



IMPACT OF SOLID WASTE ON GEOTECHNICAL PROPERTIES OF SOIL

Dr. Prashant Pande ^{*1}, Parimal Bhakare ^{*2}, Shreyash Goenka ^{*3}, Aishwarya Godde ^{*4}

^{*1}Assistant Professor, Department of Civil Engineering, Yeshwantrao Chavan College of Engineering, Nagpur, Maharashtra, India

^{*2}Student, Department of Civil Engineering, Yeshwantrao Chavan College of Engineering, Nagpur, Maharashtra, India

^{*3}Student, Department of Civil Engineering, Yeshwantrao Chavan College of Engineering, Nagpur, Maharashtra, India

^{*4}Student, Department of Civil Engineering, Yeshwantrao Chavan College of Engineering, Nagpur, Maharashtra, India

Abstract: In the greater part of Indian urban areas, MSW used to dump close by on low laying lands. This examination means to describing MSW and surveying geotechnical properties of tainted soils at dumping grounds in Akola City of Maharashtra. Delegate strong squanders from chosen wards of the city were gathered and examined. Significant arrival of leachate structure the landfill yards happened during recent years and the dirt at the landfill site experience broad defilement. The test aftereffects of defiled and uncontaminated soil show expansion in Optimum Moisture Content and abatement in Maximum Dry Density. The unconfined compressive strength diminished impressively for soil tests acquired at 0.0 m, 0.5 m and 1.0 m profundities underneath squander dump. At profundities more prominent than 1.5m compaction qualities and UCC strength intently coordinates with the uncontaminated soil. Little variety in pH esteem, which makes soil somewhat basic, was noticed. From the examination, it is construed that, this examination is critical, as the establishment typically at these profundities might be influenced by this defilement.

Keywords: Compaction, geotechnical, landfill, leachate, MSW, soil.

I. INTRODUCTION

Municipal Solid Waste (MSW), a mind-boggling decline made from different materials with various properties. A portion of the segments are steady while others debase because of organic and substance measure. Leachate came about because of this, is most unsafe contamination for the dirt fundamental and therefore ground water. Filtering of supplements and substantial metals into the dirt which prompts soil and groundwater tainting. MSW the executives is predominantly centered around significant urban areas in India. Protected and logical act of MSW removal for any creating city is need of great importance. [3]

The expanding level of solid waste is, presently a day, a difficult issue in the metropolitan spaces of the world. A high pace of development of populace and expanding per-capita pay have brought about the age of huge strong waste representing a genuine danger to nature of soil and water. This is more so on account of agricultural nations where enormous amounts of strong waste are unloaded heedlessly, subsequently, squeezing scant land and water assets and simultaneously influencing the geotechnical properties of soil [2].

II. AREA OF STUDY

The investigation area, one of the municipal solid wastes dumping site located in Akola, Maharashtra which is known as the cotton city. The city's soil is principally black (somewhere brown). The site chosen for study was in the outskirts of the city, located near MIDC Phase 4. The current act of Solid Waste Management is informal, arranging squanders on open space without thinking about the future ecological results. [5]

III. MATERIALS AND METHODOLOGY

In this examination the fundamental center was to decide the degree of leachate impact on soil beneath the landfill as for pH, Optimum Moisture Content, Maximum Dry Density and Unconfined Compressive Strength properties. To accomplish the investigation destinations, the accompanying advances were followed:

- a) Assessing geotechnical properties of contaminated soils at various depths
- b) Characterizing Municipal Solid Waste

Delegate strong squanders from chosen parts of Akola city were gathered and investigated. Upset soil test was gathered quickly beneath squander dumps destinations which are seven to eight years of age. The dirt examples likewise gathered from uncovered pits directly beneath the strong waste dump at various profundities and were utilized for portrayal. The delegate uncontaminated soil tests are additionally gathered neighboring unloading site for correlations.

IV.RESULTS AND DISCUSSION

The degree of impact of MSW leachate on soil at unloading destinations is introduced in this paper. This examination intends to describe MSW and evaluating geotechnical properties of polluted soils at unloading destinations in Akola city of Maharashtra.

Characterizing Municipal Solid Waste

The strong squanders created for a time of multi week from abiding places of chosen wards were gathered and brought to research center. The strong squanders are isolated for portrayal. The MSW comprise of materials compostable waste (66 %), paper, cardboard (26%), plastic, glass (6%), leather, fabric, material (1%) and idle material (1%).

Geotechnical Properties of Contaminated Soils at Various Depths:

Compaction characteristics:

The compaction attributes of soil at deferent profundities were concentrated in the lab utilizing standard delegate test according to IS:2720 (Part-VII) – 1980 [4]. The Optimum Moisture Content and Maximum Dry Density esteems were set up for uncontaminated soil. Soil tests acquired quickly underneath the strong waste dump, at profundities of 0.5m, 1.0m and 1.5m underneath the dirt surface were tried in the lab. The test consequences of Optimum Moisture Content and Maximum Dry Density for tainted soil show expansion in Optimum Moisture Content (26% - 63%) and decline in Maximum Dry Density (18%-13%) contrast with uncontaminated soil [6,7]. The test outcomes are addressed in Table.1. This might be because of molecule flocculation because of soil defiled with MSW at different fixation.

