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Roller compacted concrete: Literature review

Anwer M. Ali *
M Sc Student
Civil Engineering Department,
University of Baghdad
Baghdad-Iraq
Eng.anwar2012@gmail.com

Zena K. Abbas
Assistant professor
Civil Engineering Department,
University of Baghdad
Baghdad-Iraq
dr.zena.k.abbas@coeng.uobaghdad.edu.iq

ABSTRACT

Roller compacted concrete (RCC) is a material with no slumps and is made from the same raw materials as conventional concrete. The roller compacted dam method, the high paste technique, the corps of engineers method, and the maximum density method are all ways of designing RCC. The evolution of RCC has resulted in a substantial change in construction projects, most notably in dams, because of the sluggish pace of conventional placement, consolidation, and compacting. The construction process was accelerated by incorporating RCC into dams, resulting in a shorter construction period. Research shows that the dams that used RCC had completed one to two years sooner than the dams that used regular concrete **(Bagheri and Ghaemian's, 2004)**. The application of RCC has risen significantly during the past several decades, particularly for pavement applications. It has a lower construction cost than asphalt and may be completed fast. It is extensively used in areas/roads that transport big goods at moderate speeds. RCC is increasingly being used in metropolitan areas, particularly on roadways and streets. RCC has shown great interest in asphalt roads in terms of durability, compressive strength, prolonged service life, and lower maintenance costs. Fibre addition is frequently favored in RCC, just as in traditional concrete. Fiber inclusion contributes to the mechanical qualities of RCC as well as its long-term sustainability. Within the focus of this research, RCC is reviewed based on four factors: environmental effect, cost, fiber addition, and country-specific RCC use. This study is unusual in this sense and provides researchers with valuable information.

Keywords: concrete road, roller-compacted concrete, application of roller-compacted concrete

*Corresponding author
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مراجعة الخرسانة المرصوصة بالحدل

انور منير علي*
طالب ماجستير
قسم الهندسة المدنية/ جامعة بغداد

زينة خضير عباس
استاذ مساعد
قسم الهندسة المدنية/ جامعة بغداد

الخلاصة

تتميز الخرسانة المرصوصة بالحدل بأمتلاكها على قيمة هطول مساوية الى الصفر, هذه الخرسانة تتكون من نفس مكونات الخرسانة التقليدية. الفارق بين الخرسانة المرصوصة بالحدل والخرسانة التقليدية هي طريقة التصميم,هناك العديد من الطرق المتبعة في تصميم الخرسانة المرصوصة بالحدل ومن اهم الطرق المتبعة في تصميم هذا النوع من الخرسانة هي طريقة الكثافة العظمى. ان التطور في استخدام هذا النوع من الخرسانة قاد الى تغير كبير في تنفيذ المشاريع الهندسية وعلى الاخص في السدود وذلك بسبب الوتيرة البطيئة للخرسانة التقليدية بالنسبة للصب والدمك. ادى استعمال الخرسانة المرصوصة بالحدل في السدود الى تسريع هذه العملية وبالتالي زمن انشاء اقل. كما ذكر في بحث معد من قبل **(Bagheri and Ghaemian's 2004)** ان استعمال هذا النوع من الخرسانة في السدود يؤدي الى اختصار في زمن التنفيذ من 1 الى 2 عام مقارنة مع السدود المنفذة بالخرسانة التقليدية. ولهذه الاسباب اصبح استخدام هذا النوع من الخرسانة رائجا في السنوات الاخيرة وخصوصا في السدود وتطبيقات رصف الطرق. مقارنة مع الخلطات الاسفلتية ان استخدام هذا النوع من الخرسانة يؤدي الى تقليل في كلفة الانشاء والاسراع في عملية التنفيذ.في السنوات الاخيرة اصبح استعمال الخرسانة المرصوصة بالحدل في رصف الطرق ذو نطاق واسع وذلك بسبب المميزات التنافسية لهذه الخرسانة مقارنة مع الاسفلت من ناحية المقاومة, الديمومة, انخفاض كلف الصيانة والعمر الخدمي لهذه الخرسانة. كما في الخرسانة التقليدية يتم اضافة انواع مختلفة من المواد للخرسانة المرصوصة بالحدل لتحسين الخصائص الهندسية والتشغيلية لهذه الخرسانة. الهدف من هذا البحث هو مراجعة اهم البحوث التي وظفت استعمال هذا النوع من الخرسانة.

الكلمات الرئيسية: خرسانة رصف الطرق, الخرسانة المرصوصة بالحدل, تطبيقات الخرسانة المرصوصة بالحدل

1. INTRODUCTION

Infrastructure, hydraulic projects, and pavements have long relied on roller compacted concrete (RCC) **(Wang et al. 2018)**. Using RCC in urban areas has been more popular in recent years, according to **(Williams 2014)**. RCC is made up mostly of cementitious materials, water, and well-graded aggregates. Mixing methods are the main difference between RCC and regular concrete. Using a vibrating Roller and a compactor by this means, RCC could be applied to guarantee that the concrete is strong and durable. According to **(Jones 2012)**, RCC has a more significant percentage of fine aggregates than conventional concrete, which might be considered the fundamental difference between the two. As a result, RCC can pack and consolidate more efficiently **(ACI 327, 2015)**.

