sub>a</sub> 83.39	m <sub>b</sub> 64.49	
	m <sub>b</sub> 64.48	m <sub>c</sub> 8.86	m <sub>b</sub> 63.33	m <sub>c</sub> 8.26	m <sub>b</sub> 64.49	m <sub>c</sub> 9.39	
	m <sub>w</sub> 19.35	m <sub>s</sub> 55.62	m <sub>w</sub> 18.53	m <sub>s</sub> 55.07	m <sub>w</sub> 18.90	m <sub>s</sub> 55.10	
	w = 34.79 %	w = 33.65 %	w = 34.30 %				
No. .... m ~ m	No. ....		No. ....		No. ....		w = ..... %
	m <sub>a</sub> .....	m <sub>b</sub> .....	m <sub>a</sub> .....	m <sub>b</sub> .....	m <sub>a</sub> .....	m <sub>b</sub> .....	
	m <sub>b</sub> .....	m <sub>c</sub> .....	m <sub>b</sub> .....	m <sub>c</sub> .....	m <sub>b</sub> .....	m <sub>c</sub> .....	
	m <sub>w</sub> .....	m <sub>s</sub> .....	m <sub>w</sub> .....	m <sub>s</sub> .....	m <sub>w</sub> .....	m <sub>s</sub> .....	
	w = ..... %	w = ..... %	w = ..... %				

Remark: Moisture Content  $w = \frac{m_a - m_b}{m_b - m_c} \times 100 = \frac{m_w}{m_s} \times 100 (\%)$

- m<sub>a</sub>= mass of moist soil and container (g)
- m<sub>b</sub>= mass of dried soil and container (g)
- m<sub>c</sub>= mass of container (g)
- m<sub>w</sub>= mass of moisture in soil (g)
- m<sub>s</sub>= mass of dried soil (g)



## PARTICLE SIZE ANALYSIS TEST ( For Hydrometer Test )

Project Name ..... Yangon River Survey Project ..... Date ..... 17.08.15 .....  
 Location ..... Operator ..... E E W, Y L L M .....  
 Sample No. .... Bago River .....

Mass of (Air-Dried Soil + Cont:) = ..... g Specific Gravity Gs = 2.696  
 Mass of Container No. ( ) = ..... g Plasticity Index Ip = 22.25  
 Mass of Air - Dried Soil  $m_s$  = ..... g Dispersing Agent 100ml of  $Na_2SiO_3$   
 $\frac{m_2}{m_o}$  = -

### 1. Measurement of Moisture Content of Air - Dried Soil

No. .... $m_a$ ..... $m_b$ ..... $m_w$ ..... W = ..... %	No. .... $m_a$ ..... $m_b$ ..... $m_w$ ..... W = ..... %	No. .... $m_a$ ..... $m_b$ ..... $m_w$ ..... W = ..... %	Mean Moisture Content w = ..... %
----------------------------------------------------------------------	----------------------------------------------------------------------	----------------------------------------------------------------------	--------------------------------------

$$\text{Mass of Dry Soil } m_{so} = \frac{100 m_s}{100 + w} = \frac{40.00}{100 + w} \text{ g}$$

2. Hydrometer Test Container No. BO-12 Cylinder No. H Hydrometer No. 387

1	2	3	4	5	6	7	8	9	10	11	12	13	
Measured Time	Elapsed Time min	Reading of Hydro:		Water Temp: °C	Effective Depth L mm	$\frac{L}{60t}$ mm/s	$\sqrt{\frac{L}{60t}}$	$\sqrt{\frac{0.018 \eta}{(Gs-1) \rho_w}}$	Particle Size 7 x 8 mm	Correct: factor F	r' + F	P (11) x M %	Corrected P P x $m_2/m_0$ %
		Decimal Place	r' 2 + Cm										
9:36													
9:37	1	0.0190	0.0198	26.0	142.5141	2.37523	1.54118	0.03073	0.04736	0.0020	0.0218	86.35	
9:38	2	0.0162	0.0170	26.0	147.9017	1.23251	1.11019	0.03073	0.03411	0.0020	0.0190	75.26	
9:41	5	0.0122	0.0130	26.0	155.5982	0.51866	0.72018	0.03073	0.02213	0.0020	0.0150	59.42	
9:51	15	0.0090	0.0098	26.0	161.7554	0.17973	0.42394	0.03073	0.01303	0.0020	0.0118	46.74	
10:06	30	0.0069	0.0077	26.0	165.7961	0.09211	0.30349	0.03073	0.00933	0.0020	0.0097	38.42	
10:36	60	0.0050	0.0058	26.0	169.4520	0.04707	0.21696	0.03073	0.00667	0.0020	0.0078	30.90	
13:36	240	0.0023	0.0031	26.0	174.6472	0.01213	0.11013	0.03073	0.00338	0.0020	0.0051	20.20	
9:36	1440	-0.0005	0.0003	26.0	180.0348	0.00208	0.04565	0.03073	0.00140	0.0020	0.0023	9.11	

$$\frac{1}{m_{so}/V} = \frac{25.000}{\text{cm}^3/\text{g}} \quad \frac{Gs}{(Gs-1)} \times \rho_w = \frac{1.5845}{\text{g/cm}^3} \quad M = \frac{100}{m_{so}/V} \times \frac{Gs}{(Gs-1)} \times \rho_w = 3961.161$$

$m_{so}/V$  : Mass of dry soil per 1 ml of suspension      Meniscus correction  $C_m$  0.0008

### 3. Sieve Analysis

Sieve Size (µm)	Container No.	(Retained Soil + Cont :) Mass (g)	Container Mass (g)	Retained Soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x $m_2/m_0$ (%)
							100	
850				0.02	0.05	0.05	99.95	
425				0.02	0.05	0.10	99.90	
250				0.04	0.10	0.20	99.80	
105				0.19	0.48	0.68	99.33	
75				0.64	1.60	2.28	97.73	

Remarks:

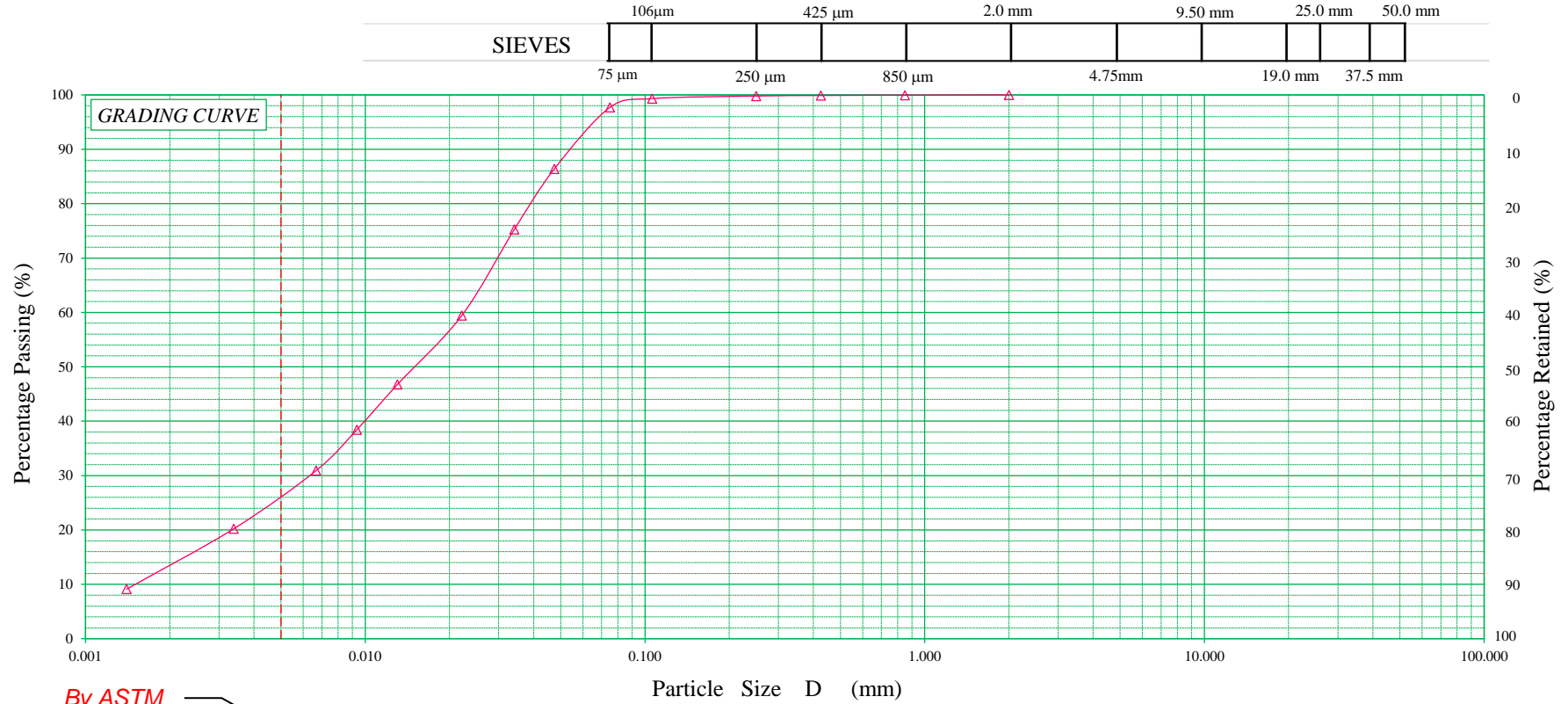
## PARTICLE SIZE ANALYSIS TEST (Grain Size Distribution Curve)

SAMPLE No. Bago River

DATE: 17.08.15

PROJECT: Yangon River Survey Project

LOCATION:



*By ASTM*

Colloids	Fines (Clay)	Fines (Silt)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobble
	0.005		0.075	0.425	2.0	4.75	19.00	75.00

<b>Remarks:</b>	Gravel (%) = -	Silt (%) = 71.73	<b>TEST BY: E E W, Y L L M</b>
	Sand (%) = 2.28	Clay (%) = 26.00	<b>CHECK BY: T H</b>

## PARTICLE SIZE ANALYSIS TEST ( For Hydrometer Test )

Project Name ..... Yangon River Survey Project ..... Date ..... 17.08.15 .....  
 Location ..... Operator ..... E E W, Y L L M .....  
 Sample No. .... Elephant Point ( 10 km ) .....

