ISSN: 2454-9940

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

E-Mail :
editor.ijasem@gmail.com
editor@ijasem.in

www.ijasem.in

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940www.ijsem.in

Vol 9, Issuse.1March 2021

Review Report on Eco-Friendly Multipurpose Geo polymer Ferro Cement Panels

Dr.R.Malathy1,M.Poornima2

Abstract: As opposed to inserting reinforcing bars individually, ferro cement uses huge volumes of small diameter wire meshes across the cross section instead. We're going over the existing literature to see what we can find out about fibrocement construction, material qualities, and the many ways to apply geopolymer mortar to the reinforcing mesh in an attempt at synthesis. Building materials such as concrete and brick can be replaced with ferro cement. In order to construct structural elements like as beams and columns, different panel parts are pieced together. In addition, the low-calcium fly ash-based geopolymer's strong resistance to sulphate attack and good acid resistance provide significant economic benefits when employed in infrastructure applications. It briefly examines the structural behavior of multi-purpose fibrocement panels made with geopolymer mortar.

Keywords: Geopolymer, Ferro cement, Steel slag, and Flyash are all included in this mixture.

INTRODUCTION

Iron cement is a type of thin-walled reinforced concrete made from hydraulic cement mortar and continuous, small-sized wire mesh layers. Metal or other suitable materials can be used to make the mesh. Mastication matrix fineness and composition must be compatible with both mesh and armature systems. Discontinuous fibers in the matrix are possible. A form isn't necessary when using ferrocement reinforcement, which can be formed to a suitable shape before the mortar is applied. As a result of the significant research done on ferro cement material, we now have access to basic technical information on a wide range of design, construction, and application elements of this product.

The search for a structurally sound building material that is also lightweight, environmentally benign, economically viable, and capable of serving the intended purpose is an urgent one (Akhtar et al. 2009). Any desired shape or structural configuration is feasible with ferrocement, unlike ordinary masonry, RCC, or steel (RoblesAustriaco, 2006; Dongyen et al., 2006; Kondraivendhan & Pradhan, 2009). Pier Luigi Ne rvi is largely attributed with the creation of the material referred to as ferrocement in 1942-1943.

1Professor&Head,DepartmentofCivilEngineering,SonaCollegeofTechnology,Salem.2Research Scholar,DepartmentofCivilEngineering,SonaCollegeofTechnology,Salem.

Composition and qualities of ferro cement as it stands right now

Reinforcement with wire mesh 0.020 to 0.62 inches in diameter (0.5 to 1.5 millimeters) Galvanized chicken wire, square woven wire, or welded wire mesh are all acceptable types of mesh.

Mesh apertures range in size from 14 inch to 1 inch (6 to 25 millimeters)

• Mesh layer count More than one layer for every millimeter in thickness (5 layers per 10 millimeters of thickness)

8% maximum in both directions of fractional volume up to 40 pounds of steel reinforcing rod per cubic foot of concrete (630 kilograms per cubic meter)

As much as 10 square inches per cubic inch of reinforcement (400 square millimeters per 100 cubic millimeters) in both directions is possible

If necessary, the application of intermediate skeleton reinforcement. Type strands, wires, rods, and cloth

From 1/8 to 3/16 inch in diameter (3 to 10 millimeters)

• 2 to 4 inch grid (50 to 100 millimeters)

This is a typical mortar mix Cement from Portland, Oregon Depending on the application, it can be of any type.At least a weight ratio of one to two in the sand to cement

• Water-to-cement weight ratio of 0.4 to 0.6

• Recommendations There must be no more than 5 percent of weight passing US sieve number 100, and the sand must be graded continuously between these two points.

Composite characteristics Between one-fourth and two-inches (6 to 50 millimeters)

• 1/16 to 3/16 inch thick steel (1.5 to 5 millimeters)

• The maximum tensile strength of the material. 5000 psi is the maximum pressure (34 megapascals)

Tensile tension that can be tolerated up to 1500 pounds per square inch (10 megapascals)

Inflammation-induced rupture modality a maximum pressure of 8000 pounds per square inch (55 megapascals)

4000 to 10,000 pounds-per-square-inch (28 to 69 megapascals)

