



Material Testing Laboratory  
Faculty of Engineering  
Chulalongkorn University

Laboratory Test of FERROCEM 511

SPT-69/56



Laboratory Test

of

FERROCEM 511

For

Ferro Construction Product Company Limited

Material Testing Laboratory

Department of Civil Engineering

Faculty of Engineering

Chulalongkorn University

Tested by:.....

(Assist. Prof. Dr. Withit Pansuk)

.....

(Assoc. Prof. Dr. Tirawat Boonyatee)

On Behalf of Head of Civil Engineering Department



### Test Product

FERROCEM 511

### Mix Proportion

Water-Cement ratio = 0.15

### Test Standards ASTM C 1107-02

Type of Test	Test Standard
Compressive Strength of Hydraulic Cement Mortars	ASTM C 109/C 109C
Bleeding of Concrete	ASTM C 232
Time of Setting of Hydraulic Cement by Vicat Needle	ASTM C 191
Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures	ASTM C 1090
Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear	ASTM C 882
Flow of Hydraulic Cement Mortar	ASTM C 1107



**Type of test:** Compressive Strength of Hydraulic Cement Mortars

**Specimens from:** FERRO CONSTRUCTION PRODUCTS CO., LTD.

**Test product:** FERROCEM 511

**Mix proportion:** W/C = 0.15

**Specimen description:** 50 mm cubes of FERROCEM 511

**Test results:**

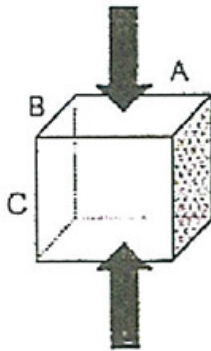
Dimension (mm)			Weight (g)	Date		Age (day)	Maximum Crushing Load (kg)	Maximum Crushing Strength (ksc)
A	B	C		Cast	Tested			
51.30	52.00	52.30	309.7	2/4/56	3/4/56	1	12500.0	468.6
50.60	52.05	52.40	303.0	2/4/56	3/4/56	1	12400.0	470.8
51.90	52.60	51.50	311.6	2/4/56	3/4/56	1	12700.0	465.2
Average							12533.3	468.2

Dimension (mm)			Weight (g)	Date		Age (days)	Maximum Crushing Load (kg)	Maximum Crushing Strength (ksc)
A	B	C		Cast	Tested			
50.40	51.45	51.35	298.0	2/4/56	5/4/56	3	15400.0	583.27
51.35	51.35	52.05	304.1	2/4/56	5/4/56	3	11600.0	410.86
50.60	51.30	51.70	299.5	2/4/56	5/4/56	3	15100.0	548.18
Average							14033.0	514.10

Dimension (mm)			Weight (g)	Date		Age (days)	Maximum Crushing Load (kg)	Maximum Crushing Strength (ksc)
A	B	C		Cast	Tested			
51.10	52.40	51.50	308.5	2/4/56	9/4/56	7	14700.0	549.0
51.70	52.55	51.55	310.7	2/4/56	9/4/56	7	18500.0	680.9
50.75	52.25	51.45	301.9	2/4/56	9/4/56	7	15100.0	569.4
Average							16100.0	599.8



Dimension (mm)			Weight (g)	Date		Age (days)	Maximum Crushing Load (kg)	Maximum Crushing Strength (ksc)	
A	B	C		Cast	Tested				
51.25	52.10	51.25	305.9	2/4/56	30/4/56	28	21200.0	794.0	
51.05	53.95	51.05	311.3	2/4/56	30/4/56	28	24200.0	878.7	
51.15	52.40	51.30	309.0	2/4/56	30/4/56	28	19100.0	712.6	
Average								21500.0	795.1





**Type of test:** Bleeding of Concrete

**Specimens from:** FERRO CONSTRUCTION PRODUCTS CO., LTD.

**Test product:** FERROCEM 511

**Mix proportion:** W/C = 0.15

**Test procedure:** The non-shrink mix was prepared using a mechanical mixer for a mixing time less than 3 minutes, as recommended by the manufacturer. After the completion of mixing and molding the test specimen, draw off the water that has accumulated on the surface by large medicine dropper at 10 minute intervals for the first 40 minutes and at 30 minute intervals thereafter until cessation of bleeding.

**Test results:**

Date	Elapsed Time (hr:min)	Weight of bleeding water (g)	Cumulative bleeding (g)	Bleeding (%)	Remark(s)
2/4/2013	0:00	none	none	0	
	0:10	none	none	0	
	0:20	none	none	0	
	0:30	none	none	0	
	1:00	none	none	0	
	1:30	none	none	0	
	2:00	none	none	0	
	2:30	none	none	0	
	3:00	none	none	0	



**Type of test:** Time of Setting of Hydraulic Cement by Vicat Needle

**Specimens from:** FERRO CONSTRUCTION PRODUCTS CO., LTD.

**Test product:** FERROCEM 511

**Mix proportion:** W/C = 0.15

**Test procedure:** After the completion of mixing, apply the paste to the mold under the Vicat apparatus. The specimens were placed without being disturbed for 30 min after molding. Determine the penetration of the 1-mm needle in 30 sec after being released every 15 min until a penetration of 25 mm or less was obtained. No penetration test was made closer than 1/4" (6.4 mm) from any previous penetration or 3/8" (9.5 mm) from the inside of the mold. The time when a penetration of 25 mm was obtained was an initial setting time. The final setting time was when the needle did not sink visibly into the paste.