Mass of (Air-Dried Soil + Cont:) = ..... g Specific Gravity Gs = 2.692  
 Mass of Container No. ( ) = ..... g Plasticity Index Ip = 5.07  
 Mass of Air - Dried Soil  $m_s$  = ..... g Dispersing Agent 100ml of  $Na_2SiO_3$   
 $\frac{m_2}{m_o}$  = -

### 1. Measurement of Moisture Content of Air - Dried Soil

No. .... $m_a$ ..... $m_b$ ..... $m_w$ ..... W = ..... %	No. .... $m_a$ ..... $m_b$ ..... $m_w$ ..... W = ..... %	No. .... $m_a$ ..... $m_b$ ..... $m_w$ ..... W = ..... %	Mean Moisture Content w = ..... %
----------------------------------------------------------------------	----------------------------------------------------------------------	----------------------------------------------------------------------	--------------------------------------

$$\text{Mass of Dry Soil } m_{so} = \frac{100 m_s}{100 + w} = \frac{50.00}{100 + w} \text{ g}$$

2. Hydrometer Test Container No. BO-19 Cylinder No. N Hydrometer No. 297

1	2	3	4	5	6	7	8	9	10	11	12	13	
Measured Time	Elapsed Time min	Reading of Hydro:		Water Temp: °C	Effective Depth L mm	$\frac{L}{60t}$ mm/s	$\sqrt{\frac{L}{60t}}$	$\sqrt{\frac{0.018 \eta}{(Gs-1) \rho_w}}$	Particle Size 7 x 8 mm	Correct: factor F	r' + F	P (11) x M %	Corrected P P x $m_2/m_0$ %
		Decimal Place	r' 2 + Cm										
9:36													
9:37	1	0.0065	0.0073	26.0	162.9242	2.71540	1.64785	0.03077	0.05071	0.0020	0.0093	29.50	
9:38	2	0.0031	0.0039	26.0	169.5814	1.41318	1.18877	0.03077	0.03658	0.0020	0.0059	18.72	
9:41	5	0.0028	0.0036	26.0	170.1688	0.56723	0.75315	0.03077	0.02318	0.0020	0.0056	17.76	
9:51	15	0.0020	0.0028	26.0	171.7352	0.19082	0.43683	0.03077	0.01344	0.0020	0.0048	15.23	
10:06	30	0.0010	0.0018	26.0	173.6932	0.09650	0.31064	0.03077	0.00956	0.0020	0.0038	12.05	
10:36	60	0.0000	0.0008	26.0	175.6512	0.04879	0.22089	0.03077	0.00680	0.0020	0.0028	8.88	
13:36	240	-0.0002	0.0006	26.0	176.0428	0.01223	0.11057	0.03077	0.00340	0.0020	0.0026	8.25	
9:36	1440	-0.0007	0.0001	26.0	177.0218	0.00205	0.04526	0.03077	0.00139	0.0020	0.0021	6.66	

$$\frac{1}{m_{so}/V} = \frac{20.000}{\text{cm}^3/\text{g}} \quad \frac{Gs}{(Gs-1)} \times \rho_w = \frac{1.5861}{\text{g/cm}^3} \quad M = \frac{100}{m_{so}/V} \times \frac{Gs}{(Gs-1)} \times \rho_w = 3172.184$$

$m_{so}/V$  : Mass of dry soil per 1 ml of suspension      Meniscus correction  $C_m$  0.0008

### 3. Sieve Analysis

Sieve Size (µm)	Container No.	(Retained Soil + Cont :) Mass (g)	Container Mass (g)	Retained Soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x $m_2/m_0$ (%)
							100	
850				0.02	0.04	0.04	99.96	
425				0.06	0.12	0.16	99.84	
250				0.42	0.84	1.00	99.00	
105				14.55	29.10	30.10	69.90	
75				12.50	25.00	55.10	44.90	

Remarks:

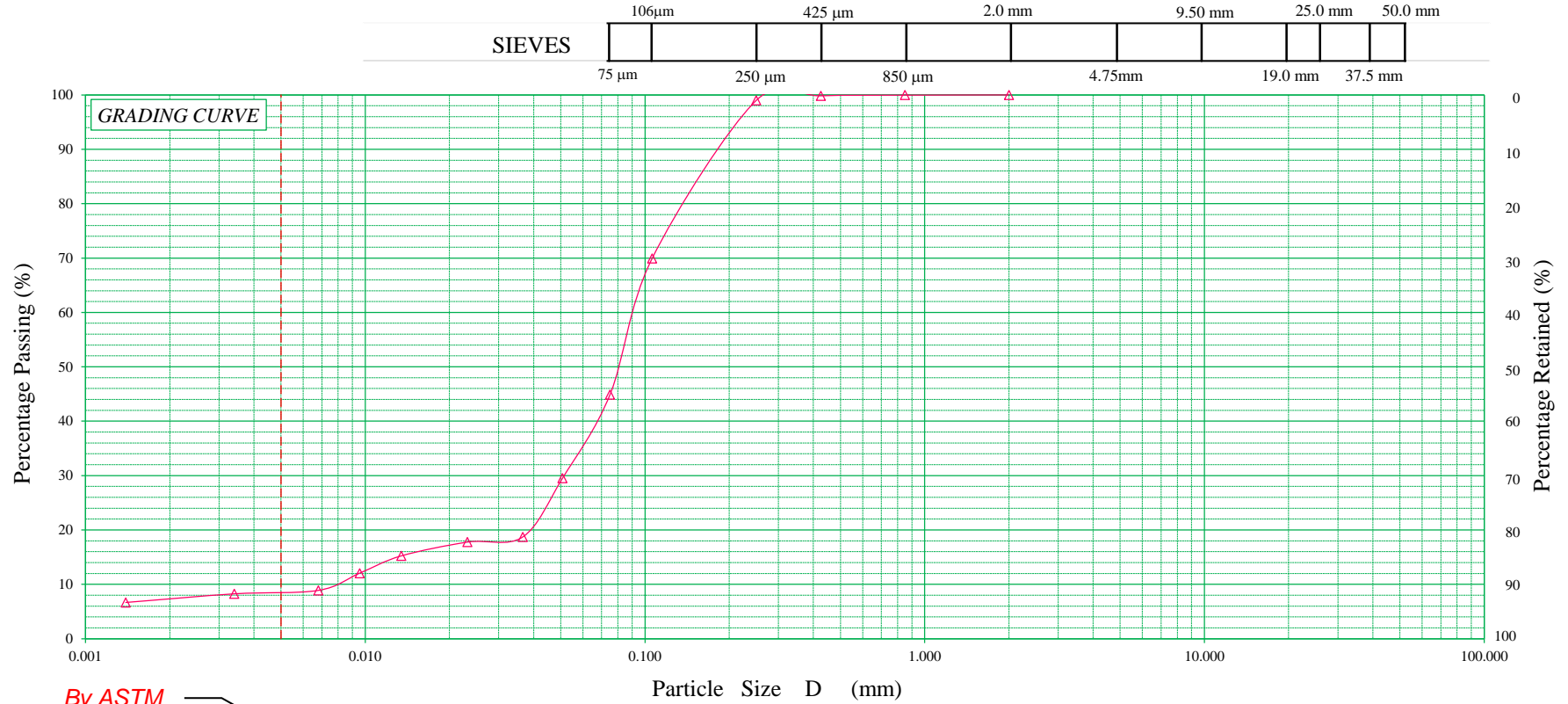
## PARTICLE SIZE ANALYSIS TEST (Grain Size Distribution Curve)

SAMPLE No. Elephant Point ( 10 km )

DATE: 17.08.15

PROJECT: Yangon River Survey Project

LOCATION:



*By ASTM*

Colloids	Fines (Clay)	Fines (Silt)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobble
	0.005	0.075	0.425	2.0	4.75	19.00	75.00	

Remarks:	Gravel (%) = -	Silt (%) = 36.40	TEST BY: E E W, Y L L M
	Sand (%) = 55.10	Clay (%) = 8.50	CHECK BY: T H

## PARTICLE SIZE ANALYSIS TEST ( For Hydrometer Test )

Project Name ..... Yangon River Survey Project ..... Date ..... 17.08.15 .....  
 Location ..... Operator ..... E E W, Y L L M .....  
 Sample No. .... Elephant Point Upper ( 4.80 km ) .....

