Construction of Retaining Wall Using Scrap Tyres

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Abstract - Abstract- The exploration examined the viability of using used tyres as earth underpinning for pitch form to reclaim old tyres and produce affordable, environmentally responsible pitch repairs. This paper describes a study on determining the tensile strength of used tyres in absence a test standard that's now egregious. The design and perpetration of the proposed scrap tyre-corroborated earth system, as well as the choice of a suitable attachment to link the tires in a field trial. Unwanted scrap tyres are produced in enormous amounts each time, posing significant environmental pitfalls each over the globe. The present recycling procedures for scrap tyres only allow for the operation of a fairly small chance of used tyres. The increase in scrap tyres and the recycling rate for used tyres are inharmonious. It's now a significant issue problem in numerous countries. The product of large portions of scrap tyres and their accumulation poses a clear threat to the ecosystem. Tire trash, whether in the shape of a tyre or as tyre waste, is a feather light substance that might be employed. Chancing styles to reclaim or exercise worn tyres has come necessary Because of this problem. The price of making tyres is far lower than the cost of disposing of them. At the end of their useful life on bus, Waste tyres are still reliable and Strong. They're extensively available in sizeable quantities and regarded as disposal issues. The use of left over tyres to construct graveness retaining walls illustrated. In Brazil, natural pitches have stabilized using this technology. It making use of the Universal Testing Machine to test the tensile strength of discarded tyres. The tensile test was performed on scrap tyre samples in the popular sizes R14 and R15 A polypropylene rope with a 12 mm periphery is to be used to join the tyres. Whole Tyres must be connected after creating a face using polypropylene rope, backfilled with soil. These tyre matts were piled on top of one another to produce a corroborated earth- suchlike structure. They showed that used tyres could fluently support a 30 KN tensile cargo. A polypropylene rope with a periphery of 12 mm could offer the joint with the necessary matching strength. For repairing pitches up to 5 measures, scrap tyre- corroborated earth systems with whole tyres tied in polypropylene rope and piled on top of one another and backfilled with cohesive tropical residual soil fill performed remarkably well.

Keyword - ***SCRAP TYRES, POLYPROPYLENE ROPE, RETAINING WALL, STABILITY OF SLOPES, REDUCTION OF SOIL EROSION, COST EFFECTIVE STRUCTURE, EFFECTIVENESS***

Introduction - Every year, a massive amount of unwanted waste tyres are produced, posing serious environmental risks all over the world. The current methods for recycling scrap tyres may only use a very small portion of the unwanted tyres. The rise of garbage tyres and the recycling rate for used tyres are incompatible. In many nations, this has grown to be a significant issue.

In order to create a material with special qualities like extremely high tensile strength, flexibility, and high frictional resistance, rubber or polymer materials are forcefully reinforced with synthetic fibers and high-strength steel. Even after it has reached the end of its typical lifespan as an automobile wheel component, its mechanical properties are still usable. In regions where slope failures (landslides) are frequent and waste tyres are plentiful, using used tyres as reinforcement, especially for slope repairs, would be extremely helpful. It's important to have a solid understanding of the tyre's physical, mechanical and durability properties before using discarded tyres as reinforcement. Additionally, it appears that there is no testing standard or guideline that is appropriate for measuring the tensile strength of used tyres for such a purpose. Scrap tyres are occasionally utilized as face components of retaining walls in nations like India, although not often as the full system.

The most widely used passenger car tyres, R14 and R15, were the subject of an experimental investigation into their physical and mechanical strength properties. This paper also discusses the design of an attachment that would connect the tyres so they would function as a single unit in a reinforced earth application. The proposed scrap tire-reinforced earth system's performance in a field trial at a height of five meters, employing in-situ cohesive tropical residual soil as backfill, is also discussed in the study.

Environmental Impacts of Tyre Waste:

Waste tyres are a contemporary danger that the US is facing head-on. Tyres are still disposed of unlawfully despite recycling initiatives and national and state government restrictions. Some users recklessly store them in empty lots or purposefully discard them there. These activities have long-term effects, regardless of the motivation.

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Waste of Natural Resources: Natural resources are a major component of the creation of tyres. 90% of the natural rubber used in many tyres comes from rubber trees (Hevea brasiliensis) that are cultivated in Southeast Asia. These trees mature five to six years after planting. The trees need to be drained every day for the following 20–25 years once they are fully matured. It is also possible to use synthetic rubber in place of this limited resource. But each tyre made of this rubber costs one barrel of oil. Our finite natural resources are depleted with each new tyre produced. If the tyres are recycled as they reach the end of their useful lives, the majority of these resources can be recovered and utilized again. While certain tyres may receive a second chance at a facility that is closing, this is not the case for the majority of tyres. Recycling the waste material into new valuable items is the best use for it. The goal of waste tyre recycling machinery, like the units we manufacture here at Eco Green Equipment, is to remove and separate as much recyclable material from each tyre as possible.

