[ICEMESM-18]
DOI-10.5281/zenodo.1226623

ISSN 2348 – 8034
Impact Factor- 5.070

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

A STUDY ON EFFECT OF ADDING EPS BEADS IN SOIL AND CONCRETE

Pranali Nikure[1], Kaushal Prajapati[2], Vishal Barapatre[3]
[1]Department of civil engineering, S.R.P.C.E., Nagpur
[2] Department of civil engineering, K.D.K.C.O.E, Nagpur
[3]Department of civil engineering, K.D.K.C.O.E, Nagpur

ABSTRACT

The disposal problem of EPS waste is increasing, the use of it in the field of civil engineering gives an environmental friendly solution. This paper contains the review of composite material of soil and EPS, and its application in the field of geotechnical engineering. It also contains review on replacement of natural sand with EPS in concrete, and their application

Keywords: EPS beads, EPS beads in soil, EPS beads in concrete.

I. INTRODUCTION

Disposal of waste is considered as a significant issue and the best environmental solution of this problem is to reuse and recycle. Expanded Polystyrene (EPS) is one of such waste material. EPS beads are created a stage before the generation of square i.e., the blocks are made by combination of beads. It is a waste material from packaging industry which creates a big disposal problem. EPS beads are contained around 98% air and 2% polystyrene which are fine circular formed particles. It can't ingest water because of its shut cell structure. The sound and thermal insulation properties are good. Also it has good impact resistance. Polystyrene foam is a non-biodegradable material. EPS densities for practical civil applications range between 11 and 30 kg/m^3. EPS beads are colourless and comprises polystyrene and broke up pentane. For different particular purposes EPS globules are accessible in various kinds and it is found as a very compressible material.

Because of their light self-weight, it has many practical advantages in construction. To understand the usage of EPS beads as a fill material, different examinations have been completed by mixing them with soil and cements as a fastener material.

Fig. 1 Photograph of EPS beads

II. EFFECT OF ADDING EPS BEADS IN SOIL

Liu et al. (2006) contemplated the impacts of various weight proportions including EPS and soil (EPS/S), water and soil (W/S) and cement and soil (C/S), on the unit weight of expanded polystyrene (EPS) composite soil (EPSCS). On comparing the unit weight EPSCS with native clay, it is found that the variation in the unit weight of EPSCS occurs from the 7 to 11 kN/m^3 and that of native clay ranges from 17 to 19 kN/m^3. The super light EPS gives the most important influence factor on the dry unit weight which is expected. The dry unit weight doesn't demonstrate any huge impact because of cement and water content. On expanding EPS/S proportion from 2 to 6% directly,

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diminishes in unit weight was found. Inside the tried EPS/S goes, a 1% expansion in the EPS/S proportion brings about a rough drop of 1 kN/m^3 in the dry unit weight of the example

On concentrate the unconfined compressive quality (UCS), qu, of EPSCS. A 28 days curing did over an sample of various C/S and EPS/S proportions and the deliberate UCS was found in the scope of 110 kPa to 520 kPa. A relatively straight increment in the UCS was found because of an expansion in the C/S proportion inside the examination scope of 10 - 25 %. And the coefficient of permeability ,*k*, was found to be on the order of 10-6 to 10-7 cm/s by constant head permeability tests. As the C/S ratio and curing period increases, permeability decreases. However, it increases with the increase of EPS/S ratio.

G. E. Abdelrahman et al. studied material made by addition of EPS-beads, stabilizing material such as cement with sandy soil. With various blend proportions of cement sand and EPS beads different tests are completed, for example, optimum moisture content, ultimate shear stress, max dry density and angle of internal friction of lightweight mixture. It is observed that, the sum and density of EPS-beads used can viably control the density of the lightweight blend. With the incorporation of 0.3% of EPS-bead (to sand by weight), the bulk density of the lightweight blend framed can be decreased to 8.5-18 kN/m^3. On by changing the amount of cement used in the shear strength, the stiffness of the lightweight mixture can be controlled. The angle of shearing resistance of the lightweight mixture increases significantly, if cement to soil proportion of 3-10% is utilized. On addition of cement to EPS-beads and sand mixture founds higher dry density along with less optimum moisture content.

Horvath (1994) Studied on EPS geofoam and EPSCS found that depending on the curing periods and the mixture proportion of specimen's initial modulus, Eo, of EPSCS varies from 79 to 555 MPa. These Eo esteems are significantly higher contrasted and that of EPS geofoam, which are in the range of 1.4-15 MPa relying upon the thickness of the EPS blocks. Therefore, EPSCS is less compressible than EPS geofoam.

III. EFFECT OF ADDITION OF EPS BEADS ON SOIL

Thomas Tamut et al. studied the properties of concrete by introducing EPS beads. The different properties of concrete, for example, tensile strength, compressive strength quality are done on light weight concrete containing EPS beads and afterward contrasted it and the consequence of typical concrete i.e., concrete without EPS dots. The outcome demonstrated that the proportion of EPS beads in concrete impacted the properties of hardened concrete. At 28 days, it was discovered that compressive strength of concrete containing beads are 5%, 10%, 15%, 20%, 25% and 30% and that of concrete with no beads shows 91%, 77 %, 71%, 63%, 57% and 45%, respectively.

Idawati Ismail et al. carried out an experimental investigation to study the properties of hardened concrete brick which are prepared by mixing expanded polystyrene beads. Sand in the blends is supplanted by beads. On watching the outcome it was discovered that polystyrene concrete is exceptionally inclined to segregation and has low compressive strength. The substance of polystyrene beads in the concrete blend impact the properties of brick. The results indicate that, addition of some portion of beads in polystyrene concrete mix will give alternative material in the construction industry.

B.A. Herki et al. studied the consequences of partially supplanting the natural aggregate by waste polystyrene based lightweight aggregate called Stabilized Polystyrene (SPS)in concrete and furthermore checked the mechanical and durability properties of concrete mix. The properties explored are water absorption by capillary action, ultrasonic pulse velocity (UPV), total absorption and compressive strength. The composite total was framed with 10% Portland concrete, 80% waste polystyrene which was destroyed to various sizes and to enhance the protection from segregation, 10% of natural additives are added. The common fine aggregate were supplanted with 0%, 30%, 60% and 100% (by volume) of SPS. The outcome establishes, there was an increasing in water ingestion and a diminishing in compressive strength and UPV with the increase in SPS aggregate content in concrete.

ISSN 2348 – 8034
Impact Factor- 5.070

IV. CONCLUSIONS

From the above literature it can conclude that

1. The use of EPS beads one of the waste materials can be recycled by making a composite material of soil and EPS beads or by replacing the natural sand by EPS beads in concrete.
2. The addition of EPS beads in soil reduces the dry density of soil.
3. EPS composite soil acts as a light weight material and can be used as a fill material for bridge abutment, embankment and underground cavities.
4. The EPS composite soil can significantly reduce lateral earth pressure.
5. The partial replacement of sand by EPS gives a solution on disposal problem of EPS and it can positively use as alternate material in nonstructural members of building.
6. The compressive and tensile strength of concrete reduces with increasing the content of EPS in concrete

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