الخلامة :

# THEORY AND PRACTICEIN BUILDING INDUSTRY

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نم التخطيط لهذا البحث لدراسة وتقبيم بعض العناصر التي تؤثر في جودة الخرسانية ، امتناز عدد ستمائة مكعب خرساني يمثلون مائة عينة ثم اخدهم من عشرين موقع عمل مختلف في محافظة الدفيلية وثم اختبار مقاومتهم للففط في أعمار لا أيام و ٢٨ يوم ، ثم حسباب منوسط مقاومة الففط للخرساسة والاسحراف المعياري ومعامل الاختلاف للعبنات المختلفة كما تسم توقيع بعض العلاقات التي تباعد على تقبيم جودة الخرسانة ، ولقد دلت الدراسة على أن جسبودة الخرسانة تتوقف الى حد كبير على كفاءة العنمر البشري ومقدار فهمه وتطبيقة لامول فيسلسط العودة ، كما أوضف الدراسة الحاجة الى زيادة العناية بفيط جودة الخرسانة على المستسبوي

### ABSTRACT

This research was conducted to investigate and assess some of the factors affecting the quality of concrete. Six hundred concrete cubes out of one hundred samples were taken from twenty different sites at different locations in El-Dakahlia governmente. They were tested in compression. Average compression strength values, the standard deviation and the coefficient of variation were computed and correlations were made.

The study indicated that the human factor is very significant and the quality control in general is deficient and needs to be reviewed.

## INTRODUCTION

In the last few years failures in buildings due to the poor quality of concrete increased with high frequancy in Egypt Fig. (1). This fenomina was investigated by different research workers in different countries (1 - 5). In Egypt extensive research has been started either in the laboratory or in the field (7-9)

The present study was planned to investigate the quality of concrete in the governerate of El-Dakahlia. Six hundard concrete cubes out of one hundred samples were taken from twenty different sites and tested in compression. These samples were provided by the inspectors authorised for quality control in the different construction sites and tested at the Strength of Materials laboratory in El-Mansoura University.

#### EXPERIMENTAL WORK

Compression test was carried out on 600 concrete cubes representing mainly two groups. The first group consisted of fifty two sets each of six cubes taken from the same batch, cured in water and tested at 7 days age. The second group consisted

of forty eight sets of six cubes each tested at 28 days age. Tests were carried out in accordance with the British Standard Specifications 8.S. 1881.

For each set of concrete cubes tested in compression at 7 days age or 28 <sup>-1</sup> days age, the mean strength, the standard deviation and the coefficient of variation were computed and correlations were made.

To evaluate the concrete quality, certain procedure was carried out into the test results of the first group of cubes tested at 7 days age (312 cubes) as well as the second group of cubes tested at 28 days age (288 cubes). For each group the cubes were arranged in desending order according to their strength then devided into sets with equal class interval with a range of 30 Kg/cm². The average strength value of each set was calculated as well as the frequency which is the number of cubes with strength lies within the boundries of each set.

Check sheets, histograms and Ogive comulative curves were plotted from which the mode and the median values were determined.

The standerd deviation for each set of cubes was evaluated according to the A.C.I. classification. An overall veiw was carried out to evaluate the general situation of the cubes tested at 7 days age as well as those tested at 28 dyas age.

An analytical relationship was determined between the compressive strength of the concrete cubes recived from the different construction sites of El-Dakahlia provence and tested at 7 days age and those tested at 28 days age.

#### ANALYSIS AND DISCUSSIONS

Tables (1 and 2) show the test results of the different sets for concrete cubes tested at 7 days age and for those tested at 28 days age, respectivelly. Generally speaking, it is clear that there is a great difference between the strength of the different cubes within the same set. However, table (1) shows that the average compressive strength of the 312 concrete cubes tested at 7 days age is 215.59 kg/cm², while, the average standard deviation is 54.12. The coeffecient of variation varied between 4.17 and 54.34. Table (2) shows that the average compressive strength of the 288 concrete cubes tested at 28 days age 1s 280.12 kg/cm², while, the average standard deviation is 64.21. The coefficient of variation varied between 6.73 to 30.44. These results indecate that good effort was done by the inspectors which led to concrete of reasonable average strength, however, these inspectors need more training on the quality control and inspection applications.

