Manuscript ID : 00000-20237

Source ID : 00000006

International Journal of Advanced Research in Engineering and Technology

Volume 11, Issue 09, September 2020, Pages 368-379, Page Count - 12

ASSESSMENT OF COAL MINE OVERBURDEN SAND FOR USE IN CONCRETE MAKING AS FINE AGGREGATE

A. S. Rathore [(1)*] Manoj Pradhan [(2)] S. V. Deo [(3)]

[(1)] Department of Mining Engineering, National Institute of Technology, Raipur, India.
[(2)] Department of Mining Engineering, National Institute of Technology, Raipur, India.
[(3)] Department of Civil Engineering, National Institute of Technology, Raipur, India.

Abstract

This paper presents a study carried out to assess the suitability of sand recovered from a coal mine overburden as an alternate to river sand. The overburden consists of weathered sandstone sludge. The sand particles were recovered by washing the overburden and separating sand particles by sedimentation and decantation method. To assess the suitability of the sand for making concrete, tests as recommended in Indian standard code IS:383 - 2016 were carried out. The recovered sand named CMOB sand was found suitable for making concrete. The recovered sand was fine grained having fineness modulus of 2.24 and falls in zone III. Saturated and surface dry loose and compacted bulk density was found to be 1499.44 kg/m^3 and 1696.67 kg/m3 respectively. The specific gravity was found to be 2.6 and water absorption 1.2%. The chief constituents in CMOB sand were SiO_2 about 90.00% and Al_2O_3 about 4.00%. No deleterious material was found beyond the limit prescribed in the IS code

Author Keywords

Bulk density, CMOB sand, Deleterious materials, Fine aggregate, Fineness modulus, M-sand, Overburden, Sieve analysis, Petrographic examination

Acknowledgement

The authors want to acknowledge the managements of the M/S Rajasthan Rajya Vidyut Utpadan Nigam, for granting permission to collect samples and providing necessary information and M/S Navuco cement for XRF analysis. The authors also want to acknowledge the director of the National Institute of Technology (Raipur, India) for providing the necessary support to carry out the laboratory experiments

ISSN Print: 0976-6480
ISSN Online: 0976-6499
Source Type: Journals
Document Type: Journal Article
Publication Language: English
DOI: 10.34218/IJARET.11.9.2020.038
Abbreviated Journal Title: IJARET
Access Type: Open Access
Publisher Name: IAEME Publication
Resource Licence: CC BY-NC
Major Subject: Physical Sciences
Subject Area classification: Engineering and Technology
Subject area: Civil and Structural Engineering
Source: SCOPEDATABASE

Reference

References (40)

1. Singh, S. K., Kirthika S. K. and Surya. M
   Agenda for use of alternative sands in India

   (2018) Indian Concrete Institute Journal, Volume 19, Issue 3, Page No 1-11,

2. Ministry of Environment, Forest and Climate Change, Govt. of India
   Sustainable sand mining management guidelines

   (2016)
   Article Link: http://mines.bih.nic.in/Docs/Sust.ainable-Sand-Mining-Management-Guidelines-2016.pdf

3. Ministry of Environment, Forest and Climate Change, Govt. of India
   Enforcement & monitoring guidelines for sand mining

   (2020)
   Article Link: http://environmentclearance.nic.in/writereaddata/SandMiningManagementGuidelines2020.pdf

4. Ishan K
   India can rely on sand imports till the time it is visible

   (2018)
   Article Link: https://www.downtoearth.org.in/coverage/environment/india-can-rely-on-sand-imports-till-the-time-it-is-viable-60892

5. Kuranchie, F.A., Shukla, S.K., Habibi, D., Mohyeddin, A
   Utlisation of iron ore tailings as aggregate in concrete

   (2015) Cogent Engineering, Volume 2, Issue 1,

6. Shettima A. U., Hussain M. W. and Mirza J
   Evaluation of Iron ore tailings as replacement for fine aggregate in concrete

   (2016) Construction and Building Materials, Volume 120, Page No 72-79,

7. Thomas B. S., Damare A. and Gupta R.C
   Strength Durability characteristics of copper tailing concrete

   (2013) Construction and Building Material, Volume 48, Page No 894-900,

8. Widojoko L., Hardjasaputra H. Susilowati S
   Study of Gold Mine Tailings Utilization as Fine Aggregate Material for Producing Shotcrete Based on Concept of Green Technology

   (2014) 3rd International Conference on Engineering and Technology Development,
   Article Link: https://www.neliti.com/publications/171172/study-of-gold-mine-tailings-utilization-as-fine-aggregate-material-for-producing

9. Parthasarathi N., Ramalinga Reddy B. M., Satyanaryanan K.S
   Effect of workability of concrete due to partial replacement of natural sand with gold mine tailings

   (2016) Indian Journal of Science and Technology, Volume 9, Issue 35, Page No 1-4,

10. Caveri L., Borg R. P., Mantia, F. P., Liguori V
    Quarry limestone dust as fine aggregate for concrete

    (2018) FIB Conference: Sustainable Concrete: Materials and Structures, Page No 1-11,
    Article Link: https://iopscience.iop.org/article/10.1088/1757-899X/442/1/012003

