|| Volume 5 || Issue 3 || March 2020 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH
AND ENGINEERING TRENDS

USE OF FERROCEMENT IN SMALL WATER HARVESTING STRUCTURE

Ms. Akshada B. Jadhav[1], Ms. Shubhangee P. Bharti[2], Ms.Komal R. Rananavare[3], Mr.Abhishek S.Mane[4] , Prof. Dr. S. S. Deshmukh[5]

UG Student, Trinity Academy of Engineering, Kondhwa, Pune[1]
UG Student, Trinity Academy of Engineering, Kondhwa, Pune[2]
UG Student, Trinity Academy of Engineering, Kondhwa, Pune[3]
UG Student, Trinity Academy of Engineering, Kondhwa, Pune.[4]
Professor, Trinity Academy of Engineering Kondhwa, Pune.[5]

Abstract: India has different climatic conditions according to region or area i.e.; hilly region dessert region etc as we are discussing about Maharashtra, In 2019 at the same time we face drought condition and also heavy rainfall problems a whole city is under water due to heavy rainfall. There is huge need of economical and strong water harvesting structure to overcome these conditions and to find effective ways. Now we are facing problem of covid19 and to control water scarcity and drought condition in future is basic need.

Keywords:- *Ferrocement, Toposheet, Thematic maps, DEM, IMD data.*

I INTRODUCTION

Ferrocement is a construction material in which reinforced mortar or plaster (containing lime or cement, sand and water) spread over an "armature metal mesh", woven expanded-metal or metal-fibers and closely spaced thin steel roads such as rebar (these are all type of mesh that are used in ferrocement) these metals commonly used as iron or some type of metal\steel. The cement is typically a very RMD mix of cement and sand in a 3:1 ratio and when used in building boats we does not used gravels in it, so we cannot say it concrete.

Ferrocement is mostly applied in construction like relatively thin, hard strong surfaces and structures in many different shapes i.e., hulls of boats, shell roofs and water tanks. The concept of ferrocement is developed or originated in 1840s in France and Netherlands and is origin is reinforced concrete. The concept of "ferrocement' has been developed by extension to other composite materials, including some containing no cement and no ferrous material. It has wide range of other uses having or as containing sculpture and prefabricated building components.

Ferrocement is made up with the wire mesh of diameter 0.5mm to 1mm reinforcement between cement mortar of ratio 3:1 of cement and sand.

Watershed is a geographical term, originally. The area that drains into a single river is the watershed for that river. Watershed can also mean a ridge, like that formed by a chain of mountains, which sends water to two different rivers on either side.

The advantage of a well built ferrocement construction is the low in weight and maintained costs has long lifetime in comparison with purely steel construction. When the ferrocement sheet is mechanically overloaded intends of breaking the sheet will be tends to fold or crumble like stone or pottery. As in water harvesting structure, it act as it may fail and leak but possibly hold together. It's totally up to the techniques which are used in construction.

In India, ferrocement is used or applied often the reason behind is the construction made from it are more resistance to earthquake. and earthquake resistance is totally up to or on the technique which are used in constriction.

II LITERATURE STUDY:

1. Delineation of potential sites for Water Harvesting structures using Remote sensing and GIS: M.Girish Kumar, A.K Agarwal, Rameshwar bali- 12 February 2008-

Water, one of the most basic and important resources in our day to day life is deflecting faster in rural as well as urban areas mainly because of increase in agricultural and domestic use. In water resources planning, ground water table is recharging an ever-increasing interest due to scarcity of good quality of sub surface water and growing need of water for domestic, agricultural, and industrial need. In a widely populated country like India, ground water resource is in high demand. Continuous failure of mansoon, increasing need and over exploitation leads to depletion of ground water table, which in turn tends to recharging both the investment and the operational costs. This problem could be sorted out to certain parameter by artificially recharging the potential aquifers. In hard rock terrain availability of ground water table is of l extend up to certain limit. Occurrence of ground water in such a rock is needed confined to fractured and weathered horizons. Effective management and planning of ground water in these areas is of the at most need and important. Effective hydrological studies have been carried out by several workers in delineating ground water potential zones in hard rock terrain.

