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Post-Grouting Geotechnical Evaluation Of Coastal Soil Using Standard Penetration Test

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Abstract : This paper presents a post-treatment geotechnical evaluation of coastal soil improved using lime grouting. After grouting, Standard Penetration Tests (SPT) and grain size analysis were conducted to assess soil strength. The results indicate improved bearing capacity and stability, confirming the effectiveness of lime grouting.

Index Terms: **Coastal Soil, Lime Grouting, SPT, Ground Improvement, Bearing Capacity**

1. Introduction

Construction in coastal regions is challenging due to shallow groundwater and weak soil conditions. Lime grouting is commonly used to improve soil strength. This study evaluates post-treatment soil behavior using SPT and grain size distribution.

2. Site Description

The study area is located in Puducherry near the coastal belt. The groundwater table is less than 1 m below ground level. The soil consists mainly of clay and sand with clay. Lime grouting was adopted before detailed investigation.

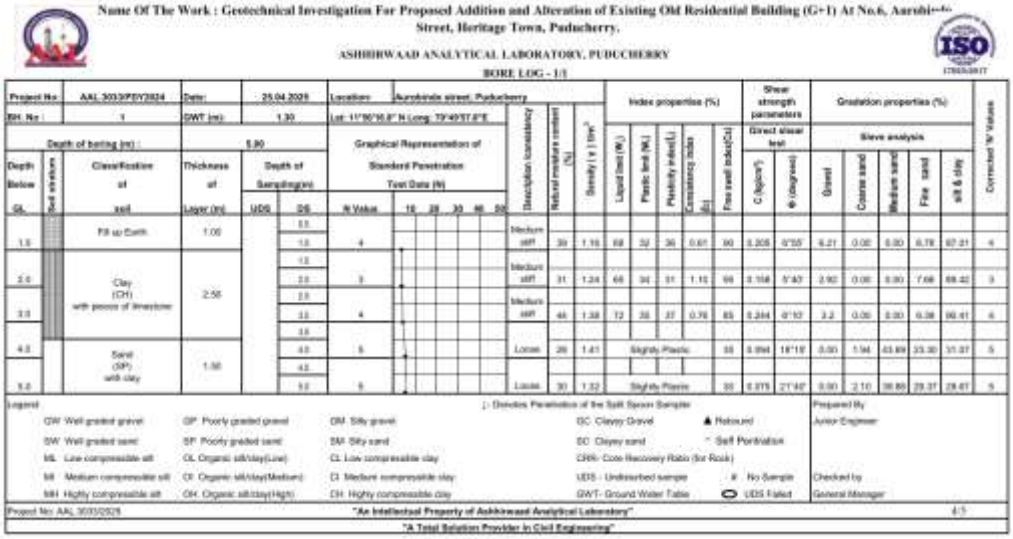
3. Methodology

Lime slurry was injected into the ground under controlled pressure. After curing, SPT and sieve analysis were conducted up to 5 m depth.

4. Standard Penetration Test and Grain Size Analysis

SPT was conducted as per IS:2131. Grain size analysis was performed to determine soil gradation.

Figure 1: Bore Log and SPT N-Value Profile



Name Of The Work : Geotechnical Investigation For Proposed Addition and Alteration of Existing Old Residential Building (G+1) At No.6, Aarubhi--to Street, Heritage Town, Puducherry.

ASHIRWAAD ANALYTICAL LABORATORY, PUDUCHERRY

BORE LOG - 1/1

Project No :	AAL.3033/PDY/2024	Date:	25.04.2025	Location :	Aarubhale street, Puducherry
BH. No :	1	GWT (m):	1.30	Lat: 11°56'16.8" N Long: 79°49'57.6"E	
Depth of boring (m) :		5.00			

