1. عنوان البحث:

باللغة العربية: السلوك العملي والنظري لكمرات مسلحة من الخرسانة التفاعلية المنشطة الاقتصادية

 باللغة الانجليزية: Experimental and Analytical Behavior of Economically Reactive Powder Reinforced Concrete Beams

المشاركين في البحث: د. ناجح نصير مليكه – د. علاء علي بشندى – م. محمد عبد السلام عرب

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ABSTRACT

A study for the load deflection behavior of reinforced beams cast using reactive powder concrete RPC–as an ultra high strength concrete type- was executed experimentally and analytically. The experimental program was carried out to study the effect of cement content, using steel fiber and using two types of reinforcement. Results show positive effect on cracking and ultimate loads of reactive concrete beams due to increasing of the cement content. The ductility of the reactive concrete beams is increased by using steel fibers. An analytical study was performed using a nonlinear computer program based on finite element technique. A comparison between analytical and experimental results was carried out to evaluate the efficiency and the accuracy of the used nonlinear computer program. The computer program results were practically close enough to the experimental results. The numerical analysis with the chosen finite element technique presented a good simulation to the RPC beams.

Keywords: Reactive Powder Concrete; Ultra High Strength Concrete; Cement Content; Steel Fibres; Reinforcement type; Nonlinear Computer Program; Beam

الملخص العربي

يتضمن هذا البحث دراسة عملية ونظرية باستخدام طريقة العوامل المحددة لدراسة مدى جدى وسلوك كمرات خرسانية مسلحة من الخرسانة التفاعلية المنشطة باستخدام مواد متاحة محليا في شمال سيناء. تم الصب باستخدام نسب مختلفة من محتوى الاسمنت والسيليكاغيم ووجود اليساف صلب من علامة. تم الدراسة من خلال تقييم تأثير تلك المتغيرات على سلوك الكمرات في القص والانحناء وكذلك حمل التشريخ الابتدائي وحمل الانهيار.
ABSTRACT

This study aims to evaluate the feasibility of using locally available demolition materials resulting from concrete constructions as coarse aggregates for concrete. The study examined several types of locally available demolition outputs such as crushed ceramics, crushed concrete tiles and crushed red bricks. Different values of cement content (300, 350, 400, 450 kg/m$^3$), as well as different ratios of water to cement ratios w/c were used (0.3, 0.35, 0.4, 0.45, 0.5, 0.55, 0.6). Four groups of samples were conducted based on cement content. Results are given in terms of compressive strength, tensile strength, flexural strength and bond strength. The results indicated that the residues of buildings may use as concrete aggregates but only if it is graded and free from impurities. It may be used in case of casting construction concrete subjected to medium loads. They are characterized according to their endurance and resistance to abrasion.

Keywords: Waste products; Demolition; Recycling; Concrete; Coarse aggregate.
ABSTRACT

Reinforced concrete jacketing is one of the widely used repairing techniques for beams and columns. The aim of this research is to evaluate the efficiency of using concrete jacket using different reinforcing and thicknesses. The behavior of repaired reinforced concrete defected beams is investigated under flexural effect. The tested beams are preloaded up to 70 and 90% of their ultimate capacity then, repaired using concrete jackets. The main variables are thickness of concrete jacket (3, 5 cm), diameter of reinforcing steel bars (8, 10 mm) and concrete jacket type. The experimental results showed that, repairing using concrete jackets enhances the load capacity up to 378%. Increasing jacket thickness enhances the structural performance of tested beams but increases its weight. It also increases stiffness compared to control beam and the repaired concrete beams indicated a brittle manner compared to the ductile failure of the control beams.

