Data in Brief 6 (2016) 959–964

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Dataset of long-term compressive strength of concrete with manufactured sand

Xinxin Ding [a], Changyong Li [a], Yangyang Xu [b], Fenglan Li [a], Shunbo Zhao [a,*]

[a] School of Civil Engineering and Communication, North China University of Water Resources and Electric Power, No. 36 Beihuan Road, 450045 Zhengzhou, China
[b] School of Transportation Engineering, Huanghe Jiaotong University, Wuzhi Yingbin Road, 454950 Zhengzhou, China

ARTICLE INFO

Article history:
Received 20 January 2016
Received in revised form
26 January 2016
Accepted 28 January 2016
Available online 5 February 2016

Keywords:
Concrete with manufactured sand(MSC)
Long-term compressive strength
Stone powder

ABSTRACT

This paper presents 186 groups compressive strength tests data of concrete with manufactured sand (MSC) in different curing age and 262 groups compressive strength tests data of MSC at 28 days collected from authors' experiments and other researches in China. Further interpretation and discussion were described in this issues.

Specifications table

Subject area	Construction and building materials
More specific subject area	Construction materials
Type of data	Tables, figure, text file
How data was acquired	Tests and collection
Data format	Raw and filtered

DOI of original article: http://dx.doi.org/10.1016/j.conbuildmat.2016.01.028
* Corresponding author.
E-mail address: sbzhao@ncwu.edu.cn (S. Zhao).

http://dx.doi.org/10.1016/j.dib.2016.01.065

Experimental factors	Curing ages of 3–388 days and stone powder contents of 3–13%, as well as water-to-cement ratios of 0.32–0.56 were designed in experiments of long-term compressive strength of MSC. Stone powder contents of 0–20% and water-to-cement ratios of 0.30–0.70 were considered in experiments of compressive strength of MSC at 28 days.
Experimental features	Testing the long-term compressive strengths and compressive strengths at 28 days of MSC with different stone powder content at designed curing age in laboratory situation.
Data source location	Zhengzhou City, China, Latitude 34.7568711° and Longitude 113.663221°.
Data accessibility	Data is within this article.

Value of the data

- Indicating long-term compressive strength of MSC in laboratory situation.
- Illustrating the long-term compressive strength and compressive strength at 28 days of MSC with different stone powders content included.
- Be useful for comparing compressive strength of MSC with that of concrete made by different aggregates.

Data

The long-term compressive strength test data of MSC from authors' experiments and compressive strength test data of MSC at 28 days collected from authors' experiments and other researches in China are presented.

1. Experimental design, materials and methods

1.1. Experimental design

Two experiments have been designed to obtain the long-term compressive strength of MSC [1–3]. The design details of experiments [1] are presented in Table 1. All samples of compressive strength

Table 1
Experimental design details

Trial no.	Cement type	Water-to cement ratio	Stone powder content (%)	Groups	Desinged curing age (days)
D1	P.O.42.5	0.45	5	20	3, 7, 14, 28, 35, 42,
D2			9		56, 70, 84, 98, 118,
D3			13		148, 178,208, 238, 268, 298, 328, 358,388
C1		0.56	5	12	3, 7, 14, 28, 42, 56,
C2			9		84, 118, 178, 238,
C3			13		298, 358
E1		0.40	5	12	3, 7, 14, 28, 42, 56,
E2			9		84, 118, 178, 238,
E3			13		298, 358
A1	P.O.32.5	0.56	3	9	3(4), 7(8), 14, 28,
A2			7		56, 90, 120, 150,
A3			13		180
B1	P.O.42.5	0.32	3	9	3(4), 7(8), 14, 28,
B2			7		56, 90, 120, 150,
B3			13		180

