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# Effect of Production and Curing Methods on the Properties of Roller-Compacted Concrete: A Review

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## ABSTRACT

Roller Compacted Concrete (RCC) exhibits many characteristics of both asphalt and rigid pavements, but their use is restricted. Many reasons led to this decision, including the fact that RCC is a type of concrete mixture that requires a specific consistency. It should be firm enough to be compacted by a roller compactor but also have enough moisture to ensure even distribution. The lab-field performance difference of RCC is another reason for decreasing its use. The laboratory RCC mixes are prepared using the modified Proctor compaction method. Subsequently, specimens are fabricated utilizing a vibratory hammer (VH) to evaluate their strength properties. Nevertheless, in the construction industry, pavement is built utilizing static, pneumatic, and vibratory rollers. Consequently, quality control is carried out by acquiring pavement samples and comparing them to laboratory samples. Each of these procedures employs different processes and energies, resulting in variations in field and laboratory behavior. In this investigation, some studies will be discussed about the RCC behavior under field and lab conditions using various design methods, such as the vibrating table (VH), vibratory table (VT), gyratory compactor (GC), and modified proctor (MP). These studies showed a difference in RCC mechanical and macroscale properties between laboratory compaction methods. For instance, VH specimens led to a higher evaluation, while GY specimens produced a less favorable estimation of the hardened properties observed in the field. While the MP and VT compacted specimens had a comparable structural arrangement to the field, they exhibited notable differences in terms of porosity and strength. Other studies revealed the essence of the curing stage in terms of RCC mechanical properties and indicated that some curing processes, like compound curing, may improve RCC performance.

**Keywords:** Vibrating table, Roller compacted concrete, Modified proctor, Gyratory compactor, Vibrating hammer

## 1. INTRODUCTION

Roller-compacted concrete (RCC) is a type of concrete that is compacted using a roller while

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it is still in its unhardened state and is able to withstand the weight of the roller during this compaction process. **(Abed and Salih, 2017)**. The RCCP applications go back to the 1930s and 1940s. However, they were intermittent and inconsistent back then. The Canadian timber industry invented RCC for the storage of goods and lumber in the 1970s **(Britpave, 2013)**. The formulation of RCC is different from conventional concrete, as are its application and installation methods. Creating RCCP for paving with mechanical qualities better than traditional concrete are feasible by using an optimal paste volume and a granular skeleton with maximum compactness **(Vahedifard et al., 2010)**. RCCP paving is commonly employed in areas with minimal vehicular activity, such as parking lots, storage facilities, and spaces designated for recycling or composting. Base Course Reduction (BCR) is ideal for paving locations with a lot of mechanical traffic. RCC provides higher rut resistance than asphalt, together with a high-quality surface finish. Typically, a pug mill-style mixer that can create a homogenous mixture within specified limits is used to make RCC. The mixing strength of the equipment is adequate to effectively distribute the small amount of water uniformly throughout the RCC mixture. The production plant's mobility allows it to be closer to the site, reducing transportation distances. The concrete is transported to the placement location using standard dump trucks. After that, bituminous mixtures are poured into the concrete using pavers. To handle thicker layers and larger volumes of material, the device might need to make some minor modifications. RCCP are frequently located in lifts measuring 150 and 200 mm, with a maximum of 250 mm and a minimum of 100 mm **(ACI PRC-309.5, 2022.; Tarrad and Abbas, 2023; Abu-Khashaba, 2014)**. **Fig. 1** illustrates typical RCC pavement practices. For RCCP, it is possible to obtain extremely low permeability with strength properties that are comparable with those found in conventional concrete by densely grading an appropriate source of aggregates, using dense compaction, a proper curing process after rolling, and the appropriate amount and type of cement **(Dale et al., 2010)**. Moreover, the production of RCC is often more cost-effective than traditional concrete due to its lower water and cementitious material content. RCCP typically contains 12% cementitious materials, while PCC contains 15% **(Abbas, 2022; Shamran and Abbas, 2023)**.