GEOPOLYMERS

Ferro-polymer cement geopolymer sheets (replacement of cement with 100 percent activated fly-ash). Sand:flyash and an activator solution are combined in a 1:1 ratio to make Geo polymer mortar. Different meshes are used to cast the slabs, which are then examined under the UTM. In this study, the major goal was to produce viable housing components that could be employed as structural elements for several purposes. sodium silicate with NaOH Preparation of the alkaline liquid should begin at least a day in advance of casting. First, the needed molarity of NaOH solution is made, and then it is combined 1:1 with Na2SiO3. Establishing the ideal water-to-binder ratio as well as the binder's molarity. Similarity in Geopolymer Mortar Compressive Strength Ratio. It was necessary to prepare samples for 8M, 10M, and 16M. (In which case, M–molarity). In other words, a liter of water containing an 8M concentration of sodium hydroxide weighs 320 grams (where 40 is the molecular weight of NaOH). Wire mesh boosts the section's flexural strength, according to the researchers. square woven three-layer mesh was found to be the most effective based on the experimental test findings. b) The use of weld mesh in ferro cement constructions increases the strength and improves the performance of the ferro cement. Because fly ash may be used in geo-polymer slabs, it has the effect of cutting back on environmental pollution.

ORGANIZEDSTUDY

Panel on Ferrocement Usage in Developing Countries was established in 1972 by the U.S. National Academy of Sciences through its Board on Science and Technology for International Development. The panel's report provides an excellent overview of ferrocement construction's history and current uses (Reference 3). Committee 549 of the American Concrete Institute was established in 1975 to gather information on ferrocement. The Asian Institute of

Technology in Bangkok, Thailand, established the International Ferrocement Information Center in 1976.

There is a clearinghouse for information on ferrocement and a journal called the Journal of Ferrocement published by the International Development Research Center of Canada, which is funded by the United States Agency for International Development, the government of New Zealand, and other organizations. To assess ferrocement testing procedures, RILEM (the International Union of Testing and Research Laboratories for Materials and Structures) formed Committee 48-FC in 1979

FERROCEMENTSTRUCTURESWORLD-WIDE

Buildings made of ferrocement include housing units, shell roofing and water tanks and swimming pools; biogas digesters; silos; food storage; and for some specific applications such as floating maritime buildings, reinforced concrete is preferred over ferrocement (Naaman, 2000; Hago et al., 2005; Abasolo et al., 2009). In Australia, New Zealand, and the United Kingdom, ferrocement construction was widely accepted in the early 1960s. In the years that followed, countless ferrocement boats and structures were constructed all over the world. Improved homes are built with ferrocement in Israel (Adajar et al., 2006). Bangladesh, Indonesia, and Papua New Guinea have all built ferrocement buildings using local materials like wood, bamboo, or bush sticks as an alternative to steel. The Building Research Institute, State Engineering Corporation, Colombo, Sri Lanka has developed and tested corrugated ferrocement sheets as a replacement for asbestos cement corrugated sheets that are widely used as a roofing material in Sri Lanka (Adajar et al. 2006). (Naaman and Shah, 1976; ACI Committee 549R- 97). CSR's ferrocement constructions in India are a testament to the technology's long-term viability in this country (CoP, 1997). In India, the Philippines, Malaysia, Brazil, Papua New Guinea, Venezuela, and the Pacific, precast ferrocement parts have been used for roofing, wall panels, and fences. Singapore, India, Indonesia, Peru, and Zimbabwe all use precast corrugated roof components reinforced with native fibers akin to asbestos cement sheet and galvanized iron sheet (RoblesAustriaco,1992). To construct water tanks, sunscreens, secondary roofing slabs, and facade cladding materials in Singapore, highly mechanized procedures have been adopted (Paramasivam, 2011). The National University of Singapore has erected a large rectangular ferrocement flume 35 m (115 ft) long, 2 m (6.6 ft) wide, and 1.3 m (4.3 ft) high to undertake model experiments under wave action (Paramasivam et al. 1985). Some of the most impressive works done with ferrocement may be found hanging from the de Menil Museum's ceiling as well as the Schlumberger building's ceiling in Cambridge, United Kingdom (Ferro 7, 2001).

APPLICATIONSOFFERROCEMENT

Ferrocement can be used to build new structures as well as repair and renovate existing ones because of its dual roles as a thin reinforced concrete product and a laminated cement-based composite.

MARINEAPPLICATIONS

Marine applications of ferrocement include vessels (such as boats and ferries), docks (such as barges and docks), cargo tugs, flotation buoys, water or fuel tanks, and flotation devices. Watertightness, impact resistance, thickness, and light weight are all important considerations in this type of application. It has been used to build a wide range of vessels, from fishing boats to flat-bottomed transport boats to catamarans to yacht replicas to oil tankers and farm boats.

A replica of an 18th century British armed schooner, the Sulthana, which was built in Boston by BenjaminHalllowellin1767.ItwasbaptizedtheLarindaandlauchedinCapeCod,Massachusetts,in 1996.

TERRESTRIALAPPLICATIONS

Agribusiness, water supply and sanitation, rural electricity, and home repair and rehabilitation are just a few of the land-based applications for ferro cement. Water tanks, liner for underground pits and irrigation

channels, pipe lining, and fish and chicken farm shells are just a few of the agricultural applications for this material.

