

# A Review on using Crumb Rubber in Construction of Rigid Pavement

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**Abstract** - Crumb rubber concrete has been used to decrease pollution due to its storing in large areas. It can be used as chips, as fine or coarse aggregates or as sand. By using it cracking and widening of concrete can be decreased. Replacing rubber particles with fine aggregates will effect shrinkage of rubber concrete in a positive way. The process of distributing different materials with rubber is quite hard and complicate. This study concludes the effectiveness of concrete by replacing fine and coarse aggregates with rubber particles. Treatment of rubber will be done by water-soaking method instead of dry process. This will lead to a uniform distribution of rubber and will help to decrease entrapped air in mixture to contain higher compressive strength.

**Key Words:** crumb rubber, concrete, water-soaking rubber treatment, compressive strength, etc.

## 1. INTRODUCTION

Consistently, at a normal of around 11,000,000 new vehicles are added to the Indian streets. Likewise, there is an expansion of disposed tires every year which represent a possible danger to the climate. However, the tires are being reused at this point. There is a critical number of tires added to the current tire dumps or landfills. The age of such waste tires is far surpasses than that which are currently being reuse. Squander elastic tires cause genuine climate issues all around the world. Subsequently, this amassed squander material can be utilized for the structural designing development.

These tires are stored in enormous regions and this waste must be utilized for additional alternatives. Elastic is not normally biodegradable and it will stay at its place for quite a long time and still not degrade. Development ventures can utilize a lot of these materials to upgrade the qualities. There for this prompts use morsel elastic from the outside piece of scrap tires is utilized as a fractional substitution for FA in cement, and the solid delivered from this substitution is known as CRC, rubber treated solid, elastic tire solid, versatile solid, elastic cement, rubbercrete etc.

Over the most recent 20 years, a ton of work had been done in different structural designing activities by utilizing these waste materials. A few examinations had been directed to encourage utilizing of this waste material into solid. Rubber concrete is a moderate development material that withstands more weight and effect when contrasted with customary cement. Rubber concrete can be subsequently utilized in structures as a tremor stun wave safeguard,

establishment cushion of the mechanical strength. It was seen that, the rubber has hydrophobic nature and has lower thickness. It improved the compressive, pliable and flexural qualities of rubber treated concrete. It is clear from the work revealed over that various examinations have been attempted on the properties of rubber treated cement; the greater part of the investigations are restricted to a solitary w/c proportion. Further, there are not many tests for the consolidated impact of incorporation of waste elastic tire fibre and silica rage in cement.

The idea that if the issue rises up out of urbanization and the arrangement should oblige it ought to likewise be valued. Accordingly, the point of this study is to present an ecological well-disposed innovation, which will profit the general public and the country.

## 2. LITERATURE REVIEW

**Harshit b. prjapati (2020), "utilization of crumb rubber in rigid pavement"**- The test assessment completed on CRC by substitution of FA/CA or both with rubber at various degrees by volume of concrete. The mould size was 150\*150\*150mm and compression and water absorption test were conducted w/c ratio was 0.40. when portion of crumb rubber was increased by time to time complexity was seen in their mixing pattern. Near about 10% of increase in compression strength and a change in water absorption properties was noticed.

**P. Sarala (2019), "crumb rubber concrete blocks"**- Among the characteristics of concrete compressive strength is most important. Increasing the quantity of crumb in concrete resulted the improvement in compressive strength as well as increased tensile strength. Due to the weakness of concrete in tension, rubber can do a great work to enhance it. Silica fume has been added and these can be used in colder areas. Properties like abrasion resistance and durability has been improved.

**Nandurkar sagar, thorat tejas (2019), "Rigid pavement using crumb rubber and synthetic fibre"**- Water soaking method was selected to treat the rubber and it gave us better results including cost effectiveness and practical procedure, entrapped air was seen decreasing, concrete mix was homogenous comparatively. It plainly featured that aggregate volume should be a base for mix design if done any. It resulted in incorrect mix proportion when rubber is added in terms of aggregates volume. Conclusion about

water cement ratio was between 0.4 to 0.45 and 0.43 was adopted in this study.

**Abhay kumar (2017), "use of crumb rubber as fine aggregate in concrete to increase the strength of concrete block"**- In this study it concluded that the percentage of higher amount of rubber will affect its workability in a negative term. These were just fundamental rules for strength loss of privately delivered concrete compared to 20mpa targeted concrete. Rubbercrete can be a good insulator for heat and noise, so it can be helpful for decreasing the noise pollution. So it tends to be utilized as a protecting material in dividers in private just as buildings and as a noise protector in theatres, film lobbies, and assembly halls and so on.

**Mohammed safan (2017), "Enhanced Properties of Crumb Rubber and Its Application in Rubberized Concrete"** - This study was about testing of hardened and fresh concrete in terms of rubber-sand replacement ratio. Sand was replaced with treated and untreated rubber. Rubber was treated with NAOH solution and it effects it in positive ways. It was seen that compressive strength reduction percentage was reduced. Tensile strength was not decreased due to NAOH treatment. The ideal decrease was recorded at 10% rubber substitution proportion. Concrete slump was slightly reduced because of sand replacement and unit weight was also reduced.