Additionally, RCC uses less cement than standard Portland cement concrete. Comparing PCC and RCC, PCC has 15% cementitious material, whereas RCC contains 12%. It is common for RCC to employ Portland cement Type II because of its impact on hydration and strength development. The strength of RCC is said to be affected by the quality of the aggregate and the water used **(Luhr, 2000)**. The comparison between regular concrete and RCC is shown in **Table 1**. There are several reasons and applications for which RCC has been used since it is so simple (**Salih and Abed, 2016)**. It is widely advocated as a replacement for asphalt on highways. When using this material, highway and road pavements may be opened to moderate traffic in short order **(Mohammed, 2018)**. As a result, it is a time-efficient application. Formwork, surface finishing, dowelled joints, and reinforcement are not required with RCC. RCC might be considered. Cost-effective and expedient in this regard **(Berry and Tayabji, 2001)**. This research aims to review the literature about the composition of RCC (both with and without added fibers), its application, and the benefits of its use in construction projects. Additionally, RCC is evaluated within the scope of this research by considering four factors: environmental impact, cost, fiber addition, and country-specific RCC utilization. This study is unusual and gives valuable data to the researchers.

Table 1. Comparison between RCC and traditional concrete. **(Hazaree, 2007)**.

standard	PCC	RCC
Consistency	measured by flow or slump tests (no required for a ve-be test)	Measured by the Ve-Be process.
Cement	Defined Based on the aggregate system's water consumption and the water to cement ratio.	It often contains just small amounts of cement.
Moisture content	The (W/C) ratio is used to define it	Optimal water content is used as a measure.
Aggregate gradation	Comparatively less well graded	Well graded
Characteristic determination of Fresh concrete	Methods based on slump and temperature	Fresh density, consistency, and moisture content
Distribute and lay	From the mixing truck and/or manually	loader, asphalt pavement machine, etc.
Compaction	A vibrator may be either internal or exterior	Rollers or compactors
Strength	comparably low	comparably high
the roughness of the surface	Smooth	Roller compaction has caused it to be rough and wavy in appearance

RCC, a zero-slump product made from the same components as ordinary concrete, has received much attention from experts in recent years **(Madhkhan et al., 2012)**. Depending on the amount of cement used, RCC may be utilized in various ways. The recommended quantity is 66 kg/m^3 when pozzolanic material is not used **(ACI 327, 2015)**. On the other hand **(Mardani Aghabaglou and Ramyar, 2013)** stated that RCC mixtures usually need 100 to 200 kg/m^3 of cement. RCC may be made in four ways: with a corps of engineers, a high past, Roller compacted dams, or the technique of maximum density:

1.1 The corps of Engineers technique: the necessary strength determines the maximum aggregate size and water content. This approach is based on the (water/cement) ratio and the strong connection between the two.

1.2 The RCC Dam Method is based on two ideas.

- The quantity of cement used must be kept to a minimum while yet achieving the appropriate strength. To reduce the hydration temperature, the mixture must also include flying ash.
- The ratio of sand to aggregate must be greater than that of standard mass concrete to prevent segregation and guarantee appropriate compaction **(Aghabaglou et al., 2019)**.

1.3 The approach of High Paste: This method entails three phases;

- To achieve particular compaction energy, minimum gradation of aggregate selection is needed.
- The paste volume is controlled by the amount of space between the aggregates to produce the necessary workability.
- To get the demanded strength, the water to cement proportion and pozzolans content must be specified.

1.4 Maximum Density Method: aggregate makes up the overwhelming bulk of this combination (coarse and fine). As a result, as **(Ghábaglou et al., 2019)** stated, "The aggregate gradation is first taken from the table."

A variety of elements affected the RCC strength including the kind of cement used, the type of aggregate used, the degree of compaction, the RCC strength, and the ambient circumstances of the construction project **(Chhorn et al., 2018)**. Since RCC roads can be built faster than asphalt, they may see traffic sooner than asphalt. Road opening requires RCC to be strengthened to a minimum of 20 N/mm^2 **(Pig-gott, 1999)**. RCC can produce a 20N/mm^2 strength in two days in warm weather; in colder weather, this time frame is four days **(Toplicic-Curcic et al., 2015)**. Since conventional techniques of pouring, compacting and consolidating concrete are far slower than RCC, construction projects and notable dams have changed significantly. With the incorporation of RCC into dams, the building process was hastened, and the construction duration was reduced. Traditional dam projects will take 1-2 years longer to complete than RCC constructions **(Bagheri and Ghaemian, 2004)**. RCC's usage in pavement applications has increased dramatically in recent years. It is less expensive to build and may be completed more quickly than asphalt pavements. It is often utilized in locations and on highways where heavy products are transported at a modest rate of speed. Compressive strength, durability, reduced maintenance costs, and the longer service life is benefits of RCC over asphalt pavements that perform as well as high-performance asphalt. Although its construction industry share is currently tiny, its relevance has increased over the last several years. Recent years have seen an upsurge in design methodologies in response to this increased interest in RCC applications.

2. RCC CHARACTERISTICS

RCC is essentially equal to conventional concrete in terms of materials and anticipated qualities like compressive and flexural strength, abrasion resistance, and so forth. Mechanical properties in essential to be evaluated in conventional concrete (**Abdullah et al., 2021)**. Flexural, compressive, toughness, and shear mechanical properties have been superior to traditional concrete **(Madhkhan et al., 2015)**. The necessary consistency, which directly impacts the required mix percentage, distinguishes RCC from regular concrete **(Khayat et Liberté, 2014)**. Because compaction creates friction between the aggregates or particles, it is crucial for RCC's load-carrying capabilities **(Hashemi et al., 2018)**. The compressive, flexural, and tensile strengths of RCC have been studied extensively under the impact of different fiber or combination materials. The following sections will go through them in further depth. The manufacture of RCC is seen in **Fig. 1**.

2.1 Setting time and workability

Ordinary concrete workability and consistency may be assessed using the slump test. This test cannot determine RCC's workability. RCC concrete Workability is measured using the Ve-Be time scale **(ACI 327, 2015)**. Compactable concrete is advised to have a Ve-Be time between 20 and 75 seconds **(Chhorn et al., 2018)**. **Table 2** lists RCC's recommended Ve-Be times.

