# FEASIBILITY STUDY ON UTILIZATION OF CONSTRUCTION AND DEMOLITION WASTE IN ROAD WORK

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***Abstract*— For individuals concerned with sustainable development and environmental protection, the recycling and reuse of waste materials is a subject of enormous international significance. Construction and demolition (C&D) waste, which is dumped in landfills, accounts for the majority of solid waste produced globally. Due to the need to manage CDW, eco-friendly practises that encourage reuse and recycling of this type of trash have emerged. The goal of this review is to determine whether it is technically feasible to use construction waste as a material in the base pavement layers of road surfaces.**

**Keywords— Construction and Demolition Waste, Recycled aggregates, Standard test**

## Introduction

Construction and demolition trash is defined as "waste arising from construction, renovation, explosion activities, surplus and damaged products and material arising in the course of construction work and on-site work." Speaking with experts such as project managers, architects, civil engineers, contractors, government agencies in charge of solid waste management, and city engineers is a key component of the main waste management strategy.

Agriculture is the largest industry in India. The eleventh five-year plan ranks construction as the second-largest industry, behind agriculture. The majority India's skilled/semi-skilled population and a sizable portion of the labour force are dependent on the building industry. Materials play significant role in all kinds of construction projects. Whether a building project is successful or unsuccessful largely depends on the management of the materials. Both of these trends are true in a country like India where development and redevelopment projects have increased significantly while also having adverse environmental effects that are accentuated.

Resource depletion, flood levels brought on by illegal garbage explosion into rivers, and illegal hill slope explosion that is visible in major cities are just a few of the environmental issues we face today. India's infrastructure facilities are expanding as result of the construction, remodelling, and explosion of buildings, bridges, runways, flyovers, roads, factories, industries, hospitals, and other similar formulations. Typically, the waste material is made up of inert, inactive, and non-biodegradable substances like

- Plaster
- Plastics
- Wood
- Cracked tiles
- Recovered objects
- Roadway concrete

In India, numerous metric tonnes of rubbish are produced each year and disposed of in landfills. However, because this waste is not effectively regulated, enormous amounts of undisposed waste may be seen in various regions of the country. So that future generations can be assured of a bright future, good waste management and traditional methods to recycle, reuse, and reduce are now essential. thereby disseminating vital information regarding the environment and our reliance on it for survival.

### 1.1 Black Cotton Soil

They spread throughout states of Maharashtra, Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu, and Uttar Pradesh, spanning an area of around 3,000 square kilometers. These soils are created from basalt or trap, and the mineral montmorillonite, which causes excessive soil swelling and contraction, is present. The volume variations in the soil are what make light-loaded structures most vulnerable to harm. For the foundation of a house or other light construction, under reamed piles are seen to be the most appropriate choice. These

piles are lowered below the moisture content zone where seasonal variations occur.

**Characteristic of Black Cotton Soil**

- Having a particle size of less than 2 microns; and
- Having a significant specific surface area (SSA).
- A significant Cat ion Exchange Capacity.
- High plastic and liquid limits

### 1.2 Stabilization of Soil

In a broad sense, stabilisation includes any techniques used to change a soil's characteristics in order to enhance its engineering performance. Stabilisation is used in a wide range of engineering projects, with road and airport pavement construction seeing the most frequent use. In these projects, the main goals are to increase the strength or stability of the soil and lower construction costs by making the best use of locally accessible resources.

## 2. LITERATURE REVIEW

**Pankaj Rathod and Ashutosh Kumar (2018)** examined numerous studies and pinpointed their deficiencies. They noted the utilisation of coarser particles and the avoidance of finer particles. Additionally, they recommended using fibres to enhance the soil's natural qualities.

**Fayaz Bhat and Dr. Rakesh Gupta (2018)** Summaries of numerous studies on the utilisation of construction and destroyed debris in pavement subgrade were given to Dr. Rakesh Gupta and Fayaz Bhat from SRMEIT, Ambala in 2018. They came to the conclusion that using C&D trash improved sub-grade characteristics and decreased the cost of landfilling. They noticed that although finer aggregates could have been utilised to increase the soil's packing density, coarser aggregates were employed instead.

**Parimal Kumar, Vivek Shukla, and Mallikarjun (2018)** sought to increase the black cotton soil's strength and bearing capability at various water contents. They came to the conclusion that when stabiliser levels increased, the soil's flexibility index declined. The soil carrying capacity increased whereas the MDD and OMC dropped.

### 2.1 OBJECTIVE OF THE WORK

- To classify the soil based on IS classification.
- To determine Index properties of soil.
- To check the use of demolition waste by adding different % of them to Black cotton soil
- To find optimum value of OMC & MDD
- To find optimum value of C by unconfined test
- To find the optimum value of CBR
- To find the best optimum value of demolition and construction waste.

