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## Abstract

The aim of this research is to study the effect of liquid additives on strength and behavior of R.C beam models .

Cracking and deflection of these beam models has been studied .  
The liquid additives (High-range water reducing/superplasticizer ) in different ratios of cement weight in the range of 0% , 0.4% , 0.8% , 1.2% , 1.6% , 2% have been used .

The compressive strength of concrete was measured at 7 and 28 days of age and modulus of elasticity of concrete , shear modulus , modulus of volume change , Poisson's ratio , deflection and cracking at 28 days . have been calculated .

It became evident from the test results of the compressive strength , modulus of elasticity of concrete , shear modulus , modulus of volume change , Poisson's ratio and deflection for the different beams when the additives were used in reinforced concrete model beams in the ratio of 1.6 % of the cement weight achieved the best results .

It can also be concluded that the cracking behavior (both at first cracking stage and at ultimate load ) is not affected by additives.

## الملخص

إنَّ هدفَ هذا البحث هو دراسة اثر الاضافات السائلة على المقاومة والسلوك في نماذج عارضات خرسانية مسلحة .

استخدمت الاضافات السائلة (إضافات تخفيض ماء خلط الخرسانة بدرجة عالية / السوبر بلاستسيزر ) بالنسب 0.0 % ، 0.4 % ، 0.8 % ، 1.2 % ، 1.6 % ، 2 % من وزن الاسمنت .

وتم قياس مقاومة الضغط في 7 أيام و 28 يوم و تم حساب معايير المرونة للخرسانة و معايير القص ومعايير التمدد الحجمي ونسبة بواسون والانحرافات والتشققات.

وضح من نتائج اختبارات مقاومة الضغط ومعايير المرونة للخرسانة ومعايير القص ومعايير التمدد الحجمي ونسبة بواسون والانحرافات للعارضات المختلفة ان افضل نتيجة تم الحصول عليها عندما استخدمت نسبة الاضافات 1.6 % من وزن الاسمنت .

واتضح من خلال الدراسة أن التشدعات الناتجة (عند حد المرونة وعند التحميل الأقصى) لم تتأثر بالإضافات .

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### List Of Abbreviations (symbols)

Symbol	Abbreviations
$h$	overall depth of the section
$d$	effective depth (depth to the centreline of the steel )
$d'$	inset of the compression steel
$b$	breadth of the section
$L$	effective length span of beam
$x$	depth to the neutral axis
$Z$	lever arm
$v$	shear stress
$v_c$	Ultimate shear stress in concrete
$e$	Eeccentricity
$S_{max}$	maximum likely crack spacing
$f_{cu}$	is the characteristic strength of concrete
$f_y$	is the characteristic strength of steel
$P$	ultimate load
$m$	is the design moment
$m_u$	is the maximum moment capacity of section
$A_s$	area of tension reinforcement
$A_{s'}$	area of steel in compression
$\Phi$	diameter of main steel
$\Phi_{link}$	diameter of links
$K$	bulk modulus
$G$	shear modulus
$E_c$	modulus of elasticity of the concrete
$E_s$	modulus of elasticity of the steel
$\alpha_e$	modular ratio, $E_s/E_c$
$\nu$	Poisson's ratio
$C$	cover of steel
$a$	deflection
$a_{cr}$	distance from surface crack position of zero strain
$\epsilon_c$	strain in the concrete (0.0035)

$\epsilon_s$	strain in the steel
$C_c$	force in the concrete in compression
$C_s$	force in the steel in compression
$T_c$	force in the concrete in tension
$T_s$	force in the steel in tension
$f_{cc}$	stress in the concrete in compression
$f_{sc}$	stress in the compression steel
$f_{st}$	stress in the tension steel
$f_{ct}$	stress in the concrete in tension at the level of the tension steel 1 N/mm <sup>2</sup> for short-term loads; (0.55 N/mm <sup>2</sup> for long-term loads)