**Figure 1.** RCC placement using modified asphalt pavers **(ACI 325.10R, 1995)**

More often than any other natural disaster, water is among the most harmful weathering substances for concrete structures, causing damage or even collapse **(Khan and Abbas, 2021).** Water shrinkage and bleeding were restricted in the RCC mixture due to a lower water content. When using less cement, the thermals that lead to cracking are reduced **(Tarrad and Abbas, 2023; Ghahari et al., 2017)**. Lastly, previous studies have shown that the compaction mechanism of laboratory specimens is different from that of those produced in the field **(Selvam and Singh, 2023).**

To achieve proper compaction in the field, a combination of different types of rollers is used. This process includes an initial compaction using static rollers, followed by the use of vibratory or pneumatic rollers, and concluding with a final pass using a static roller to eliminate any residual marks caused by the roller. Different techniques are employed in the laboratory to achieve a similar degree of compaction.

The vibrating table (VT), vibrating hammer (VH), modified proctor (MP), and gyratory compactor are the most common laboratory procedures for creating RCCP specimens. **Table 1** shows the variations between laboratory compaction techniques of RCCP **(Selvam and Singh, 2023)**.

This study investigates how laboratory approaches affect the mechanical characteristics and aggregate structure of RCCP (Roller-Compacted Concrete Pavement) and their similarity to field compaction methods via RCC manufacture.

**Table 1.** Comparing laboratory compaction methods for RCC **(Selvam and Singh,2023)**

| **Compaction technique** | **MP** | **VT** | **VH** | **GY** |
|---|---|---|---|---|
| compaction effort | Impact | Vibration and Pressure | Vibration and Impact | Kneading and Pressure |
| Advantages | Easy to use, portable, and less bulky | Easy to use | Easy to use and portable | 1. Fast and reliable outcome<br>2. The specimen can be created to meet the required specifications.<br>3. Better Reliability<br>4. Constant observation of the compaction procedure Continuous monitoring of the compaction process<br>5. Economy |
| Disadvantages | • Force of Impulsive<br>• A greater degree of aggregate fracture modifies the distribution of particle sizes. | Reduced strength is the result of compaction. | •Excessive compaction<br>•Dependent on the operator<br>•One compaction attempt is sufficient to produce the specimen. | Poor quality and difficult to use |
| Does it mimic the situation in the field? | × | × (Undervalue the field qualifications) | × (Overvalue the field qualifications) | ✓ (Generate similer results.) |
| Standard guidelines References | **(ASTM D1557-12, 2021)** | **(ASTM C1176, 2008)** | **(ASTM D1435, 2005)** | **(ASTM C1800, 2016)** |

## 2. BENEFITS OF THE USE OF ROLLER-COMPACTED CONCRETE

The use of RCC offers many advantages in various categories **(Engineers, U.A.C.O., 2000).**

- The use of this material results in decreased maintenance expenses and minimized periods of inactivity, as it effectively covers specific weak subgrade regions and can withstand repeated heavy loads without experiencing failure.
- Provides evidence of exceptional durability in the presence of heavy concentrated loads, as well as intense industrial, military, and mining conditions.Removing rutting and the necessity for subsequent repairs.
- Prevents seepage through the pavement and provides exceptional durability, especially in freeze-thaw conditions.
- Enhances durability, reduces permeability, boosts strength, and improves resistance against chemical corrosion
- Prevents vertical movement or shifting by offering robust resistance to shearing at joints and uncontrolled cracks.

## 3. RCC PRODUCTION

The rapid manufacturing rate and cost-effectiveness of RCCP have led to its widespread acceptance, especially in pavement construction. This has been supported by positive evaluations from various studies **(Debieb et al., 2009; Bayqra et al., 2022; Ghaharia et al., 2017)**. To prevent the deterioration of the material during placement or compaction, it is essential to have a homogeneous mixture of Roller-Compacted Concrete (RCC) that is not excessively wet. A mixture that is excessively rigid will also be unable to achieve its maximum density, requiring additional energy for compaction. An optimal compaction density can only be attained when there is satisfactory uniformity in the RCC mixture. A significant level of strength can be attained through the use of a higher-density and appropriate aggregate interlock **(Chhorn et al., 2017)**. The components of RCC are not proportional to those found in traditional PCC **(LaHucik and Roesler, 2018)**, and the splitting tensile strength could potentially exceed 1.6 MPa after a period of 28 days. Based on **(Fardin and Santos, 2020)** study**,** The compressive strength (f'c) of RCC is approximated to be between 28-41 MPa, while its flexural strength (fr) is expected to be in the range of 3.5-7 MPa. The conventional paver is employed to lay RCC, as illustrated in **Fig. 2.**