Pollution caused by the dumping of scrap tyres: Tyres don't break down. Tyres can emit chemicals into the air, ground, and water when they accumulate in junkyards or landfills, changing the ecosystem. A used tyre emits methane gas into the atmosphere just by being in the sun. Our carbon footprint grows as a result of this greenhouse gas, which may also contribute to climate change. Toxic black smoke can be released into the air if the tyre catches fire. Many of the chemicals used in making tyres are carried in this smoke. Because of this, water cannot put out a tyre fire. The chemicals are removed from this form of fire when water is splashed on it. Once there, they can contaminate our lakes and ponds by seeping into groundwater reserves. All it takes to destroy helpful soil bacteria is to leave tyres on the ground for a long time. These bacteria create nutrients that are necessary for the nutrition of both plants and animals. Animal and plant species lose their environment and extinction occurs without the bacteria.

Improper disposal of waste tyres can lead to several types of pollution, including:

Air Pollution: When tyres are burned or cremated, harmful chemicals and pollutants like Sulphur dioxide, nitrogen oxides, and particulate matter are released into the atmosphere. These contaminants can have detrimental health impacts on both people and animals, such as cancer, heart disease, and respiratory issues.

Water pollution: When used tyres are disposed of in landfills, hazardous chemicals and other pollutants may leak into the groundwater and soil, contaminating neighboring rivers, lakes, and seas. Because of this, aquatic life may be harmed, and drinking the water becomes dangerous.

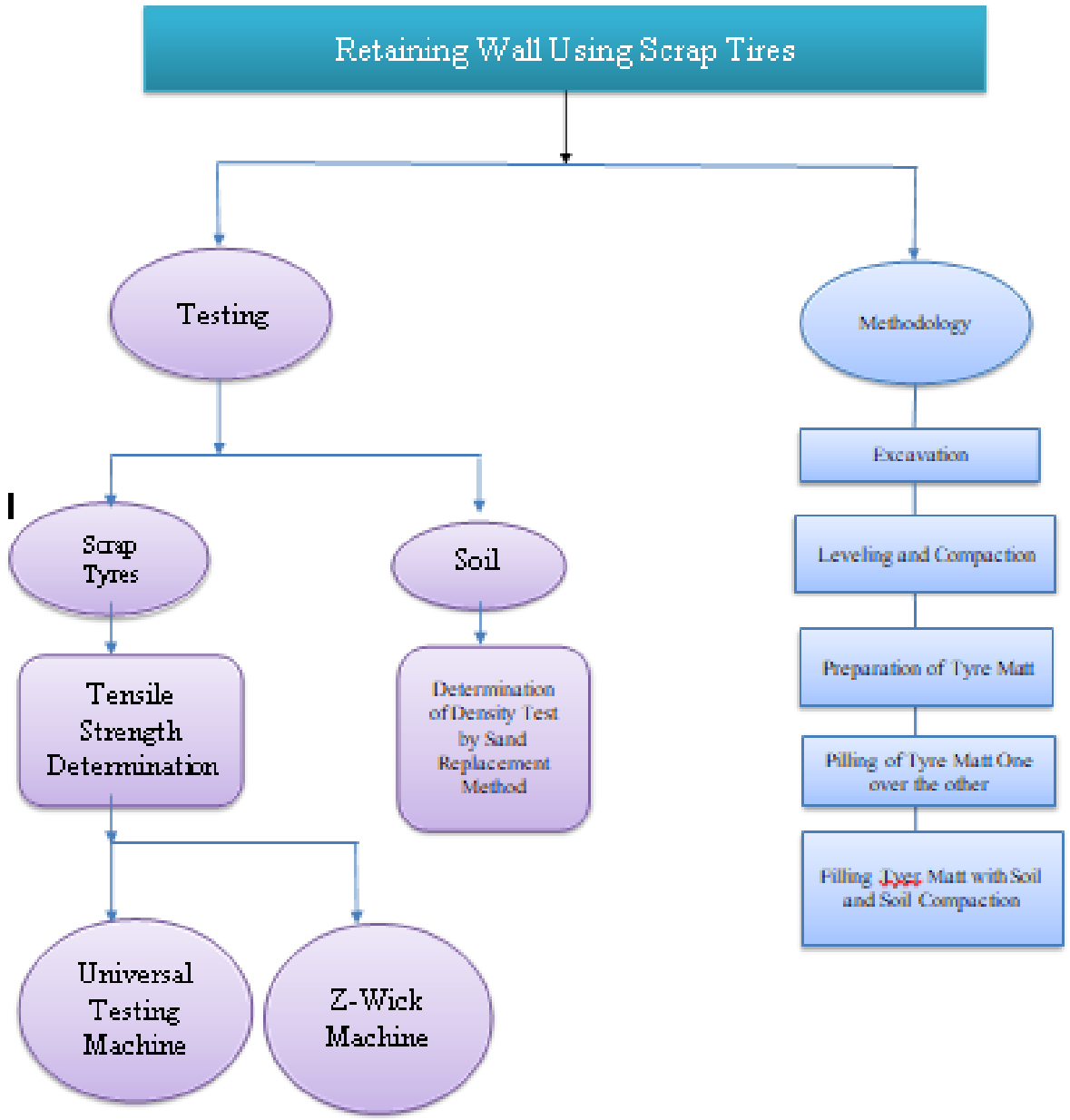
Soil Pollution: Tyre pollution: While decomposing, tyres can take hundreds of years, and during that time, they can release toxic chemicals into the soil, rendering it unusable for farming or other purposes.

