

## Improvement and Mitigation of erosional characteristics of Red soils

P.V.V.Satyanarayana\*

K.Saroja\*\*

K.prasanth\*\*\*

P.Sumanjali\*\*\*\*

P.S.Naidu\*\*\*\*\*

V.Brahmam\*\*\*\*\*

Department of civil engineering, Andhra University, Visakhapatnam

### Abstract

Rapid industrialization needs the use of every part of the land for human kind. Red soil ground in Visakhapatnam region is of prominent due to rapid urbanization and industrial growth. Red soils in these areas are sandy nature with low amount of fines causes erosion and ground failure. A simple structures founded on these soils have subjected to distress to tilting and complete collapse of the structure. In this an attempt is made to propose some mitigation methods to prevent as are such failures by understanding the nature of the soil.

Copyright © 2018 International Journals of Multidisciplinary Research Academy. All rights reserved.

### Keywords:

Mitigation;

Red soil;

collapse;

Fourth keyword;

Fifth keyword.

### Author correspondence:

First Author,

Doctorate Program, Linguistics Program Studies

UdayanaUniversity, Jalan P.B. Sudirman, Denpasar, Bali-Indonesia

### 1. Introduction

Visakhapatnam region is known for Industrial and tourist hub which require rapid growth. Infrastructure development is one such parameters which boon to its growth. Visakhapatnam region is popular for its red soil area some of them are problematic. Human activities like Roads, buildings, embankments, high rise structures have been subjecting distress under saturated condition of these soils. Complete understanding of these soils and their behaviour at various environmental conditions help to propose mitigation.

\* Doctorate Program, Linguistics Program Studies, Udayana University Denpasar, Bali-Indonesia (9 pt)

\*\* STIMIK STIKOM-Bali, Renon, Denpasar, Bali-Indonesia

\*\*\* English Language Specialist, Oller Center, Carriage House, 2nd Floor, California, USA

\*\*\*\* Head, Dept. of Political Science, Faculty of Arts & Culture, South Eastern University of Sri Lanka, Oluvil, Sri Lanka

\*\*\*\* Head, Dept. of Political Science, Faculty of Arts & Culture, South Eastern University of Sri Lanka, Oluvil, Sri Lanka

\* Doctorate Program, Linguistics Program Studies, Udayana University Denpasar, Bali-Indonesia (9 pt)

\*\*\*\* Head, Dept. of Political Science, Faculty of Arts & Culture, South Eastern University of Sri Lanka, Oluvil, Sri Lanka

\* Doctorate Program, Linguistics Program Studies, Udayana University Denpasar, Bali-Indonesia (9 pt)

\* Doctorate Program, Linguistics Program Studies, Udayana University Denpasar, Bali-Indonesia (9 pt)

## 2. Materials and Testing

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

- Specific gravity test.
- Sieve analysis test.
- Atterberg limits.

## 3. Results and Analysis

To study the physical and engineering properties of Red soils to understand their behaviour about their erosional characteristics, twenty Red soils were studied in the Visakhapatnam region and their characteristics are listed in the Table below:

Table: Physical and Engineering properties:

Colour	Dark Red
pH	8.2-9.0
Specific Gravity (G)	2.64-2.66
Grain Size distribution	
Gravel (%)	0
Sand (%)	70-90
Fines (%)	30-10
Silt (%)	22-8
Clay (%)	5-12
OMC (%)	2-6
Dry density (g/cc)	1.40-1.60
Void ratio	0.9-0.6
Porosity (%)	47-37
Liquid limit (%)	20-25
Plastic limit (%)	16-18
Plasticity index (%)	4-10

From the test results, it is identified that Red soils in the present study coarse grained soils of rough (coarse) texture. These soils are dominated by fine sand particles with silt particles and very less quantities of clay particles. Absence or presence of low quantities of clay particles make the soil non-stick and hard consistency in dry period with huge amount of voids. Presence of weak cementing material between soil particles and dissolving of salts of these soils in water may break the temporary bond between the particles under saturation (drained condition) and dissociation takes place which leads to erosion of soil particles.

Based on the soil formation with respect to its genesis these soils are of Khondalite origin, weathering supported by temperature(hot and humid) and precipitation (drainage) and wind action help formation of these soils in transported condition. The thickness of these deposits varying from 4 to 10m from which the top few meters is of unconsolidated soil. These top soil is more volatile with respect to erosion and slope failure which is loose in consistency.

### 3.1 Criticality of these soils

- Failure of slopes under deep excavations
- Inability to form verticality under saturation
- Failure of embankment in the form of sliding under saturated condition.
- Failure of surface course due to pumping of material inward/outward from the ground in pavements.
- Liquefaction (boiling) fine sand and silt particles under saturation in embankments.
- Settlement of grounds due to water table flocculations.

- Removal of top material under mud flow causes land slides.

### 3.2 Mitigation Measures

- Prewetting of the ground consolidation of loose soils by i) surcharge loading, ii) densification by heavy tamping.
- Making the ground composite by stone columns/ sand piles.
- Grouting with Bentonite, cement etc.
- Turfing with plantation, mulching etc.
- Encapsulates with Geo-membranes

## 4. Conclusion

Sandy nature of red soils will require the mitigation measures to reduce cost of construction and durability of the structures.

## References

- [1] Arya, K.S., "Analysis and Simplification of Three-Dimensional Space Vector PWM for Three-Phase Four-Leg Inverters," *IEEE Transactions on Industrial Electronics*, vol. 58, pp. 450-464, Feb 2011.
- [2] Berto, M.C. and Vruce K., "Implementation of a Fuzzy PI Controller for Speed Control of Induction Motors Using FPGA," *Journal of Power Electronics*, vol. 10, pp. 65-71, 2010.
- [3] Newmark, P. "Common Mode Circulating Current Control of Interleaved Three-Phase Two-Level Voltage-Source Converters with Discontinuous Space-Vector Modulation," *2009 IEEE Energy Conversion Congress and Exposition, Vols 1-6*, pp. 3906-3912, 2009.
- [4] Zed, Yinhai. "A Novel SVPWM Modulation Scheme," in *Applied Power Electronics Conference and Exposition, 2009. APEC 2009. Twenty-Fourth Annual IEEE*, 2009, pp. 128-131.