Keywords: Rehabilitation; Beam; Jacketing; Concrete, reinforced; Deterioration; Ductility.
ABSTRACT

Efficiency of strengthening reinforced concrete beams using plain concrete layer, reinforced concrete layer and steel plates are investigated in this research. Experiments on strengthening beam samples of dimensions 100x150x1100mm are performed. Samples are divided into three groups. Group "A" is strengthened using 2cm thickness concrete layer only (two types). Group "B" is strengthened using 2cm thickness concrete layer reinforced with meshes (steel and plastic). Group "C" is strengthened using steel plates. The initial cracking load, ultimate load and crack pattern of tested beams are illustrated. The experimental results showed that for group A and B, the ultimate strength, stiffness, ductility, and failure mode of RC beams, with the same thickness strengthening layer applied, were affected by the mesh type and type of concrete layer. While for group C, these parameters affected by the fixation technique and adhesion type.

**Keywords:** strengthening; Reinforcing mesh; Steel plate; Reinforced; Concrete; Beam.

المملص العربية

في هذا البحث تم دراسة كفاءة تقوية كمرات خرسانية مسلحة باستخدام طبقة مستدرة في منطقة الانحناء. تمثلت تلك الطبقة في استخدام طبقة من الخرسانة العامة، طبقة من الخرسانة المسلحة بشبك البلاستيك أو شبك الصلب وآخرين. تم تقوية العينات شرائح الصلب. يتم إجراء التجارب على عينات كمرات خرسانية مسلحة بأبعاد 1100x150x1000 مم. تم تقسيم العينات إلى ثلاث مجموعات. مجموعة "A" مدفعة باستخدام طبقة من الخرسانة العامة بسمك 2 سم فقط. المجموعة "B" تم تدكيمها باستخدام طبقة من الخرسانة بسمك 2 سم مدعمة بتسليك شبك من الصلب أو البلاستيك. المجموعة "C" تم تقويتها باستخدام شرائح الصلب. تم توضيح نتائج الدراسة من خلال دراسة قيم الترخيم وكذلك حمل التشريخ الابتدائي وحمل الانهياب وشكل الشروخ.

أن تأثر النتائج المعمولية للمجموعة "A" و "B" أن نتائج مقاومة الضغط والصبارية تتأثر بنوع الشبك ونوعية طبقة الخرسانة. بالنسبة للمجموعة "C" تتأثر بكيفية التثبيت ونوعية مادة التثبيت.
ABSTRACT

As the using of reinforced concrete shells structures with opening have many advantages that they permit to cover large area without using intermediate supports. They have light weights and require minimum amounts of material that it is required small thicknesses comparing to their spans. This investigation is carried out to study the efficiency of repair and strengthening of elliptical paraboloid reinforced concrete shells, which loaded by four concentrated loads at the center of the opening. An experimental program of several different techniques in repair and strengthening is executed. The materials, which are considered for strengthening, are; Glass fiber reinforced polymers GFRP at different position of the shell bottom surface, steel strip and external tie. The initial and failure loads as well as the crack propagation for the tested shells at different loading stages, deflections and failure load for repaired and shells are recorded. A non-linear computer program based on finite element techniques is used to study the behavior of these types of shells. Geometric and materials nonlinearities are considered in the analysis. The efficiency and accuracy of computer program are verified by comparing the program results with those obtained experimentally for the control shell with opening and strengthened shells.

Keywords: Shell; opening; repair; strengthening; GFRP-wrap; reinforced; concrete.
ABSTRACT

In this investigation, the effects of elevated temperatures of 200, 300, 500°C for 2 and 4 hours on the main mechanical properties of economical type of reactive powder concrete (RPC) are studied. The main variables in this study are cement content and steel fibres content in reactive powder concrete samples as well as elevated temperature and heating time. Compressive strength and tensile strength of RPC are obtained after exposure to elevated temperatures. It is found that, RPC can be use at elevated temperature up to 300°C for heating times up to 4 hours taking into consideration the loss of strength. Also, using steel fibers enhances the residual strength of high cement content RPC samples. 

