
Erosional Characteristics of Red Soils of Visakhapatnam

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Abstract

Visakhapatnam and its surrounding areas are highly covered with red earths the top few meters thick is loose and disintegrated. Red soil beds in there location continuously eroding their top layers and some time collapsing of the slopes are also taking place in deep excavation. In this aspect complete understanding of these red soils is essential. In this soil from various locations of visakapatnam has been studied with respect to physical and engineering characterization and explained the probable reasons for the development of soil erosion.

Keywords:

Red soio;
collapsing;
exacavation;
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1. Introduction

Red soils are widely distributed over south India next to black cotton soils. These soils are highly collapsible and erodible soils. These soil are poor quality for anthropogenic activity with respect to construction and agriculture. The man activities on these soils lot of constraints and these are to be reflectively managed by complete understanding of these soils is required. In this aspect the study of physical, drainage and engineering properties of these soil probable reasons and characteristics favorable for soil erosion.

1.1 Literature Review

Albright (1995) studied the physical and hydraulic characteristics of Bentonite added to soil and identified that decrease in permeability characteristics were observed. Tiwari and Srivastava et.al, (2000) studied the effect of flyash and sodium Bentonite for permeability and compression characteristics. Kolawole, J.O., et. al., (2006), and Sheela Evangiline .Y, et.al. (2012) also studied bentonite amended Laterite soils as clay liner materials.

2. Materials and Testing

To study the erosional characteristics of red soils .six soils are collected from different locations of Greater Visakhapatnam Muncipal corporation (GVMC) and these soils were tested as per IS 2720.

3. Results and Analysis

The physical and Geotechnical test results are shown in Table:

	China waltair	Pendurthi	NAD	Simhachalam	Sivajipalem	Pedawalatair
Colour	Dark red	Dark red	Dark red	Dark red	Dark red	Dark red
Specific Gravity (G)	2.65	2.66	2.65	2.65	2.66	2.65
Texture	Coarse	Coarse	Coarse	Coarse	Coarse	Coarse
p ^H	8.4	8.6	8.2	8.9	8.3	8.5
Gradation						
Gravel(%)	0	0	0	0	0	0
Sand(%)	78	78	85	85	76	72
Silt(%)	13	16	11	18	18	20
Clay(%)	9	6	4	7	6	8
Index Properties						
Liquid limit(w_L)	25	24	22.5	25	23	24
Plastic limit(w_p)	19	18	17.5	18.5	18.5	18
Plasticity Index (I_p)	6	6	5	6.5	4.5	6
IS Classification	SM-SC	SM-SC	SM-SC	SM-SC	SM-SC	SM-SC

3.1. Texture and Grain Size distribution

All these red soils are coarse grained soils dominated by sand particles with coarse texture. These soils have very limited quantities of fines (silt and clay particles) which are in the range of 15-28%, out of which the presence of clay particles are limited to 4-9%. Low quantities of clay particles fails to bond the soil particles together and close together under saturation. In dry periods lifting of particles will take place under high wind velocities.

3.2. Topography and Genesis

Red soils in GVMC area are formed by weathering of Khondolite rocks of Eastern ghats which are Dark Red colour is due to presence of rich in iron oxides followed by Manganese and Aluminium oxides. These soils are also some time dominated with Kaolinite mineral. These are originated by erosion and transportation especially running water and wind. Topography is of this local is gentle to steep with well drainage characteristics.

3.3. Physical characteristics

In hot and humid climates these soils are dry in condition with low moisture contents (2-4.3%) and dry densities are in the range of 1.4-1.58 g/cc with high porosity and high void ratios in the range of 43-46% and 0.75-0.85 respectively. These characteristics show these soils are of loose in

condition with honeycombed structures and can easily eroded under saturation due to heavy rainfall and drainage condition.

Essential characteristics are further accelerated by presence of minimum quantities of clay particles which give bonding property. Dominated by sand particles which are fine texture and can also easily drifted under high seepage pressures with increasing the drainage gradients. These are also verified their hydraulic conductivity which is in the range of 4.9×10^{-4} - 6.8×10^{-4} cm/sec.

4. Conclusion

Red soils are coarse grained soils dominated by sand particles with open structure. These have high porosity which can easily eroded under drainage condition. The texture and in-situ conditions help to these soils to erode effectively.

W (%)	2.4	2.9	2.0	3.6	2.2	3.8
γ_d(g/cc)	1.43	1.46	1.50	1.56	1.48	1.52
n (%)	46	45	44	42	44.4	43
e	0.82	0.82	0.77	0.71	0.80	0.75
K(cm/sec)	4.9×10^{-4}	4.6×10^{-4}	6.3×10^{-3}	3.1×10^{-4}	7.5×10^{-3}	6.8×10^{-4}

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