2.Option for water storage and rainwater harvesting to improve health and resilience against climate change in Africa- Eline Boelee, Mekonnen Yohannes, Jean-Noel Poda, Matthew McCartney, Philippe Cecchi-29 January 2012: The economy and live hood systems of West and East Africa is totally upto heavily in rainfall. However, both regions experience highly variable rainfall that is expected to increase with climate change. Climate change in sub-Saharan Africa will exacerbate current climate various changes, so that water resource planners and managers will have to work with increasing number of vairiablities. Current scenarios predict that climate variability will increase water scarcity in many regions. Coupled with increased population 75-250 million people in sub-Saharan Africa will experience increased water stress by 2020.

Water harvesting and storage are important mechanism for adapting to number of climate variability. These interventions promote economic growth and help alleviate poverty by reducing risk and making water available when and where it is important. Recent studies suggest that in Africa and globally, soil storage enhancement and small-scale runoff harvesting can make a useful contribution to agricultural productivity under current and future climatic changes. Rainwater harvesting is manage old practice, applied for domestic water supply and for agricultural. such water system include domestic systems for single households and small communities, on-farm water conservation system, small surface reservoir systems for smallholder irrigation, livestock watering and domestic water use and large surface dam system for large scale irrigation, hydropower production, industrial and domestic water supply.

3.The effects of Water Harvesting Techniques on Runoff, sedimebtation and soil properties- Saleh H. Al-seekh, Ayed G.Mohammad 7 February 2009: Throughout arid and semi arid regions, water shortage is the major limiting factor for agricultural development and rangeland development. Therefore, water harvesting techniques (WHT) have long been utilized as a need to reduce soil erosion and sedimentation and to increase soil water storage and soil fertility. water harvesting can be defined as the process of collecting rainfall as runoff from a large catchment area to be used in a smaller targeted regions.WHT consist of two components: the catchment area, where runoff is collected, and the cultivated area, where the runoff is collected, and the cultivated area, where the runoff is collected. Water harvesting may also be used for restoration of the productivity of land which suffers from insufficient precipitation increasing productivity of rain fed farming, minimizing risk of drought in regions prone to be and decreasing the threat of desertification through decreasing runoff and increasing infiltration. The most important advantages of water harvesting are that it is simple, cheap, replicable, efficient and affordable. Runoff causes erosion of fertile topsoil, resulting in soil degradation and over-exploitation of natural resources for forest and range land production.

Traditionally, water harvesting practices have been implemented and developed by local farmers in arid and semi-arid areas of the world in order to increase the amount of water available for crop fertilisation and tree growth. li and Gong reported that ridge and furrow rainfall harvesting system increased water availability crops and stable agricultural fertilization in many areas of the Loess Plateau in northwest china. In the northern Negev Deserts, contour ridge are the most water common harvesting techniques.

4.Self-flowing mortar for ferrocement in strengthening applications- Shamir Sakir, S.N Raman, A.B. M.A.Kaish, A.A.Mutalib 18 February 2016): Ferrocement is a thin-shell mortar system reinforced with single or multiple layers of metal wire mesh. In most cases of ferrocement construction, mortar is placed by hand-toweling, which makes standardized placement as a challenge. Another method is by plastering the wire mesh with cement mortar manually in several stages that makes it labour workable. Therefore, the equality of the end product becomes non-uniform and at the same time it becomes both time and labour consuming. Self flowing mortar (SFM) can easily eliminate these riddles. Another advantage of SFM is that the time and manpower needed to place large section is considerable decreased. these type of mortar mix also decreases the chance of voided formation caused by the bad labourship and ensure proper compaction (Hasan et al 2014).preparing a self flowing mortar mix without compromising its strength properties is a challenge/as the rheological properties often contradict with the mechanical properties. low viscosity and particle homogeneity are required for adequate fluidity of fresh mix. Using super plasticizer and addition of some specific filler materials improves the flow ability but often decrease strength properties. and optimization between fluidity and strength is needed. these study discusses ferrocement strengthen mechanism and applicability of SFM in ferrocement for strengthen applications. The study also focused above the principle, raw materials, preparation techniques and recent developments of SFM, which are compatible with ferrocement technology