Tables (3 and 4) show the concrete compressive strength of the cubes tested at 7 days age and those tested at 28 days age respectively as arranged in desending order. Tables (5a and 5b) show the classification of concrete strength into sets with definite limits. However, the range of each set and the frequency of test results are also indicated. The check sheets and the histograms shown in Figs. (2 and 3) indicate that the highst frequency (the mode) of the 7 days and the 28 days concrete compressive strength are at 225 kg/cm² and 205 kg/cm², respectively.

Table (6) and Fig. (4) show that the median of the 7 days age test specimens is 217 kg/cm<sup>2</sup>. However, table (7) and Fig. (5) show that the median of the 28 days age test specimens is  $270 \text{ kg/cm}^2$ .

The Egyptian Code of Practice stated that the strength of concrete used in reinforced concrete structures should not be less than 120 kg/cm². However, about 1.0 % of the tested cubes were of strength less than 120 kg/cm² at 28 days age. The Code of Practice stated also that the strength of the hand mixed concrete with 300 kg/m² cement should not be less than 160 kg/cm². However, about 5 % of the tested cubes were of strength less than 160 kg/cm² at 28 days age.

Tables (8 and 9) show the evaluation of the different concrete mixes tested at 7 days and 28 days age respectively with respect to the standard deviation and taking the classification of the A.C.I. Code into consideration.

Table (10) and Fig. (6) show the evaluation of the whole status of the quality of concrete tested at 7 days age, while, table (11) and Fig. (7) show the evaluation of those cubes tested at 28 days age.

A summery of the whole situation as classified according to the A.C.I. Oode is shown in Fig. (8).

The relationship between the 7 days and the 28 days concrete compressive strength is plotted in Fig. (9). Big agreement is found between the expression drived through a computer program for curve fitten ( $f_{\rm C28} = 1.3 f_{\rm C7} - 15.049 \ {\rm kg/cm^2}$ ) and the imperical expression ( $f_{\rm C28} = 1.26 \ f_{\rm C7}$ ).

#### CONCLUSIONS

This research study led to the following conclusions:

- In quality control the human factor is very significant, thus, the inspectors should be given extensive training courses in such field and its application in the laboratory and in the site.
- 2. More care should be taken for the quality control of concrete as a product,
- 3. The expression drived through a computer program for curve fitting of the experimental test results obtained in this research is  $f_{C28} = 1.3 f_{C7}-15.049$ . This expression is in a good agreement with the imperical expression  $f_{C28} = 1.26 f_{C7}$  which relates the concrete compressive strength at the age of 28 days to that at 7 days age.

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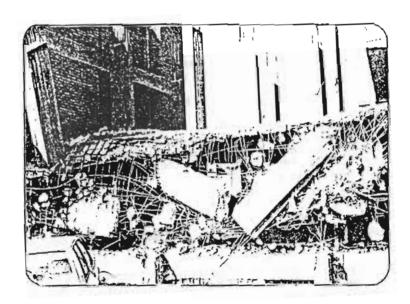


Fig. (1) Building Failure

Table (1)

Table (2)