Table 2. Recommendations for water content and Ve-Be times.

Ve-Be (second)	OWC (%)
-	5 - 8
It should take 20 seconds to achieve rollability; nevertheless, 30-40 seconds is acceptable.	4.5 – 6.5
Acceptable: 30-40 seconds	-
Applicable is between 50 and 75 seconds.	-

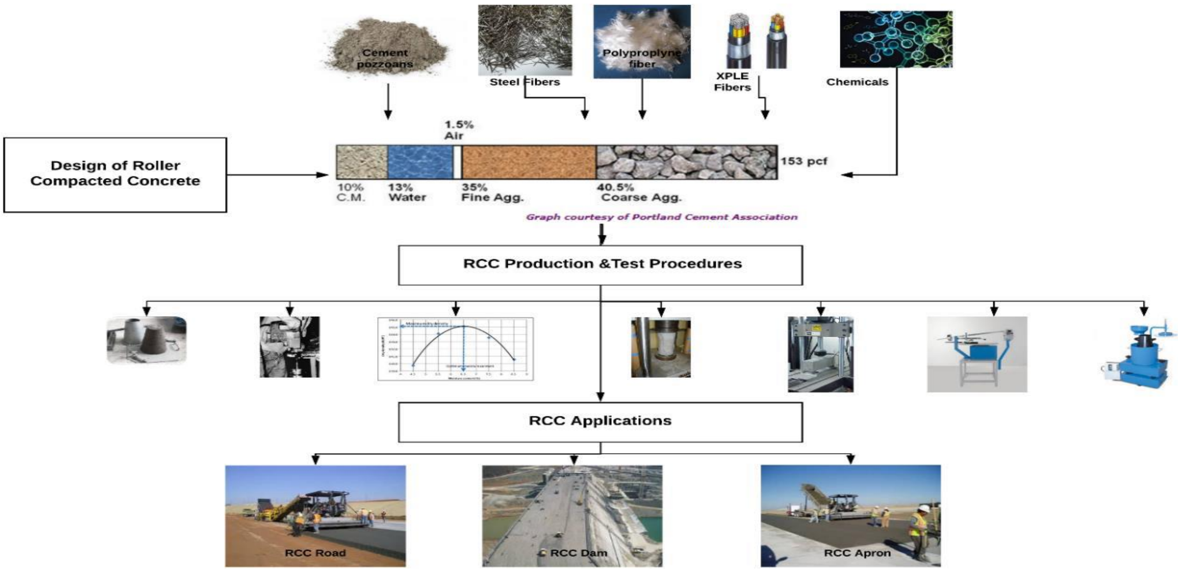

Figure 1. RCC production plan.

2.2. Compressive strength evaluation

(Auta et al., 2015) and (Kiyanets, 2018) stated "Conventional concrete must have sufficient compressive strength, whether or not it contains fibers." RCC, like conventional concrete, must be evaluated for compressive strength using the vibrating table **(ASTM C1176-92)**, proctor **(C1557)**, and coring tests **(C42)**. RCC's 28MPa compressive strength has been verified for 28 days **(American concrete pavement Association, 2014)**. A significant concern with RCC is salt scaling caused by saline solutions like de-ice salt scaling. Pozzolans, a cementitious ingredient, and an air-entrainment agent, have recently been studied to resist salt scaling in concrete **(Ghahari et al., 2017).** Cross-linked polyethylene (XLPE) was also used in RCC to reduce the environmental impact of waste material. **(Shamsaei et al. 2017)** found that the unit weight of cement dropped when XLPE was used as a replacement for aggregate. However, XLPE has been shown to reduce compressive strength, as in **Fig. 2d**. Similarly, as the quantity of crumb rubber grew, so did the compressive strength, as in **Fig. 2c (Adamu et al., 2018)**. In a recent study, a ground granulated blast furnace (GBBS) was used instead of cement. Adding GBBS may improve the Compressive strength of a material. Compressive strengths equivalent to cement may be achieved by adding GBBS **(Rao et al., 2016)**. Similar to GBBS, fly ash affects RCC in the same way. The Compressive strengths of the two mixtures are almost comparable when fly ash replaces the removed cement volume. Both fly ash and GBBS have been shown to function as cement replacements in RCC designs based on the results of these two trials. Furthermore, the Compressive strength of the mixtures is almost comparable, as in **Fig. 2b**. RCC combination with steel fibers was also investigated. According to recent research, Steel fiber increased Compressive strength by around 20% to 30 **(Madhkhan et al., 2012)**. Steel fiber was tested in both RCC and conventional concrete. To see how effective it was, compared to conventional concrete, RCC's steel efficiency is much higher **(Karadelis and Lin, 2015)**. The impact of polypropylene fiber on RCC is comparable to that of polyethylene fiber **(Benouadah et al., 2017)**. In Thailand, another study showed that integrating steel fiber with RCC reduced impressive strength **(Sukontasukkul et al., 2019)**. A summary of the literature review can be seen in **Table 3**. RCC's compressive strength may be modified in both incremental and decremental ways by using different fibers or components.

