Construction of E3 Shelter by Civil Waste Material
Prof. Zen P. Raut¹, Monika Nimje², Babypooja Tembhurne³, Manish Lalwani⁴, Pallavi Kaware⁵, Shubham Somkuwar⁶.

¹Assistant professor, Dept. of Civil Engineering, GNIT, Nagpur
², ³, ⁴, ⁵, ⁶ B.E. Scholar, Dept. of Civil Engineering, GNIT, Nagpur

ABSTRACT

Shelters are the basic needs of all human beings. Waste materials are used for to design the shelter. Locally available eco-friendly materials are used in shelter. The waste material like broken pieces of granite, bricks, tiles are used it gives the enough strength to the shelter due to use of waste material it reduced the cost of structure and waste material are easily available in reasonable rates the structure are eco-friendly and economic. Waste material are reused therefore the shelter is eco-friendly. The primary objective of the project is to plan designed E-3 shelter (ECONOMIC ENERGY EFFICIENT, ECO-FRIENDLY).

Key words: - ECONOMIC ENERGY, EFFICIENT, ECO-FRIENDLY.

1. INTRODUCTION

The process of development also leads to the generation of waste material along with it. Right from the early stage of construction, waste material is been produced out of it. Constantly increase in waste material from the construction industries leads to the major problems of disposal operation. The waste generated from construction work is huge in quantity and occupies large space. In India, of the total waste generated, 25% is from construction material. Few of the construction waste material are been listed below.

- Broken bricks
- Scrap metal
- Wood
- Broken pieces of granite
- Broken pieces of tiles
- Electrical wiring
- Nails
- Insulation
- Rebar
- Plaster etc.

The necessity has been arising to manage the construction waste for sustainable development. Various measures are been taken to reuse the construction waste material in suitable way as per the demand of project. Many companies in recent times are striving hard to reuse the construction waste in many ways. The project undertakes the creation of shelter using the waste material from the construction site, enabling the reduction in cost of construction material, thus making it economical and sustainable in use, also proving it to be eco-friendly and efficient. In future time the project aims in economical and speedy shelter construction from construction waste material. The type of construction can be used in various bus stops construction also in traffic posts, toll tax counter, small stationary shops, shelter for monuments, public toilets. Also, in disaster affected areas where the waste is generated in huge quantity and shelter becomes one of the important needs for the homeless people, E3 shelter project find its way in helping people, government, and the environment for construction of shelter in economic and efficient way.

1.2. OBJECTIVE

- Construction of temporary shelter using waste material
- Reducing amount of waste material from environment.
- Construction of sustainable structure using waste material and protecting environment.
- Cost effective construction of shelter.

Millions of tons of waste is produced in the world each year and most of it is not recyclable. Furthermore, recycling waste consumes energy and produces pollution. The largest and
most important industries and at the same time one of the largest polluters cannot wait until the goals of sustainable development have been identified and tool to achieve them have proved practical.

Construction of structure will be much more economic as waste materials are used.

II. LITERATURE REVIEW

Arpad Horvath et.al (1999) He quoted that construction must pay heed to the widespread social interest in

Bo Xia et.al (2014) has cited that the construction industry has a responsibility to ensure the sustainability of both its products and processes. Sustainability assessment is procedure used to ascertain whether environmental and social changes arising from human act resources are environment. Using waste material in concrete production is an appropriate method for achieving two goals: eliminating waste and adding positive properties in concrete. Since the green concrete industry is expanding, it is necessary to Katherine S. Dewlaney et.al (2012) revealed that though the rapid growth in LEED is exciting, it is essential for designers and constructors to identify, analyze, manage, and respond to the increased safety risks associated with sustainable design and construction.

Katherine S. Dewlaney et.al (2012) revealed that though the rapid growth in LEED is exciting, it is essential for designers and constructors to identify, analyze, manage, and respond to the increased safety risks associated with sustainable design and construction. The influences of sustainable design and construction methods were qualified as direct multipliers (positive or negative) against base-level conditions. This increase in risk knowledge is essential for identifying the highest risk design elements and construction activities and for prioritizing safety resources that must ultimately be allocated to respond to these risk. In addition, accumulation of waste in the suburbs and the disposal of waste are very dangerous for the

Tawakoni et.al (2012) Concrete, one of the most important construction materials in the construction of infrastructure and development facilities, has the potential for significant and positive environmental participation. Waste material in concrete can be used as cement or aggregate replacement, fillers or fibres. As cement is a dangerous pollutant of the environment, waste material can be used as a substitute for cement as well as for aggregates.

The environmental advantages of using waste material as a replacement for cement can be investigated in two ways. One is the removal of a part of the cement from concrete and the other is the use of waste material that is useless in concrete. Due to the volume of cement consumption around the world, a lot of waste can be used as a replacement for concrete. From the standpoint of reducing cement, there are many benefits attached to the use of pozzolans, including the reduction of greenhouse gasses, the most hazardous of which are carbon dioxide.