5. Effect of silica Fume and Foundry waste sand on strength characteristics of Geordie and Ferro cement panel-Rahul Roy, Dr.V.Sairam Agarwal at 1992, Rao et al 2001: With the advancement of research technology, use of thin cement composite elements made of cement mortar and layers of continuous and relatively small sized mesh is increasing day by day. Ferrocement is a thin construction element with thickness is the order of 10-50 mm and uses rich cement mortar, no coarse aggregate is used and the reinforcement consist of one or more layers of continuous/small diameter steel wire/weld mesh netting it requires no skilled labour for casting and employee only little or no formwork at the same time ferrocement is very strong and elegant with very high tensile strength to weight ratio and superior cracking behavior in comparison to conventional reinforced concrete. while of similar durability, it is more elastic than reinforced concrete. These means that thin ferrocement structures can be made relatively light and water tight. In ferrocement, cement matrix does not crack seems cracking forces are taken over by wire mesh reinforcement immediately below the surface ferrocement has a high tensile strength and stiffness and better impact and punching shear resistance than reinforced concrete, because of two dimensional reinforcement of the mesh system. So it undergoes large deformation before cracking or high deflections before collapse.

III METHODOLOGY:

Collection of data: Toposheet, IMD Data, secondary data (runoff at stream gauge station), use of different thematic maps, Rational equation, Satellite images, Study of watershed using ARC-GIS.

Study of Watershed: The toposheet were downloaded from Google earth of scale 1;50000. The georeferncing of toposheet is finished with the help of ARC-GIS software. The Catro DEM of 30m resolution is used. The boundary of watershed basin is delination with using ARCSwat tool. The DEM data was downloaded of study area from internet. And further used for engineering properties. Decreasing retain earth height by re-grading backfill earth surface, and landscape changing or pressing down drainage culvert at the wall back face.

To Study of engineering properties of watershed and ferrocement: According to collection of data, and engineering properties and ground water table, rainfall, runoff, discharge, storage of water, irrigation needs, water required per year for multi-purpose according to area chosen structures are decided respectively, With consideration of above points, the study of engineering properties i.e., strength of ferrocement, soundness, fineness, consistency, setting time, strength, heat of hydration, chemical composition etc.

(Self-prepared)

Design and analysis parameters	**Reinforced cement concrete (RCC)**	**ferrocement**
Labours	Skilled	Semi-skilled
Standard ratio	According to grade of concrete	3:1
Settling time	After placing within 30 min	7 days
Curing required	7 days or 28 days	26 days

Table 1: Comparative Analysis

To study the design and analysis properties of small water harvesting structure of ferrocement: With the study of all parameters we have adopted different procedure to design the structures accordingly and suggest the economical design to overcome the mentioned conditions.

IV RESULT AND DISCUSSION:

1. Ferrocement has low shear sytrength and ductility as compare to the conventional cement.
2. For the construction of ferrocement required large number of labours.
3. Suscepitilibity t stress rupture failure
4. Ability of large delfection
5. Good in impeameablity
6. Low mainatace cost

(self-clicked)

Image 1: Drought condition

IV CONCLUSION

- Our expected conclusion of this study is to use ferrocement in small water harvesting structures (water tank, bandhara wall etc.) and to suggest the use of ferrocement in small water harvesting structure.
- The advent of ferrocement technology construction, we have noticed ferrocement is durable waterproof and does not required repair crack resistance material at the same moment ferrocement is better in earthquake resistance and wind resistance and resistance in all dessert regions.

REFERENCE

1. Self flowing mortar for Ferro cement in Strenthing application-Shamir saikh. S. N. Raman. A. B. N. M. Kaish A. A. Mutalib-9 june 2016.

