# Utilization of Low Density Polyethylene Waste in the Manufacturing of Paver Brick

**Ch. Sravan Kumar Reddy, Bendapudi Sarath Chandra Kumar, SS.Asadi**

***Abstract:*** ***The composition of waste is different in every country where plastic plays a major role in environmental pollution. Enormous amount of plastic waste has been generating every day globally. Accumulation of plastic in environment, improper handling, land filling and decomposing causes pollution which effects human habitat and wild life. As we know that a construction material should have more life span, so we can use plastic, since plastic is a versatile and long-lasting material. The main theme of this paper is to reduce environmental pollution by recycling the waste Low-Density Polyethylene (LDPE) plastic bags and decrease plastic waste. In this paper the LDPE plastic bags are recycled and used as total replacement for cement to prepare plastic paver bricks. There will be no economic problems as waste plastic is used. Compressive strength, melting point and water absorption and environmental factors has been found out for the results to avoid the effects on environment. The results of the paper shows that LDPE plastic can be recycled which helps to reduce the environmental pollution and carries socioeconomic factors.***

***Index Terms:Environmental Pollution, Economical, LDPE, Plastic paver bricks, Poly bags.***

## I. INTRODUCTION

Plastic pollution is the accumulation of plastic products in the environment that adversely affects wildlife and humans. As of 2018, about 380 million tons of plastic is produced worldwide each year. It is estimated 6.3 billion tons of plastic has been produced worldwide, of which an estimated 9% has been recycled and another 12% has been incinerated. Plastics themselves contribute to approximately 10% of discarded waste. Many kinds of plastics exist depending on their method for their polymerization. Plastics have different properties which depend on their chemical composition which are related to contaminant absorption. The largest component of the plastic waste is polyethylene, polypropylene, polyethylene terepthalate and polystyrene [1].

Landfills are the source of effect of plastic to environment. Plastic waste by disposing through landfills releases less gas emission but space given for landfills is limited. Providing layers for landfill will leads to releasing or leaking of toxins which contaminate soil and nearby waster bodies. Handling of plastic plays major role in protecting environment. To ensure safe collection, storage, segregation, transportation processing and disposal. To ensure no damage is caused to environment during this process. Have to maintain collection centers for plastic. To maintain alternative ways to recycle the plastic at any cost. To engage agencies and groups in waste management for plastic pickers. This will help for reduction on effect of plastic to environment. The focus is shifting to utilization of plastic in construction industry which is very much feasible in construction driven and intensive countries like India. But the recycling involves many technical and scientific procedures as recuperated one cannot be utilized again with regard to the structural changes and temperatures required for melting. Quantities of plastic wastes have increased rapidly throughout this decade due to its beneficial properties of low density, light weight and strength. By keeping all the above in mind, we have to recycle plastic to reduce the environmental affect by using plastic as replacement in manufacturing of paver bricks. By keeping the cost of cement in mind, only fine aggregate is used in the mixture where there plastic paver blocks can be used at low strength required area like footpaths in gardens, parking areas, other outer placers. The factors which affect the environment by the plastic brick were raised and solved [1].

The plastic paver brick made of plastic bags, fine aggregate and quarry dust gives strength equal to conventional paver brick and reduces weight up to 15%. They concluded that recycling of plastic is better than disposing it and reduce plastic pollution [2]. The use of plastic waste in manufacturing of paver bricks is a productive way which reduces cost which leads to economical factor. They conclude that though the strength of the brick is low, it can be used in gardens, pedestrian paths [3]. The plastic sand paver blocks production leads to cost efficiency and results in removal of plastic waste which is abolishing lands which can be used for other requirements. This can also reduce the emission of green-house gases [4]. The strength of geo polymer paver block is increased by increasing the foundry sand as replacement of fine sand [5]. Recycle coarse aggregate and Polyethylene Teraphthalateare likely to be used in construction industry which is more economical in manufacturing of brick [6]. Reuse of plastic can improve the properties of concrete and increases the strength which is eco-friendly and economical [7]. 0.5% of recycled plastic chips and coconut fiber adding to concrete will give good strength which is suitable to use in light medium traffic [8]. Producing plastic cement using polyethylene materials which can be used as replacement for cement up to 30% in manufacturing of plastic paver block

**Revised Manuscript Received on December 22, 2018.**

**Ch.Sravan Kumar Reddy,** Department of Civil Engineering,KoneruLakshmaiah Education Foundation, Vaddeswaram, Guntur, A.P, India – 522502.

