



## **A Study on use of Landfill Soil in Constuction Work as an Instead of Natural Soil**

**Karan Kumbhalkar, Raman Thawkar, Chaitali Selokar, Gaurav Bawankule, Harshal Malode, Neha Khobragade**

Department of Civil Engineering, RTMNU, Suryodaya College of Engineering and Technology, Umred Road  
Nagpur

---

### **ABSTRACT**

The design of embankments with MSW is similar to that of earthen embankments. The MSW embankment is designed as a composite structure with MSW in the core and a cover of good earth on either side. For failure mechanism slope stability and settlement analysis of the embankment should be perform by using commercial software like PLAXIS, GEOSLOPE, GEO5. The Municipal Solid Waste (MSW) is a heterogeneous material which cannot be used in road embankments as such. It has large size plastics, clothes and even boulder size C&D waste. The material is much different than soil and use of MSW in embankments may result in long term settlements and ultimately lead to failure of road built over it.

**Key words:** Embankment, Landfill soil, Geotechnical

---

### **INTRODUCTION**

The huge dumps lying at these landfills are affecting the health, hygiene, sanitation and aesthetics of the surrounding areas. These places have become habitat for bacteria, rats, flies and mosquitoes, all posing threat to human health and causing numerous human diseases. If these wastes are not properly treated, they can prove to be dangerous and environmentally hazardous. Large scale infrastructural development is being carried out in the country considering the huge surge in industrial and consumer good production. Several thousand kilometers of roads are built in the form of National Highway Development Program (NHDP) and Pradhan Mantri Gram Sadak Yojana (PMGSY) program. Rapid growth of population, industrialization and urbanization during the last few decades has resulted in generation of huge quantity of municipal solid wastes (MSW) in different cities. Different constituents of this waste dump includes; food and vegetable remains, packing materials, paper, remains of used fuels, wood, metals, plastics, glass, ceramics, cloth etc. Construction and demolition (C&D) wastes are also dumped which consists of bricks, concrete, steel etc. Further, waste from the markets, small industries and non-infectious hospital waste is also dumped. The waste is dumped directly onto grounds without any segregation. Large open grounds and open excavations are often used as unregulated dumps for disposal of a variety of wastes. Landfills are mainly used as unlined open dumps for municipal and industrial wastes.

### **LITERATURE REVIEW**

As our topic is related to solid waste management, so refer the journal paper which works in solid waste management field & utilization of waste so we have an idea how we utilize & disposal the solid waste effectively. We have to do detail study about the geotechnical and chemical nature of waste as well as impact of solid waste on environment.

**Problems of MSW:** The problem of municipal solid waste management (MSWM) is also prevailing in the urban environment of Mysore. Therefore the present study was taken to find out the problems and prospects of Municipal solid waste in Mysore city. A detailed investigation was made regarding the methods of practices associated with sources, quantity generated, collection, transportation, storage, treatment and disposal of Municipal solid waste in Mysore city. The data concerning to SWM in Mysore was obtained through questionnaire, individual field visit, interacting with people and authentic record of municipal corporation.

**Landfill Soil is used as a Natural Soil:** In a study of reclamation of landfill site, Gurgaon Haryana. Stated that recovered soil fraction indicated that the fraction can be suitable for landfill cover material.

**Chemical Test of MSW:** The results of the chemical tests for the soil and water samples, at all sites, showed that the maximum contents of sulphate, chloride and organic materials were 22.5%, 0.57% and 4.71%, respectively

**Moisture Test on Soil:** Municipal solid waste management (MSWM) is one of the major environmental problems of Indian cities. Improper management comprehensive review of the characteristics, generation, collection and transportation, disposal and treatment technologies of MSW practiced in India.

**Shekdar (2009)** Asian countries Solid waste management has been an integral part of every human society. In keeping with global trends, the systems are being oriented to concentrate on sustainability issues; mainly through the incorporation of 3R (reduce, reuse and recycle) technologies. High-income countries like Japan and South Korea can afford to spend more to incorporate 3R technologies. Most of the latest efforts focus on “Zero Waste” and/or “Zero Landfilling” which is certainly expensive for weaker economies such as those of India or Indonesia.

**Aakriti Chauhan (2017)** MSW soil from Gazipur landfill can be called a feasible fill material for road embankments. For further investigation, a test track may be prepared and investigated upon for better clarity on the feasibility of this material. Proper safety precautions must be taken into account.

**Rules of MSW:** The civic services in the city of Jalgaon are managed by Municipal Corporation of the City of Jalgaon. Managing Solid Waste generated

in the city - collection, transportation and its safe disposal is one of the most priority area of attention for improvement of the Municipal Solid Waste Management in light of the MSW Rules 2000. Other than the conventional disposal system, sustainable methodologies should be applied such as reuse and recycle.

### SCOPE

A study on application of admixture and geosynthetic material to modify soil properties should be performed.

For failure mechanism slope stability and settlement analysis of the embankment should be performed by using commercial software like PLAXIS, GEOSLOPE.

The landfill soil can be mixed with the local available soil in the proportion to understand the improvement in properties of soil.