RuralEnergyApplications:

Biogasdigestors,biogasholders,incineratorsandpanelsforsolarenergycollectors.

Water tanks, sedimentation tanks, well casings, septic tanks, service modules (i.e., water sink and latrine), sanitary tanks, linings for swimming pools, and fuel tanks are included in this category.

Requests for Rental Housing:

Precast housing elements, wall panels, sandwich panels, corrugated roofing sheets, hollow-coreslabs, sunscreens, permanent formwork, water tanks, swimming pools, mausoleums, community centers, museums, mosque domes and other places of worship, mausoleums, shelters, sheds, domed structures, and repairs and rehabilitation of existing housing

OtherStructure:

Bus shelters, architectural forms for reinforced concrete construction, sheds, pedestrian bridges, passerelles,servicecoreunitsforhousing,slidesforplaygrounds,skateboardringsandindustrialshelterssuchastohouseelectricalgeneratosorotherequipment.

Permanent Formwork: For reinforced or prestressed concrete columns, beams, slabs. Art and Architecture:Sculptures,models,lightdiffusingleaves.

REPAIRANDREHABILITATION

Ferrocement is an excellent choice for patching and other minor repairs because of its simplicity and inexpensive cost of application. Some examples include reinforcing reinforced concrete columns with confinement jackets to improve their seismic resilience, as well as skin reinforcement for unreinforced brick or masonry walls.

ADVANTAGESOFFERROCEMENTASACONSTRUCTIONMATERIAL

ferrocement enjoys all of the advantages that concrete and reinforced concrete have in building applications. Ferrocement is no different. Ferro cement, on the other hand, has advantages over wood, masonry, reinforced concrete, steel, and plastic reinforced with glass fibers.

1. Ferrocement can be manufactured from locally sourced materials, such as jute, sisal, bamboo, and other natural fibers, if steel mesh is unavailable. Cementitious matrices made from indigenous materials, such as laterite, can also be employed at the lower end. The usage of fiber reinforced plastic meshes and high performance cementitious matrices, both of which are used in advanced laminated fiber reinforced composites, can also be applied to ferroconcrete.
2. Two. Ferrocement has a wide range of applications, from self-help building to highly prefabricated industrial processes inclining precast panels for dwellings, pipe channels and curtain walls.
3. Because ferrocement is relatively light in weight, it does not necessitate the employment of large construction machinery or plants for its production.

Ferrocement is an excellent alternative for industrialized construction and prefabrication because of its reduced weight than typical reinforced concrete.

5. Ferrocement may be manufactured in any shape, and has been utilized in domes, boats, buildings, and sculptures. Shells and free-form shapes are ideal for this material.

. Ferrocement, like concrete and bricks, is non-flammable and resistant to the environment. Fiber-reinforced polymers have a shorter service life and are corrosive. 7.

Ferrocement is easy to maintain and repair.Using ferrocement is a wise use of resources.

9. The United Nations Conference on Environment and Development (UNCED) has defined ferrocement as an environmentally friendly technology (Rio de Janerio, 1992). Ecologically sound technologies utilize fewer resources, recycle more of their waste and products, and dispose of any remaining trash in a more environmentally friendly manner than the technologies they are meant to replace. Ferrocement is a "green" substance since it is less polluting and wasteful than other building materials.

CONCLUSION

Geopolymer ferrocement panels have exceptional qualities and are well-suited to construct precast concrete products that are required in the rehabilitation and retrofitting of structures following a disaster, according to the research. It is a revolutionary material that is well-suited for housing and water and food storage buildings in underdeveloped countries due to its accessibility to resources and ease of construction. Many types of ferrocement structures can be safely designed and built using the current design information and field experience. The kind and location of the application determine whether or not ferrocement can be economically competitive with alternative materials. Standard ferrocement construction methods and the effect of shape on the generation of new forms must be explored and their benefits revealed. The unique properties of ferrocement make it a significant structural alternative to RCC and a repair material in the future, and this means it has enormous promise for both emerging and developed countries.. countries.

REFERENCES

1.AntonieE.Naaman,"FerrocementandLaminatedcementitiouscomposites"-Material.

2.ACICommittee549-1R-88and1R-93:GuidefortheDesign,Construction,andRepairofFerrocement,ACI549-1R-88and1R-93,in ManualofConcretePractice,AmericanConcrete Institute,FarmingtonHills,Michigan,1988and1993,27pages.

3.ACICommittee549-R97:State-of-the-ArtReportonFerrocement,ACI549-R97,inManualofConcretePractice,AmericanConcreteInstitute,FarmingtonHills,Michigan,1997,26pages.