**B.Sarath Chandra Kumar,** Department of Civil Engineering, KoneruLakshmaiah Education Foundation, Vaddeswaram, Guntur, A.P, India - 522502

**SS.Asadi,** Department of Civil Engineering, Vignan's Foundation for Science, Technology and Research, Deemed to be University, A.P, India.

will increase strength [9]. Any material made by recycled plastic can be used as light weight material as an alternate and has many environmental features [10]. By replacing 20% of recycled plastic aggregate as a replacement for coarse aggregate doesn't not affect any properties of concrete block [11]. We can replace recycled plastic aggregate as a replacement for coarse aggregate up to 60% to 70%, but only 20% is possible to use for better results [15]. As the percentage of recycled plastic aggregate is increased, compressive strength, split tensile strength and flexural strength also increases up to 10% [12]. The usage of recycled plastic aggregate as a sustainable option to reduce the ecological footprint is a best choice [13]. The effective way reutilization of hard plastic waste as a bitumen as an innovative technology which results in flexible pavement, increases the melting point and strength of bitumen [14]. By using plastic waste as a replacement of fine aggregate up to 40%, the weight of the block decreases and acceptable strength is attained [15]. The physical properties of LDPE poly bags are tabulated in Table I [16].

## II. RESEARCH SIGNIFICANCE

The research is regarding the environmental pollution occurred by plastic waste. Lot of plastic waste is produced every day by humans because of needs. So, we cannot stop using plastic but disposal of plastics can be done by recycling it. To reduce the pollution by plastic, plastic is recycled and used in manufacturing of plastic paver bricks. As it gives less strength when compared to concrete paver block, it can be used where low loads are applied. This research can also be helpful for jobless to start a manufacturing unit.

## III. OBJECTIVES

1. To know the performance of plastic paver brick in construction industry.
2. To comparison of compressive strength between plastic paver brick and conventional paver brick.
3. To study the usage of plastic as a partial replacement of cement in plastic paver block.

## IV. MATERIALS USED

The following are the materials used in manufacturing of plastic paver blocks. Waste poly bags and fine aggregate are the only materials used to make an economical paver brick. As plastic and fine aggregate are light in weight, the result of the brick weight will be low. So, materials play a vital role regarding strength and weight respective to brick.

### *A. Poly Bags*

Low-density Polyethylene poly bags or plastic bags are the waste which is highly found in environment. These types of bags are regularly used by the people for carrying goods and daily needs. Being light weight they can carry enough number of items which we can predict good strength. A lot of research had been done by the researchers to involve plastic in the construction material. These waste low density polyethylene poly bags are found in the dumping area and the place where huge plastic bags are gathered. Due to environmental problems by these waste LDPE poly bags, they have to properly disposed by using plastic management techniques or used for recycling [23].

**Table I: Physical Properties of LDPE Poly Bags**

| | |
|---|---|
| Density | 0.95gm/cc |
| Stable range | 50ºC to 85ºC |
| Melting point | 105ºC to 115ºC |
| Thickness | 20microns to 250 microns |

### *B. Fine Aggregate*

The aggregate which passes through 4.25mm sieve is termed as fine aggregate. It is nothing but natural sand or crushed stone which is found in natural sources like riverbeds, quarries and mines. Generally fine aggregate is used to fill the gaps between coarse aggregates and cement. For a good construction material the fine aggregate should be hard, clean and free from absorbed chemical, clay and shells from river. Physical Properties of Fine Aggregate are mentioned in Table II.