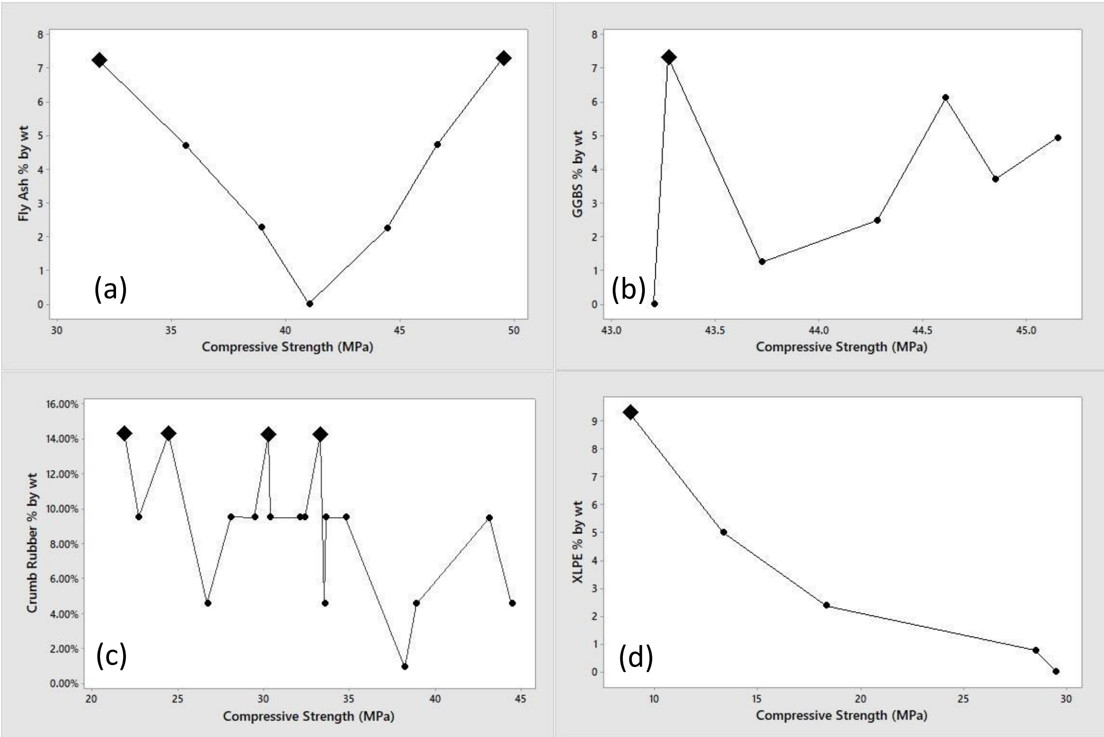

Figure 2. RCC compressive strength with different content.

Table 3. RCC literature review summary.

References	compressive strength (MPa)	Flexural Strength (MPa)	Material that was used	results
(Chhorn et al., 2018)	24.30	---	Fly Ash	The compressive strength has decreased
(Shamsaei et al., 2017)	28.49	5.51	Cross-linked polyethylene (XLPE) fiber	The CS dropped by 3.42 percent when XLPE was used at 5 percent by weight
(LaHucik et al., 2017)	55.40	1.43	Different sizes and shapes of microfiber	In terms of fatigue resistance, fiber-added RCC may match or even outperform Portland Cement concrete

(c) (d)

(Ghahari et al., 2017)	35	---	Natural mineral pozzolans	Tress natural pozzolans account for 20% of the cement's weight. Initially, samples indicate a 35% reduction in compressive strength; over time, this decreases to a 14% reduction
(Rao et al., 2016a)	44.95	8.05	(GGBS)	GGBS was used in place of cement. 4.51 percent of the improvement in compressive strength occurred
(Mardani-Aghabaglou and Ramyar, 2013)	48.90	5.25	Fly ash	Concrete compressive strength is improved by the inclusion of fly ash in the mix
(Adamu et al., 2018)	44.75		Crumb rubber with fly ash	The optimum outcome might be achieved by replacing 10% fine aggregate with crumb rubber and replacing 53% cement with fly ash.

2.3 Tensile and flexural strength evaluation

flexural strength of RCC is equally as crucial as it is for conventional concrete.'s service life. Cross-linked polyethylene (XLPE) was recently investigated for its impact on RCC. The coarse aggregate was replaced with XLPE in varying percentages of 5 to 30 percent. RCC with 5% XLPE has a lower flexural strength than the test sample. As demonstrated in **Fig. 3d**, the trend with increasing XLPE for flexural strength is decreasing**.** Nonetheless, these specimens fulfill the RCC guide's basic requirements **(Shamsaei et al., 2017)**. In additional studies, cement was substituted with varying percentages of Ground Granulated Blast Furnace Slag (GGBF). (10 percent, 20 percent, 30 percent, 40 percent, 50 percent, and 60 percent). It was discovered that GGBF has a cumulative effect on the flexural strength of RCC, as in **Fig. 3c)**. Flexural strength increases when cement is lowered in favor of GGBS. It also has a comparable impact on split tensile. Split tensile exhibits an increasing tendency as GGBF increases **(Rao et al., 2016)**. The effect of using fly ash in RCC produced similar findings, as in **Fig. 3a**.