## 3. MATERIALS AND METHODOLOGY

**Black cotton soil: -**B C Soil, also known as Swelling Soil. The Central States and a few locations in south India are home to this type of black soil. This BCS is

really beneficial for producing cotton.

**Fig 3.1: Black Cotton Soil**

**Brick Waste:** The Brick Waste was collected for PB Road Davangere.

**Fig 3.2: Brick Waste**

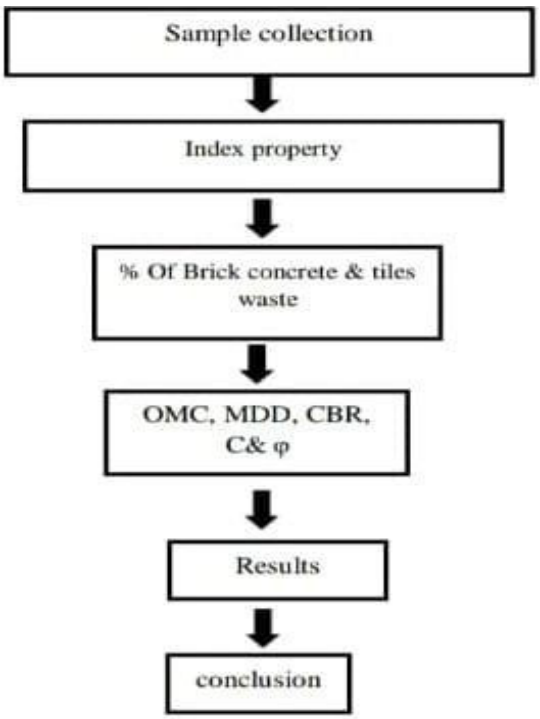
**Tile Waste :** The Tiles Waste was Collected from Police Quarters PB Road Davanagere.

**Fig 3.3: Tile Waste**

**Concrete Waste :** The Waste was Collected from Police Quarters PB Road Davanagere.

**Fig 3.4: Tile Waste**

**METHODOLOGY**




## 4. RESULTS & DISCUSSION

### Sampling of soil:

**Table 4.1: Sampling of Soil**

| Sl no | Soil particulars | Percentage of construction & demolition waste |
|---|---|---|
| **01** | Natural soil | 0% |
| **02** | Soil Sample-1 | Natural soil + 6% C&D waste |
| **03** | Soil Sample-2 | Natural soil + 8% C&D waste |
| **04** | Soil Sample-3 | Natural soil + 10% C&D waste |
| **05** | Soil Smaple-4 | Natural soil + 12% C&D waste |

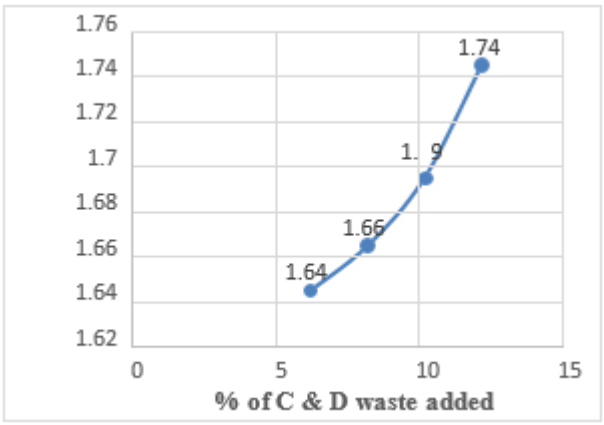
**Natural Soil Test Results:**

**Table 4.2: Sampling of Soil**

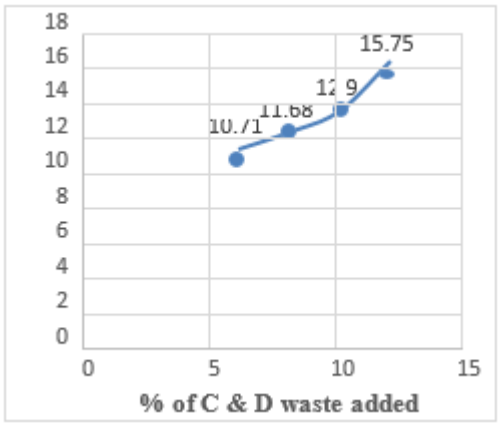
| Sl. No. | Tests | Results |
|---|---|---|
| 1 | Sp. Gravity | 1.62 |
| 2 | Water Content | 22.19 |
| 3 | Soil Type | Clay |
| 4 | SPT | MDD: 1.49 g/cc<br>OMC : 19 % |
| 5 | UCS | 28.16 kg/cm$^2$ |
| 6 | CBR | 3.54% |