**Table II: Physical Properties of Fine Aggregate Is 383: 1970**

| | |
|---|---|
| Specific Gravity | 2.6 |
| Water Absorption | 0.64% |
| Zone | II |

## V. EXPERIMENTAL PROCEDURE

### *A. Plastic Composition*

LDPE poly bags waste is collected from the dumping yards or landfills, places where these bags can find more. The bags should be clean, free from other ingredients inside the poly bags. These bags are heated till it turns to viscous form. About $150^0$C to $160^0$C heat is required to melt the plastic bags [23].

### *B. Mixing Procedure*

Manufacturing of plastic paver blocks has to be done in open places and far from city. A metal tin with fire under it is arranged to heat the plastic. The plastic bags are heated according to the weights given in mix design. While heating care should be taken by wearing gloves to hands, a long rod can be used for mixing the plastic waste. When the plastic changes to viscous form fine aggregate is added to the viscous form. The both materials are mixed properly like concrete. The mixture is molded in molds. Its takes only few minutes to mix to get dry and hard. We can de mold the brick in 2 or 3 minutes and dry it for 24 hours in cool or warm places. Actually while preparing mix design, there is no any specifications in following the ratios. By predicting that the paver brick will be formed at the predicted ratios, the mix design is prepared. If the mix designs from the code book is followed, the bricks may form or may not.


Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

*C. Mix Design*

Mix design can be defined as the procedure for selecting required materials of mixture and finding the proportions which results in enough strength, durability in economical. In this experiment the ratios are taken in kilograms. Actually the mixture for plastic paver block is made according to the designed ratios. The ratios M1, M2, M3, M4 and M5 are experimented in which some were failed. At first M1ratio is experimented which is failed. Here the sand ratio is more and the plastic ratio is less, so the mixture is turned into powder. The same thing happened to M4 ratios. When it comes to M5 ratio the plastic is high, so the mixture is in liquid form. At M2 and M3 ratios, the bricks were formed. The following tests are done to the bricks to check its ability. Zone selection for fine aggregate are given in Table III.

**Table III: Zone selection for fine aggregate IS 383: 1970**

| Sieve sizes (mm) | Weight retained in grams | Cumulative weight retained in grams | Cumulative percentage retained in grams | Percentage passing for grading | |
|---|---|---|---|---|---|
| | | | | Cumulative percentage passing | Zone II |
| 10 | 0 | 0 | 0 | 100 | 100 |
| 4.75 | 6 | 6 | 0.6 | 99.4 | 90-100 |
| 2.36 | 15.5 | 21.5 | 2.15 | 97-85 | 75-100 |
| 1.18 | 195.5 | 217 | 21.7 | 78.3 | 75-90 |
| 600 | 203 | 420 | 4.2 | 58 | 35-59 |
| 300 | 384 | 804 | 80.4 | 19.6 | 8-30 |
| 150 | 165.5 | 969.5 | 96.95 | 3.05 | 0-10 |

we can't guess at which ratio the brick will be formed, so first ratios are fixed and bricks were formed according to the ratios. The designation of mix is tabulated in Table IV.

**Table IV: Designation of Mix**

| Ratios of Mix | 1:3 | 1:2.5 | 1:2 | 1:1.5 | 1:1 |
|---|---|---|---|---|---|
| Mix ID | M1 | M2 | M3 | M4 | M5 |

Here, 1:3 is 1 kilogram of plastic and 3 kilograms of fine aggregate. This is followed for all the ratios respectively.

*D. Design Procedure*

Materials used: poly bags, fine aggregate.
Type of poly bags: low density polyethylene.
Size of fine aggregate: passing through 4.75mm sieve
The mixture for plastic paver block is made according to

**Fig.1: Plastic Paver Block**

Fig. 1 is plastic paver brick after curing for 24 hours which is ready to test compressive strength.