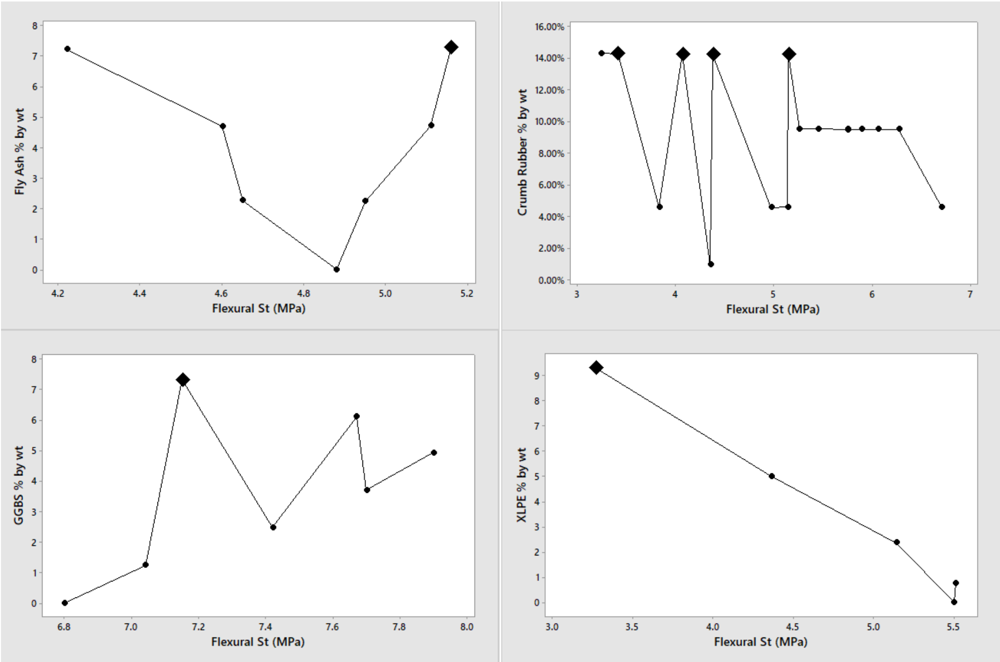

Figure 3. RCC flexural strength with different content.

2.4. Modulus of Elasticity evaluation

On-site samples are seldom used to assess the Modulus of Elasticity of RCC. Paste volume age, strength, and Aggregate type all impact the elastic modulus **(Omran et al., 2017)**. RCC's Modulus of elasticity is often on par with or higher than normal concrete.'s, even though the two materials contain almost identical cement amounts **(Berry and Tayabji, 2001)**. The Elastic Modulus of RCC may be increased or decreased by inserting fibers **(Muscalu et al., 2013)**. An example of graphic design is displayed in **Fig. 4**. Recent research examined the RCC elastic modulus in samples with fiber additions**,** as shown in **Fig. 4.** Elastic Modulus is the greatest in the sample made of fiber-reinforced steel **(LaHucik et al., 2017)**.

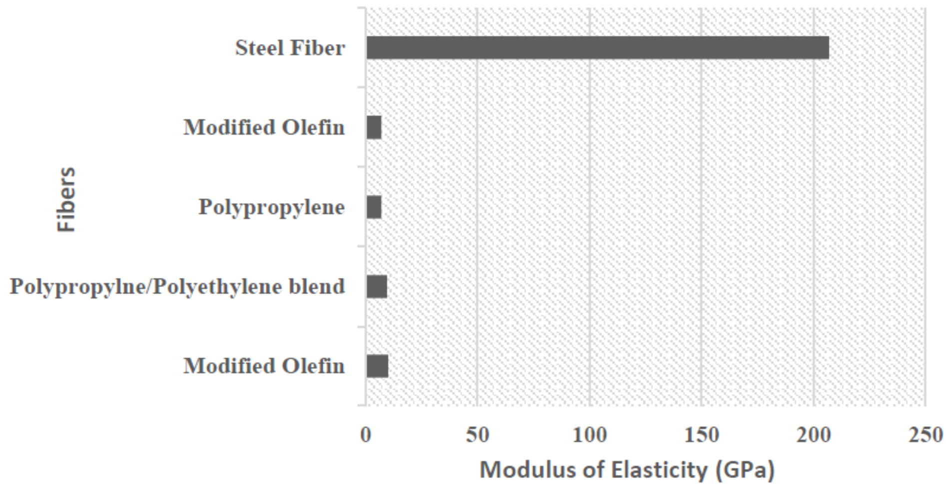

Figure 4. RCC Elastic Modulus with different Fibers.

2.5. RCC microstructure and durability evaluation

The sliding and scraping motion of the wheels causes abrasion on pavements during vehicle movements **(Rao et al., 2016)**. Consequently, RCC's abrasion resistance is crucial, especially in transportation applications. To measure the RCC's surface resistance, abrasion tests are performed by ASTM C944. RCC is put on the construction site using a finisher and compactor. Because of its installation type, RCC may attain outstanding durability **(Benouadah et al., 2017)**. The aggregate percentage, the kind of aggregate, the strength, the mix ratio, the fiber content, the curing procedure, and the method used to polish the surface are all factors that go into defining the abrasion resistance of concrete **(Rao et al., 2016)**. According to test results, despite having poor abrasion resistance at an early age, the RCC sample's abrasion resistance grew dramatically over time.

Furthermore, fly ash improves abrasion resistance by 30% **(Won and colleagues, 2009)**. Abrasion resistance was reduced in the other trial when cement was substituted with a large amount of fly ash. **(Adamu et al., 2018)** stated, "That replacing aggregate with crumb rubber had the same impact on the concrete." The influence of cationic asphalt emulsion as an addition to RCC was explored in recent research. The density method ASTM D1557 was used to create the design. RCC's transport qualities may be improved by adding asphalt. As a result, as seen in **Fig. 5**, asphalt causes fewer capillary holes **(Dareyni et al., 2018)**. Asphalt has been used to plug the capillary pores. The effects of steel slag in an electric arc furnace on RCC's properties were studied. The splitting tensile and impressive strengths of the mixtures were found to be greater than those of the reference mix **(Rooholamini et al., 2019)**. **Fig. 6(a-d)** illustrates the microstructure of steel slag from an electric arc furnace and a river utilized in RCC. The structure of river filler, on the other hand, is denser, and EAF slag is a rare kind. The slag produced by the EAF is finer and smoother than that produced by river filler. As a result, it's reasonable to deduce that EAF filler has a more defined use. Due to the regions where RCC is used, such as motorways and dams, frost resistance is an important feature. The effects of steel and rubber fibers on RCC frost resistance were investigated in recent research. According to the results of the tests, RCC's frost resistance is not increased by steel or rubber fiber **(Zhang et al., 2018)**. **Fig. 7** illustrates the microstructure of the steel fiber used to reinforce RCC. The consequences of replacing cement with glass powder (GP) in RCC have been examined. RCC's mechanical qualities are improved by adding glass powder (compressive and flexural strength). There have been increases, especially in the elderly aged 91 days and beyond. In the case of severe weather, this may be a useful upgrade **(Omran et al., 2017).** Impervious nature of glass, GP with RCC has a reduced permeability, as in **Fig. 8 (Omran et al., 2017)**.