**Figure 2.** Paving the RCC **(Dale et al., 2010)**

## 4. RCC COMPACTION

Gravitation energy and extrinsic consolidation vibrational are required for the placement of RCC. The main factors contributing to the strength of cement are the hydration process and the compaction of its component ingredients, including aggregates and cement mortar **(Lee et al., 2014; Pouliot et al., 2001)**. Compaction is crucial for the ability of RCCP to endure loads because it generates friction among the particles or aggregates **(Hashemi et al., 2018; Wu et al., 2015; Ahmadi et al., 2021; Park et al., 2020)**. Once the concrete has been placed. A 10 ton of dual drum vibratory roller is commonly employed to compact the RCCP **(ACI 325.10R, 1995; Kheirbek et al., 2022; Söğüt, 2014; Naik et al., 2001; Ludwig et al., 1994)** within 45 minutes of the initial mixing and 15 minutes of spreading, as recommended by **(Damrongwiriyanupap et al., 2012; ACI 327R, 2015; Lam et al., 2018; Özcan et al., 2008; Asthana and Khare, 2022).** Optimal compression must be achieved, and it must be executed adequately. The achieved density in the field is dependent upon the underlying layer's ability to provide support, the thickness of the layer, and the compaction, which generally needs to reach a minimum of 95% of the maximum density **(Donegan, 2011).** Density of RCC can be measured either in a laboratory or on-field using a range of different techniques. It is advisable to use a nuclear gauge to measure the density at the location of compacted RCCP. Moreover, it is essential to investigate multiple random sites. The maximum dry density can be determined in the laboratory by following the procedures described in **(ASTM D1557-12, 2021)**. **Fig.3** shows the procedure of RCCP paving.

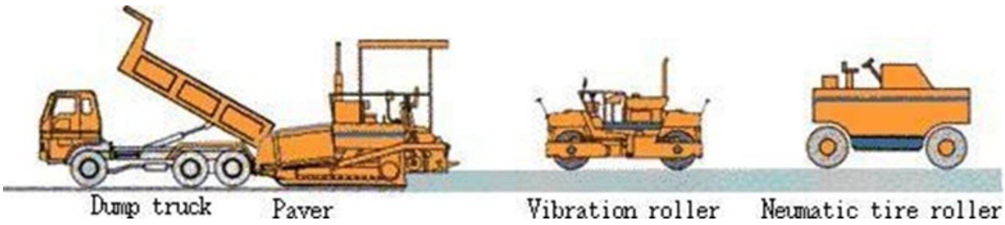

**Figure 3.** Equipment and Machinery Employed in RCC Paving **(Aghaeipour and Madhkhan, 2020)**

## 4.1 Investigate the Production of RCC Sample with Different Compaction Techniques

Laboratory compactors such the vibratory table (VT), gyratory compactor (GY), vibrating hammer (VH), and modified proctor (MP) simulate field compaction **(Sengün et al., 2019; Wang et al., 2018; Qasrawi et al., 2005; Marques Filho et al., 2008; Shen et al., 2020)**. Researchers now use California kneading compactors and other equipment to make RCC specimens. In addition, the Marshall hammer method is utilized to make RCC specimens for bituminous/asphalt mixes **(Nanni, 1989; Villena et al., 2011)**. Many research comparing models will determine the compactor. (**Shafigh et al., 2020)** studied MP and VH RCC designs. With moisture levels from 4.5 to 7%, VH exhibited increased density and strength. MP crushed material has 0.26-0.65% lower density than VH compacted material. Comparing MP-compacted specimens to VH-compacted specimens showed that the former was 3-9.7% stronger. **(Sengün et al., 2019)** performed a comparative analysis of MP,VH, VT, and GC. The study's results indicated that the GC technique produces the higher density, followed by VH, MP, and VT, hence (**Amer et al., 2003)** chose it. GC compactors utilize kneading and pressure energy to compact RCC mixtures. A gyratory compactor with a gyration number between 50 and 75 can lead to efficient field compaction due to the combined effect of shear forces (kneading) and static pressure. Studying the behavior of RCCP under different compaction methods is crucial in order to identify the most suitable laboratory compaction approach that accurately replicates field conditions **(Selvam and Singh, 2023). Fig. 4** displays various laboratory compaction methods for RCCP.