Table.1 Compaction characteristics of soil samples

Test	Un contaminated soil	Contaminated soil below natural ground level			
		0.0m	0.50m	1.00m	1.50m
		OMC %	16.0	19.5	25.0
ODD kN/m ³	20.0	16.68	17.72	18.18	20.58

The Unconfined Compressive Strength tests were directed on soil tests got at characterized profundities as referenced in the Table.2 and the outcomes are contrasted and Unconfined Compressive Strength worth of uncontaminated soil. The Unconfined Compressive Strength diminished significantly (61% - half) for soil tests acquired at 0.0 m, 0.5 m and 1.0 m profundities beneath squander dump. At profundities more prominent than 1.5m compaction attributes and Unconfined Compressive Strength intently coordinates with the uncontaminated soil. This plainly shows the impact of MSW on strength conduct of soil.

Table.2 Unconfined Compressive Strength of soil samples

Test	Un contaminated soil	Contaminated soil below natural ground level			
		0.0m	0.50m	1.00m	1.50m
		UCC kN/m ²	40.0	15.0	20.0

pH value

The pH tests were additionally directed on soil tests got at different profundities and the outcomes are contrasted and pH worth of uncontaminated soil. The test outcomes are as portrayed in table.3. The test outcome shows soil pH esteem 5. increments bringing about changing from somewhat acidic to marginally antacid within the sight of leachate at various profundities. It additionally shows that in the diminished centralization of leachate beneath 1.5 m, the pH of soil practically equivalent to pH worth of uncontaminated soil [1].

Table.3. pH value of soil samples

Test	Un contaminated soil	Contaminated soil below natural ground level			
		0.0m	0.50m	1.00m	1.50m
		pH value	6.4	7.5	7.6



V. CONCLUSION

The target of this examination was to decide the conceivable impact of leachate on soil in the strong waste unloading site which was seven years of age, in which strong waste unloading in this site was practically speaking for a time of balanced and half years and later there could have been no further unloading occurred in this site. A broad research facility testing program was done to accomplish these destinations.

The accompanying ends were drawn dependent on test results:

- Leachate defilement leads to alter the compaction, thickness, and strength properties of soil.
- The impact of leachate diminishes with profundity and its impact reflects as fixation shifts. This is ascribed because of substance responses with the leachate and soil particles.
- Experimental results showed that geotechnical properties of soil differ with profundity up to 1.0 m and there is not many changes in its properties past 1.5 m profundity suggests, leachate impact was restricted to inside this profundity as additional unloading of MSW was halted.
- This examination demonstrates that, more noteworthy impact to higher profundity in the kept unloading site could be anticipated, as the size of landfill and assortment of strong squanders arranged expands, enormous measure of leachate will be produced and make ecological issues.
- Future studies might be completed to evaluate the leachate impact on soil and groundwater along the side in the landfill area.

VI. REFERENCES

- [1] Allam M.M, Sivapullaiah, P.V, Sankara Gullapalli; 2008 "Geotechnical Behavior of Soil Containing Mixed Layered Illite - Smectite Contaminated with Caustic Alkali, Electronic Theses and Dissertations of Indian Institute of Science.
- [2] Edward J Martin, James H Johnson. Jr, (1987), Hazardous Waste Management Engineering, published by Van Nostrand Reinhold Company Inc. New York
- [3] H. S. Nanda, Shivaraju. R, C. Ramakrishnegowda, 2011 "Impact of Municipal Solid Waste Disposal On Geotechnical Properties Of Soil" Proceedings of Indian Geotechnical Conference December 15-17,2011, Kochi (Paper NoL-183)
- [4] IS: 2720 (Part-VII) – 1980
- [5] Priyanka AV, VD Guldekar and VV Ghabane; 2018 "Assessment of available soil nutrient status in Black soils of Akola district, Maharashtra" Journal of Pharmacognosy and Phytochemistry 2018; 7(5): 1124-1129
- [6] Sitaram Nayak, B.M. Sunil and S. Shrihari. (2007), Hydraulic and Compaction Characteristics of leachate-Contaminated Lateritic Soil, Jr. Engineering Geology, 94, Science Direct, ELSEVIER, 137-144. Sunil. B.M, Shrihari. S and Sitaram Nayak. (2008).
- [7] Soil-Leachate Interaction & Their Effects on Hydraulic Conductivity and Compaction Characteristics, the 12th International Conference of International Association, for computer methods & Advances in Geomechanics (IACMAG), 1-6 October 2008, Goa, India, 2380-2386.