Depth Below GL	Soil symbols	Classification of soil	Thickness of Layer (m)	Depth of Sampling(m) UDS	Depth of Sampling(m) DS	Graphical Representation of Standard Penetration Test Data (N) N Value	Description /consistency	Natural moisture content (%)	Density (γ) t/m³	Index properties (%) Liquid limit (WL)	Plastic limit (WP)	Plasticity index(IP)	Consistency index (Ic)	Free swell index(Cs)	Shear strength parameters Direct shear test C (kg/cm²)	Φ (degree)	Gradation properties (%) Sieve analysis Gravel	Coarse sand	Medium sand	Fine sand	silt & clay	Corrected 'N' Values
1.0		Fill up Earth	1.00		1.0	4	Medium stiff	39	1.16	68	32	36	0.81	60	0.208	6°55'	6.21	0.00	0.00	6.78	87.01	4
2.0		Clay (CH) with pieces of limestone	2.50		2.0	3	Medium stiff	31	1.24	65	34	31	1.10	55	0.158	5°45'	2.92	0.00	0.00	7.68	89.40	3
3.0					3.0	4	Medium stiff	46	1.38	72	35	37	0.76	65	0.244	6°10'	3.2	0.00	0.00	6.38	90.41	4
4.0		Sand (SP) with clay	1.50		4.0	5	Loose	26	1.41	Slightly Plastic				35	0.094	18°15'	0.00	1.94	63.89	33.30	31.37	5
5.0					5.0	5	Loose	30	1.32	Slightly Plastic				35	0.078	21°45'	0.00	2.10	38.66	29.37	29.87	5

Legend

GW: Well graded gravel	GP: Poorly graded gravel	GM: Silty gravel	GC: Clayey Gravel	▲ Rebound	Prepared By: Junior Engineer
SW: Well graded sand	SP: Poorly graded sand	SM: Silty sand	SC: Clayey sand	" Self Penetration	
ML: Low compressible silt	CL: Organic silt/clay(Low)	CL: Low compressible clay	CRR- Core Recovery Ratio (for Rock)		
MI: Medium compressible silt	CI: Organic silt/clay(Medium)	CI: Medium compressible clay	UDS - Undisturbed sample	# No Sample	Checked by:
MH: Highly compressible silt	OH: Organic silt/clay(High)	CH: Highly compressible clay	GWT- Ground Water Table	UDS Failed	General Manager

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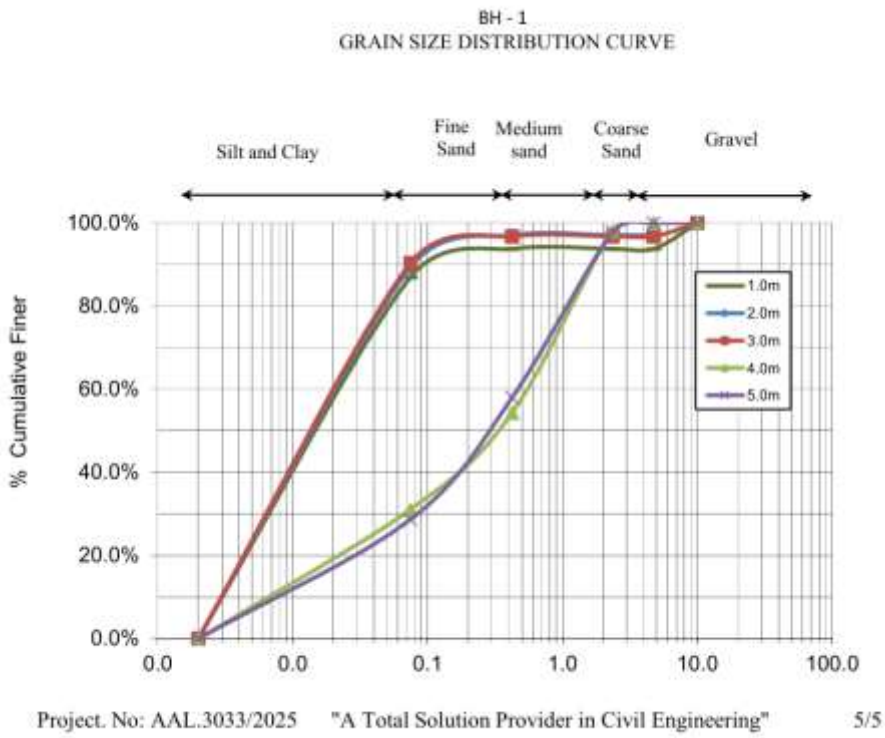
Figure 2: Grain Size Distribution Curve



5. Results and Discussion

The SPT profile indicates moderate to good soil resistance after lime grouting. N-values range from low to moderate in upper layers and improve with depth. The grain size curves show dominance of fine particles with sand fractions, indicating stabilized soil structure after treatment.

6. Conclusion

Lime grouting significantly improved the strength of coastal soil. Post-treatment SPT and grain size results confirm enhanced stability. The site is suitable for safe foundation construction.

References

1. IS:2131 (1981), Standard Penetration Test for Soils, BIS.
2. Bowles, J.E., Foundation Analysis and Design.
3. Braja M. Das, Principles of Geotechnical Engineering.
4. Holtz and Kovacs, Geotechnical Engineering.