

## ACHIEVING THE BEST MIXTURE PLANE FOR SELF COMPACT CONCRETE

**Amir Baniasadi Moghdam<sup>1,\*</sup>, Abdolhamid Bahrpeyma<sup>2</sup> & Mohammad Givehchi<sup>2</sup>**

<sup>1</sup> Department of Civil Engineering, Islamic Azad University of Zahedan, Zahedan, Iran

<sup>2</sup> Assistant Professor of Civil Engineering, University of Sistan & Baluchestan, Zahedan, Iran

### ABSTRACT

Self compact concrete is a genuine product of concrete technology. that is used in Europe ,America, japan for many years and it is usage among engineers is increasing. SCC is a new generation of concrete that doesn't need a vibrator and is compacted by it is own weight we can use this concrete in areas with Big number of bars that concrete cannot be vibrated with a vibrator and so that we could have a concrete with high quality.

Because mixture plane of this type is money and time consuming so it hasn't been became popular in Iran. Our goal is to achieve a good mixture plane of SCC with high compacting resistance by using local materials. In this research we test 210 mixture plane on new concrete. Among these experiments 50 achieved Standards of SCC. We achieved approximate relations and equations among experiments results and also we found the best. Optimum mixture plane by testing compaction experiment on 14,28 days old samples.

**Keywords:** *Self compact concrete, mixture plane, compressive*

### 1. INTRODUCTION

Self compact concrete (SCC) first suggested by prof. okamura[1]. (kuchi university) in 1986 and the first sample was made by prof.ozava [2] (Tokyo university) in 1988.then this type of concrete spread around the world.

In two past decades this type of concrete is usage increased in civil industry [3].

SCC concrete allows using concrete in places with high number of bars that vibrator cannot be used or place is not reachable and concreting is done without compaction and paros would be filled [4].

this type of concrete moves by gravity and does not need internal or external compaction .we can conquer problems that face with them In ordinary concreting in structures by this type of concrete. This specification caused increasing usage of SCC today. But because mixture portions of SCC is a little bit different from ordinary concrete and the best mixture plane is found after concreting so that finding optimum mixture plane is time money consuming doing different experiments on SCC and offering a good mixture plane from compaction resistance point of view are done with local materials that is a good success in civil industry of country.

### 2. INGREDIANTS

Ingredients making SCC should be corresponded with EN260 these material should be appropriate for applications and they should not be composed of harmful material that decrease quality of concrete or oxidize reinforcing bars.

In addition of general conditions, any parts of material should be tested to correspond standards [4].

Cement used was Qaen cement type II that was bought packed from factory rock materials were prepared from a mine in southern khorasan. That are sand, gravel and their size and dimensions pass standards water used is drinking water of birjand that is appropriate to make concrete.

### 3. MIXTURE PLANE

after preparing materials and checking their specifications mixture plane was done by experimental amounts below[5].

- Volume portion of water/powder : 0.8 to 1.1
- Powder materials 160 to 240 liters (400 to 600 kg) per m<sup>3</sup>
- Amount of big size grains 28 to 35 percent of mixture volume water portion to concrete was applied in EN 206 standard
- Generally water amount should not be more than 200 lit/m<sup>3</sup>
- Amount of sticky (cement) materials in mixture should not become more than 40% .
- Sand amount should be less than 50% of cement and more than 50% Particles and more than 40% of mixture volume.

In situations that we don't achieve a good result .below solutions are used

- Using filling materials

- Changing sand-big portions in mixture
- Using a viscose
- If not using a viscose use another supper ,appropriate to materials
- Using another excessive to correct water / cement portion.

Following above conditions we achieved 210 mixture plane in all planes water / cement portion of 0.4 was adopted and amount of cement, aggregate ,rock powder used as filler, Super Plasticizer were changing.

## 6. EXPERIMENTS AND FINDINGS

Before beginning mixture plane, any ingredients of SCC should be tested and results be compared to limits and standards that are available to know weather concrete is SCC or not, we should suppose different experiments for the concrete. We don't have a simple experiment that covers all specifications of SCC. And for each part we have functions. So that any part of SCC should be controlled with more than one test to quality different parameters. Different ways of experiments suggested for testing SCC and standard extends defined for each experiment are in a table.

*Table (1):Different suggested experiments for scc and defined standard limits*

Row	Test type	Unit	Characteristics measured	Measurements of changes	
				MIN	MAX
1	Slump flow	mm	Fill ability	650	800
2	Slump flow T50 cm	Sec	Fill ability	2	5
3	Loop J	Mm	Ability to pass	0	10
4	Funnel V	Sec	Fill ability	6	12
5	Funnel V T50 cm	Sec	Resistance to cut	0	+3
6	Box L	(h2/h1)	Ability to pass	0.8	1
7	Box V	(h2-h1) mm	Ability to pass	0	30
8	Fill Box	%	Ability to pass	90	100
9	Characteristics measured	%	Resistance to cut	0	15
10	Armit	Sec	Fill ability	0	5

Among experiment refered above, slump flow, loopy, funnel V, u box, fill box, were done on samples.Samples were chosen which obeyed minimum ,maximum limits correspond the table. And had necessary specifications of SCC. Between 210 samples,50 of them obeyed specifications of SCC. Relations between these 50 experiments results are represented.