Mass of (Air-Dried Soil + Cont:) = ..... g Specific Gravity G<sub>s</sub> = 2.916  
 Mass of Container No. ( ) = ..... g Plasticity Index I<sub>p</sub> = -  
 Mass of Air - Dried Soil m<sub>s</sub> = ..... g Dispersing Agent 50ml of Na<sub>2</sub>SiO<sub>3</sub>  
 $\frac{m_2}{m_o} = \dots\dots\dots$

### 1. Measurement of Moisture Content of Air - Dried Soil

No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... w = ..... %	No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... w = ..... %	No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... w = ..... %	Mean Moisture Content w = ..... %
-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	--------------------------------------

$$\text{Mass of Dry Soil } m_{so} = \frac{100 m_s}{100 + w} = \frac{60.00}{100 + w} \text{ g}$$

**2. Hydrometer Test** Container No. .... BO-20 ..... Cylinder No. .... 0 ..... Hydrometer No. .... 297 .....

1	2	3	4	5	6	7	8	9	10	11	12	13	
Measured Time	Elapsed Time min	Reading of Hydro:		Water Temp: °C	Effective Depth L mm	$\frac{L}{60t}$ mm/s	$\sqrt{\frac{L}{60t}}$	$\sqrt{\frac{0.018 \eta}{(G_s - 1) \rho_w}}$	Particle Size 7 x 8 mm	Correct: factor F	r' + F	P (11) x M %	Corrected P P x m <sub>2</sub> /m <sub>0</sub> %
		Decimal Place	r' 2 + Cm										
9:42													
9:43	1	0.0000	0.0008	26.0	175.7271	2.92879	1.71137	0.02891	0.04948	0.0020	0.0028	7.08	
9:44	2	-0.0003	0.0005	26.0	176.3145	1.46929	1.21214	0.02891	0.03505	0.0020	0.0025	6.32	
9:47	5	-0.0005	0.0003	26.0	176.7061	0.58902	0.76748	0.02891	0.02219	0.0020	0.0023	5.82	
9:57	15	-0.0008	0.0000	26.0	177.2935	0.19699	0.44384	0.02891	0.01283	0.0020	0.0020	5.06	
10:12	30	-0.0010	-0.0002	26.0	177.6851	0.09871	0.31419	0.02891	0.00908	0.0020	0.0018	4.55	
10:42	60	-0.0010	-0.0002	26.0	177.6851	0.04936	0.22216	0.02891	0.00642	0.0020	0.0018	4.55	
13:42	240	-0.0012	-0.0004	26.0	178.0767	0.01237	0.11120	0.02891	0.00322	0.0020	0.0016	4.05	
9:42	1440	-0.0015	-0.0007	26.0	178.6641	0.00207	0.04547	0.02891	0.00131	0.0020	0.0013	3.29	

$$\frac{1}{m_{so}/V} = \frac{16.667}{\dots\dots\dots} \text{ cm}^3/\text{g} \quad \frac{G_s}{(G_s - 1)} \times \rho_w = \frac{1.5171}{\dots\dots\dots} \text{ g/cm}^3 \quad M = \frac{100}{m_{so}/V} \times \frac{G_s}{(G_s - 1)} \times \rho_w = \frac{2528.571}{\dots\dots\dots}$$

m<sub>so</sub> / V : Mass of dry soil per 1 ml of suspension      Meniscus correction C<sub>m</sub> ..... 0.0008 .....

### 3. Sieve Analysis

Sieve Size (µm)	Container No.	(Retained Soil + Cont :) Mass (g)	Container Mass (g)	Retained Soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x m <sub>2</sub> /m <sub>0</sub> (%)
							100	
850				0.01	0.02	0.02	99.98	
425				0.06	0.10	0.12	99.88	
250				0.30	0.50	0.62	99.38	
105				36.41	60.68	61.30	38.70	
75				12.61	21.02	82.32	17.68	

Remarks:

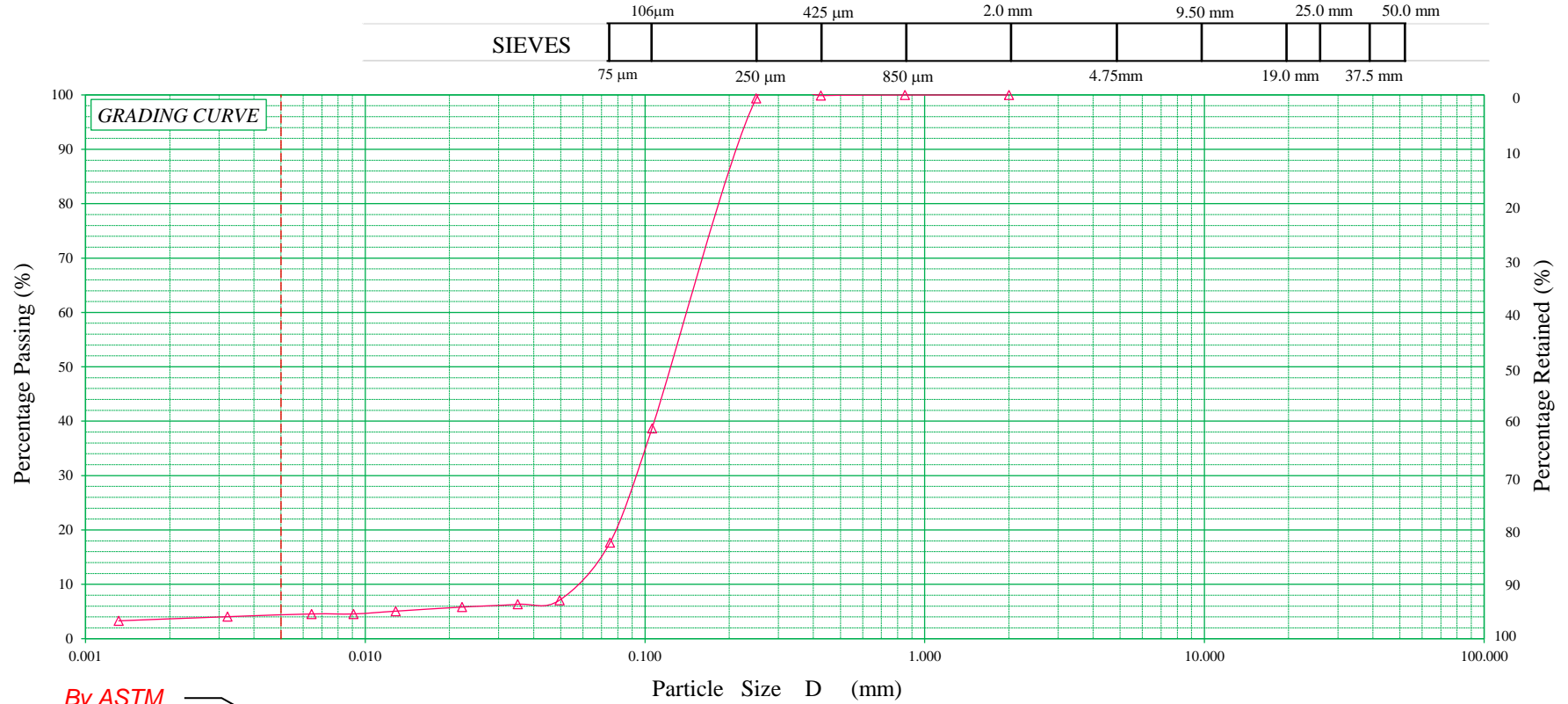
## PARTICLE SIZE ANALYSIS TEST (Grain Size Distribution Curve)

SAMPLE No. Elephant Point Upper ( 4.80 km )

DATE: 17.08.15

PROJECT: Yangon River Survey Project

LOCATION:



*By ASTM*

Colloids	Fines (Clay)	Fines (Silt)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobble
	0.005	0.075	0.425	2.0	4.75	19.00	75.00	

Remarks:	Gravel (%) = -	Silt (%) = 13.48	TEST BY: E E W, Y L L M
	Sand (%) = 82.32	Clay (%) = 4.20	CHECK BY: T H

## PARTICLE SIZE ANALYSIS TEST ( For Sieve Analysis Test )

Project Name Yangon River Survey Project Date 17.08.15  
 Location ..... Operator EEW, YLLM  
 Sample No. Near Monkey Point

<p><b>Total mass of air-dried sample <math>m</math></b>                  Mass of (Air - Dried Soil + Cont:) = ..... g                  Mass of Container No. ( ) = ..... g                  Mass of Air - Dried Soil <math>m</math> = ..... g                  Mass of air-dried sample passing 2.0 <math>\mu\text{m}</math> : <math>m - m_1</math> = ..... g</p>	<p><b>Dry mass after washing on 2000 <math>\mu\text{m}</math> Sieve <math>m_1</math></b>                  Mass of (<math>m_1</math> + container) = ..... g                  Mass of container No. ( ) = ..... g                  Dry mass after washing on 2000 <math>\mu\text{m}</math> Sieve <math>m_1</math> = ..... g</p>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### Measurement of Moisture content of Air - Dried Soil