**Figure 4.** Different RCC laboratory compaction methods **(Şengün et al., 2019)**

## 4.2 Comparison of the Mechanical Properties of RCC Produced Using Field and Laboratory Methods

RCC exhibits a compressive strength with a range of 28 to 41 MPa **(Dale et al., 2010).** The cement hydration process significantly affects the compressive strength of conventional concrete. However, the compressive strength of RCC was influenced by the compaction and hydration of cement **(Chhorn et al., 2018)**. There have been few studies examining the effects of various compaction techniques on the compressive strength of RCCP. The compressive strengths of specimens fabricated in the field and in the lab differed by 45% and approximately 10-15%, respectively, as a result of variations in densities **(Amer et al., 2004; LaHucik and Roesler, 2017)**. A separate study showed that, based on results obtained from specimens compacted using various laboratory techniques and field slabs and subjected to a curing period of 7 days, no compaction method was able to precisely replicate the compressive strength observed in the field. After a curing period of 28 days, MP specimens showed strength that was comparable to that of the field slab. In contrast, The VH compacted specimens demonstrated an increase in strength of approximately 18%. The compressed samples VT and GC demonstrate a reduction in strength of 13% and 18%, respectively. **Table 2** Examines the influence of various compaction methods on the compressive strength and additional characteristics of RCC samples after 7 and 28 days of curing **(Selvam and Singh, 2023).**

**Table 2.** Mechanical Properties of RCCP at Different Compaction Efforts **(Selvam and Singh,2023)**

| Compaction Technique | Testing age | FS | VH | MP | VT | GC |
|---|---|---|---|---|---|---|
| Compressive Strength (MPa) | 7-days | 30(1.5) | 36(1.5) | 23(2.1) | 22(3.5) | 16(0.5) |
| | 28-days | 40(3.3) | 47(1.6) | 39(1.8) | 35(2.2) | 33(2.9) |
| Flexural Strength (MPa) | 7-days | 3.8 (0.24) | 3.6 (0.23) | 3.1 (0.26) | 3.7 (0.26) | - |
| | 28-days | 4.6 (0.17) | 4.7 (0.33) | 4.2 (0.15) | 4.5 (0.3) | - |
| Indirect TensileStrength (MPa) | 28-days | 3 (0.23) | 3.3 (0.58) | 2.9 (0.65) | 2.6 (0.15) | 2.4 (0.13) |
| Elastic Modulus (GPa) | 28-days | 35.44 (1.70) | 39.14 (3.31) | 37.32 (2.30) | 32.19 (1.28) | 24.29 (2.33) |

### 4.3 RCC Internal Structure

Compaction is necessary for concrete skeleton aggregate. Image analysis may distinguish field-compacted specimens from aggregate meso-structures crushed by various methods (**Selvam and Singh, 2023)** in numerous investigations. Imaging advances have allowed morphology computation, skeletal structure assessment, and aggregate segmentation **(Han et al., 2016).** RCC specimens were made to study VH, VT, MP, and GY laboratory compaction mechanics. **Table 3** summarizes the specimens' macroscale features. Note that specimen compactor behavior differed in each situation. Material crushed with VH has the maximum density and compressive strength. VH specimens have double the compressive strength of GY-compacted specimens. Strength differed by 25% between VT and VH compacted specimens. VH has the greatest packing density, followed by MP, VT, and GY. Particle arrangement during dry compaction may considerably affect strength outcomes throughout a wide spectrum. (**Selvam and Singh, 2023)** found that MP and VH are better options that can increase strength because to the RCC matrix's improved component design. **(Kennedy et al., 1940)** excess paste hypothesis may be used to study RCC specimen compaction with various compactors. This notion states that after filling particle gaps, the whole surface will be coated with cement paste. The aggregates are distributed more evenly in the concrete matrix due to less interparticle friction. After VH-compacted aggregates, additional cement paste reduced voids and optimized packing density to increase mixture compatibility. These findings show that increasing paste volume in VT and GY compactors strengthens RCC best. The aggregates and their respective voids within the hardened concrete matrix are shown in **Fig. 5**.