**Iman mohammadi (2014), "In depth assessment of crumb rubber concrete (CRC) prepared by water soaking treatment method for rigid pavements"**- introducing water soaking method for treatment was effective for gaining a homogenous mixture and for the proper distribution. If we direct add the rubber particles into concrete it will result in trapping air bubbles into it. Intense vibration will have applied to this during compaction, then disintegration of mixture will be quite hard. This study told that low w/c ratio was not workable and if we take high w/c ratio then it would be effecting the rodding effects. Strength did not reduced due to using water soaking method and it gave 8% hand 22% higher compressive and flexural strength. A positive effect was seen on fatigue behaviour in concrete.

**Dr. soosan T.G. (2014), "Studies on Scrap Tyre Added Concrete for Rigid Pavements"** -This study was done on M35 mix by adding aggregates made up of crumb rubber at different percentages. Various tests were determined. The investigations show very little increase in slump value with the expansion of rubber particles. It shows us up to 8% of rubber can be added as aggregates so that strength could not be reduced. It can mainly used for rigid pavements. It will be economically helpful and environment friendly.

### 3. OBJECTIVES

- To minimize the negative effects on environment due to increasing amount of waste rubber tyres.
- To achieve a better solution for tire rubber waste management.
- To gain and provide the enough and important knowledge on rubber concrete using in pavements because it requires less strength.
- To Explore the chance of adding reused rubber into the concrete to improve shrinkage properties and resistance to cracking of concrete.
- To overcome the problem of storing waste tyres in environment.
- To produce sustainable concrete by using rubber aggregates.
- To enhance the properties and characteristic of concrete using crumb rubber.

### 4. MATERIALS

**4.1 Cement** – The broadly and most generally utilized cement in all types of construction works is Ordinary Portland Cement (OPC). The OPC 53 Grade cement conforming to IS: 12269-1987 was utilized for all concrete mixes. Whereas the water is included in the Portland cement, chemical reactions happen between the cement and water and thus coming about within the energy release and the cement paste event which is mindful for making hardened substance. This process of response happens between cement and water is named as the hydration process and the help of the energy during this process is named as the heat of hydration. For the research work, the Ordinary Portland Cement of 53-grade use.

**4.2 Coarse aggregates** - coarse aggregates are made up of rock quarried from ground deposits. They are an integral part of many construction applications. Coarse aggregates can retain on IS 20mm sieve. They are used under a slab or pavement. Aggregates contribute 70 to 75% of weight within concrete. It is the prime ingredient within the concrete. When it blended with cement and water it gets to be glued and therefore the entire strong mix is bound during a strong mass which called concrete. Coarse aggregates are larger size filler materials in construction. As the name indicates, they are classified depending on the sizes of aggregate

particles. The surface area of the coarse aggregate is less than fine aggregates. Coarse aggregates are utilized in concrete, railroad track ballast, etc.

**4.3 Fine aggregates-** fine aggregates can retain on 4.75 mm sieve. This is sparkling yellow, greyish, and adjusted. The expense of Construction Sand is nil because of its ordinary accessibility yet its transportation cost is more. Handling of these aggregates is simple by ordinary machines without utilizing and Blast materials or any Crushing machines. These are essential for strength, thermal and elastic properties of concrete. This is liberated from any Organic Materials or any radiation or solid stones. It is used for inlaying, mortar, and solid, street clearing, Plastering, filling under Foundations, fortified prepared blend solid, Building Blocks, and assembling brick work blocks.

**4.4 Water-** water is an essential part of the construction process. 15 to 20% water is added to the mix to get the desirable properties out of the concrete. We use water which can easily available to the site. At the point when water is blended in with concrete it shapes a paste that ties all materials together. The part of water inside the mix is most basic due to the water-cement ratio (w/c extent). In this study w/c proportion is 0.40 taken out.

**4.5 Crumb rubber** – crumb rubber in concrete is utilised as partial replacement with aggregates (F/A). It has a low specific gravity from 0.51 to 1.2 than fine aggregates. It also has low water absorption, strength and stiffness. Rubber does not let water to let into it and it entraps air on the surface. It is used for many works including sports surfacing. It works better when using on pavements. It increases its lifespan due to its anti-aging effect and it keeps it pavement in better condition.

## 5. CONCLUSION

The use of rubber will always help to find a more climate friendly construction work. It has been concluded that treated rubber is more effective rather than untreated rubber for similar works. It was seen that crumb rubber effected workability. Workability is in direct proportion to the rubber added. Using rubber in concrete can help to decrease total weight of the structure, which will be better for their lifespan. It also effects its compressive and tensile strength. CRC is really considered as a material of our future for a green and economical turn of events.

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