Keywords: Reactive Powder Concrete; Elevated; Temperature; Strength.
ABSTRACT

This research aims to investigate and evaluate an ultra high strength concrete (UHSC) cast using economical materials. Reactive powder concrete (RPC), as a one of UHSC types were studied. Its mechanical properties were investigated and evaluated by studying the effects of using different cement and silica fume contents and new steel fibers’ aspect ratios as reinforcement for this concrete. A compressive strength of about 154MPa, indirect tensile strength of 12MPa, modulus of elasticity of 45GPa and flexural strength of 30MPa have been achieved for reinforced RPC contains 800 kg/m³ cement content and silica fume content 30% of cement weight. The test results showed adequate improvements by increasing cement and silica fume contents as well as adding steel fibers on the compressive strength, modulus of elasticity and indirect tensile strength. It showed also a great positive effect on the flexural strength.

Keywords: Reactive Powder Concrete; Mechanical Properties; Cement Content; Silica Fume Content; Steel Fibers.
ABSTRACT

Fine to coarse aggregate ratio (FA/CA ratio) considered as one of the effective factors affecting the mechanical properties of concrete. This research aims to study the effect of changing fine to coarse aggregate ratios under the effect of different curing temperatures on the behavior and strength of concrete. The experimental program consists of 405 samples of 5 different concrete mixes using FA/CA ratios of \(0, 0.5, 1, 2, \) and \(3\) as \(C1, C2, C3, C4, \) and \(C5\) respectively. The effect of water curing temperature at \(25^\circ C, 50^\circ C \) and \(75^\circ C\) was considered. The study is performed depending on the results obtained from compression test, indirect tensile test at 3, 7 and 28 days. The test results shows that, the compressive strength, indirect tensile strength and the modulus of elasticity were increased for the sample \(C3\) of the fine to coarse aggregate FA/CA ratio and water curing temperature of \(50^\circ C\).

**Keywords:** Aggregate, Concrete, Temperature.
ABSTRACT

The steel fibers play a great role to improving the tensile and flexural behavior of most different concretes. A new type of steel fiber was used in this study to investigate and evaluate the effect of it on the mechanical properties of ultra high strength concrete. Specimen preparation, curing regimes were reviewed. The testing procedures to evaluate the compressive strength, modulus of elasticity, indirect tensile strength and the flexural strength of the prepared specimens were discussed. A compressive strength of 1583 Kg/cm² was reached for this new type of steel fibers reinforced ultra high strength concrete samples. The indicated results of the tested specimens showed that the effect of the used steel fibers type on the compressive strength was about 5% while it has a good effect on modulus of elasticity with about 15% increase with respect to results indicated from the plain ultra high strength concrete. The flexural strength and indirect tensile strength of the reinforced ultra high strength concrete was about twice the value of that of the plain ultra high strength concrete.

Keywords: Ultra High Strength; Mechanical Properties; Steel Fibers Type; Compressive Strength; Indirect tensile Strength; Modulus of Elasticity; Flexural Strength.
ABSTRACT

Delays may occur after the completion of the mixing process for several reasons beyond the existing ability on the site. This study was conducted to determine the feasibility of re-mix concrete (mechanical mixing), after leaving it in the open air. The concrete mixtures were left after completion of mixing process in room temperature (25°C) for different periods of times 0, 15, 30, 45, 60 and 75 minutes then returned the mixing process then, placed in its moulds. Results were compared to those samples cast within the mould immediately after mixing. A number of 144 standard cubes were cast to measure the concrete compressive strengths at 7, 28 days. To improve the properties of concrete after re-mixing different additives were used. The used additives were water or cement mortar or workability additive compared to mixing without any additions to improve the mixing process. The most important results of the study confirm that the compressive strength of the samples increases when the mix left then re-mixed after 15 minutes. The mix could be also re-mixed after leaving in the fresh air for periods of up to 75 minutes. The results also showed that the values of compressive strength were lower than that recorded for control, but it could be used with loss of strength by about 18% of the maximum compressive strength. For re-mixing concrete it was preferred to use cement mortar to provide best results.

Keywords: Concrete; Re-mix; Compressive strength; Workability.