When it comes to curing, the formed plastic paver brick is dried for 24 hours in warm climate. Because as plastic is melted into liquid state, so to get hard it needs warm or cool climate. As it takes long period for curing the brick in water for 7 days, 14 days and 28 days, so drying takes less time and the production will also be high.

*E. Compressive Strength*

If a material is introduced in construction field, the main aspect to be considered is strength. To find the resistance of this plastic brick under compression, compressive strength test has to be done by using UTM. The surface of the brick should be plane in all the sides, so that the load can distributed evenly. The importance of finding compressive strength is to measure the load bearing capacity of the brick. The following Table V shows the results for compressive strength of different mix ratios.

**Table V: Compressive strength**

| S. No | Mix ratios | Compressive Strength ($kN/mm^2$) |
|---|---|---|
| 1 | M1 | 0 |
| 2 | M2 | 9.3 |
| 3 | M3 | 5.3 |
| 4 | M4 | 0 |
| 5 | M5 | 0 |

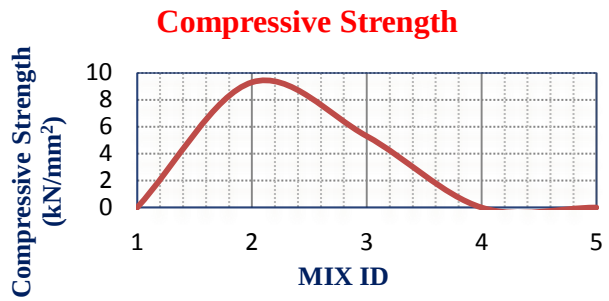


**Fig. 2: Compressive Strength of Plastic Paver Brick**

*F. Water Absorption*

Water absorption test for brick is conducted to find the amount of water absorbed in water or humid environments. The water absorption capacityof brick should not exceed more than 2%. First three bricks are weighed after 24 hours drying and noted as net dry weight. The bricks are kept for curing in water for 24 hours. After curing the bricks are again weighed and noted as wet weight. The difference between the weights gives the amount water absorbed. The following are the results obtained by conducting water absorption tests. The importance of the finding the water absorption for paver brick is to find out how much water it will absorb in humid atmosphere. If the absorption value increases according to code, then the brick is not eligible to use.

**Table VI: Table of water absorption for Mix ratios**

| S. No | Mix Ratios | Water Absorption (%) | Remarks |
|---|---|---|---|
| 1 | M1 | 0 | Liquid state |
| 2 | M2 | 1.5 | Solid state |
| 3 | M3 | 1.07 | Solid state |
| 4 | M4 | 0 | Pulverised state |
| 5 | M5 | 0 | Pulverised state |

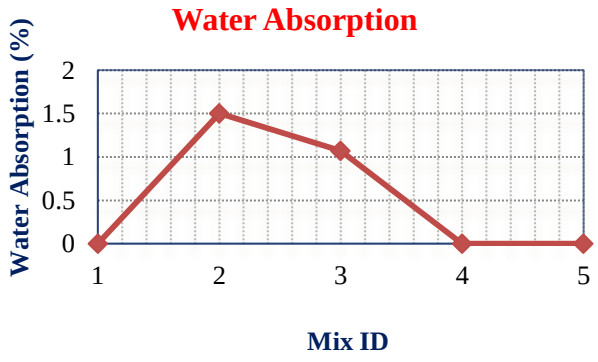


**Fig. 3: Water Absorption of Plastic Paver Brick**

According to mix design, the brick were formed at M2 and M3, where for M1 the mixture is in liquid state. And for M4 and M5, the mixture is in pulverized state. So, water absorption test has been done only for M2 and M3. The following Table VI shows results for water absorption of M2 and M3 mix ratios and comparison is shown in Fig. 2.