			* 14		tan / bert			
					E1000		47.51.	10.
P	11.70		180 04	418.04	150.00 115.00	141.14	34.12	34. 17
N. C.	171.00	420 De	44 60	48.49	45.95 113.14	141.62	31.11	24, 24
77 19	133 16	11: 10	114 04	304.94	141 99 113.14	117. 20	26. 77	42. **
	102 64	1.1 54	179.35	111. 14	131 00 1561 PR	382.82	19.25	41.45
11.50	101.44	414- es	141. 00	***	130.00 007.10	170 07	24, 11	4 10
17.34	167.10		444.14	191. PR		717.04	11:11	19. 31
P1.60	117.10	113.00	235 04	117 64	210.04 1171 27	212.74	29.77	42.11
11.09	111.00	311.41	121 34	111.01	(14.04 Tra H	121 11	44.41	76.11
17.14	101 00	221.00	161 14	147.54	11.94 1113 24	141 17	14.21	13.37
77.29	227.00	111.00	111.10	213.11	112 19 1951. 14	221.15	11.51	\$2.45
28. 58	271.14	111.00	351.44	132 29	248. 00 CASE. W	1-1.00	26. 46	11. 60
	217.28	344.24	121.14	111.00	112. PF 1712. DE	110.11	40.73	19.13
Ja.ab	174.00	140.00	121 CT	114.10	375. PP 1051. ve	149 75	11.71	** **
17.00	171.00	130. 89	213.00	111.4	211.00 1377.20	1:4.91	22.14	24. 11
12.94	124.00	732 94	110.57	100.00	214.00 1437.77	1-2.01	34.21	15.12
18.00	782.30	777 78	309.84	210 04	279 29 1274- 44	24 1 22	10.01	11. **
15.36	171.49	157.00	201.00	214 29	239 00 1174. b#	407.19	11.41	11.41
06.04	179.10	217.40	311.04	127.70	311 00 1712. 10	211.00	41.20	11.45
11.40	133.79	171 38	711.10	197.94	237 ME 1517 18	241.11	44.71	20. 41
12.00	222.90	242 29	111.00	131.27	La . 90 12/2 04	324.47	41.41	22.39
77 99	119. 90	128.00	275.99	177. 14	121 00 1177 00	200.31	11.20	39.01
17.79	311.24	111 00	117.00	177 14	140 pe 6111 40	110. **	12.7+	43. 17
17 10	171.49	157 50	110.20	616 s#	781 86 1131 50	400.23	34.14	Da. 21
43.40	701.10	112.78	214 94	410.13	\$20 be \$344. PS	334 43	F7.14	27 11
15.00	\$15.00	\$62.47	212 PF	412.44	\$91 vm 3411 3-4	3+9 24	19.14	\$1.45
32. 46	311.14	134.30	270. 40	313.41	201.69 1421.42	219.07	. 33,40	11.21
77 70	277.10	233 20	207 105	221.19	221 40 1412 00	149.41	74.31	11.11
14.14	271.14	111 10	184 80	311 47	\$10.00 1307 PR	131.47	44.31	11.77
11 26	738.40	111.39	791 00	041.44	150.00 1151.04	240.41		27. 14
39.29	477. TA	171.00	113.00	111.10	11.00 FIL 00	382 44	11. 17	24.45
15. +6	12.00	1:4 44	100 14	30: 10	411.00 400 40	100 11	PG . FF	30. 11
15.49	\$10. PF	378.88	279 14	110.00	113 PG (401.60	£33. * E	11.17	21.47
H.49	120.20	117.10	115 10	122.10	417 bg 476 30	100.13	17.12	24.61
13.30	231.00	\$14.00	213.14	273.00	344.44 1141 79	214 12	15.15	19. 71
17.00	243.20	211.14	312 14	107 44	#13,44 1118 PA	225. 82	11.29	1.11
12. 30	17. 10	19.00	197.04	199.34	49.06 678 40	128. 00	41.14	14.75
7 70	777.40	777 75	179 90	144 10	hts. re 1240. 10	121.41	13. 14	71 71
13.20	130.12	150.50	141 80	107.07	173.00 141.45	141.54	23.24	11.12
17 60	211. 10	173.04	111 20	111 04	111.00 1111.16	384.64	****	25. 14
77.30	211 10	211 32	2ca. 10	124 96	121-10 1212-18	730.11	11.11	*1. 11
11.10	100.20	PPP 30	143 74	111 30	197,60 1145.93	170.61	1.11	. 12
11. 50	143. 10	202.52	274 60	125. 10	244.00 1242.24	But. PI	P1.74	15. 17
PC. DE	140. 40	22 7. 00	111.00	177.44	175. 10 1343.44	330.+4	10.91	17.29
75 10	315 80	148 00	157. 80	113.30	117. 10 1417 04	167.41	12, 21	42. 22
1: 30	141.50	614.90	135 46	172 90	141.99 1744 19	210.75	85.24	19.77
at ted	110.00	111.23	210 64	\$10 60	116 68 1630.60	117.77	12.11	29. 14
11 44	354 00	214. 44	141.00	148 90	154.28 (811.24	***	57 41	12.75
11.74	23 E. 64	1'1 00	174 00	344 00	122.04 4391.24	945.15	21 14	13 13
17 69	343 Det	018 90	141 04	211.00	\$13 PO 1"44.PE	172.00	77 11	10 11
17.80	311-00	1/5. 14	2-7.69	117.00	199. 00 1317. De	179.17	11.75	17.12
76. 10	237, 80	177.	117.14	71). H	(+6,86 4304.18	111'45	13. 15	4,71
						******		