**Table 3.** Macroscale properties of different laboratory-compacted specimens **(Selvam and Singh, 2023).**

| Properties | Compaction methods | | | |
|---|---|---|---|---|
| | **MP** | **VH** | **VT** | **GY** |
| Compressive strength (MPa) | 46 (2.6) | 48 (0.2) | 36 (1.8) | 24 (1.2) |
| Dry density (kg/m$^3$) | 2434 (8.9) | 2478 (14) | 2423 (8.70) | 2325 (17) |
| Packing density | 0.83 (0.003) | 0.87 (0.005) | 0.81(0.01) | 0.76 (0.001) |
| Void content | 0.17 (0.003) | 0.13 (0.005) | 0.19 (0.01) | 0.24 (0.001) |
| Porosity (%) | 2.80 (0.32) | 2.94 (0.28) | 3.60 (0.27) | 4.86 (0.77) |

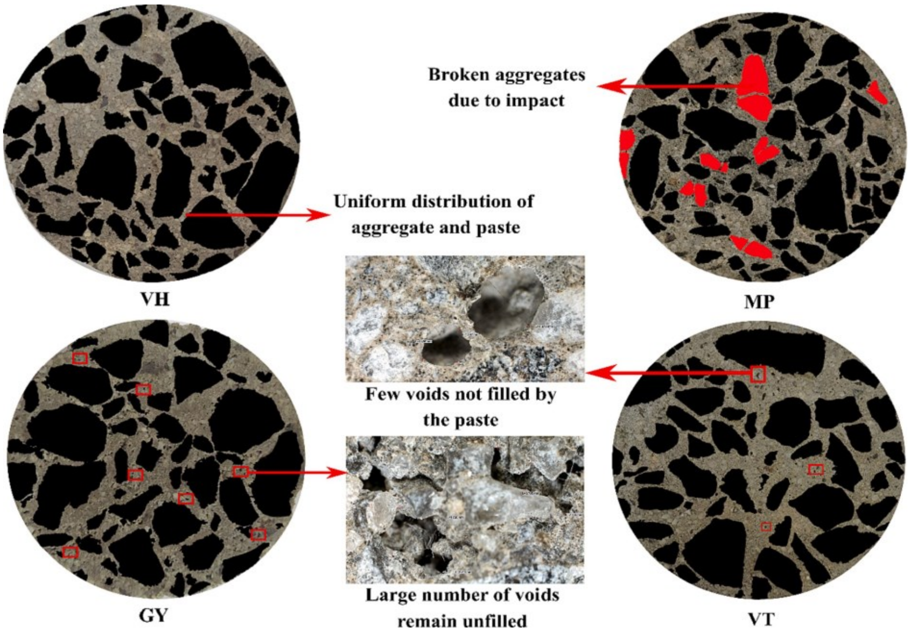

**Figure 5.** The internal structure of the laboratory-compacted specimens **(Selvam and Singh, 2023)**

## 5. RCC CURING

Long-term RCC strength and durability depend on curing. Curing the pavement improves its quality by allowing the concrete to attain the desired strength and minimizing the occurrence of scaling, dusting, and reveling on the hardened surface. Applying the curing solution immediately after final compaction in Roller-Compacted Concrete (RCC) prevents premature drying due to insufficient water content and lack of bleed water. The mechanical characteristics of RCC after various manufacturing procedures have been extensively studied. **(Ghafoori and Cai, 1998)** found that RCC's compressive, flexural, and cracking tensile strengths improved 22% after 180 days in lime-saturated water. Our improvement was compared to the findings after 28 days of water immersion to solidify the material. A separate research examined RCC age and pressure resistance. This was done by sprinkling, wetting burlap, coating with nylon, soaking, chemical drying, and curing. The findings show that specimens without permanent curing lose 20–25% of their strength after 28 days, but specimens with continuous curing keep their strength. **(Ahmed and Gata, 2015).** The higher percentage can be attributed to the significantly reduced amount of mixing water, leading to a rapid decrease in the cement's heat of hydration due to internal self-desiccation **(Anderson et al., 1987).** Furthermore, results indicate that there is no notable difference in the compressive strength values among all curing methods even after a period of 3 days. Samples subjected to continuous watering during the curing process exhibit a clear and significant improvement in compressive strength after 28 days. However, samples cured using alternative methods display a distinct variation in compressive strength. When comparing RCC samples that were cured for 180 days with those that were not, it was observed that the compressive strength of the cured samples was higher. The increases in compressive strength were as follows: 56.2% for wet burlap, 55.3% for continuous watering, 33.3% for sprinkling, 58% for nylon, and 43.2% for curing compound and curing cycles. The observed behavior is most likely a result of the ongoing process of hydration, which is made possible by the continuous supply of water. As shown in **Table 4 (Ahmed and Gata, 2015).**

