

PROPOSAL FOR UTILISATION OF PLASTIC WASTE IN BUCKINGHAM CANAL RESTORATION WORK

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ABSTRACT

The lesser-known 200-year-old Buckingham Canal in Chennai, which was once used for navigation, is now only a canal that transports sewage water within the city limits, owing to insufficient waste management. Recognizing the canal's importance in the current situation, a government order has been issued for the 'complete' restoration of the Buckingham canal. The PWD and Greater Chennai Corporation would have complete control over channel improvement and solid waste removal. The disposal of solid waste from the canal must be taken seriously. An urban space project has been launched to promote non-motorized transportation in the city. The project proposal includes a walkway and cycle track along the Buckingham Canal. The project would span 2.2 kilometers, from Madhya Kailash Junction to the Tidel Park signal. The goal of this project is to find an eco-friendly solution for the disposal of solid waste generated by the canal cleaning process by utilizing plastic waste in the form of recycled plastic tiles, fencing pickets, and bricks along this stretch for the cycle track and walkway. In this project, an outline for walkway and cycle track is suggested along with the calculation of quantities of recycled materials required for the construction.

Keywords: Buckingham canal, solid waste, recycled plastic tile, recycled plastic fencing pickets, recycled plastic bricks.

I. INTRODUCTION

Disposal of solid wastes is a hurtful and extensive problem in both urban and rural areas in many developed and developing countries. Municipal solid waste management solutions must be economically justifiable, technically achievable, socially, legally suitable and environmentally friendly. Solid waste management issue is the major challenge faced by world today. Municipal solid waste in landfills have become a great nuisance significantly affecting the health, hygiene, sanitation, and aesthetics of surrounding area. The solid waste collected from the Buckingham canal during the cleaning process will have a big question to be answered 'where and how to dispose it?'. If it is possible to utilize the solid waste as a useful construction material this question can be answered now, and it can be an answer for future solid waste disposal problems too. The various methods available to make the beneficial use of solid waste to help people generating wastes to identify beneficial uses for those wastes rather than sending them to a landfill is one of the best options to effectively approach this world-wide problem. In this project a proposal is made for the utilization of the plastic waste collected from the canal to be utilized in the form of recycled plastic tile, recycled plastic fencing materials and recycled plastic bricks for a selected 2.2 km straight stretch from Madhya Kailash Junction to Tidel Park signal.

II. METHODOLOGY

The civic body intends to develop the urban space on the Canal's eastern bank. The project would cover a 2.2-kilometer stretch. A cycle track and a walkway will be built on the eastern bank of the Buckingham Canal. The 2.2-kilometer stretch will connect the MRTS stations of Kasturba Nagar, Taramani, and Tiruvanmiyur. A rough estimate of Rs 20 crore has been prepared, and funds will be approved.

Map of selected stretch



Figure 1 Google map image of the selected location (Madhya kailash junction to tidel park signal)

Paving tiles

According to data gathered from a Delhi-based start-up, Shayna Eco Unified India Pvt. Ltd, which has been using plastic waste to create colorful floor tiles for the past two years. Around 10,000 paver tiles and 4,500 square tiles are produced per day. A kg of plastic waste yields 1 sq ft of tiles, which consists of four plastic paver tiles. “All our tiles are anti-static, antimicrobial, and antibacterial with a heating capacity of up to 140 degrees Celsius and can be cooled down to -25 degrees Celsius,” says Paras Saluja, founder of Shayna Eco Unified India Pvt. Ltd. Currently, tiles with load-bearing capacities of 20 tons and 40 tons are manufactured. Paras claims that their plastic tiles will last at least 50 years.

Plastic fencing

Based on the information gathered, it was discovered that 100% recycled plastic wood fencing material can be manufactured with minimal effort. A UK-based company called "KEDEL'S LIMITED" is successfully using recycled plastic materials to manufacture outdoor furniture and other construction materials. According to the company, the cost of timber is significantly higher than the cost of plastic fences. The graph shows that the initial cost of recycled plastic is slightly higher than that of timber, but as time passes, maintenance is required for timber, whereas plastic fences do not require maintenance for more than 25 years.