No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... $w = \dots\dots\dots\%$	No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... $w = \dots\dots\dots\%$	No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... $w = \dots\dots\dots\%$	Mean Moisture Content  $w = \dots\dots\dots\%$
-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	------------------------------------------------------

Mass of dry sample passing 2000  $\mu\text{m}$  Sieve  $m_2 = \frac{100(m - m_1)}{100 + w} = \dots\dots\dots 162.55 \text{ g}$

Total mass of dry sample  $m_o = m_1 + m_2 = \dots\dots\dots 171.52 \text{ g}$

$\frac{m_2}{m_o} = \frac{\text{Mass of dry sample passing 2000 } \mu\text{m sieve}}{\text{Total mass of dry sample}} = \dots\dots\dots 0.948 \text{ g}$

### Sieve analysis of sample retained on 2000 $\mu\text{m}$ sieve

Sieve Size (mm)	Container No.	(Retain Soil + Cont:) Mass (g)	Container Mass (g)	Retain soil Mass (g)	Retain (%)	Accumulative (%)	Accumulative P (%)
53.00							
37.50							
26.50							
19.00							100.00
9.50				2.43	1.42	1.42	98.58
4.75				1.54	0.90	2.31	97.69
2.00				5.00	2.92	5.23	94.77

### Sieve analysis of sample passing 2000 $\mu\text{m}$ sieve

Sieve size ( $\mu\text{m}$ )	Container No.	(Retained soil + Cont:) Mass (g)	Container Mass (g)	Retained soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x $m_2/m_o$ (%)
850								
425								
250								
106								
75								

Remarks:

## PARTICLE SIZE ANALYSIS TEST ( For Hydrometer Test )

Project Name ..... Yangon River Survey Project ..... Date ..... 17.08.15 .....  
 Location ..... Operator ..... E E W, Y L L M .....  
 Sample No. .... Near Monkey Point .....

Mass of (Air-Dried Soil + Cont:) = ..... g Specific Gravity Gs = .....  
 Mass of Container No. ( ) = ..... g Plasticity Index Ip = .....  
 Mass of Air - Dried Soil  $m_s$  = ..... g Dispersing Agent .....  
 $\frac{m_2}{m_o} = 0.948$

### 1. Measurement of Moisture Content of Air - Dried Soil

No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... w = ..... %	No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... w = ..... %	No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... w = ..... %	Mean Moisture Content w = ..... %
-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	--------------------------------------

$$\text{Mass of Dry Soil } m_{so} = \frac{100 m_s}{100 + w} = \frac{70.00}{100 + w} \text{ g}$$

### 2. Hydrometer Test      Container No. .... BO-2 .....      Cylinder No. ....      Hydrometer No. ....

1	2	3	4	5	6	7	8	9	10	11	12	13	
Measured Time	Elapsed Time min	Reading of Hydro:		Water Temp: °C	Effective Depth L mm	$\frac{L}{60t}$ mm/s	$\sqrt{\frac{L}{60t}}$	$\sqrt{\frac{0.018 \eta}{(Gs-1) \rho_w}}$	Particle Size 7 x 8 mm	Correct: factor F	r' + F	P (11) x M %	Corrected P P x m <sub>2</sub> /m <sub>0</sub> %
		Decimal Place	r' 2 + Cm										
	1												
	2												
	5												
	15												
	30												
	60												
	240												
	1440												

$$\frac{1}{m_{so}/V} = \dots \text{ cm}^3/\text{g} \quad \frac{Gs}{(Gs-1)} \times \rho_w = \dots \text{ g/cm}^3 \quad M = \frac{100}{m_{so}/V} \times \frac{Gs}{(Gs-1)} \times \rho_w = \dots$$

$m_{so}/V$  : Mass of dry soil per 1 ml of suspension      Meniscus correction  $C_m$  .....

### 3. Sieve Analysis

Sieve Size (µm)	Container No.	(Retained Soil + Cont :) Mass (g)	Container Mass (g)	Retained Soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x m <sub>2</sub> /m <sub>0</sub> (%)
850				1.45	2.07	2.07	97.93	92.81
425				15.05	21.50	23.57	76.43	72.43
250				33.69	48.13	71.70	28.30	26.82
106				14.34	20.49	92.19	7.81	7.41
75				1.58	2.26	94.44	5.56	5.27

Remarks: Dispersing Agent Correction - -



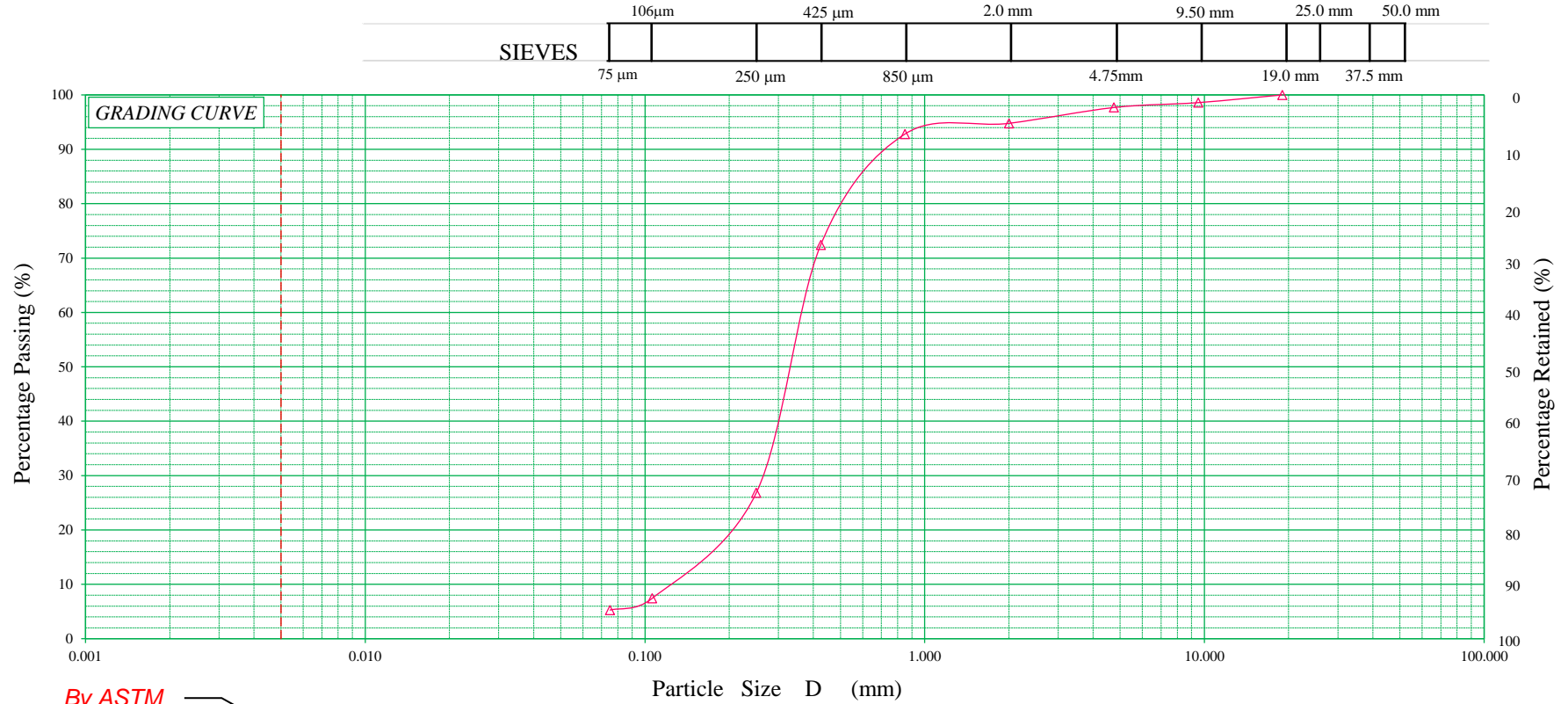
## PARTICLE SIZE ANALYSIS TEST (Grain Size Distribution Curve)

SAMPLE No. Near Monkey Point

DATE: 17.08.15

PROJECT: Yangon River Survey Project

LOCATION:



*By ASTM*

Colloids	Fines (Clay)	Fines (Silt)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobble
	0.005		0.075	0.425	2.0	4.75	19.00	75.00

Remarks:

Gravel (%) = 2.31

Silt (%) =

5.27

Sand (%) = 92.42

Clay (%) =

TEST BY:

E E W, Y L L M

CHECK BY:

T H

## PARTICLE SIZE ANALYSIS TEST ( For Hydrometer Test )

Project Name ..... Yangon River Survey Project ..... Date ..... 17.08.15 .....  
 Location ..... Operator ..... E E W, Y L L M .....  
 Sample No. .... Pasundaung Creek .....

Mass of (Air-Dried Soil + Cont:) = ..... g Specific Gravity G<sub>s</sub> = 2.712  
 Mass of Container No. ( ) = ..... g Plasticity Index I<sub>p</sub> = 27.94  
 Mass of Air - Dried Soil m<sub>s</sub> = ..... g Dispersing Agent 100ml of Na<sub>2</sub>SiO<sub>3</sub>  
 $\frac{m_2}{m_o} = \dots\dots\dots$

### 1. Measurement of Moisture Content of Air - Dried Soil

No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... W = ..... %	No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... W = ..... %	No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... W = ..... %	Mean Moisture Content w = ..... %
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$$\text{Mass of Dry Soil } m_{so} = \frac{100 m_s}{100 + w} = \frac{40.00}{100 + w} \text{ g}$$

**2. Hydrometer Test** Container No. .... **BO-15** ..... Cylinder No. .... **G** ..... Hydrometer No. .... **387** .....