*G. Melting Point:*

As plastic can melt for heat, so melting point test is conducted to the plastic bricks to check at what temperature the brick will melt. According to IS: 5762-1970, the brick should be placed on the heater.When the time increases the temperature also increases. After few min the brick gets heated and it gets start melting. By keeping the thermometer near the melting place, the temperature is found. The temperature will be increasing from one point to another. The starting point is noted as well as the ending one. In the same way, the other bricks are also experimented and melting point is found. The importance of this finding melting point is to check whether the brick can resist the high temperature when it is in use. So, that it may not affect any structure or life when fire accidents occur.

The melting point for the plastic brick in M3 ratios is 160 ºC to 200 ºC and in M2 brick is 147$^{o}$C to 200$^{o}$C. This happens because the impurities or the solvents in the brick under goes depression in which the impurity disturbs the crystal lattice energy and there will be reduction in size of the solvents. This leads to melting of the brick when the heat reaches to saturated state.

*H. Environmental Factors*

As we know the main theme of this paper is to reduce the environmental pollution producing by the plastic waste. Environmental factors depend upon how the bricks are used. The following are the factors which effect environment from manufacturing of plastic brick to utilization of plastic bricks in light weight loading areas.

The plastic has to be heated in this manufacturing process. Heating of plastic is a different matter where harmful gases will raise while heating plastic. Slightly toxic gases are emitted which are harmful to the human life. So, the process of heating should be taken very far away from the city, where no life is present. When the plastic is heated, the week bonds between the polymer chains will be melted first and when the temperature exceeds the melting point, the organized bonds starts melting. Apart from that acetone is the chemical which will helps to melt the plastic which not harm environment. Acetone is a organic compound and a small ketone with the formula $(CH_3)_2O$. Acetone doesn't affect the environment because it is naturally the environment plants, trees, volcanic gases and as a product of break down body fat [17].When the plastic brick is in use, some important factors have to be considered in which heat resistance of the brick is major one. As we know plastic is a bad conductor of heat so some heat resistance paints have to be used. For that the plastic bricks are covered with combination of aluminium and fire resistant epoxy coat. For example Fire Resistant Epoxy Resin SR 124/SD 893 x products can be used for coating. These epoxy adhesives can withstand up to 350$^{o}$C [18].

Plastic contains some chemicals which present after melting and added to any material. So, when plastic bricks

are laid at footpaths, walk way in gardens, parapet wall, there is a chance of some chemicals leak into soil which pollutes the soil and sometimes ground water. Nano coating is best choice for brick which controls the brick from water ingress, salt ingress which disintegrate the brick slowly, cracks in the brick, edges flaking away [19]. Actual life span of plastic brick is 60 plus years. If we want to recycle the plastic bricks, the plastic bricks can be converted into fuel. This also reduces the extraction of fossil fuels from the earth. By this there will be no chance of throwing the waste plastic bricks and pollute the environment. As we are producing the fuel from the recycled plastic, the fuel price gets low [20].When plastic is heated the smell also changes. When the plastic ratio and the fine aggregate ratio are increasing, the aesthetic sense of the brick smells like fired one. But when the plastic ratio and fine aggregate ratio value is nearby, the brick smells normal. This is found by placing the bricks in water and sunny places for one month. When the plastic bricks are laid at any garden areas, the aesthetic sense of the brick may disturb the peacefulness of the person and odd atmosphere may be raised. When we use some coatings for brick regarding fire resistance and weathering, the odor of the paint may bring the aesthetic sense of the brick to normal state.

## VI. RESULTS AND DISCUSSION

The manufacturing of paver bricks by using only waste poly bags and fine aggregate is a innovative attempt to reduce the pollution occurred by plastic bags. Here the plastic paver brick is having high strength compared to clay brick and low when compared to concrete paver block. So, it can be used at externals walls as a brick and can be used at car parking areas, path ways in gardens where low traffic is present. Regarding heat resistance, the brick should have fire resistance coating as a mandatory thing. As it is bad conductor of heat, a suggestion is given to use at exterior places at homes. When it comes to cost, plastic paver brick is low compared to paver brick, but it may be high at coatings. But this may reduce some pollution which is occurred by plastic bags and results in good health and wealth.