			10		195 11 0011			
						~-	#1. PE	CP .
*2 10	356 Pe	337.00	III. Pe	111.10	111. 10 1341 PE	789. CW	31.77	2 b. w
41.10	754 44	114.00	: ** **	171.59	161. 00 tjet 20	100.07	11.71	10.0
34. 19	70x. 20	314.40	134.44	141,00	111.00 1257.20	254.79		et
41 17	26 28	194.28	130.20	ceb. 14		F#1 58	17.71	21.5
15 18	178 24	117.40	111.00	*11.25	291.40 1021 14	148 34	11 41	11. 1
De 60	203 44	104.54	721.00	210. D	391.M 1100 40	131.42	p. ii	11.2
	346 48	112.24	200.00	117.40	\$10.30   110 mg	233 13	17.11	7. 2
7.12	155 14	111.79	134.20	115.ZB	111. 19 1ust. 00	191 50	\$0.50	10.7
	276 48	111.79	117.20	313.00	131.00 LATE. 40	212. 60	51.11	PR. 11
14	313.04	174 20	177 40	107.00	Fri. 25 7425,44	343.44	87 14	14. 1
	311. 10	201. 18	301.20	111	130.00 1277 00	284.17	24.41	
N5 14	245.48	255.18	174-6P	277.48	319. 19 1313 GA	710.32	34-11	74. 41
71.10	241.40	140.15	110.00	310 60	295, 49 1344, 80	230.48	40.43	P\$ 41
11.11	711.04	270.00	*** 60	+20.50	402 00 1317 12	314.97	47.02	13.11
97. 40	211.40	lbr op	217 00	174.94	1+1 DO 1649 PM	214. 00	11 44	17.73
24	201.10	111 -0	179.44	141.75	147 04 1111 04	343 17	45 27	75 2
75. >8	724.84	217.12	295.35	111.20	\$18.40 1417 43	104 04	11.74	13 11
17.74	141.44	10s.49	314. be	147. 60	187 90 1771 45	111 10	11,11	80.41
24 24	311 99	101, 70	217. 22	151, 10	224 te 1115 46	111.40	1.11	. 41
** **	114.00	477.48	314. 44	753.00	743 00 3378 10	H1	84.75	10.00
73.00	411.14	747.40	231.60	225. 10	100 70 1171.30	171.12	54. FT	\$7. 11
22. 00	311.10	241.00	:24 48	275 PG	248 29 1115.00	111.42	24.45	1.01
22. 10	121.00	275.90	314.29	2:9.00	717 10 1717 50	241. 17	57 PI	
17.00	201.24	711.00	214 00	289.24	311 20 1174 TO	344 40	44 21	11.00
22.00	335.54	ning up	111.70	298. PE	200 44 1737 41	211 11	19-33	14. 11
41.46	111.20	2+1.00	217.00	100 40	211.46 1171 11	215 121	10.11	7 19
FI. H	*24. 73	347.70	113.27	201 50	170 Mg 2112 P3	1.7 11	10.77	11.95
11.24	111.00	200.79	414 30	+0.1.04	104. 20 1111. 14	*** 14	11.15	
41.44	344. **	175.50	747 70	730.00	110.00 2012.00	211.00	0.5	1.13
17.74	123. 44	147.04	971.19	410.00	115 10 231 P. NO	210.14	94.27	
17.90	+12 PG	* 40. PH	*** **	377.44	244 40 7:41 60	214.07	100 41	31 19
1: 14	100 CH	117.00	711 44	177 44	220 00 1131 20	3-1.11		24: 67
21.14	117.70	171,00	\$14.50	25 h. Fr.	120.00 2018 60	317.41	84. 27	Pt 31
94. 11	317.10	404.46	374 00	244.14	151 we 1015 PO	115	28 44	11.00
** **	211.00	110.00	710 11	111.94	101 20 1712 19	110.11	11 39	9.10
67 19	210.44	110 04	314.61	\$79.00	114 BR 4719 45	213.00	11.11	19.19
11 mg	247.00	114 00	1/1 64	124.00	[De. po 1219 pg	220.15	15.11	19.25
17.90	1 F . 040	110.00	\$11.94	117.00	749.00 1303 00	211.10		4. 77
57.50	111 14	111.00	bes. 24	111.14	Jal se   Dar 18	417.74	11.11	19-45
	211 44	342 00	111 04	141 20	100.00 (54) Va		11.44	17. PO
11 00	313.99	140 00	117.00	40.171	133. 10 (12)	250.33	34.00	45.48
** **	417.14	270 DG	1/1.00	161.66	101.00 1345.30	275.49	0 1. 29	P4.74
11.50	203.00	2 N1 od	130.44	111.00	319.00 1511.00		93-93	12.75
17 04	114 04	441 90	120 M	111 44	111.00 1/71.00	244. 45	37. 14	39.49
rs. 10	211 20	:15.19	222.44	171 41		7 * 7. 449	BP. 24	20.33
	118 60	401 20	3.1 14	175.00	\$28. PO \$4751. 24	357.41	33. 45	10.60
74. PH	*19.00	113.00	201.11	114.10	\$14.00 2017.04	345.45	34. 40	35.51
19,20	191.00	310.10	201.11	774.00	342.38 17/6. FO	317.40	81.75	26. 24
					300 Ja 1711 70	259,70	34. 24	11.72
						******		
_			_			200.12	\$4.34	