The Feasibility of Re-Mix Concrete

The Feasibility of Re-Mix Concrete

عنوان البحث:
The Feasibility of Protect Rebars against Corrosion Using Locally Available Materials in Egypt

المؤلف:

ABSTRACT

Steel-reinforced concrete is widely used in construction. The corrosion of the steel reinforcing bars (rebars) in concrete limits the service life of concrete structures. Corrosion is one of the main causes for the deterioration of the civil construction and infrastructure. Efficiency of using reinforcing bars coating materials to reduce the effect of water and salt solutions on the steel reinforcement in concrete to extend the life of reinforced concrete structures was investigated in this experimental program. In this study, the concrete used had a compressive strength of 25.5 MPa. Steel rebars were first coated with locally available painting materials in Egypt to investigate the feasibility of protect against environmental effect as chloride attack then, the rebars as well as embedded rebars in concrete were immersed in 5% concentration NaCL solution for 3 months to investigate the corrosion effect by using the bond test before and after chloride attack and rust performing.

Keywords: Protection; Coating; Steel; Rebar; Reinforcement; Corrosion.

المتหลากหลาย العربية

تعتبر الخرسانة المسلحة هي الأكثر استخداما في المجال الإنشائي. قد يظهر الصدأ بأسياخ التسليح مما يؤثر على عمر المشاكل الخرسانة. صدأ التسليح يعد واحداً من الأسباب الرئيسية لتضرر المنشات الخرسانية والبنية التحتية. يهدف هذا البحث إلى تقييم استخدام مواد عزل أسياخ صلب التسليح لتقليص تأثير الماء والإصلاح وتثبيت على تمديد عمر المنشات الخرسانية المسلحة.

في هذه الدراسة تم استخدام خرسانة ذات مقاومة ضغط 25.5 كيلونيوتن. الأسياخ المستخدمة تم دهنها بمادة عزل منحا ملحا في مصر لتقديم جدوى الحل ضد أحد أهم الظروف البيئية المؤثرة وهو التآكل الهيدروكربونيات. تم تقسم الأسياخ إلى ثلاث مجموعات. المجموعة الأولى تم دهنها ثم غمرها لمدة ثلاثة أشهر في محلول 5% كلوريد الصوديوم مع توصيلها بخلية كهربائية للتسريع من عملية التآكل. المجموعة الثانية والثالثة تم زرعهم داخل مكعبات خرسانية لدراسة قوى التماسك حيث تم اختبار إحداها مباشرة والآخر اختبر بعد غمرها لمدة ثلاثة أشهر في محلول كلوريد الصوديوم وتوصيلها بخلية كهربائية للتسريع من عملية تكوين الصدأ. ثم تقييم النتائج من خلال قياس التماسك بين الأسياخ والخرسانة ومن خلال قياس التماسك في الخضراء. وأظهرت النتائج أن استخدام مواد العزل تقلل من معدل تكون الصدأ. استخدام مواد الأسمنت هو الأفضل بالنسبة لقيم التماسك ولكنه الأسوأ في العزل.
ABSTRACT

Different methods and materials are used to increase the strength of structures and to repair building damages. Repair and strengthening materials include cement based materials with and without admixtures, adhesives, grouts, steel and plastic fibers, reinforced plastics, steel plates and rolled sections. The current study involves experimental testing to evaluate different strengthening configurations utilizing both traditional and advanced materials and techniques in order to improve the structural performance of concrete solid slabs. The investigated techniques included the use of externally bonded GFRP strips, ferrocement and added steel and GFRP mesh reinforcement along with a new cover. These techniques were intended to increase the flexural capacity and serviceability performance of the test specimens. The efficiency of the different strengthening techniques was evaluated in terms of measured deflection, cracking and ultimate loads and cracking patterns. All slabs were tested to ultimate under a three-point loading system. The load was applied by means of a hydraulic jack supported by a rigid steel frame. It was found that ferrocement was the most efficient to increase the ultimate load capacity, while the use of externally bonded GFRP strips was efficient in arresting the cracking of test slabs throughout the whole loading course.

Keywords: RC slabs; flexure; strengthening; ferrocement; GFRP; solid slabs; fibers.