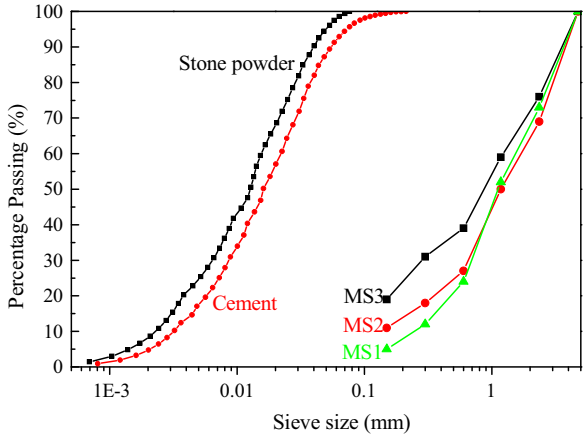

Fig. 1. Particle size distribution of stone powder, cement and manufactured sand.

Table 2
Test data of long-term compressive strength in experiment [1].

Curing age (days)	Compressive strength (MPa)								
	D1	D2	D3	C1	C2	C3	E1	E2	E3
3	38.4	38	38.1	32.5	28.7	28.5	42.7	39.7	34
7	42.2	42.3	41.7	33.5	34.9	34.7	49.4	49.7	43.6
14	44.9	44.8	44.2	39.7	38.9	37	51.9	51.4	43.8
28	54.2	50.9	51.5	41.2	41.3	40.5	52.9	61.7	57.7
35	51.6	52.3	52.6	–	–	–	–	–	–
42	53.7	53.6	54	42	41.8	42.3	64	62.5	60.6
56	54.2	54.3	56	43.8	42.4	45	65	64	61.2
70	55.3	55	56.5	–	–	–	–	–	–
84	56.5	58.3	57	47.4	48.8	48	66.9	64.6	63
98	58	58.8	57.2	–	–	–	–	–	–
118	59.7	63.7	63	48.9	49.3	48.7	67.3	65	64
148	62.4	64.1	65	–	–	–	–	–	–
178	63.1	64.3	66.2	49.7	51.9	49.9	68	69.6	67.8
208	63.6	65.1	67	–	–	–	–	–	–
238	64.4	67.8	68.7	51.1	55.4	54.5	73	71	68
268	65.4	68.3	69.9	–	–	–	–	–	–
298	67.1	70.8	71.2	51.2	56.2	54.8	74.1	77.9	70.6
328	67.6	71.1	71.4	–	–	–	–	–	–
358	67.8	71.5	72	51.6	56.4	55.1	74.6	78.2	73.1
388	68.2	71.9	72.4	–	–	–	–	–	–

were designed as cubes in dimension of 150 mm. One group includes three test samples. Samples of experiment [1] were stored at 20 ± 2 °C water for curing, where samples of experiment [2,3] were left in standard curing box with a temperature of 20 ± 2 °C and humidity of 95–99%.

1.2. Materials

Raw materials of experiment [1] were grade P.O. 42.5 ordinary Portland cement, crushed stone mixed in proportion 2:5:2:1 by the series of 5–10 mm, 10–19 mm, 19–26.5 mm and 26.5–31.5 mm, and manufactured sand with different contents of stone powder, as well as tap water and high-performance

Table 3
Test data of long-term compressive strength in experiment [2,3].

Curing age (days)	Compressive strength (MPa)					
	A1	A2	A3	B1	B2	B3
3	–	20.2	23.5	–	–	–
4	27.2	–	–	48	46.5	42
7	–	29.4	28.5	–	–	–
8	31	–	–	51.6	55.9	48.7
14	35.9	39.2	32	58.3	60	60.3
28	40.7	39.5	37.7	60.4	61.2	61
56	47.2	49.3	50.9	67.8	68.1	63.1
90	52	54.5	55.6	69.6	74.4	73.1
120	56.7	57.4	57.5	77.5	78.5	75.9
150	58.5	58.5	59.6	74.1	75.7	75.7
180	60.3	67.4	64.4	82.1	77.9	80.5

water reducer. Raw materials of experiment [2,3] were grade P.O. 42.5 and P.O.32.5 ordinary Portland cement, crushed stone mixed in proportion 1:1 by the series of 5–10 mm and 10–25 mm, and manufactured sand with different contents of stone powder, as well as tap water and high-performance water reducer.