Table (3)

			_		
	7	days			
1	-	T PAIRTE	IN 05-1140	AMP C-INA	
413.40	257.90	173.33	100.00	214.10	312
210.003	351.20	111.00	112.00	342.40	215
214, 40	345.20	341 10	201.40	236.40	112
221.22	331.20	117.00	170.00	210 00	230
378.00	2:1.40	111.00	170.00	317.00	316
313.10	314.00	T13.00	112.40	314.40	317
310.00	228. 10	701. DO	202. 80	203.40	351
277.10	127.00	177.00	JT3. DO	251.20	245
211.00	283. 80	711.00	213.80	277.60	113
213. 10	291. 40	174 .0	177.40	271.20	777
277.00	277.00	177.00	173.00	271.00	7/1
278.80	270. 60	270. 10	170.40	270.60	110
219.20	788. 40	741.40	144.70	\$44.70	240
20 4. 00	254.00	237,10	137.40	331 40	117
255.10	133. 20	:33.10	171.00	333.00	222
233.00	213.0d	110.40	220.80	250.00	127
249 00	715. 40	214. +0	240.20	200.20	714
142.00	212.00	717 00	2 80. DO	369.001	121
237.70	229.00	237 10	227.40	237.65	723
129.00	773.00	212 20	:33.30	212.20	737
177 79	233. 20	200 20	113.30	271.00	721
221-50	230.00	1:4.20	228. 80	217 27	724
221.10	213. od	771.40	714.40	321 44	7.1
222. 20	727.00	220.00	270.00	370.00	119
270.00	220.00	224.00	170.00	310.00	717
217.10	317.00	211.20	212.20	314.00	117
217.40	213.40	713.10	213.40	211.00	714
311.20	211.00	719.00)	207 99	201.00	101
307.00	204.80	701.00	100.60	794.70	104
202.40	222.40	701. 40	103 20	200.20	200
100.50	100.30	(10.00	118.00	111.00	111
194.00	119. 60	113.10	473.80	195,90	1 **
173.10	113.00	177.14	173.70	(7).30	100
191.40	111.10	131,00	177.00	181.00	150
194.00	181.00	141.10	184.40	(\$1.30	112
123.40	102.40	112-10	100.40	140.40	110
177.20	139.20	177.20	176.00	171-00	174
174.00	1 14. DO	171.00	172.40	117-10	110
177.09	173.80	113.20	107.40	121.50	117
147.20	107. 20	147.10	117.39	111.00	147
147.90	142.40	(41.40	142.30	111.40	1+0
15F. 50	131.40	131.10	154.70	131.00	174
172.00	111.00	131.00	147 40	111.50	112
147.40	143.30	111.40	143.14	111.00	110
149.30	179.60	117.50	(15.20	114.20	111
1122.00	129. 25	137.40	121.10	127.60	1.5
113.10	177.20	122.00	121.90	112.10	110
111.23	114.00	117.70	116.00	115.60	111
414.40	112.90	110.00	197,90	107.19	101
103.12	10.00	PP. 700	11.00	77 10	*1
74.40	F2 20	22.10	44.00	61 00	30
11 00		44.11		** **	4.

