

Study on the Performance of Bitumen Waste Stone Column in Soil Stabilization

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Abstract: Stone Column is a technique for improving and stabilising weak soils such as soft clays, silts, and loose sands, allowing highway facilities, storage tanks, embankments, and bridge abutments to be built. We are utilising bituminous waste as an alternative material for coarse aggregate in the construction of stone columns to save expenditure by partially replacing coarse aggregate with bituminous waste. We're mixing bitumen waste and coarse aggregate, which have been passed through a 16 mm IS sieve and are being retained. Different mix proportions of coarse aggregate and bitumen waste for stone column samples represented as (X% aggregate + Y% bitumen waste) were tested such as (100%C), (70%C+30%B), (60%C+40%B), (50%C+50%B) and (100%B). Intermediate Plastic Clayey soil (CI) at OMC was used as the test sample in which stone column was installed. The CBR test was performed on the stone column with a diameter of 50 mm and depth of 100 mm installed in the compacted soil in CBR mould to determine CBR value and bearing capacity of samples. After that the results were compared with 100% coarse aggregate stone column sample (100%C).

Keywords: Stone column, CBR, Bitumen waste, coarse Aggregates

REFERENCES

- [1]. A Review on stone columns used for ground improvement of soft soil-Istuti Singh, Anil Kumar Sahu(CSEE) -April 19
- [2]. Sustainable materials used as stone column filler-AzhaniZukri and RamliNazir- Material science and engineering 342-2018
- [3]. Experimental study on soil improvement with stone Columns and granular blankets- NimaMehranria, FarzinKalantary, NavidGanjian – journal of central South university- 2018
- [4]. A Study on Behaviour of Stone Columns on Compacted Pond ash Bed-ShoaibNisar Bodha,Prashant Garg and Pradeep Singh - April- June 2019
- [5]. Ground improvement using stone column-K. S.Beana – 29 may 2010
- [6]. IsabelaDellaliberaPiccinini&Prof. Simon Wheeler (2014), ground improvement with stone columns - methods of calculating settlement improvement factor. University of Glasgow, School of Engineering, MSc. Civil Engineering, Glasgow.
- [7]. S. Soumya&Prof. R. Ayothiraman (2011), use of shredded tyre chips as aggregates in stone column: an experimental study.IIT Delhi, Proceedings of Indian Geotechnical Conference , December 15-17, 2011, Kochi (Paper No. L-175).
- [8]. Adel Hanna, MohoudKhalifa, Mohamed Abdel Rahman (2018). Experimental investigation on stone column in cohesive soil. Published in Latest Thoughts on Ground Improvement Techniques. Publisher: Springer International Publishing.
- [9]. Magdi M. E. Zumrawi and HussamElnour (2016). Predicting bearing strength characteristics from soil index properties. International Journal of Civil Engineering and Technology (IJCIET) Volume 7, Issue 2, March-April 2016, pp. 266-277.

- [10]. AzhaniZukri and RamliNazir (2018), sustainable materials used as stone column filler: a short review. IOP Conference Series: Materials Science and Engineering 342 012001.
- [11]. Pradip Das, Sujit Kumar Pal (2013). A study of the behavior of stone column in local soft and loose layered soil, Vol. 18: (pp. 1777-1786). Electronic Journal of Geotechnical Engineering.
- [12]. Shivashankar R., DheerendraBabu M. R., SitaramNayak, V. Rajathkumar (2011). Experimental studies on behavior of stone columns in layered soils. Vol:29, (pp. 749–757). Geotechnical and Geological Engineering
- [13]. Gniel J, Bouazza A., (2009), improvement of soft soils using geogrid encased stone columns, 27, (pp. 167–175). J Geotextiles Geomembrane.
- [14]. Lee J. S., Pande G. N., (1998). Analysis of stone-column reinforced foundations. 12, (pp. 1001-1020). International Journal for Numerical and Analytical Methods in Geomechanics.
- [15]. Ambily A. P., Gandhi S. R. (2007). Behavior of stone columns based on experimental and fem analysis, 133(4), (pp. 405–415). J. Geotech. Geoenvironmental Engineering ASCE.
- [16]. Malarvizhi, S. N., Ilamparuthi, K. (2004). Load versus settlement of claybed stabilized with stone and reinforced stone column. 3rd Asian Reg. Conf. On Geosynt.: 322-329.
- [17]. Black, J. A., Sivakumar, V. And Bell, A. (2011). The settlement performance of stone column foundations, Géotechnique, 61, (11): 909–922.
- [18]. Egan, D., Scott, W. And mccabe, B. A. (2008). Installation effects of vibro replacement stone columns in soft clay. Proceedings of the 2nd International Workshop on the Geotechnics of Soft Soils, Glasgow, pp. 23-30.
- [19]. Afshar J. N. And Ghazavi, M. (2014). A simple analytical method for calculation of bearing capacity of stone column. International journal of civil engineering, Vol. 12, No. 1, Transaction B: Geotechnical Engineering, January 2014.
- [20]. Samuel Thanaraj. M, FreedaChristy.C, Brema.J(2019). Analysis on the performance of stone columns with different materials in soil stabilization. International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-8, Issue-3S, February 2019.
- [21]. IS 15284-part 1 (2003), design and construction for ground improvement guidelines for stone column.
- [22]. IS:2720(Part 4):1985 Grain Size Analysis by Wet Sieving
- [23]. IS:2720 (Part 3): 1980 Specific Gravity test of Soil using Pycnometer
- [24]. IS:2720 (Part 5): 1985 Atterberg Limit Test for Liquid and Plastic Limits
- [25]. IS:2720(Part 7): 1980 Standard Proctor Test
- [26]. IS:2720(Part 10): Unconfined Compressive Strength (UCC) test
- [27]. IS: 2720(Part 13): Direct shear test
- [28]. IS:2720(Part 16): CBR (California Bearing Ratio) Test