2. Structural performance of confined masoonary walla retrofitting using Ferro cement and GFRP under plane cyclic loading - Mossad El - Diasity. Hussein Okail. Osama kama-14 march2015

3. Durability of polymer and fly ash modified ferro cement elemnts -V. Bhikashma. Ravandekeshore and R. Srinivas. - 2011

4. Integrated watershed management: evolution development and emerging trend -Guangyu wang, shari mang, Haisheng Cai,shirong liu,zhiqiang zhang, liguo wang , john .l.innes-june 2016.

5. Analysis of land use and land cover change ,dynamics using GIS and remote sensing during 1984 and 2015 in the berrassa watershed northern central highland Ethiopia-tesfa waorku, meshesha.s.k.triphati,dipak khaire-Aug 2016.

6. Dynamical statically frame work for seasonal stream flow forecasting in an agricultural

watershed-louise.j.salter, jabriele villarini, a.allan bradly,Gabriel.a.vechi-March2016.

7. Different studies on ferrocement channel unit under compression, flexure, fatigue and impact effect-ali khadim salal-vol.4 Issue 2 _May 2018.

8.Investigation of ferrocement channels using experimental and finite element analysis-Hanid Eskandari, amirhossein madadi-Dec 2014.

9.Improving shear strength of beams using ferrocement composite- Taha A. el sayyad, abir m. irfam-Dec 2017.

10.A dynamical statical framework for seasonal streamflow forecasting in an agricultural watershed-Louise j. slater,Gabriele vecchi-13 july 2017.

11. Integrated watershed management: evolution, development and emergin trends-yuangyu wang, shari mang, haisheng cai-30 june 2016

12. Analyses of land use and lnd cover change dynamics using GIS and remote sensing during 1984 and 2015 in the beressa watershed northern central highland of eithiopia-tesfa worku meshesha, s.k.tripathi,Deepak khare-3oct2016

13.Different studies on ferrocement channel units under compression flexure,fatigue and impact effect-alikadhimsallal-ISSN2455-0876-volume 4-Issue 2- 2 may 2018

14.Light weight ferrocement matrix compressive behavior:experiments versus finite element analysis amirhossein mdadi,hamid easkandari naddaf morteza nik-27 April 2011

15.Improving shear strength of beams using ferrocement composite Taha A el-sayyed, abeer m. eertan-5 octember 2018

16.Flowable nano SiO2, based cementitiouse mortar for ferrocement jackted column-j.revalmy, P.gajananlakshmi,M.assem ahmed-28 octember 2016

17.Investigation of ferrocement channels using experiment and finite element analysis-hamid eskandari, amirhossein mDdid-9 may 2015

18.Loren Agostini, (December 2016). The failure of Concrete Retaining Block Wall, Research Gate, chapter 4.

19. Design Analysis and construction of precast ferrocement store room-S.Priya Vadhana M.Neelamegam S.Lavanya Prabha-ADVENT TECHNOLOGY-june 2016.

20. Ferro cement -A modern technology with its application in water resource department-A.R.Khandelwal S.S.Deshmukh.-Water resource department (WRD)-april 2016.

21. option for water storage and rain water harvesting to improve health and resilience against cliamate change in africa -Eline Boelee. mekonnen Yohannes jean- noel pondati - 21 december 2010/ Accepted 29 january 2012 / publish - 25 february 2012.

22.The effect of water harvesting technique on runoof Sedimentation and soil property-Saleh H. Al- Seekh . Ayeed G . Mohammad- 21 may 2009.

23.Effect of silica fume and foundry waste sand on strength characteristics of geogrid and ferro cement panel- Rahul Roy, Dr. V. Sairam – 2018.

24.Improved ferro cement jacketing for restrengthning of square Rc short coloumm-A. B. M. A. Kaish., M. R. Alam. M. Jamil. M. F. M.zain.-27 April 2012.

25. The potential of in situ rainwater harvesting in rigid region developing a methodology to identify suitable areas using GIS based decision support system-Shereif H. Mohammad. A. A. Alazba- 17 july 2014.

26. Ferro cement jacketing for restrengthning of squre reinforced concert coloumn under concentric comprehensive load - A. B. M. Amrul. Kaish. M. R. Alam. M. Jamil. And M. A. Wahed - march 2013