11. Prakash K. S. and Rao Ch. H
Study on Compressive strength of quarry dust as fine aggregate in concrete

(2016) Advance in Civil engineering,

12. Rajapaksha R. W. C. N. & Sooriyaarachchi H. P
Feasibility of quarry dust to replace river sand as fine aggregate of concrete

(2009) Engineer - Journal of the Institution of Engineers, Sri Lanka, Volume 42, Issue 4, Page No 30-37,

13. Ministry of Mines, Govt. of India
Sand mining framework

(2018)
Article Link: https://www.mines.gov.in/writereaddata/UploadFile/sandminingframework260318.pdf

14. Ultratech
Manufactured sand

(2013) Tech Mail, Volume 2, Issue 2,

15. Coal Controller`s Organization
Provisional Coal Statistics 2018-19

(2019)
Article Link: http://www.coalcontroller.gov.in/writereaddata/files/download/provisionalcoalstat/ProvisionalCoalStat2018-19.pdf

16. Fraser Institute
How are waste materials managed at mine sites?

(2012)
Article Link: http://www. miningfacts.org/Environment/How-are-waste-materials-managed-at-mine-sites/

17. Singh, R. D
Principles and practices of modern coal mining

(1997)

18. Jamal A & Siddartha S
Value added constructional bricks from overburden of opencast coalmines

(2008) Journal of Scientific and Industrial Research, Volume 67, Page No 445-450,

19. Chandar K. R., Gayana B. C., Sainath V
Experimental investigation for partial replacement of fine aggregates in concrete with sandstone

(2017) Advances in concrete construction, Volume 4, Issue 4, Page No 243-261,

20. SabihaG., Tarefderb R. A. and Jamilc S. M
Optimization of Gradation and Fineness Modulus of Naturally Fine Sands for Improved Performance as Fine Aggregate in Concrete

(2016) Procedia Engineering, Volume 145, Page No 66-73,

21. Coarse and fine aggregate for concrete- specification

(2016)

22. Method of test for aggregates for concrete. Part VIII Petrographic Examination

    (1963)

23. Method of test for aggregates for concrete. Part I Particle size and shape

    (1963)

24. Method of test for aggregates for concrete. Part III Specific gravity, density, voids, absorption and bulking

    (1963)

25. Method of test for aggregates for concrete. Part II, Estimation of deleterious materials and organic impurities

    (1963)

26. Method of test for aggregates for concrete. Part V, Soundness

    (1963)

27. Method of test for aggregates for concrete. Part VII, Alkali aggregate reactivity

    (1963)

28. Gambhir M. L
    Concrete Technology

    (2004)Page No 45-71,

29. Sud V
    Effect of Mica Content on Strength of Concrete

    (1995) Kurukshetra University,

30. Goltermann P., Johansen V., PalbfulL
    Packing of aggregates: An alternative tool to determine the optimal aggregate mix

    (1997) ACI Mater Journal, Volume 94, Page No 435–443,

31. Oritola S., Saleh A. L. Mohd S. A. R
    Comparison of different forms of gravel as aggregate in concrete

    (2014) Leonardo Electronic Journal of Practices and Technologies, Volume 125, Page No 135- 144,

32. Galloway, J. E. J
    Grading, shape, and surface properties

    (1994)Page No 401-441,

33. RangarajuP., Balitsaris M., Kizhakommudom

A report on impact of aggregate gradation on properties of portland cement concrete

(2013) Clemson University,
Article Link: https://www.scdot.scltap.org/wp-content/uploads/2015/01/SCDOT-SPR-689-Project-Final-Report1.pdf

34. Ajagbe, W. O., Tijani, M. A., Arohunfegbe, I. S., Akinleye, M. T
Assessment of fine aggregate from different sources in ibadan and environs for concrete production

(2018) Nigerian Journal of Technological Development, Volume 159, Issue 1, Page No 7-3,

35. Neville A M
Properties of Concrete

(2011)

36. Ayodele F O, and Ayeni I
Analysis of Influence of Silt/Clay Impurities Present in Fine Aggregates on the Compressive Strength of Concrete

(2015) International Journal of Engineering Sciences & Research Technology, Volume 4, Issue 4, Page No 95-99,

37. Cho S W
Effect of Silt Fines on the Durability Properties of Concrete

(2013) Journal of Applied Science and Engineering, Volume 16, Issue 4, Page No 425-430,

38. Ngugi H N, Mutuku R N, Gariy Z A
Effects of Sand Quality on Compressive Strength of Concrete: A Case of Nairobi County and Its Environs, Kenya

(2014) Open Journal of Civil Engineering, Volume 4, Page No 255-273,

39. Olanitori L.M
Mitigating the Effect of Clay Content of Sand on Concrete Strength

(2006) 31st Conference on OUR WORLD IN CONCRETE & STRUCTURES,
Article Link: https://www.scribd.com/document/324905436/10003103

40. Thomas, M.D.A., Fournier, B., Folliard, K.J
A Report on -Alkali-Aggregate Reactivity (AAR) Facts Book

(2013)
Article Link: https://www.fhwa.dot.gov/pavement/concrete/asr/pubs/hif13019.pdf