Inble (4)

	- 1	12 - days			
612-18		P01411	-		
\$17.30		E23 20	470.10	114.70	142.00
417 00	111.00	419.00	441.10	115.59	4 49 . DO
113 00	111.00	171 20	471.10	174 40	* ) F. DO
113 00	11 F. DO	*117.70	1111.40	111.10	111 00
45.4 50	103,00	101 00	107.00	10+. 80	104.40
*C* . 13	40 1 10	103 00	107.10	105.40	278.00
191.10	771 4.0	171. 40	110.10	117 20	347 10
200.70	313 10	212 20	114.20	171 00	374.00
374.00	374.11	370.00	11 t. Fo	117.44	2 . 7 0
215. CD	143.00	345 69	212.00	193.00	213.00
310. 40	174 70	110 00	141.40	142.50	211 (-0
213. 10	113.10	344 00	145.20	217.00	326.40
>>> FD	313.1D	310 60	330.00	210.00	278,40
277. ED	774. 10	321 40	115.40	373 40	317.40
3:1. 40	170.00	7:0 00	311.00	218.60	214.60
314 40	334.60	312 60	330 70	31.9 40	207. 20
274. 20	307.20	351.40	351 10	100.00	200.10
203.90	287.30	344 50	221.40	217 00	177.00
177. 70	145 DO	174 40	711.60	172 50	177.40
141 10	127.20	3+0 4D	710 00	311 :0	300.70
: 69. 60		191.70	154 60	:01 00	117.00
233.40	213.20	201 60	200 10	330 log	317.00
277. 63	277.30	277.10	271. 10	113 20	171.00
119.00	312 BO	759.40	220.00	110.10	179-10
244. 10	546 WD	260.30	284.10	241.40	311.10
21.00	210.50	120,00	237.40	2:1 10	713,40
21.10	7:7-10	255,00	223 00	7:1 64	711.04
713.00	250.00	349. 60	217.00	241.40	716.00
212 00	211.00	244.70	344 50	241 00	217 00
777 10	127.40	141,00	2 10 00	2 .dp	110.00
20 00	121, 10	129.40	113.40	223 40	333.00
31. 50	110 CD	273.70	123.20	131.30	213.00
24 10	336 40	229-23	\$ 21 . 00	221 00	121 20
111.00	720.00	710.00	24.40	274.40	:10 00
1. 10	117.00		170.00	120. N	149.30
15 40	213.10	217 15	711 00	314.40	313.10
21 22	211.22		21.00	711.00	311 20
00 10	707.00	111.00	100.00	710.00	797.00
PA. 60	701 70	277 00	50% ID	3-14-20	704. 90
-7 10		201 40	204. 40	103 10	103.00
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15 20	171.00	111.00	102.60	117 10	177.80
	117.20	443 45	101 99	184, PO	(17 00
13.00	152.49	114.10	130.00	60 m a	176.00
31.60	179.20	172.20	177.00	147.00	144.76
17.00	111.74	140.00	110.00	127 10	1 24 20
11.70	151.30	130.40	113.00	FRF 40	112 10

Table (5)

FOR Fig. 19

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)	30.40	41	,
,	69-78	23	1 )
,	\$0.120	103	11
•	170-120	177	[ 13
7	130-110	145	117
•	170-110	177	, ,,
•	3 40-3-0	321	,,,
	340-174	233	' '>
16	310-320	713	30
	300.310	319	1 10
- 11	210-760	313	1 17
12	110-100	371	1
	716-470		

6. PRINCHES SAME

HO. 67 1816	Claire & Mile	ANTHACE OF ICE	INTRACT
1	70-100		
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1	30-11A	( (4)	l ni
•	110 119	1/3	l ii
,	110.31>	103	1 17
•	\$10·153	135	
,	\$20.240	1 313	17
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.1	110.112	103	111
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6 19 5	1/9 103	> > >	115
!!	470 120	(1)	10
	430 410	447	
!!	140	423	,
13	110-122	503	1 1

Table (6)