III. METHODOLOGY

In order to achieve this objective, the layout, plan, design, and 3D modelling estimation and construction of 1.2mX0.6mX2.6m Shelter using civil waste material have been made. The waste material is being used along with fresh material are such as broken pieces of granite and sandstone, plaster waste material, crushed aggregate, broken concrete cubes, etc.
3.1. SELECTION OF SITE:

The site which we have selected for our temporary bus stop shelter is panchgao, Umred road, Nagpur. There is no proper maintenance of bus stop shelter. The road is of 1 lane. And people there, faces sewer problems without proper bus stop shelter. So, this place is identified for the construction of E3 shelter using civil waste material.

3.2. CONSTRUCTION OF STRUCTURE:

Materials involved in mix-

M20 grade of concrete i.e. 1 part of cement, 1.5 part of sand and 3 parts of aggregates (1:1.5:3) is being used

- Cement= 1 bag of cement of PPC fly ash based cement is used.
- Sand= Zone-II grade of sand with 4 ghamela + 2 ghamela waste material (plaster waste + sand waste) is
- Aggregate= (10mm) ghamela + 5 ghamela waste material (broken pieces of granite and tiles)
- Casting of cubes to check the compressive strength of concrete:

As per IS 516 (1959), following is the procedure by which cubes are casted.

- Take random samples from the mix while concreting.
- Pour concrete in the cubes in 3 layers.
- Compact each layer with 35 Nos. of strokes with the tamping rod.
- Finish the top surface by trowel after compaction of the last layer.
- Each specimen should be taken from different locations of the proposed concreting.
- After 24 hours, remove the specimen from the mould.
- While removing, take care to avoid breaking of the edges.

Code the cube with paint or marker. Coding should be self-explanatory, building no. and the date of casting. Submerge the specimen in clean, fresh water until the time of testing. Test 6 specimens for each of the 7 days, 21 days & 28 days curing

IV. RESULT AND ANALYSIS

The following table should be conducted as follows given below:
Table 1: 7-days compressive strength of concrete

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Weight of Cube in Kg</th>
<th>Load of Cube in N</th>
<th>Compressive Strength in N/mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7.810</td>
<td>207</td>
<td>9.2</td>
</tr>
<tr>
<td>2</td>
<td>8.100</td>
<td>596</td>
<td>8.71</td>
</tr>
<tr>
<td>3</td>
<td>8.500</td>
<td>889</td>
<td>8.4</td>
</tr>
<tr>
<td>4</td>
<td>8.990</td>
<td>220</td>
<td>9.77</td>
</tr>
<tr>
<td>5</td>
<td>0.010</td>
<td>185</td>
<td>8.22</td>
</tr>
<tr>
<td>6</td>
<td>8.150</td>
<td>185</td>
<td>8.22</td>
</tr>
</tbody>
</table>

Table 2: 21-days compressive strength of concrete

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Weight of Cube in Kg</th>
<th>Load of Cube in N</th>
<th>Compressive Strength in N/mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.123</td>
<td>287</td>
<td>12.75</td>
</tr>
<tr>
<td>2</td>
<td>8.138</td>
<td>267</td>
<td>11.86</td>
</tr>
<tr>
<td>3</td>
<td>8.122</td>
<td>299</td>
<td>13.02</td>
</tr>
<tr>
<td>4</td>
<td>8.16</td>
<td>299</td>
<td>13.02</td>
</tr>
<tr>
<td>5</td>
<td>8.11</td>
<td>300</td>
<td>13.33</td>
</tr>
<tr>
<td>6</td>
<td>8.11</td>
<td>281</td>
<td>12.48</td>
</tr>
</tbody>
</table>

4.1. RESULT

The average of 7, 21 and 28 days compressive strength of concrete is 8.77, 10.67 and 12.74 N/mm². The expected result is 65.90 and 99 percentage of strength in 7, 21 and 28 days but there is only 44, 53 and 64 percentage of strength gain in 7, 21 and 28 days. As the project aim is not to gain strength as it is a temporary structure, this much error can be negligible.
V. CONCLUSION

- After studying the reports and various review papers we concluded that the companies are striving hard to get into the process of reusing the waste material generated from the construction site into efficient and economical use of waste material into construction of shelters.
- Also the aim of the project satisfies the needs of peoples in disaster affected area in providing a temporary shelter which acts as the basic need of the time.
- As we are aiming in using waste material, it helps in reducing the pollution which acts as the helping hand in development of sustainable life in future times.
- E3 shelter can be further proposed for large scale sectors and the techniques used can be further used in other sectors.

REFERENCES

3. Masakazu Terai & Koichi Minami—“Research and Development on Bamboo Reinforced Concrete Structure”, SankaidoSyuppan, Japan