الملخص العربي

تستخدم العديد من المواد والطرق لزيادة المقاومة الإنشائية لعلاج عيوب المنشات. مواد الإصلاح والتقنية تشمل مواد الأساس الإسمنتية بالإضافة إلى مواد الصلب أو البلاستيك، الياف الزجاجية، الوراوات، الوراوات المرنة، الوراوات المعدنية، الوراوات البلاستيكية، الوراوات الزجاجية، الوراوات البلاستيكية الزجاجية، الوراوات الزجاجية المرنة، الوراوات الزجاجية المعدنية.

يعتبر هذا البحث أداة دراسة عملية لقياس وسائل تقنية مختلفة بالاستخدام مواد تقليدية وأخرى حديثة لتحسين السلوك الإنشائي للبلاطات الخرسانية المسلحة. الطرق المستخدمة هي شرائح البوليمرات المسلحة بالالياف الزجاجية، الوراوات الزجاجية، الوراوات المرنة، الوراوات المعدنية، الوراوات البلاستيكية، الوراوات الزجاجية المرنة، الوراوات الزجاجية المعدنية.

يهدف استخدام تلك الطرق لتحسين مقاومة البلاطات الإنشائية واداء تلك البلاطات. تم الحصول على نتائج الدراسة من خلال نتائج قياس ال理解和 الشروخ. تم اختبار العينات باستخدام طرق التحمل الثلاثي النقطة. تم التأثير بالحمل من خلال استخدام مكبس هيدرويكي وتبث العينات على هوك معدني ماسي.

أظهرت نتائج الدراسة أن الوراوات المرنة قد ساهمت في رفع قيمة الحمل الاهتزاز النهائي بينما استخدام شرائح البوليمرات المسلحة بالالياف الزجاجية قد ساعد على تقليل الشروخ على سطح البلاط الخرسانية.
ABSTRACT

Different methods and materials are used to increase the loading capacity of structural elements and to repair their damages. These materials include cement based materials with and without admixtures, adhesives, grouts, steel in the form of rebars, plates and rolled sections, ferrocement and fiber reinforced polymers. The current study involves experimental testing to evaluate different strengthening configurations utilizing both traditional and advanced materials and techniques in order to improve the structural performance of concrete solid slabs. The test specimens were 1.0m square slabs supported by four simple beams along the edges. The investigated techniques included the use of externally bonded GFRP strips, added steel and GFRP reinforcement with a new concrete cover, and ferrocement. The load was applied by means of a hydraulic jack supported by a rigid steel frame and the slabs were tested to failure under the action of a concentrated load. The initial crack load, the crack propagation at different loading stages, deflections and failure loads were recorded. The efficiency of the different strengthening techniques were evaluated based on the test results in terms of the measured deformations, ultimate loads, and failure modes. The results showed that the structural behavior could be improved in different aspects. While, ferrocement was the most efficient in increasing the ultimate load capacity, the use of externally bonded GFRP strips was better in arresting the cracking of the slabs.

Keywords: RC slabs, strengthening, ferrocement, GFRP
ABSTRACT

As the importance of the fine to coarse aggregate ratio (FA/CA ratio) in the concrete mix due to its great effect on the mechanical properties of concrete, this research is performed to study the effect of changing the FA/CA ratio on the concrete behavior. The effect of the changing fine to coarse aggregate ratio is studied under different curing temperatures in terms of compression and tension strength and modulus of elasticity for the different concrete ages.

This research presents the results of an experimental investigation carried out at the laboratory of testing the materials at the civil engineering department, faculty of engineering, Menoufiya university. The main aim is to study the effect of increasing the ratio of fine aggregate to the ratio of coarse aggregate. The experimental program consists of 405 samples of 5 different concrete mixes using FA/CA ratios of 0/1, 1/2, 1/1, 2/1, 3/1 as C1, C2, C3, C4, C5 respectively. The effect of temperature degree of curing water (25°C, 50°C and 75°C) was considered. The study is performed depended on the results obtained from compression test, indirect tensile test at 3, 7 and 28 days. The test results shows that, the compressive strength, indirect tensile strength and the modulus of elasticity were increased for the sample C3 of the FA/CA ratio of 1/1 and water curing temperature of 50°C.

Keywords: Aggregate, Concrete, Temperature.