**Table: 4.3 Tabulation of Overall MDD Results**

| Soil sample with percentage of C & D Waste | MDD(gm/cc) |
|---|---|
| Natural BC soil | 1.40 |
| Natural BC soil + 6% of of C&D waste | 1.64 |
| Natural BC soil + 8% of C&D waste | 1.66 |
| Natural BC soil + 10% of C&D waste | 1.69 |
| Natural BC soil +12% of of C&D waste | 1.74 |




**Graph 4.1 : Showing Variation of MDD for % of C& D Waste**




**Graph 4.2 : Showing Variation of OMC for % of C& D Waste**

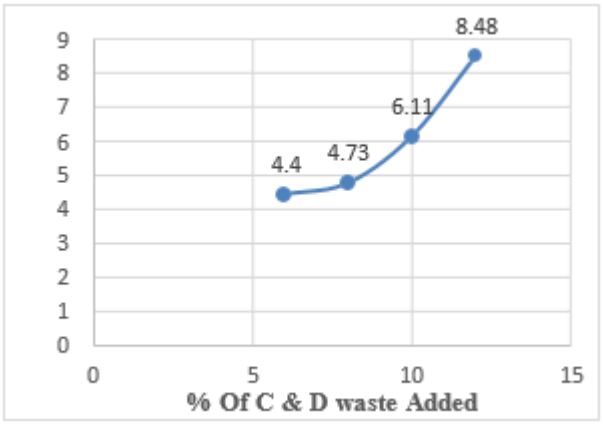
**Fig 4.1: Conducting MDD and OMC Test**

**Table 4.4: Tabulation of Overall OMC Result**

| Soil sample with percentage of C & D Waste | OMC(%) |
|---|---|
| Natural BC soil | 14.68 |
| Natural BC soil + 8% of C&D waste | 10.71 |
| Natural BC soil + 6% of C&D waste | 11.68 |
| Natural BC soil + 10% of C&D waste | 12.90 |
| Natural BC soil + 12% of C&D waste | 10.50 |

**Table 4.5: Tabulation of Overall CBR Results**

| Soil sample with percentage of C & D Waste | CBR (%) |
|---|---|
| Natural BC soil | 3.54 |
| Natural BC soil + 8% of C&D waste | 4.4 |
| Natural BC soil + 6% of C&D waste | 4.73 |
| Natural BC soil + 10% of C&D waste | 6.11 |
| Natural BC soil + 12% of C&D waste | 8.48 |

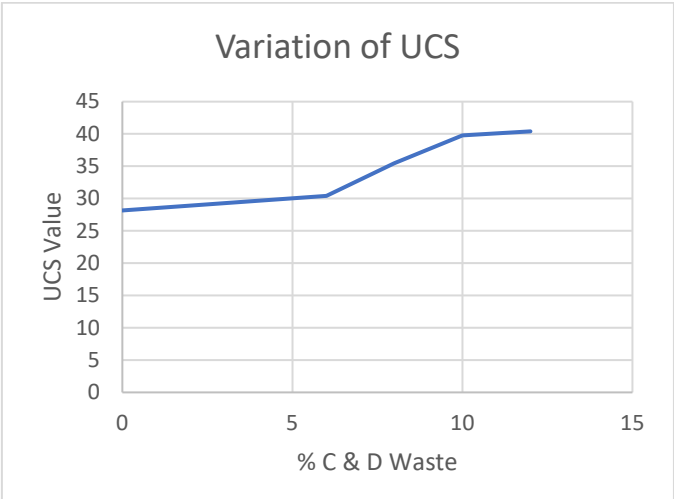



**Graph 4.3: Showing Variation of CBR for % of C& D Waste**

**Fig 4.2 : Conducting CBR Test**

**Table 4.6 :Tabulation of Overall UCS Results**

| Soil sample with percentage of C & D Waste | UCS KN/m$^2$ |
|---|---|
| Natural BC soil | 28.16 |
| Natural BC soil + 8% of C&D waste | 30.40 |
| Natural BC soil + 6% of C&D waste | 35.45 |
| Natural BC soil + 10% of C&D waste | 39.78 |
| Natural BC soil + 12% of C&D waste | 40.40 |




**Graph 4.5: Showing Variation of UCS for % of C& D Waste**

**Fig 4.3: Conducting UCS Test**

## 5. CONCLUSION

- Following the completion of a feasibility study on the use of C & D Waste debris in road building.
- According to the study, using Demolition and Construction debris to build roads offers a number of benefits, including lowering the quantity of garbage that ends up in landfills.
- However, some obstacles that must be overcome, such as ensuring that the waste is correctly processed and sorted and that it satisfies the requirements for quality for road construction.
- The Optimum value is Natural Soil with 12% C & D Waste gave a better Results.
- In general, the feasibility study suggests that using construction and demolition debris in road construction is a promising alternative with potential to offer considerable advantages in terms cost-effectiveness and environmental sustainability.

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