### OBJECTIVES

- The feasibility of landfill soil from msw can act as an alternative and sustainable method for the disposal of non plastic waste.
- Use of landfill soil as a replacement to the natural soil in road embankment construction which will help to reduce the impact of oversaturated landfill.
- Study of the physical and chemical properties of landfill soil.
- The volume of waste in bhandewadi dump yard can be reduced significantly.
- Municipal solid waste (MSW) causes hazards to inhabitants. Various studies reveal that about 90% of MSW is disposed of unscientifically in open dumps and landfills, creating problems to public health and the environment

### CONCLUSION

1. About 65% of segregation municipal solid wastes can be used for the embankment construction.
2. The soil had more than 50% particles larger than 0.075mm and had a good representation of particles of all sizes ranging from 0.075mm to 4.75mm. The soil is coarse grained sand.
3. Other than soil, plastics and textiles were observed to be major constituents in different segregated MSW (The % content of metals, wood, paper, rubber, glass observed to be less than 1% in different segregated MSW). There is no variation in the soil content or other constituents with the age of the MSW.

4. Leachate studies indicate the MSW is non hazardous material as concentration of heavy metals is within the permissible limit.

#### REFERENCES

- [1]. German Co. Operation (2017) "Solid Waste Management for Nagpur"
- [2]. Neeraj Khatri (2016) "A Study of Reclamation of Landfill Site, Gurgaon Haryana" International Conference on Emerging Technologies in Engineering, Biomedical, Medical and Science (ETEBMS –
- [3]. Nadhir Ansari (2017) "Soil Characteristic in Selected Landfill Sites Iraq" Journal of Civil Engineering and Architecture 11 (2017) 348-363 doi: 10.17265/1934-7359/2017.04.005
- [4]. Alhassan, M. (2012). "Effect of municipal solid waste on geotechnical properties of soils." International Journal of Environmental Science, Management and Engineering Research, 1(5), 204210.
- [5]. Ali, S. M., Pervaiz, A., Afzal, B., Hamid, N., & Yasmin, A. (2014). "Open dumping of municipal solid waste and its hazardous impacts on soil and vegetation diversity at waste dumping sites of Islamabad city." Journal of King Saud University-Science, 26(1), 59-65.
- [6]. Ashour, M., & Ardalan, M. H. (2010). "Road Embankment and Slope Stabilization" No. UTCA Report 09305.
- [7]. Balasubramaniam, A. S., Cai, H., Zhu, D., Surarak, C., & Oh, E. Y. N. (2010). "Settlement of embankments in soft soils." Geotechnical Engineering, 41(1), 61.
- [8]. CSIR - Central Road Research Institute (2016). "Utilization of Municipal Solid Waste(MSW) in Road Embankment." <http://www.crridom.gov.in/content/utilizationmunicipal-solid-waste-mswroadembankment>
- [9]. Dr. Krishna M. K, Chaitra B.R, Jyoti Kumari (2016). "Effect of Municipal Solid Waste Leachate on the Quality of Soil."
- [10]. Sharholly M., et al., (2007). "Municipal solid waste management in Indian cities – A review." Journal of Waste Management, 28 (2008), 459–467
- [11]. Hyun Il, P., Borinara, P., & Hong, K. D. (2011). "Geotechnical considerations for end-use of old municipal solid waste landfills." International Journal of Environmental Research, 5(3), 573584.
- [12]. IS: 2720 Part 3/Section 2 (1980), "Indian Standard for determination of Specific gravity (fine, medium and coarse grained soil)", Bureau of Indian Standards Publications, New Delhi.
- [13]. IS: 2720 Part 4 (1975), "Indian Standard for grain size analysis", Bureau of Indian Standards Publications, New Delhi.
- [14]. IS: 2720 PART VII-(1980) (Reaffirmed on 2011), "Indian Standard for Compaction Test (Light Weight/Standard Proctor Compaction)", Bureau of Indian Standards Publications, New Delhi.
- [15]. IS: 2720 Part 40 (1977), "Methods of test for soils: Determination of free swell index of soils", Bureau of Indian Standards Publications, New Delhi.
- [16]. IS: 2720 Part 26 (1987), "Methods of test for soils: Determination of pH value", Bureau of Indian Standards Publications, New Delhi.
- [17]. IS: 2720 Part 17 (1986), "Methods of test for soils: Laboratory determination of permeability", Bureau of Indian Standards Publications, New Delhi.
- [18]. Jain, P., Kim, H., & Townsend, T. G. (2005). "Heavy metal content in soil reclaimed from a municipal solid waste landfill." Waste management, 25(1), 25- 35.
- [19]. Shekdar A.V., (2007). "Sustainable solid waste management: An integrated approach for Asian countries." Journal of Waste Management, 29 (2009),1438–1448
- [20]. Aakriti Chauhan (2017) "Use of Soil from Gazipur Landfill for Road Embankment Construction"
- [21]. Mr. Hanjir (2020) "Municipal Corporation of the City of Jalgaon"
- [22]. Krishna, M., Chaitra, B. and Kumari, J. (2016). "Effect of Municipal Solid Waste Leachate on the Quality of Soil." International Journal of Engineering Science Invention, Vol. 5(No.6), ISSN (Online): 2319 – 6734
- [23]. Parth, V., Murthy, N. N., & Saxena, P. R. (2011). "Assessment of heavy metal contamination in soil around hazardous waste disposal sites in Hyderabad city (India): natural and anthropogenic implications." Journal of Environmental research and management, 2(2), 027-034. 24. Yadav, I.C., et al., (2009)."Studies on Municipal Solid Waste Management.