1	2	3	4	5	6	7	8	9	10	11	12	13	
Measured Time	Elapsed Time min	Reading of Hydro:		Water Temp: °C	Effective Depth L mm	$\frac{L}{60t}$ mm/s	$\sqrt{\frac{L}{60t}}$	$\sqrt{\frac{0.018 \eta}{(G_s - 1) \rho_w}}$	Particle Size 7 x 8 mm	Correct factor F	r' + F	P (11) x M %	Corrected P P x m <sub>2</sub> /m <sub>0</sub> %
		Decimal Place	r' 2 + Cm										
9:30													
9:31	1	0.0198	0.0206	26.0	140.9108	2.34851	1.53249	0.03059	0.04687	0.0020	0.0226	89.21	
9:32	2	0.0180	0.0188	26.0	144.3742	1.20312	1.09687	0.03059	0.03355	0.0020	0.0208	82.11	
9:35	5	0.0130	0.0138	26.0	153.9949	0.51332	0.71646	0.03059	0.02191	0.0020	0.0158	62.37	
9:45	15	0.0090	0.0098	26.0	161.6914	0.17966	0.42386	0.03059	0.01296	0.0020	0.0118	46.58	
10:00	30	0.0065	0.0073	26.0	166.5018	0.09250	0.30414	0.03059	0.00930	0.0020	0.0093	36.71	
10:30	60	0.0050	0.0058	26.0	169.3880	0.04705	0.21692	0.03059	0.00663	0.0020	0.0078	30.79	
13:30	240	0.0023	0.0031	26.0	174.5832	0.01212	0.11011	0.03059	0.00337	0.0020	0.0051	20.13	
9:30	1440	-0.0003	0.0005	26.0	179.5859	0.00208	0.04559	0.03059	0.00139	0.0020	0.0025	9.87	

$$\frac{1}{m_{so}/V} = \frac{25.000}{\text{cm}^3/\text{g}} \quad \frac{G_s}{(G_s - 1)} \times \rho_w = \frac{1.5790}{\text{g/cm}^3} \quad M = \frac{100}{m_{so}/V} \times \frac{G_s}{(G_s - 1)} \times \rho_w = \frac{3947.519}{\text{g/cm}^3}$$

m<sub>so</sub> / V : Mass of dry soil per 1 ml of suspension      Meniscus correction C<sub>m</sub> ..... 0.0008 .....

### 3. Sieve Analysis

Sieve Size (µm)	Container No.	(Retained Soil + Cont :) Mass (g)	Container Mass (g)	Retained Soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x m <sub>2</sub> /m <sub>0</sub> (%)
							100	
850				0.80	2.00	2.00	98.00	
425				2.05	5.13	7.13	92.88	
250				0.52	1.30	8.43	91.58	
105				0.25	0.63	9.05	90.95	
75				0.13	0.33	9.38	90.63	

Remarks:

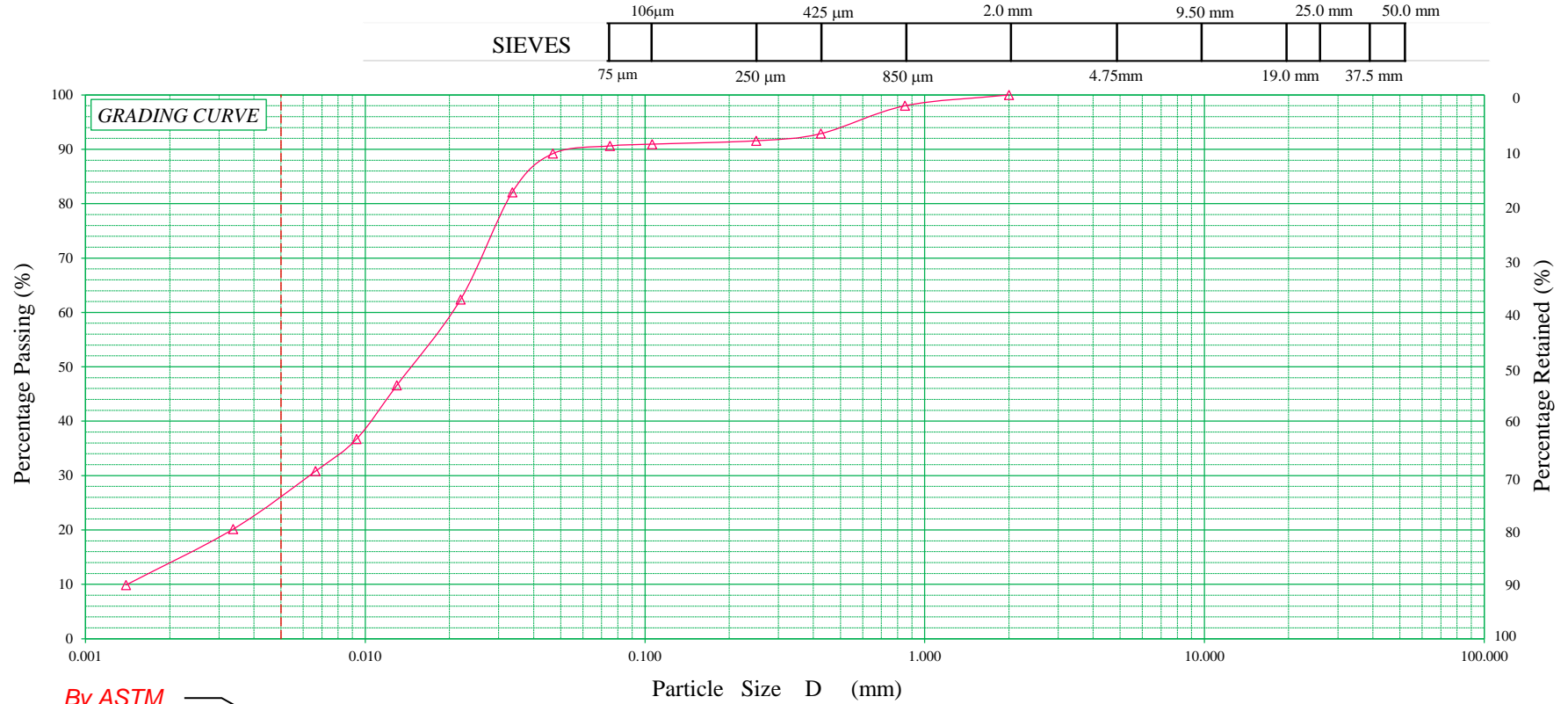
## PARTICLE SIZE ANALYSIS TEST (Grain Size Distribution Curve)

SAMPLE No. Pasundaung Creek

DATE: 17.08.15

PROJECT: Yangon River Survey Project

LOCATION:



*By ASTM*

Colloids	Fines (Clay)	Fines (Silt)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobble
	0.005	0.075	0.425	2.0	4.75	19.00	75.00	

Remarks:

Gravel (%) = -                      Silt (%) = 64.63  
 Sand (%) = 9.38                      Clay (%) = 26.00

TEST BY: E E W, Y L L M

CHECK BY: T H

## PARTICLE SIZE ANALYSIS TEST ( For Sieve Analysis Test )

Project Name Yangon River Survey Project Date 17.08.15  
 Location Thilawa Area Operator E E W, Y L L M  
 Sample No. Thilawa Area

<p><b>Total mass of air-dried sample <math>m</math></b>                  Mass of (Air - Dried Soil + Cont:) = ..... g                  Mass of Container No. ( ) = ..... g                  Mass of Air - Dried Soil <math>m</math> = ..... g                  Mass of air-dried sample passing 2.0 <math>\mu\text{m}</math> : <math>m - m_1</math> = ..... g</p>	<p><b>Dry mass after washing on 2000 <math>\mu\text{m}</math> Sieve <math>m_1</math></b>                  Mass of (<math>m_1</math> + container) = ..... g                  Mass of container No. ( ) = ..... g                  Dry mass after washing on 2000 <math>\mu\text{m}</math> Sieve <math>m_1</math> = ..... g</p>
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### Measurement of Moisture content of Air - Dried Soil

No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... w = ..... %	No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... w = ..... %	No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... w = ..... %	Mean Moisture Content  w = ..... %
-------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------	------------------------------------------

$$\text{Mass of dry sample passing 2000 } \mu\text{m Sieve } m_2 = \frac{100(m - m_1)}{100 + w} = \frac{102.71}{100 + w} \text{ g}$$

$$\text{Total mass of dry sample } m_o = m_1 + m_2 = 103.66 \text{ g}$$

$$\frac{m_2}{m_o} = \frac{\text{Mass of dry sample passing 2000 } \mu\text{m sieve}}{\text{Total mass of dry sample}} = \frac{0.991}{103.66} \text{ g}$$

