

# BRE: CASE STUDY

**BRE Case Study:** Comparison of ConcTest accelerated test of concrete on compressive strength in relation to EN 12390 crush test results



## Our Objectives

The BRE is a former UK government national laboratory that was privatised in 1997. BRE provides research, advice, training, testing, certification and standards for both public and private sector organisations in the UK and abroad.

The main test programme was to cast three cubes from each of three different classes of concrete mixes and to test for compressive strength at 28 days. The purpose of this project was to compare CST Instrument's fresh concrete strength estimation test (the ConcTest Instrument) to test results obtained from the BS EN 12390-3 standard tests.

BRE cast three 100 mm cubes from concretes made from each of three separate mix designs. The mix designs were a nominal C25, C40 and C50. At the time of casting, slump and wet density tests were also performed.

All cubes were compacted using a vibrating table, followed by 24 hours curing under damp sacking and polythene. They were then demoulded and stored in water (at a nominal 20°C) until the time of test. At 28 days, the cubes

were tested in compression in BRE's 2000 kN Controls Compression Testing Machine. Whilst the concrete was still fresh, the ConcTest Instrument was used to estimate the 28 day concrete compressive strength. The inputs used by the ConcTest Instrument are laid out in the ConcTest user manual, which is available on our website found below.

The instrument requires an "aggregate quality" input. This input, which was selected based on an inspection of the aggregate, was varied from 1.3 to 1.5 as a full assessment of the aggregate had not been undertaken before casting.

**bre**

**The Building Research Establishment (BRE) invited us to carry out tests on freshly mixed concrete with the ConcTest to compare against BS EN 12390 test standards, and to demonstrate the benefit our instrument will provide to the construction industry.**

**Table 1. Concrete Cube Compressive Strength Test Results**

Mix Design Strength Class	Concrete Cube Compressive Test Results (MPa)	Concrete Cube Compressive Strength (MPa)
C25	34.4	34.1
	34.3	
	33.6	
C40	48	46.9
	48.2	
	44.6	
C50	54.6	54.5
	53.1	
	55.8	

**Table 2. ConcTest Instruments Concrete Cube Compressive Strength Estimates**

Mix Design Strength Class	Aggregate Quality Input Value	Concrete Cube Compressive Strength Estimates (MPa)
C25	1.3	32.2
	1.4	34.6
	1.5	37.1
C40	1.3	-
	1.4	39.6
	1.5	42.4
C50	1.3	50.6
	1.4	54.6
	1.5	58.5

### Our Outcome

As tests were performed for different aggregate quality input values, we can compare these different results to the results of the crush test. Comparing Table 1 and 2, we can see that for strength classes C25 and C50, the aggregate quality input value of 1.4 gives us tolerance values of 1.47% and 0.18% respectively, a very satisfactory result.

This was verified in the report provided by BRE, who confirmed: "The concrete cube compressive strength estimates with an aggregate input value of 1.4 appear to correlate well with the concrete cube compressive strength for the C25 and C50 concretes"

### Our Development

Although we experienced very satisfactory results for C25 and C50 strength classes, we identified a unsatisfactory result occurring for our testing process for the C40 class. This was identified to be due to a user error, and not specific to any other variables.

Since the result, we have updated the software on the ConcTest instrument to make the conductivity measuring process more automatic, which reduces the potential for user error. We look forward to publishing the test results from this software update soon.

**Table 3. Collated Results**

Event	ConcreteClass	Rcem	LSlump	q_PlastImpact	T_time	A_Quality	Q_Cem	W_water	R_conc	Rconc. BS EN	Tolerance %
10	C 25	53.63	8	0	28	1.4	347.69	209.39	34.64	34.1	1.583577713
11	C 25	53.63	8	0	28	1.3	347.69	209.39	32.16	34.1	-5.68914956
12	C 25	53.63	8	0	28	1.5	347.69	209.39	37.11	34.1	8.826979472
18	C 50	53	6	0	28	1.3	500	218.38	50.6	54.5	-7.155963303
19	C 50	53	6	0	28	1.4	500.69	218.45	54.57	54.5	0.128440367
20	C 50	53	6	0	28	1.5	500.69	218.45	58.46	54.5	7.266055046
21	C 40	53	7	0	28	1.4	382.09	209.81	39.59	46.9	-15.58635394
22	C 40	53	7	0	28	1.5	382.09	209.81	42.41	46.9	-9.573560768

This case study shows the instrument can be used to define unknown variable input values about aggregates characteristics in the freshly mixed concrete sample.

A\_Quality = 1.4 for C25 & C50 Tolerance % Average: 0.85600904



Once this data has been acquired, it can be used for accelerated testing of concretes which have similar aggregate composition to achieve satisfactory results as above.

For more information on this case study and our instruments [contact us](#) or find more on our website!

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