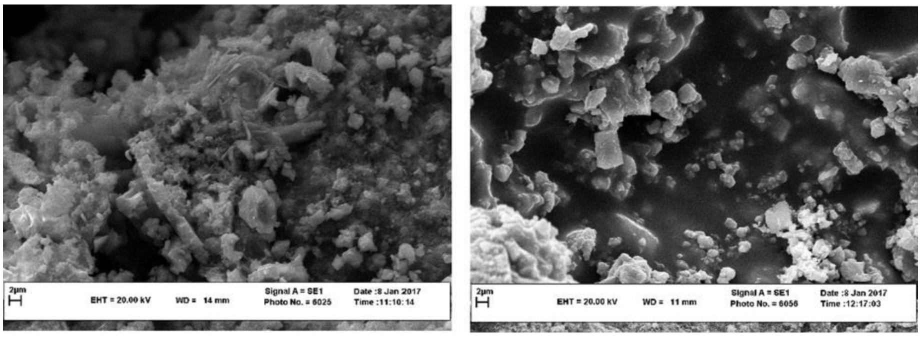

Figure 5. Asphalt microstructure applied to RCC **(Dareyni et al., 2018).**

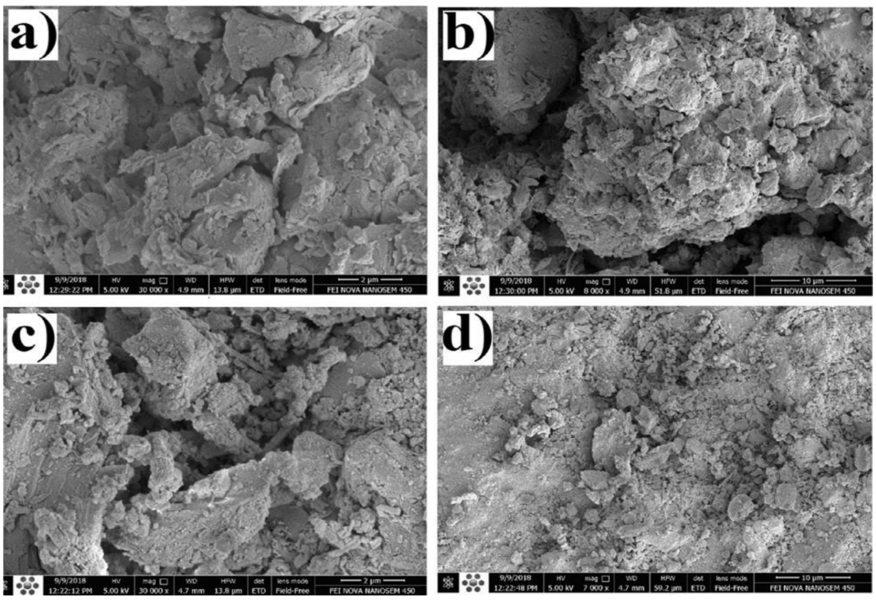

Figure 6. Steel slag that added to RCC.

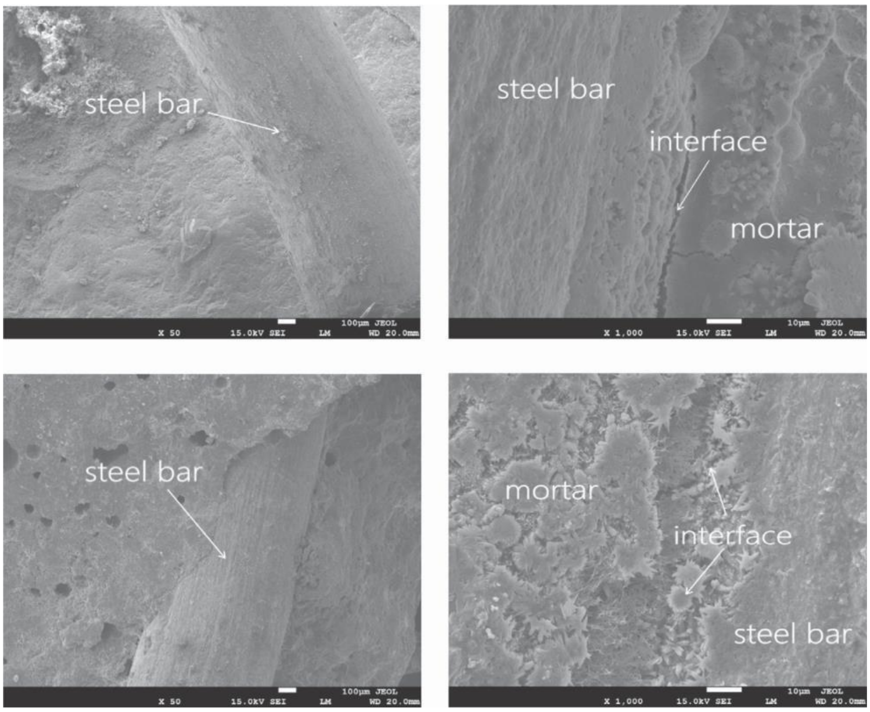

Figure 7. Fiber microstructure applied to RCC.