### Sieve analysis of sample retained on 2000 $\mu\text{m}$ sieve

Sieve Size (mm)	Container No.	(Retain Soil + Cont:) Mass (g)	Container Mass (g)	Retain soil Mass (g)	Retain (%)	Accumulative (%)	Accumulative P (%)
53.00							
37.50							
26.50							
19.00							
9.50							
4.75							100.00
2.00				0.95	0.92	0.92	99.08

### Sieve analysis of sample passing 2000 $\mu\text{m}$ sieve

Sieve size ( $\mu\text{m}$ )	Container No.	(Retained soil + Cont:) Mass (g)	Container Mass (g)	Retained soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x $m_2/m_o$ (%)
850								
425								
250								
106								
75								

Remarks:



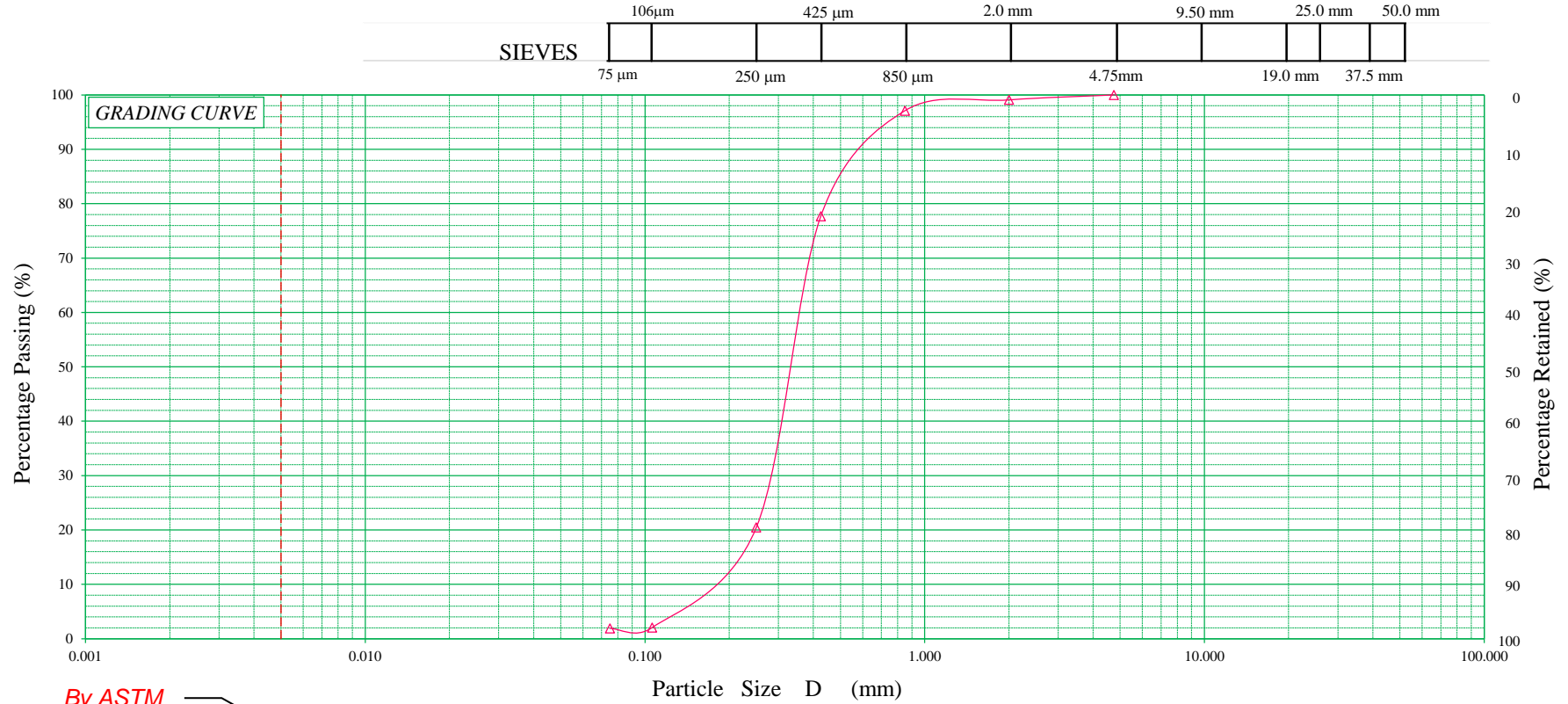
## PARTICLE SIZE ANALYSIS TEST (Grain Size Distribution Curve)

SAMPLE No. Thilawa Area

DATE: 17.08.15

PROJECT: Yangon River Survey Project

LOCATION:



*By ASTM*

Colloids	Fines (Clay)	Fines (Silt)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobble
	0.005		0.075	0.425	2.0	4.75	19.00	75.00

Remarks:	Gravel (%) = 0.00	Silt (%) = 1.90	TEST BY: E E W, Y L L M
	Sand (%) = 98.10	Clay (%) =	CHECK BY: T H

## PARTICLE SIZE ANALYSIS TEST ( For Sieve Analysis Test )

Project Name Yangon River Survey Project Date 17.08.15  
 Location Upstream of Yangon River Operator E E W, Y L L M  
 Sample No. Upstream of Yangon River

<p><b>Total mass of air-dried sample <math>m</math></b>                  Mass of (Air - Dried Soil + Cont:) = ..... g                  Mass of Container No. ( ) = ..... g                  Mass of Air - Dried Soil <math>m</math> = ..... g                  Mass of air-dried sample passing 2.0 <math>\mu\text{m}</math> : <math>m - m_1</math> = ..... g</p>	<p><b>Dry mass after washing on 2000 <math>\mu\text{m}</math> Sieve <math>m_1</math></b>                  Mass of (<math>m_1</math> + container) = ..... g                  Mass of container No. ( ) = ..... g                  Dry mass after washing on 2000 <math>\mu\text{m}</math> Sieve <math>m_1</math> = ..... g</p>
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### Measurement of Moisture content of Air - Dried Soil

No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... $w = \dots\dots\dots\%$	No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... $w = \dots\dots\dots\%$	No. .... $m_a$ ..... $m_b$ ..... $m_c$ ..... $m_w$ ..... $w = \dots\dots\dots\%$	Mean Moisture Content  $w = \dots\dots\dots\%$
-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	------------------------------------------------------

Mass of dry sample passing 2000  $\mu\text{m}$  Sieve  $m_2 = \frac{100(m - m_1)}{100 + w} = \dots\dots\dots 131.96 \text{ g}$

Total mass of dry sample  $m_o = m_1 + m_2 = \dots\dots\dots 132.96 \text{ g}$

$\frac{m_2}{m_o} = \frac{\text{Mass of dry sample passing 2000 } \mu\text{m sieve}}{\text{Total mass of dry sample}} = \dots\dots\dots 0.992 \text{ g}$

### Sieve analysis of sample retained on 2000 $\mu\text{m}$ sieve

Sieve Size (mm)	Container No.	(Retain Soil + Cont:) Mass (g)	Container Mass (g)	Retain soil Mass (g)	Retain (%)	Accumulative (%)	Accumulative P (%)
53.00							
37.50							
26.50							
19.00							
9.50							100.00
4.75				0.73	0.55	0.55	99.45
2.00				0.27	0.20	0.75	99.25

### Sieve analysis of sample passing 2000 $\mu\text{m}$ sieve

Sieve size ( $\mu\text{m}$ )	Container No.	(Retained soil + Cont:) Mass (g)	Container Mass (g)	Retained soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x $m_2/m_o$ (%)
850								
425								
250								
106								
75								

Remarks:

## PARTICLE SIZE ANALYSIS TEST ( For Hydrometer Test )

Project Name ..... Yangon River Survey Project ..... Date ..... 17.08.15 .....  
 Location ..... Operator ..... E E W, Y L L M .....  
 Sample No. .... Upstream of Yangon River .....

Mass of (Air-Dried Soil + Cont:) = ..... g Specific Gravity G<sub>s</sub> = .....  
 Mass of Container No. ( ) = ..... g Plasticity Index I<sub>p</sub> = .....  
 Mass of Air - Dried Soil *m<sub>s</sub>* = ..... g Dispersing Agent .....  
 $\frac{m_2}{m_o} = \frac{0.992}{\dots}$

### 1. Measurement of Moisture Content of Air - Dried Soil

No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... W = ..... %	No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... W = ..... %	No. .... m <sub>a</sub> ..... m <sub>b</sub> ..... m <sub>w</sub> ..... W = ..... %	Mean Moisture Content w = ..... %
-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------	--------------------------------------

$$\text{Mass of Dry Soil } m_{so} = \frac{100 m_s}{100 + w} = \frac{70.00}{100 + w} \text{ g}$$

**2. Hydrometer Test** Container No. .... **BO-3** ..... Cylinder No. .... Hydrometer No. ....

1	2	3	4	5	6	7	8	9	10	11	12	13	
Measured Time	Elapsed Time min	Reading of Hydro:		Water Temp: °C	Effective Depth L mm	$\frac{L}{60t}$ mm/s	$\sqrt{\frac{L}{60t}}$	$\sqrt{\frac{0.018 \eta}{(G_s - 1) \rho_w}}$	Particle Size 7 x 8 mm	Correct: factor F	r' + F	P (11) x M %	Corrected P P x m <sub>2</sub> /m <sub>0</sub> %
		Decimal Place	r' 2 + Cm										
	1												
	2												
	5												
	15												
	30												
	60												
	240												
	1440												

$$\frac{1}{m_{so}/V} = \dots \text{ cm}^3/\text{g} \quad \frac{G_s}{(G_s - 1)} \times \rho_w = \dots \text{ g/cm}^3 \quad M = \frac{100}{m_{so}/V} \times \frac{G_s}{(G_s - 1)} \times \rho_w = \dots$$