Plastic paver bricks don't take more time for curing but care and proper handling should be taken while pouring into mould, because very soon it gets hard. As we know plastic is bad conductor of heat, so these bricks cant used where heat is more. While heating plastic, toxic gases will be released, so a proper machine or equipment should be used which controls gases.

## VII. CONCLUSION

From the above study we can conclude that, the waste LDPE poly bags can be recycled and used to prepare plastic paver bricks. These bricks are made up of waste LDPE poly bags and fine aggregate as total replacement of cement in designed ratios. By observing the results we can conclude that

1. The compressive strength of the plastic paver brick is high than the conventional brick.
2. By using this plastic paver brick there are many advantages where the cost of brick low than the conventional brick which is economical.
3. As this cannot compete with concrete paver block, but it can be used in the places where low loads are applied like walk ways in gardens, car parking areas and in low traffic places.

## ACKNOWLEDGMENT

The authors wish to gratefully acknowledge the support of Head of the Department and Construction Technology Management Research Group members of KoneruLakshmaiah Education Foundation, Vaddeswaram, Guntur, A.P., India, is gratefully acknowledged.

## REFERENCES

1. Plastic pollution (2019, January, 2) Available: https://en.wikipedia.org/wiki/Plastic pollution.
2. Mohan Das D.M.S, Vignesh.J, Iyyapan.P, P. Suresh, "Utilization of Plastic Bags in Pavement Blocks," *International Journal of Pure and Applied Mathematics*, Volume 119, 2018, pp. 1407-1415.
3. B. Shanmugavalli, "Reuse of Plastic Waste in Paver Blocks," *International Journal of Engineering Research and Technology*, Volume 6, 2017, pp. 313-315.
4. R. Jayashankar, "Effective Use of waste plastic as Manufacturing of Paver Block*," International Journal of Advanced Research in Basic Engineering and Technology*, Volume 45, 2018, pp. 231-235.
5. Kewal, Sanjay Sharma, Hima Gupta, "Development of Paver Block By Using Foundry Sand Based Geo Polymer Concrete," *Journal of Today's Ideas Tomorrows Technologies*, Volume 3, 2015, pp. 129-144.
6. P N Mazenan, F S Khalid, N B Azmi, S SAyop, A H Abdul Ghani, J M Irwan, "Review of Recycles Concrete Aggregate and Polyethylene Terephthalate in the Manufacturing of Brick," *International Conference on Architecture and Civil Engineering*, 2018, pp. 1-7.
7. Shankar SesikanthPawar, ShubhankarAnantBujone, "Use of Fly Ash and Plastic in Paver Block," *International Research Journal of Engineering and Technology*, Volume 4, 2017,pp. 1542-1546.
8. M.Achitra, R. AmbikaRajasree, R. VijayalakshmiPandit, V. Saranya, "Recycled Plastic and Coconut Fibre Used in Concrete Paver Block," *International Journal of Engineering Science and Computing*, Volume 8, 2018, pp. 16827-16830.
9. Ahmad K. Jassim, "Recycling of Polyethylene Waste to Produce Plastic Cement, Science Direct," *ELSVIER*, Volume 8, 2017, pp. 635-642.
10. Semiha, "Evaluation of Plastic Waste Plastics as Recycled Plastic Composite Material," *Edorium Journals*, Volume 1, 2015, pp. 16-19.
11. Nabila.I.Khan, S.D Agarwal, D.Y. Kshirsagar, "Study of Concrete by Using Waste Plastic Bottle Caps as Partial Replacement of Coarse Aggregate," *International Research Journal of Engineering and Technologies*, Volume 4, 2015, pp. 1699-1704.
12. Nivetha C, Rubiya M, Shobana S, Vaijayanthi R, G. Vishwanath M.E, R. Vasanthi, "Production of Plastic Paver Block From The Solid Waste (Quarry Dust, Fly Ash and PET)," *Journal of Engineering and Applied Science*, Volume 11, 2016,pp. 1078-1079.