Commetting analysis a Con-

ME.	1.414	Class	40 00 H40 MV 5	PERCHANCE OF
147	i or	111 40/042	MIN COME CO	744 C AIR LIBIT
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13		310	139	11,01
12	,	310	303	22 10
ΙĖ	1	712	110	1 77.11
10	i .	104	219	14.35
	i	210	l i a	19.11
	i	710	123	1 55.76
7	i	140	1	**.11
	•	784	76	10.77
7		130	37	10.17
4	,	114	14	14.25
	,	re .	.,	3.1
,	1	40	,	1.7*
•		te.		0.0

Table (7)

45 CF 1ET	**************************************	THE REPLY CASE	C AIM LINES
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11	4.0	211	11.17
1.1	110	2/2	24.11
17	100	222	\$7.41
"	110	100	17,20
14	J 310	/ iii	11.40
	710	100	63.71
	300	1 60	31.11
	230	} iii	11.03
	7:0	1 %	17 13
,	110	1 55 1	11.11
•	410	} % I	1.7
	110	1 7 1	1.51
	100	1 1	
	/4		

ATTER T-0419

Table (9)

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	70.31	Yesy Board
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j D	65.47	Page .
10	62.09	Pole
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31	13.16	t-ir
39	13.)1	Teor .
19	3.33	Facillest
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21	14-15	/wr
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2)	53.87	7000
24	(4.30	D) IT
23	\$1.16	1
26	27.42	11011244
27	34.18	2007
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- 11	33.17	7etr Ored
46	36.48	2005
tr	\$4.1a	Per
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Table (10)

4

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(metlen)	<b>←</b> →	1	1).46
Topy Seed	7-41-16-3(-4-41-4)	ι	11.36
Greed	) - ( - 1 - j - L] -	10	19.33
Mir	13 - 19 - 46	,	1.78
?oor	1-2-10-11-15-11-20-21- 11-2-2-2-15-21-25- 70-12-2-2-3-3-2 17 - 48	24	11.11

Table (11)

Annipolice	1	1( 2-+1	treedingo
\$240£74#1	\$-\$-\$-\\$-27-21-)7-39	•	16.
Terr Coed	9 - 11 - 27 - 45		
0 seek	1-4-13-17	7	30
Petr	11-1(-2)6-40	,	f.s
Prot	\$-5-10-41-15-15-16-18-40- \$1-25-41-12-30-30-30- \$1-55-41-22-30-42-4-42- 14	74	ы

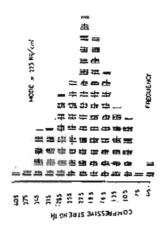


Fig. (3-a) Check Sheet for 7 Days

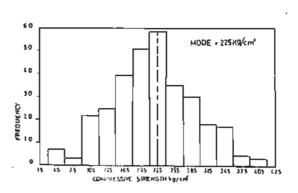


Fig. (2-b) Histogram for 7 Days

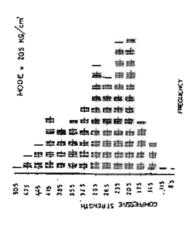
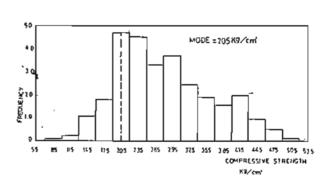


Fig. (3-a) Check Sheet for 28 Days



1

Fig. (3-b) lüstogram for 28 Days

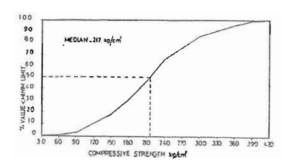
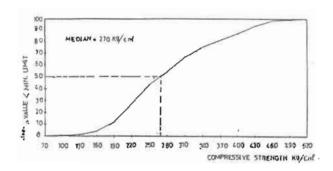


Fig. (4) Ogive Curve for 7 Days



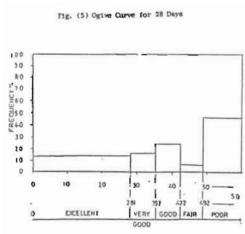


Fig. (6) Mistogree for 7 Days

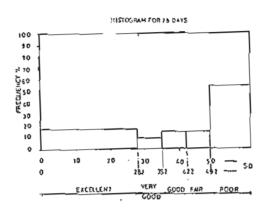


Fig. (?) Ristogram for 28 Days

mg. (8) CLASSIFICATION OF CONCRETE QUALITY ACCORDING TO A C I