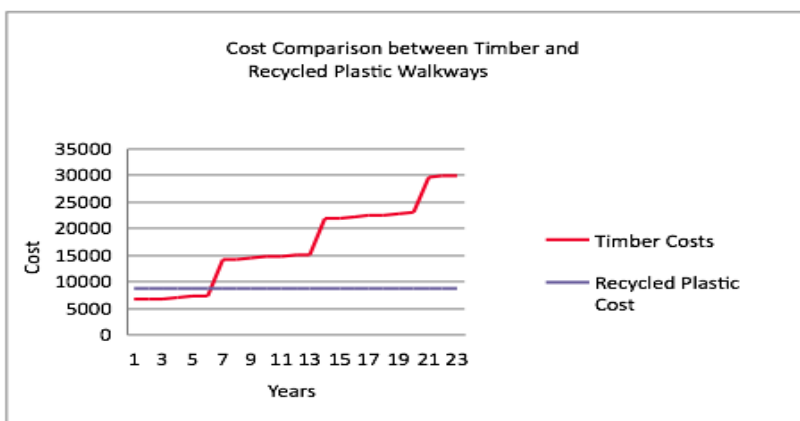


Figure 2. Cost compression graph for recycled plastic and timber for fencing

Plastic brick

Rhino Machines is a project consulting firm that offers Rhino bricks, which are made from foundry dust and waste plastic. They claim that Rhino bricks are 2.5 times stronger and 25% lighter than clay bricks. They are also reasonably priced at Rs 10 per piece, making them cost-effective. They also claim that no water is used in the manufacturing of these bricks. Furthermore, more water is saved during the construction process because the walls built with these bricks do not need to be cured with water. Foundry dust (composed of silica, clay, and carbon) is a significant waste for the foundry industry; it is also difficult to dispose of because the particles are extremely light and can remain suspended in the air, causing pollution.

III. CALCULATIONS OF QUANTITIES

By considering the above information's available the number of tiles, number of posts, pickets, length of top and bottom rail for plastic fencing and number of bricks required for the proposed cycle track and walkway is calculated.

Calculation of plastic tile required

Road length	=2200m	=23680.6sq ft
Road width for walkway	= 1.8m	=19.375sqft
Road width for cycle track	= 3m	=32.29sq ft
Total width:		
(walkway & cycle track)	=4.8m	=51.668sqft
Tile (4 tile)	=1 sq ft	=1kg plastic

Area :

$$(23680.6 * 51.668) = 1223529.2408 \text{sq ft} \sim 1223530 \text{sqft}$$

No: of tile = 4894120 tiles

Calculations of material requirement for fencing

From IS 3386-1979 published by Indian standard institution "SPECIFICATION OF WOOD FENCE POSTE" the height, width and thickness of the fence post is selected from table 5.1. Since visibility of the canal must not be blocked hence the height of the fence must be less than 2.5m (8.2 foot). Considering that TYPE 2 is selected from the table. In type two length is restricted between 1.5-2.5m and width and thickness of fence post is provided as bellow 10cm and 2-5cm respectively.

Number of posts:

Length of track	=2.2km= 2200m
Distance between each poste	= 6feet= 1.83m
No of poste	= (2200/1.83)
	=1202.18~ 1202 no's

One additional post must be added as the starting post, so 1203 posts for a total length of 2.2 kms

Number of pickets:

spacing between pickets	= 5 inches=0.127m
No of pickets	= 17322.83~ 17323 no's

Top and bottom rail length

Length of top rail	=2200m
Length of bottom rail	=2200m
Width of one poste	=10 cm=0.1m
No of poste	= 1203
Total length required	=(2200+2200) -(0.1*1203)
	=4279.7m

Adding 0.2 m to exclude first and last post

$$4279.7 + 0.4 = 4280.1 \text{m}$$

Calculations of material requirement for plastic bricks

Bricks are used to differentiate the pedestrian zone and cycle track. Vegetation and street light is provided in the zone. Two line of brick throughout the length is provided.

Length of path = 2200 m
Length of brick = 190cm=0.19m
No of bricks required = $(2200/0.19)$
= 11578.94*2
= 23157.88~23158

Adding bricks

(at the starting and end) = $(1/0.19) = 5.26*2 = 10.52$

Total number

(bricks required) = $23158+10.52 = 23168.52 \sim 23169$

(As per the information available from "RHINO BRICKS", the cost per brick is 10 Rs).

Total Cost of bricks = $23169 * 10 = 231690$ Rs

IV. CONCLUSION

The primary goal of reducing the amount of plastic waste in landfills can be accomplished by incorporating it into various construction materials. Recycled plastic can be used to make materials such as plastic tiles, plastic fences, plastic bricks, and other outdoor furniture components. The plastic brick, which is stronger, has a greater capacity for water absorption, is lighter, and has other advantages over traditional bricks. Plastic fences require no maintenance, are less expensive, and last longer than wood and metal fences. The plastic tile, which can withstand more weight and has a longer lifespan than traditional tiles. The study not only sheds light on the use of recycled plastic waste in construction, but it also advocates for less use of natural resources in construction. The project benefits from less use of natural resources, such as water and other raw materials, as well as cost savings. Municipal Solid Waste (MSW) can be used as a low-cost and widely available raw material in construction materials. In order to do so, waste must be treated to a consistency that allows it to be used as a construction material. In order to do so, waste must be treated to a consistency that allows it to be used as a construction material. If we can find alternative solutions for land filling sites in Chennai, we will have solved the problem and opened the door to future developments.

V. REFERENCES

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