13. M.Prakash, Dr.B.Hemalatha, "Replacement of Waste Material in Concrete Using Recycled Plastic," *International Journal of Mechanical Engineering*, 2014, pp. 9-14.
14. Ganesh Tapkire, SatishParihar, PramodPatil, HemarajR.Kumavat, "Recycled Plastic Used In Plastic Paver Block", *International Journal of Research in Engineering and Technology*, Volume 3, 2014, pp. 33-35.
15. Anzar Hamid Mir, "Use of Plastic Waste in Pavement Construction: An Example of Creative Waste Management," *IOSR Journal of Engineering*, Volume 5, 2015, pp. 57-67.
16. YoucefGhernouti, Bahia Rabehi, Brahim Safi, RabahChaid, "Use of Recycled Plastic Bags Waste in the Concrete," *Journal of International Scientific Publications: Materials, Methods and Technologies*, Volume 8, pp. 480-487.
17. Plastic properties (2019, January, 2) Available: https://en.wikipedia.org/Low-density polyethylene.
18. Quora (2019, January, 2) Available: https://www.quora.com/what happens when a plastic material is heated.
19. Acetone (2019, January, 2) Available: https;//en.wikipedia.org/wiki/Acetone.
20. Fire resistance (2019, January, 2) Available: https://www.quora.com/what is the advantages of plastic brick.
21. Nano fire resistance (2019, January, 9) Available: www.nanomagic.ie/nano protection service/brick wall water proofing.
22. JhonsonKwabenaAppaih, Victor Nana Berko-Boateng, Trinity, AmaTagbor, "Use of Waste Plastic Material for Road Construction in Ghana," *ELSEVIER*, Volume 6, 2017, pp. 1-7.
23. P Pavani, T Rajarajeshwari, "Impact of Plastic on Environmental Pollution," *Journal of Chemical and Pharmaceuticals*, 2017, pp. 87-93.

## AUTHORS PROFILE

**Ch. Sravan Kumar Reddy** Received the B. Tech Degree in Civil Engineering from Kallam Harnadhareddy Institute of Technology, Chowdavaram, and AndhraPradesh, India in 2017. He is Pursuing M. Tech degree in Construction Technology Management from Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur, AndhraPradesh, India. He actively participates in workshops and seminars in andaround the university.

**Dr. B. Sarath Chandra Kumar**,working as an Associate Professor in Department of Civil Engineering at K L University since November 2012. In February 2017, He moved to Eritrea Institute of Technology, Eritrea and worked as a Lecturer. He completed his B. Tech in Civil Engineering from G. M. R. Institute of Technology, Rajam, Andhra Pradesh, M. Tech in Structural Engineering from Koneru Lakshmaiah Education Foundation (Deemed to be University), Guntur, Andhra Pradesh and Ph.D in Civil Engineering from Koneru Lakshmaiah Education Foundation (Deemed to be University), Vaddeswaram, Guntur, Andhra Pradesh. He published 25 (Twenty Five) research articles in international and National referred Journals and 5 (Five) articles in the Conferences. He actively organized conferences, workshops and Guest Lectures in the Department of Civil Engineering, K L University.

**Dr.SS.Asadi,** Department of Civil Engineering, Vignan's Foundation for Science, Technology and Research, Deemed to be University, A.P, India. He received his Ph.D in Environmental Technology and M.Tech in Remote sensing & GIS from Jawaharlal Nehru Technological University (JNTU) Hyderabad. He has more than 22 years of teaching and Research experience in Remote sensing & GIS and Environmental Technology. He has published more than 220 Research Papers in many International and National journals besides undertaking various National projects sponsored by different Government departments and organizations. He received 3 National Awards. Visited number of countries around theworld and presented Research work in **USA, Sweden and Japan**. Presented and participated more than 100 International and national conferences, seminars, workshops. He guided research work of 3 students leading toaward of Ph.D. Authored 4 books. He is the life member of various International & National professional bodies.