With these 50 Plans, we made cubic samples with (15\*15\*15) dimension and test them in 14,28 days old .all samples were kept in a pool with  $20 \pm 2$  °C temp .these situation were unchanged after qualifying results of 2 compression resistance the best compressive pattern was chosen.

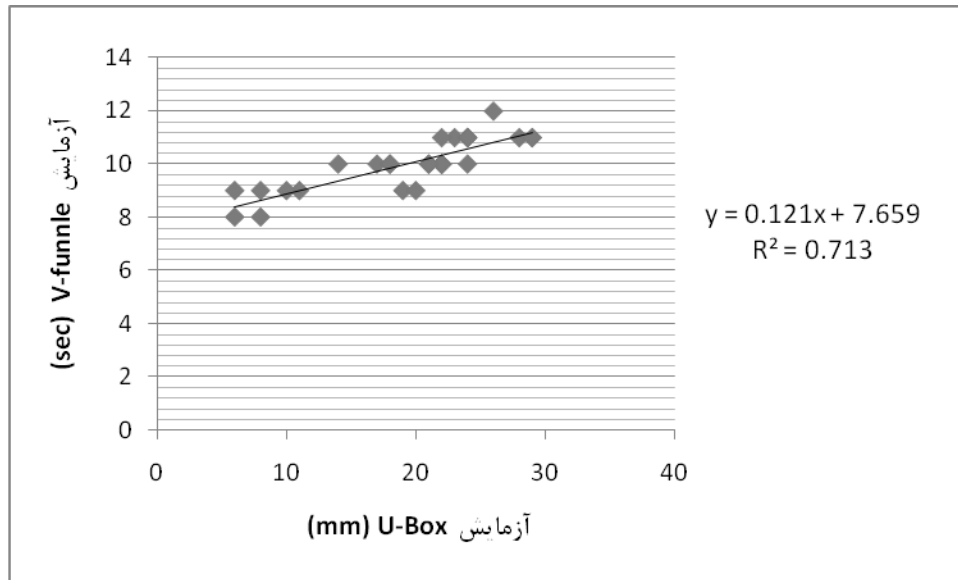


Figure 1. Relation between U-box & V-funnel test

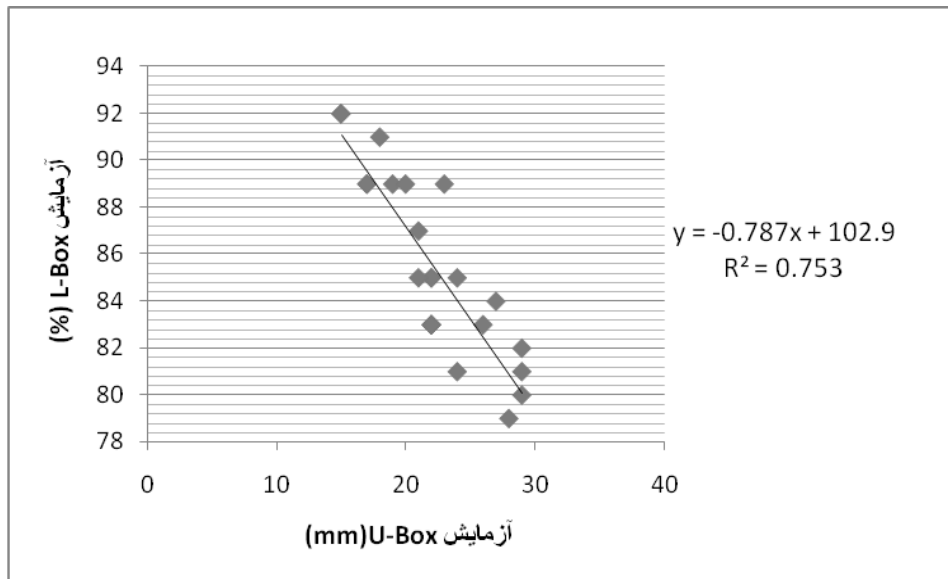


Figure 2. Relation between U-box & L-box test

Table2. Mixture plane chosen for SCC with high compression resistance

W /C	Water(kg)	Cement(kg)	Gravel(6-12mm)	Gravel(12-20mm)	Sand	Filler	Super Plasticizer
0.4	165	412.5	468	312	892.5	100	1.2

Table3.test result on fresh concrete

SLUMP FLOW mm	J- RING mm	V- FUNNEL Sec	FILL BOX %	U- BOX mm
680	5	11	90	17

## 6. CONCLUSION

although SCC has priorities and we have many resources like rock Powder, paddy ashes. We could make a qualified mixture plane, with test results that fills geography this kind of concrete could make a progress in civil technology if we could achieve a proper mixture plane locally in working places and obtain necessary relations for SCC we could remove obstacles that face SCC.

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