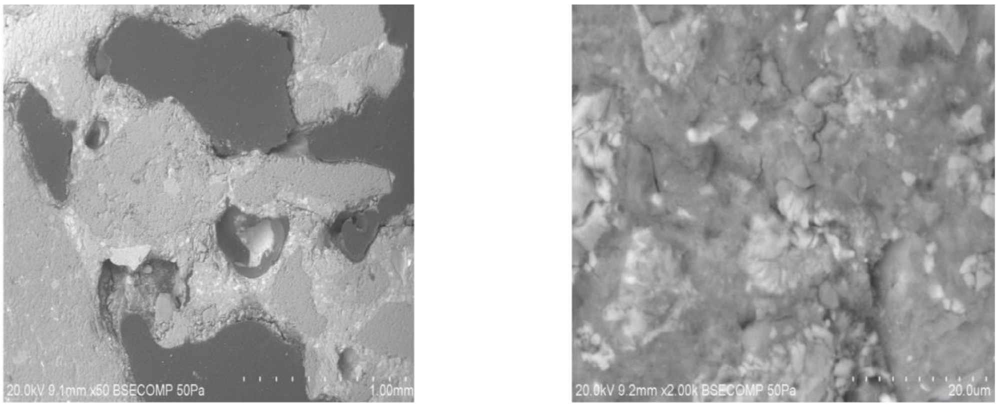

Figure 8. Glass powder (GS) added to RCC.

3. ANALYSIS OF COST

Because of its ability to be manufactured and installed on the construction site, RCC is often seen as a low-cost material **(Won et al., 2009)**. RCC's construction, operation, and maintenance costs are pretty excellent in terms of mechanical properties **(Bl et al., 2015)**. Using RCC instead of asphalt or regular concrete may save up to 30%, according to a study conducted in the United States **(Pavement, 1990)**. One study evaluates European methods and finds that RCC implementations may save as much as 12 percent on costs **(Neocleous et al., 2011)**. RCC costs 12.35 dollars per square yard, whereas asphalt costs 19.62 dollars according to a real-world case study done in the United States of America **(Damrongwiriyanupap et al., 2012)**. RCC is more costly than asphalt pavement, according to another survey **(Report, 2015)**. It is self-evident that one cannot conclude that RCC or Asphalt is less costly than the other. Indeed, it is dependent on a variety of factors, including the nation, concrete manufacturing facilities, raw material availability, and the country's financial health (currency exchange rates). Thus, more analysis is required to make a judgment, and the research must be specific to the planned construction task. Due to the high cost of fibers, fiber addition has a limited use worldwide. However, this additional expense might be offset by the quick production time associated with RCC. **(Neocleous et al., 2011)** stated, "Steel fiber in RCC saves construction costs and time by at least 10%, as well as energy consumption by 40%".

Table 4. Cost comparison of RCC and asphalt.

expense	RCC	Asphalt Constructed	Bids for Asphalt in Place
Total	$28,15	$33,49	$45,93
Expense per square yard	$11.39	$13.65	$18.68

4. RCC AND ASPHALT COMPARISON FOR ENVIRONMENTAL PURPOSES

Since the late 1980s, when it was initially addressed, sustainability has been a popular and pervasive topic in all countries. The term "sustainability" may be defined as "the utilization of natural resources while also considering future generations and ensuring that they have enough resources." Consequently, resource consumption should be kept to a minimum **(Ylmaz and Bakş, 2015)**. Engineering is currently focused on sustainability due to the fall in natural resource concerns and the rising sensitivity of non-governmental groups. In recent years, innovations in cement manufacture have resulted in a significant decrease in carbon emissions, contrary to common opinion **(Sabnis, 2016)**. RCC is also a long-term option since it decreases the amount of material utilized, lowers costs, and eliminates excavation **(Abdo, 2010)**. As seen in **Fig. 9**, RCC might be a viable solution to engineering problems.

RCC may enhance value-engineered solutions by lowering the expected HMA wear and HMA foundation after they've been value-engineered. Furthermore, the RCC needs a shallower excavation, which offers various benefits. With fewer activities on the site, minor construction, less craft, and so on, it is relatively straightforward to open for traffic. Several countries have recognized the benefits of RCC in this context, and the number of RCC dams has lately increased **Fig. 10 and 11**. The United States of America has used RCC for military, public, and private/industrial uses. The most typical use of RCC is in the construction of dams. The usage of RCC might be a great way to save money on materials. More sustainability may be achieved by using less material. RCC applications may result in a 40% decrease in energy consumption **(Neocleous et al., 2011)**.

Furthermore, by using technology in the cement manufacturing process, CO2 emissions may be lowered, resulting in lower prices. Similarly, by adding fiber or binding alternatives, the cement content of concrete may be reduced. Pavements are another fast-developing use of RCC **(Sabnis,**

2016). Despite this, RCC accounts for 45.771 kilometers of the USA's total paved road, which is 482,924 kilometers in length. To put it another way, even one of the world's largest RCC road-building nations has a national share of just 9.5 percent **(Reza and Boriboonsomsin, 2015)**.