**m<sub>so</sub> / V** : Mass of dry soil per 1 ml of suspension      **Meniscus correction C<sub>m</sub>** .....

### 3. Sieve Analysis

Sieve Size (µm)	Container No.	(Retained Soil + Cont :) Mass (g)	Container Mass (g)	Retained Soil Mass (g)	Retained (%)	Accumulative (%)	Accumulative P (%)	Corrected P P x m <sub>2</sub> /m <sub>0</sub> (%)
850				0.30	0.43	0.43	99.57	98.82
425				3.31	4.73	5.16	94.84	94.13
250				41.01	58.59	63.74	36.26	35.98
106				23.43	33.47	97.21	2.79	2.76
75				0.34	0.49	97.70	2.30	2.28

Remarks: Dispersing Agent Correction - -



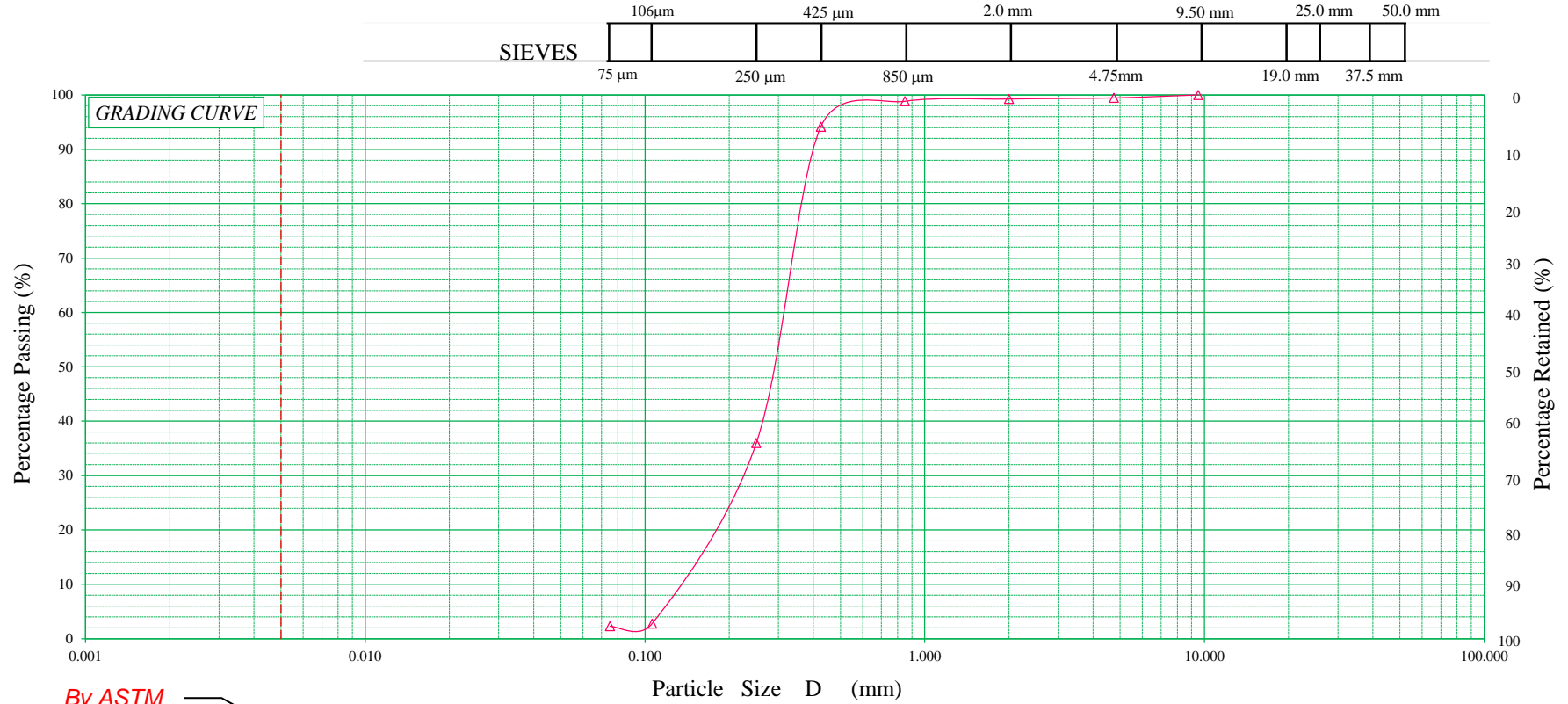
## PARTICLE SIZE ANALYSIS TEST (Grain Size Distribution Curve)

SAMPLE No. Upstream of Yangon River

DATE: 17.08.15

PROJECT: Yangon River Survey Project

LOCATION:



Colloids	Fines (Clay)	Fines (Silt)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobble
	0.005		0.075	0.425	2.0	4.75	19.00	75.00

Remarks:	Gravel (%) = 0.55	Silt (%) = 2.28	TEST BY: E E W, Y L L M
	Sand (%) = 97.17	Clay (%) =	CHECK BY: T H

## ATTERBERG'S LIMITS TEST

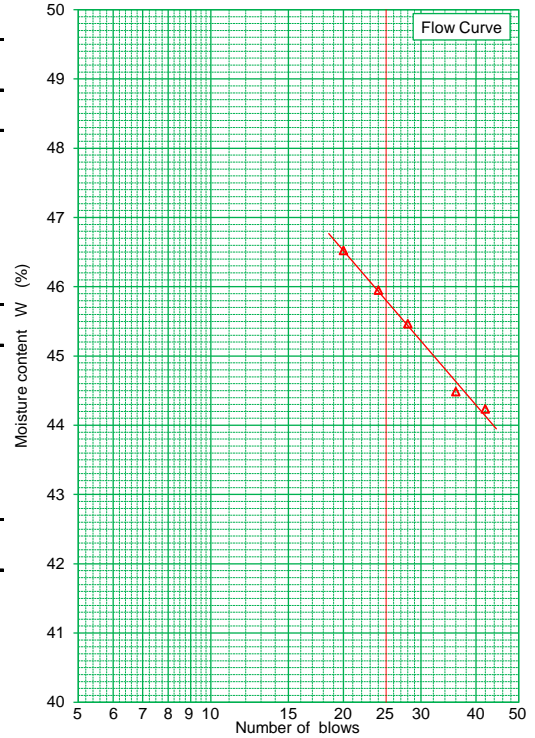
Project Name Yangon River Survey Project  
 Location .....  
 Borehole No. .....

Date 15.08.15  
 Operator S O P, Z M P, E H M

Sample No. & Depth Bago River

### LIQUID LIMIT TEST

Number of blows	42		Number of blows	36		Number of blows	28	
	No. A-316			No. A-329			No. A-360	
$m_a$	33.38	$m_b$ 25.17	$m_a$	35.08	$m_b$ 26.25	$m_a$	36.22	$m_b$ 27.00
$m_b$	25.17	$m_c$ 6.61	$m_b$	26.25	$m_c$ 6.40	$m_b$	27.00	$m_c$ 6.72
$m_w$	8.21	$m_s$ 18.56	$m_w$	8.83	$m_s$ 19.85	$m_w$	9.22	$m_s$ 20.28
w =	44.23 %		w =	44.48 %		w =	45.46 %	
Number of blows	24		Number of blows	20		Number of blows		
	No. A-336			No. A-324			No. ....	
$m_a$	34.42	$m_b$ 25.57	$m_a$	31.74	$m_b$ 23.64	$m_a$		$m_b$
$m_b$	25.57	$m_c$ 6.31	$m_b$	23.64	$m_c$ 6.23	$m_b$		$m_c$
$m_w$	8.85	$m_s$ 19.26	$m_w$	8.10	$m_s$ 17.41	$m_w$		$m_s$
w =	45.95 %		w =	46.52 %		w =		



### PLASTIC LIMIT TEST

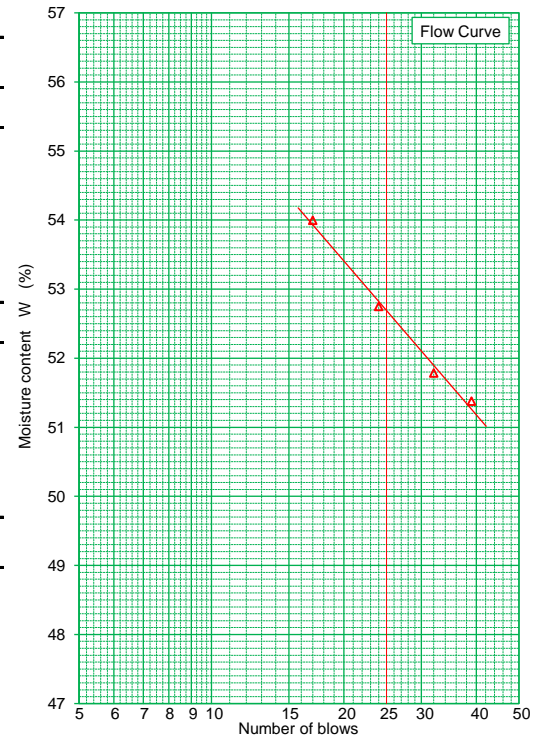
	No. 46			No. ....			No. ....	
$m_a$	41.92	$m_b$ 37.14	$m_a$		$m_b$	$m_a$		$m_b$
$m_b$	37.14	$m_c$ 16.84	$m_b$		$m_c$	$m_b$		$m_c$
$m_w$	4.78	$m_s$ 20.30	$m_w$		$m_s$	$m_w$		$m_s$
w =	23.55 %		w =			w =		