4.ASTMStandards,"StandardtestmethodsfortimeofsettingofhydraliccementbyvicatNeedle(ASTMC191-08),2008,ASTMInternational, West Conshohocken,PA.

5.ChandrasekharT,GunneswaraTD,RamanaNV(2006)."AnAppraisaloftheShearResistanceofFerrocementElements."AsianJ.Civ. Eng.Build.Hous.7(6):591-602.

6.Divekar,B.N.(2011b)—All-in-One–AUniqueMethodofConstruction ,ProceedingsoftheNationalConferenceonFerrocement,FS2011,13-14May2011,Pune,India,pp.135-141.

7.Divekar,B.N.(2011a)—RevolutionaryIdeasandInnovativeStructuresinFerrocement ,ProceedingsoftheNationalConferenceonFerrocement,FS2011,13-14May2011,Pune,India,pp.15-23.

8.KondraivendhanB,PradhanB.Effectofferrocementconfinementonbehaviorofconcrete.ConstructionandBuildingMaterials,2009;23:1218–1222.

9.Kaushik,S.K.,Gupta,V.K.,Trikha,D.N.&Mini,S.M.,Investigationsonferrocementcoredslabs.JournalofFerrocement,16(3)(July1986)227-37.

10.FerrocementModelCode.2001.BuildingCodeRecommendationsforFerrocement(IFS10-01)ReportedbyIFScommittee

11.Jagannathan,A.2011.FlexuralBehaviourOFPolymerMeshReinforcedFerrocementPanel.JournalonRecentTrendsinEngineering &Technology, Vol. 05, No.03.

12.Jain,A.K.,"FerrocementFoldedPlateRoofingIndustrialSheds",IndiaConcreteJournal,Vol.55, No.6,June1981.

13.Jagannathan,A.2011.FlexuralBehaviourOFPolymerMeshReinforcedFerrocementPanel.JournalonRecentTrendsinEngineering &Technology, Vol. 05, No.03.

14.Naaman,A.E.2000.FerrocementandLaminatedCementitiousComposites.Technopress3000, P.OBox131038,AnnArbor,Michigan,USA.

15.Naaman,A.E.2001.Ferrocementandthinfiber Reinforcedcementcomposites.JournalofFerrocement.vol.31,pp.267-280

16.P.Nath,P.K.Sarker,Geopolymerconcreteforambientcuringcondition.In:ProceedingsofAustralasianstructuralEngineeringconference(ASEC2012),Perth,Australia,July11-132012.

17.P.Nath,P.K.Sarker,EffectofGGBFSonsetting, workabilityandearlystrengthpropertiesofflyashgeopolymerconcretecuredinambientcondition.ConstBuildMater.66(2014)163–171.

18.ProfessorB.VijayaRangan,"Flyashbasedgeopolymerconcrete",Researchgate,.December2010

19.R.Padmavathy,S.Dharmar.,"ExperimentalInvestigationOnFlexuralBehaviorofFlatShapeFerrocementPanels",2ndNationalConferenceRecentAdvancementinCivilEngineering(RACE'14)21,March2014.

20.R.Anuradha,R.Venkatasubramani and B.V.Rangan(2012)“Modified guidelines for geopolymer concrete mix design using IndianStandard” –Asian JournalofCivilEngineering(Buildingand Housing),Volume13.
21.R.N.SwamyandASpanos,“Creepbehavioroff errocementsections”,JournalofferrocementVo l.15No2.July1985,pp117-129.
22.Sridhar,J.,andMalathy,R.2017.Effectofindus trialwaste-steelslaginimpactbehaviourofferrocementpan els.Eco.Env.&Cons.23(3);pp.1709-1715.
23.Shah,S.P.,“NewReinforcingMaterialsinConc reteConstruction,”JournaloftheAmericanConc reteInstitute,May1974,pages257-262
24.Shah,S.P.,“TentativeRecommendationsfort heConstructionofFerrocementTanks,”Ferroce ment—MaterialsandApplications,publicationSP-61,AmericanConcreteInstitute,Detroit,1979,p ages103-113
25.ShrutiRatnaparkhe.,“AStudyonFerrocemen t-ConcreteComposites”,VSRDInternationalJourn al,Vol.3,No.2,Feb2013.
26.Sudhakumar,J.,"Studiesonthethermalperfo rmanceofferrocementroofs",26thConferenceo nOurWorldinConcrete&Structures,Singapore, pp. 599604, 2001.
27.R.Vicentprabakar,S.Dharmar.,“Experiment alInvestigationOnFlexuralBehaviorofFoldShap eFerrocementPanels”,2ndNational Conference Recent Advancement in Civil Engineering (RACE’14)