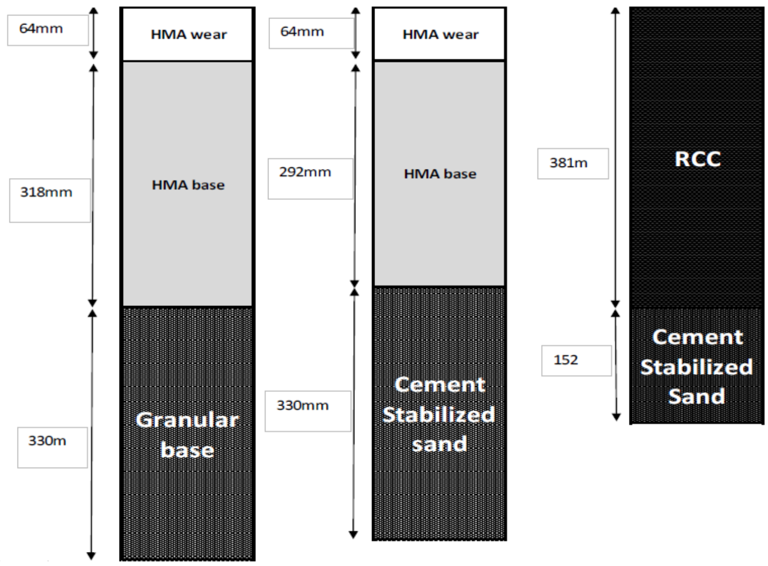

Figure 9. Comparison of RCC and HMA **(Abdo, 2010).**

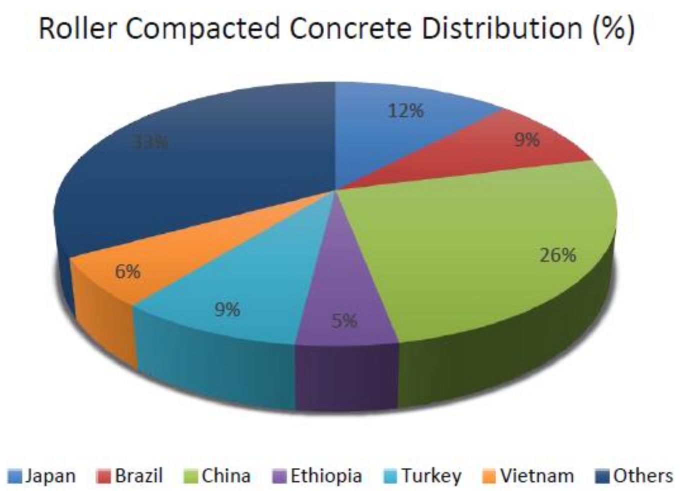

Figure 10. RCC distribution (%).

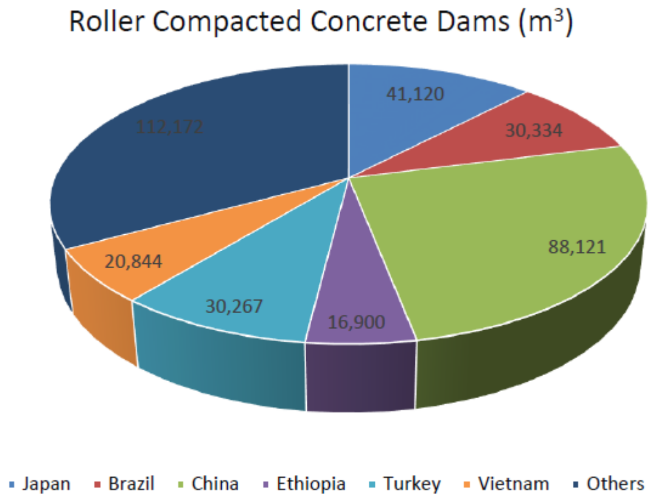

Figure 11. RCC dams (m^3)**.**

5. CONCLUSIONS

The main factors that affect the workability of RCC are the aggregate grade, the water content, the inclusion of fibers, and the pozzolans content. As a result, it needs considerable care throughout the mix and production stages. RCC may perform well with or without fiber addition. Steel fiber is the most often used fiber addition since it increases the compressive strength and may also be used to increase strength. RCC is comparable to regular concrete in this regard. Pozzolans may be an ideal substitute for cement, resulting in reducing cement consumption. Fiber insertion is a method for enhancing RCC's properties. On the other hand, Fiber-added RCC is preferred in terms of cost and volume of material manufactured on-site since it has the same or less thickness than RCC, which does not include fiber. **(Nanni, 2002**) stated, "That fiber addition does not increase pavement thickness. Indeed, the thickness of regular RCC without fiber is 45.72 cm (18 inches), but the thickness of fiber-added RCC is 35.56 cm (14 inches)." As a result, fiber addition has a beneficial effect on layer thickness. Like the United States of America and Japan, numerous nations have recognized the importance and benefits of RCC, and this number is growing. It is commonly employed in dam construction because of its mechanical qualities, the fact that it requires less cement due to the presence of pozzolans, its low cost, and the fact that it does not need tensile strength **(Berga and Buil, 2003)**. The selection criteria for pavement are pretty similar. RCC is preferred because of its lower cost, ease of opening to traffic, strong compressive strength, and extended service life. RCC uses in pavement and dam construction seem to be promising. It offers a considerable cost advantage over asphalt when compared on a $1m^3$ basis. However, in order to provide a complete picture, the whole cost of asphalt and RCC manufacture should be thoroughly investigated. RCC application is a sustainable and environmentally beneficial treatment. Pozzolans may be used instead of cement, and the requisite strength can be generated with the inclusion of fiber. As a result, less cement is utilized, and, as a result, less cement is manufactured. However, to achieve a fair comparison of CO_2 emissions throughout the RCC and asphalt production processes, a more extensive investigation should be done. This research examined the RCC and its use and its pros and limitations. RCC, of course, has many advantages and disadvantages. However, it may be suitable for use in some situations, particularly in city streets and metropolitan regions.

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