Liquid limit	WL	Plastic limit	WP	Plasticity index	IP	Remarks:
45.80	%	23.55	%	22.25		

Sample No. & Depth Pasundaung Creek

### LIQUID LIMIT TEST

Number of blows	39		Number of blows	32		Number of blows	24	
	No. A-209			No. A-343			No. A-322	
$m_a$	27.64	$m_b$ 19.62	$m_a$	28.20	$m_b$ 20.80	$m_a$	34.14	$m_b$ 24.64
$m_b$	19.62	$m_c$ 4.01	$m_b$	20.80	$m_c$ 6.51	$m_b$	24.64	$m_c$ 6.63
$m_w$	8.02	$m_s$ 15.61	$m_w$	7.40	$m_s$ 14.29	$m_w$	9.50	$m_s$ 18.01
w =	51.38 %		w =	51.78 %		w =	52.75 %	
Number of blows	17		Number of blows			Number of blows		
	No. A-350			No. ....			No. ....	
$m_a$	35.22	$m_b$ 25.16	$m_a$		$m_b$	$m_a$		$m_b$
$m_b$	25.16	$m_c$ 6.53	$m_b$		$m_c$	$m_b$		$m_c$
$m_w$	10.06	$m_s$ 18.63	$m_w$		$m_s$	$m_w$		$m_s$
w =	54.00 %		w =			w =		



### PLASTIC LIMIT TEST

	No. 45			No. ....			No. ....	
$m_a$	41.66	$m_b$ 36.41	$m_a$		$m_b$	$m_a$		$m_b$
$m_b$	36.41	$m_c$ 15.21	$m_b$		$m_c$	$m_b$		$m_c$
$m_w$	5.25	$m_s$ 21.20	$m_w$		$m_s$	$m_w$		$m_s$
w =	24.76 %		w =			w =		

Liquid limit	WL	Plastic limit	WP	Plasticity index	IP	Remarks:
52.70	%	24.76	%	27.94		

## ATTERBERG'S LIMITS TEST

Project Name Yangon River Survey Project Date 15.08.15  
 Location ..... Operator S O P, Z M P, E H M  
 Borehole No. .....

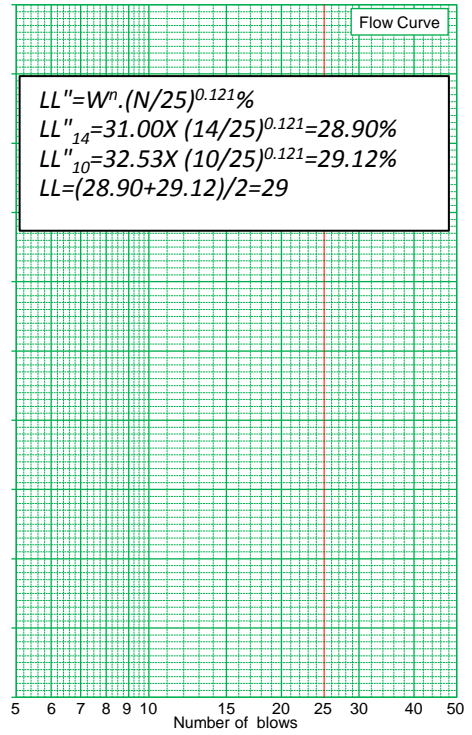
Sample No. & Depth Elephant Point ( 10 km )

### LIQUID LIMIT TEST (One point method)

Number of blows	14	10
No. A-346	No. A-303	No. ....
m <sub>a</sub> 45.44 m <sub>b</sub> 36.21	m <sub>a</sub> 40.30 m <sub>b</sub> 31.91	m <sub>a</sub> ..... m <sub>b</sub> .....
m <sub>b</sub> 36.21 m <sub>c</sub> 6.44	m <sub>b</sub> 31.91 m <sub>c</sub> 6.12	m <sub>b</sub> ..... m <sub>c</sub> .....
m <sub>w</sub> 9.23 m <sub>s</sub> 29.77	m <sub>w</sub> 8.39 m <sub>s</sub> 25.79	m <sub>w</sub> ..... m <sub>s</sub> .....
w = 31.00 %	w = 32.53 %	w = ..... %

Number of blows	.....	.....
No. ....	No. ....	No. ....
m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....
m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....
m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....
w = ..... %	w = ..... %	w = ..... %



### PLASTIC LIMIT TEST

No. 15	No. ....	No. ....
m <sub>a</sub> 36.18 m <sub>b</sub> 32.22	m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....
m <sub>b</sub> 32.22 m <sub>c</sub> 15.67	m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....
m <sub>w</sub> 3.96 m <sub>s</sub> 16.55	m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....
w = 23.93 %	w = ..... %	w = ..... %

Liquid limit WL	Plastic limit WP	Plasticity index IP	Remarks:
29 %	23.93 %	5.07	

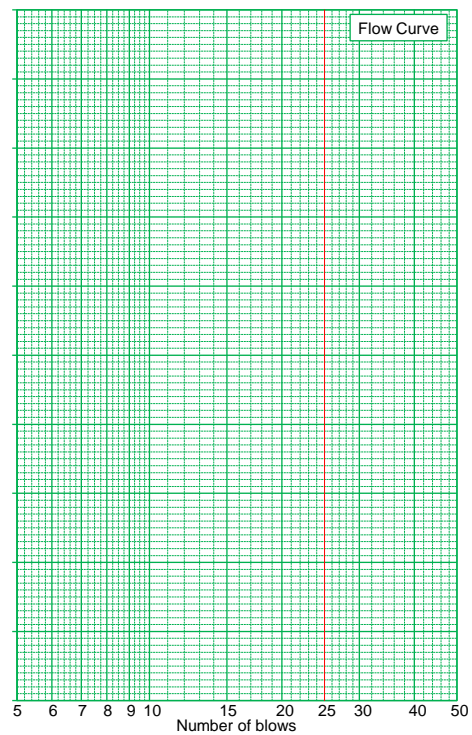
Sample No. & Depth No. ( ~ ) m

### LIQUID LIMIT TEST

Number of blows	.....	.....
No. ....	No. ....	No. ....
m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....
m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....
m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....
w = ..... %	w = ..... %	w = ..... %

Number of blows	.....	.....
No. ....	No. ....	No. ....
m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....
m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....
m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....
w = ..... %	w = ..... %	w = ..... %



### PLASTIC LIMIT TEST

No. ....	No. ....	No. ....
m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....	m <sub>a</sub> ..... m <sub>b</sub> .....
m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....	m <sub>b</sub> ..... m <sub>c</sub> .....
m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....	m <sub>w</sub> ..... m <sub>s</sub> .....
w = ..... %	w = ..... %	w = ..... %

Liquid limit WL	Plastic limit WP	Plasticity index IP	Remarks:
%	%		

# YANGON RIVER SURVEY PACKAGE 2

## River Bed and Sea Bed Material Survey



Pauzundaung Creek (a)



Pauzundaung Creek (b)



Bago River (a)



Bago River (b)



Near Monkey Point (a)



Near Monkey Point (b)

## YANGON RIVER SURVEY PACKAGE 2 River Bed and Sea Bed Material Survey



Upstream of Yangon Port (a)



Upstream of Yangon Port (b)



Thilawa Area (a)



Thilawa Area (b)



Elephant Point (4.8km Upper)(a)

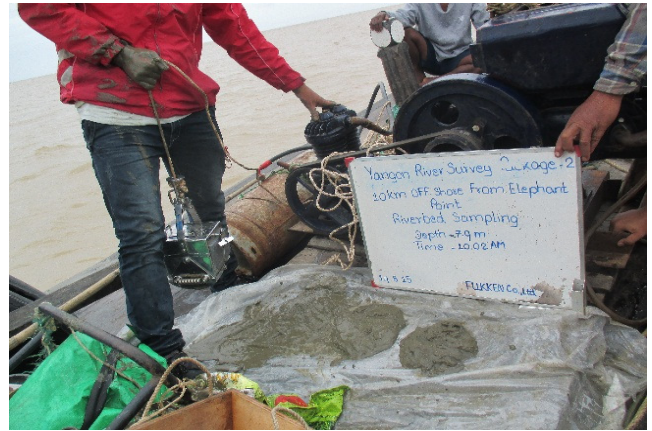


Elephant Point (4.8km Upper)(b)

## YANGON RIVER SURVEY PACKAGE 2 River Bed and Sea Bed Material Survey



10km from Elephant Point



10km from Elephant Point