Visual pollution: Waste tyres dumped in the environment can become a nuisance that is dangerous and ugly, generating blight and lowering the standard of living for locals.

Need of the study -

1. Retaining wall construction to be as inexpensive as possible.
2. To minimize the environmental pollution caused by the disposal of scrap tyres.
3. In order to consider soil tyre wall as a potential replacement for construction of retaining wall.
4. To use scrap tyres in construction instead of discarding them.

RESEARCH METHODOLOGY –



To evaluate the performance of the suggested scrap tyre-reinforced earth system, a full-scale field test was conducted. The trial site was a previously failed slope & as for the construction process Whole Tyres are tied together with Polypropylene rope to make a matt configuration and backfilled with soil. Also these Tyre Matts are filled and compacted with soil taken from the Backfill. These Tyre Matts are stacked in successive layers maintaining a slope of 45 Degree with the horizontal ground surface so the resulting structure could function as Reinforced Earth. This Scrap Tyre Retaining Wall function on the basis of Gravity Retaining Wall i.e. retains the failed soil slope through its Self-weight.

The Backfill is compacted with smooth wheel roller compactor. Each Layer is to be compacted to a thickness of about 200mm.

Field density test using Sand Replacement method on compacted fill. Vegetation should be planted on Tire Matts to give special appearance. It only requires few unskilled workers and some workings days to complete the structure.

Literature survey –

PAPER NO. 1: Application of Scrap tyres as Earth Reinforcement for the repair of Tropical leftover soil slope. Mr. Bujang B.K. Huat Conclusion: The experiment perspective is effective because It deals with natural and financial issues.

PAPER NO. 2: Tyre Waste Retaining Wall. Mr. Pravin Mahadolkar

Conclusion: This study demonstrates outstanding slope rehabilitation performance with freshly created gravity structures. These stabilize the unstable soil.

PAPER NO. 3: Retaining Walls built with scrap tyres. Mr. A.S.F. Sayao

Conclusion: The soil-tyre wall construction is more adaptable than traditional concrete or synthetically reinforced walls. We can be seeing the lateral movement was reasonably regulated

PAPER NO. 4: Tyre Retaining Wall on M62 Concrete. Mr. Donald C. Dalton

Conclusion: On the M62 highway, this recently developed construction method utilizing old tyres was applied effectively. It is low cost, rapid completion made the building extremely attractive.

PAPER NO. 5: Soil Stabilization by using Scrap Tyres. Ms. Dipti V. Zutti

Conclusion: It is discovered that the blend of dune sand and crumb rubber has a higher shear strength than just dune sand.

RESULTS AND DISCUSSION –

Table No. 5.1: - Tensile strength of Scrap Tyres

Sample No.	Tyre Size	Length, MM	Width, MM	Thickness, MM	Max. Strength, KN
1	R14	450	80	05	48.40
2	R15	500	80	07	52.23

Table No.5.2: - Tensile strength of polypropylene Rope.

Sample No.	Dia. of Rope, MM	No. of Wrap	No. of knot	Max. Strength, KN
1	12	1	1	15.0
2	12	1	2	25.0
3	16	2	2	37.0

CONCLUSIONS

The research provides the following findings:

The used tyre still had great tensile strength even though it had reached the end of its useful life as a car tyre. Using only the tyre thread, it delivered tensile strength more than 20 KN with a 99.08% probability. It works well as a building material, especially when included in reinforced earth.

Polypropylene rope proved to be the best attachment method for holding the leftover pieces of used tyres together to form a mat. It had great strength that worked with the old tyre, was adaptable and reasonably priced. Polymer materials are also renowned for not corroding and for being resistant to chemical and biological attack.

The principal advantage of the proposed waste tyre-reinforced soil system would be reduced construction and material costs. Just like used tyres, repurposed materials were used to create backfill soil. In addition, building the system wasn't complicated and didn't require skilled employees and huge machinery.

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