**Test results:**

Time of Measurement	Elapsed Time (min)	Penetration (mm)	
		Specimen No.1	Specimen No.2
12:14	0 (Mixing)	40	40
12.44	30	40	40
12.59	45	40	40
13.14	60	40	40
13.29	75	40	40
13.44	90	40	40
13.59	105	40	40
14.14	120	40	40
14.29	135	40	40
14.44	150	40	40
14.59	165	40	40
15.14	180	40	40
15.29	195	40	40
15.44	210	40	40
15.59	225	40	40
16.14	240	40	40
16.29	255	40	40
16.44	270	40	40
16.59	285	29	33
17.14	300	24	24
17.29	315	20	17
17.44	330	14	15
17.59	345	10	10
18.14	360	5	5
18.29	375	0	0
Initial Setting Time (min)		297	298
Average Initial Setting Time (min)		297	
Final Setting Time (min)		375	375
Average Final Setting Time (min)		375	



**Type of test:** Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures

**Specimens from:** FERRO CONSTRUCTION PRODUCTS CO., LTD.

**Test product:** FERROCEM 511

**Mix proportion:** W/C = 0.15

**Test procedure:** The non-shrink mix was prepared using a mechanical mixer for a mixing time less than 3 minutes, as recommended by the manufacturer. After the completion of mixing, introduce the non-shrink into cylindrical of a 50 by 100 mm. A glass plate of 40 mm diameter and 4 mm thickness was placed on top of specimen. An initial measurement was made to the surface of the glass plate using a deformation gage.





**Test results:**

Date	Elapsed Time (hr:min)	Expansion (%)	Shrinkage (%)	Remark(s)
2/7/2556	0:00	0.00	-	
	0:05	0.00	-	
	0:10	0.00	-	
	0:15	0.00	-	
	0:20	0.00	-	
	0:25	0.00	-	
	0:30	0.00	-	
	1.00	0.01	-	
	2.00	0.03	-	
	3.00	0.04	-	
	4.00	0.05	-	
	5.00	0.05	-	
	6.00	0.06	-	
	7.00	0.06	-	
	8.00	0.06	-	
	9.00	0.06	-	
	3/7/2556	22.00	0.06	
23.00		0.06	-	
24.00		0.06	-	
5/7/2556	72.00	0.09	-	Maximum expansion
16/7/2556	336.00	-	0.06	
30/7/2556	672.00	-	0.06	End of test



**Type of test:** Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear

**Specimens from:** FERRO CONSTRUCTION PRODUCTS CO., LTD.

**Test product:** FERROCEM 511

**Mix proportion:** W/C = 0.15

**Test procedure:** The non-shrink mix was prepared using a mechanical mixer for a mixing time less than 3 minutes, as recommended by the manufacturer. After the completion of mixing, apply the paste to the elliptical surface of two pieces of a 100 by 200 mm concrete cylinder cut by angle 30 degrees from vertical and joint them together. The specimens were cured until they reached the required test age.

**Test results:**

Specimen No.	Age	Size of Elliptical Surface (cm)	Bond Area (cm <sup>2</sup> )	Maximum Load (kg)	Bond Strength (ksc)	Remark(s)
1	7	10.19×19.97	159.74	15250.0	> 95.5	Failure occurred at concrete cylinder
2	7	10.31×19.48	157.66	18390.0	> 116.6	
3	7	10.22×19.67	157.81	19170.0	> 121.5	
			average	17603.0	> 111.2	



**Type of test:** Flow of Hydraulic Cement Mortar

**Specimens from:** FERRO CONSTRUCTION PRODUCTS CO., LTD.

**Test product:** FERROCEM 511

**Mix proportion:** W/C = 0.15

**Test procedure:** Place the mortar inside conical brass mold and tamp each lift 20 times. Strike the mortar off flush with the top of the mold and remove the mold. After that drop the table 25 times in 15 seconds, and measure the diameter of the mortar.

**Test results:**

Mix No.	D1(cm)	D2(cm)	D3(cm)	D4(cm)	Average (cm)	Flow (%)	Remark(s)
1	25.5	25.5	25.5	25.5	25.5	145	FULL



**This report is issued under the following conditions:**

This report applies to the specimen of the specific product given at the time of its testing. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that Chulalongkorn University approves, recommends or endorses the manufacturer, supplier or user of such product, or that Chulalongkorn University in any way “guarantees” the later performance of the product.

The specimen/s mentioned in this report is/are submitted/supplied/manufactured by the client. Chulalongkorn University therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

No part in this report shall be interpreted to mean that Chulalongkorn University has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that specimen.

This report shall not be reproduced wholly or in parts and no reference shall be made by the client to Chulalongkorn University or to the report or results furnished by Chulalongkorn University in any advertisements or sales promotion.