**Table 4.** Compressive strength of RCC-cured using different techniques after 24 hours of casting **(Ahmed and Gata, 2015)**.

| **Curing Method** | **Compressive Strength (MPa)** | | | | |
|---|---|---|---|---|---|
| | **3 days** | **7 days** | **28 days** | **90 days** | **180 days** |
| **Curing Compound** | 8.3 | 12.54 | 15 | 19 | 21.31 |
| **Nylon** | 8.5 | 12.48 | 15.03 | 19.27 | 21.5 |
| **Curing Cycles** | 8.28 | 12.3 | 14.8 | 18.54 | 20.74 |
| **Continuous Watering** | 8.1 | 12.7 | 17.7 | 19.24 | 23.36 |
| **Sprinkling** | 7 | 10.61 | 15 | 18.06 | 20 |
| **Wet Burlap** | 8.2 | 13.71 | 16.78 | 19.5 | 23.4 |
| **Without Curing** | 7.3 | 11.52 | 14.35 | 14.9 | 15.03 |

### 5.1 Most Curing Methods Used on Field

#### 5.1.1 Fogging and Sprinkling and

The low water-to-cement ratio is the defining characteristic of RCC. It has been employed in the construction of dams and in the paving of log-sorting yards and shipping facilities. The design and curing process of RCCP closely resemble that of traditional PCC, as **(Abrams et al.,1986).** Utilizing fogging and water spraying is highly effective for curing when the temperature is well above freezing and the humidity is low. In order to reduce the rate of surface evaporation, workers in the field of flatwork often utilize a system of nozzles or sprayers to disperse a fine mist, which effectively increases the relative humidity of the air above the surface **(Shaikh et al., 2017).** Moisture curing of RCC typically necessitates frequent water applications for a minimum duration of seven days. Therefore, it is not economically efficient. When employing moisture curing, to maintain a consistently moist surface during the curing process, various methods can be used, such as wet burlap, irrigation sprinkler system or a water truck equipped with a spray bar, as shown in **Fig.6.** Water spray vehicles may occasionally fail to rapidly spray water in order to prevent surface drying, depending on the surrounding conditions **(Dale et al., 2010).**

**Figure 6.** Moisture curing using sprinklers and fog spraying **(Dale et al., 2010)**.

### 5.1.2. Liquid Membrane-Forming Compounds

Once the concrete has been applied, it is crucial to promptly protect any exposed surfaces by applying a liquid that forms a protective layer, utilizing a tarpaulin, or employing a plastic sheet that inhibits the release of vapor. The completion of this task is required within a specified time period of 30 to 60 minutes **(Erdélyi et al., 1978)**. Rapid application of the curing material immediately following the final compaction is imperative for ensuring the appropriate curing of RCC. This is because RCC usually has very little or no bleed water and a relatively low moisture content. Applying a curing membrane is crucial to prevent evaporation and efficiently seal the surface. The amount of curing compound applied maybe 1.5–2 times higher than that used for traditional concrete. Ensuring a uniform and complete application of a membrane across the entire RCCP surface, without any gaps or voids, is crucial. **Fig. 7** depicts the usage of a white concrete curing compound **(Dale et al., 2010)**.

**Figure 7.** Application of curing compound **(Dale et al., 2010)**

## 6. CONCLUSIONS

This review investigates the effect of production and curing methods on the properties of RCC. The following conclusions may be reached based on the preceding:

- The comparison between field and laboratory results revealed that the laboratory methods are inadequate in accurately replicating the compaction properties observed in the field. For example, VH specimens yielded a more favorable evaluation. In contrast, the hardened properties observed in the field were estimated less favorably by GY specimens. Although the MP and VT compacted specimens had a structural arrangement that was similar to that of the field, they exhibited significant differences in terms of porosity and strength, respectively. Regarding the sole comparison of compressive strength and fresh density, MP exhibits a higher degree of similarity to the values observed in the field.
- The laboratory and field compaction studies indicate that the VH method may lead to a greater level of density in packaging, which could potentially cause an overestimation of field performance. In contrast, the VT and MP procedures were able to demonstrate an interparticle spacing that was similar to that of the FS specimens. Several researchers have recommended using the gyratory compaction technique to accurately represent field compaction in laboratory conditions, considering the underlying principles of field compaction.
- The distance between particles in VT specimens was comparable to that of FS specimens, but the VT specimens exhibited a lower level of strength in comparison to FS. In order to optimize this, one possibility is to increase the surcharge pressure or incorporate an additional pair of layers, thereby raising the total count from three to five. On the other hand, the VH approach enables the reduction of the layer count from four to three or two in order to prevent excessive compaction. In order to avoid breaking the aggregate, one option is to expand the contact area of the MP hammer. Alternatively, the number of blows for each layer might be reassessed according to the uniform energy concept, ensuring that consistent compaction energy is maintained at all depths of the specimen.
- The results of RCC curing indicate that continuous curing yields better results than samples that are not permanently cured, and the improvement in results does not appear at early ages. It is also recommended to use curing methods such as curing compounds, nylon, and wet burlap, which have demonstrated their effectiveness in increasing the compressive strength of RCC.

## NOMENCLATURE

| Symbol | Description |
|---|---|
| f'c | Compressive strength |
| fr | flexural strength |
| ɣ | Density |

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## Credit Authorship Contribution Statement

Hussien Raheem Hassoun: Analysis and writing of original manuscript.
Zena K. Abbas: Conceptualization, Methodology, and Supervising.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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# تأثير طرق الانتاج والمعالجة على خواص الخرسانة المرصوصة بالحدل : مراجعة

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## الخلاصة

تُظهر الخرسانة المضغوطة بالأسطوانة العديد من خصائص كل من الأرصفة الإسفلتية والصلبة. لكن استخدامها مقيد. أدت العديد من الأسباب إلى هذا القرار، بما في ذلك حقيقة أن الخرسانة المضغوطة بالأسطوانة عبارة عن مزيج خرساني جاف يحتاج إلى أن يكون قاسيًا بدرجة كافية لدمج الضاغط الأسطواني ولكنه رطب بدرجة كافية للتوزيع الموحد. يعد اختلاف الأداء في مجال المختبر لـ هذه الخرسانة سببًا آخر لتقليل استخدامه. يتم مزج مخاليط الخرسانة المضغوطة بالأسطوانة المختبرية باستخدام طريقة بروكتور المعدلة. بعد ذلك، يتم تصنيع العينات باستخدام مطرقة اهتزازية لتوصيف القوة. ومع ذلك، في الحقل، يتم إنشاء الرصف باستخدام بكرات ثابتة، وهوائية، واهتزازية. بعد ذلك يتم تحقيق تحكم في الجودة من خلال استخراج عينات من الرصيف الحقلي ومقارنتها بالعينات المختبرية. تستخدم كل هذه الإجراءات آليات وطاقات مختلفة، مما يتسبب في اختلاف السلوك الميداني والمعملي. في هذا البحث، سنناقش بعض الدراسات حول سلوك الخرسانة المضغوطة بالأسطوانة في ظل الظروف الحقلية والمختبرية باستخدام طرق تصميم مختلفة، مثل الطاولة الاهتزازية ، والطاولة الاهتزازية، والضاغط الدوراني ، والبروكتر المعدل . أظهرت هذه الدراسات اختلافًا في الخواص الميكانيكية والبينية بين طرق الضغط المختبرية مقارنة بالحقل. على سبيل المثال، أدت عينات المطرقة الاهتزازية إلى تقييم أعلى، في حين أنتجت عينات الضاغط الدوراني تقديرًا أقل تفضيلاً للخصائص المتصلبة الملاحظة في الحقل. في حين أن العينات المضغوطة البروكتر المعدل والطاولة الاهتزازية كان لها ترتيب هيكلي مماثل للميدان، فقد أظهرت اختلافات ملحوظة من حيث المسامية والقوة، على التوالي. وكشفت دراسات أخرى جوهر مرحلة المعالجة من حيث الخواص الميكانيكية للخرسانة المضغوطة بالأسطوانة وأشارت إلى أن بعض عمليات المعالجة، مثل المعالجة المركبة، قد تعمل على تحسين أداء هذه الخرسانة.

**الكلمات المفتاحية :** طاولة الاهتزاز ، الخرسانة المضغوطة بالاسطوانة ، بروكتور المعدل ، الضاغطة الدورانية ، المطرقة الاهتزازية