Manufactured sand and crushed stone used in experiments were both crushed from limestone in area of Jiaozuo city, China. Cements were produced by China Tianrui Group Cement Company Limited, Kaifeng.

Fig. 1 presents the particle size distribution of stone powder, cement and manufactured sand of experiment [1]. Where MS1, MS2 and MS3 represent manufactured sand with stone powder content as 5%, 9% and 13%, respectively.

1.3. Method

Particle size distribution of cement and stone powder was examined by the LS13320 laser diffraction particle size analyzer. Compressive strength of concrete samples was tested on an electro-hydraulic servo universal test machine with maximum load as 2000 kN in accordance with China Standard GB/T 50081-2002 [4] and British Standard BS EN 12390-3-2009 [5].

1.4. Effect of stone powder content on long-term compressive strength.

Tables 2 and 3 gives out the long-term compressive strength test data of MSC with different stone powder contents [1–3].

1.5. Compressive strength of MSC at 28 days collected from experiments [6,7]

Table 4 lists the cubic compressive strength of MSC at 28 days collected from experiments. Where f_{ce} represents the cement compressive strength tested in accordance with Standard ISO 679–1989 [8]. The test data of Table 4 has cubic compressive strength at 28 days ranged from 25.0 MPa to 84.6 MPa with water-to-cement ratio as 0.30–0.70, sand ratio of 30–46%, P.O.32.5, P.O42.5 and P.O.52.5 cements in density of 2871–3134 kg/m^3, coarse aggregate with maximum particle size of 20–31.5 mm, manufactured sand with limestone powder content of 0–20% and fineness modulus of 2.60–3.40.

Table 4
Tests data of cube compressive strength of MSC at 28 days.

f_{ce} (MPa)	Stone powder content (%)	Water-to-cement ratio	Sand ratio (%)	Slump (mm)	Compressive strength at 28 days (MPa)
38.2	5/7/10/13/16	0.47	36	16/28/11/17/12	40.7/44.3/45.9/43.4/44.3
47.7	3/5/7	0.32	30	20/11/13	69.6/71.7/74.7
	10/13/16	0.32	30	35/20/18	69.8/69.8/70.1
	7/7/10/13/16	0.44	32	85/108/75/80/60	57.0/59.6/56.7/57.0/56.2
46.3	5/9/13	0.56	42	135/80/50	42.9/43.8/43.9
	5/9/13	0.45	34	70/160/100	48.7/50.1/56.3
	5/9/13	0.4	32	150/170/175	55.6/60.7/57.2
	5/9/13	0.32	28	50/110/100	70.9/68.1/66.7
52.2	–	0.35/0.40	32/33	–	75.8/67.7
		0.45/0.5	35/37	–	64.2/52.0
		0.55	40	–	41.7
49.3	2.7	0.34	30/32/34	45/63/78	59.5/60.1/61.3
	2.7	0.34	36/38/40	85/90/120	60.4/59.3/57.5
	2.7	0.33/0.34	35	74/82	61.8/60.1
	2.7	0.36/0.37	35	100/113	59.1/59.8
	2.7	0.33	35	76/83/71	62.0/62.5/61.4
	2.7	0.33	35	84/72/86	61.5/61.5/61.8
52.6	0/3/5/7	0.55	42	120/140/150/175	34.6/34.9/35.9/36.4
	10/15/20	0.55	42	180/190/160	37.9/38.2/36.5
	0/3/5	0.32	42	210/220/220	67.1/69.3/68.3
	7/10/15	0.32	42	210/210/205	71.5/74.3/70.6
54.6	5/10/15/20	0.70	41/39/37/35	50/50/45/50	30.0/30.8/30.2/32.6
	5/10/15/20	0.65	40/38/36/34	65/45/40/40	34.5/33.2/34.0/34.7
	5/10/15/20	0.60	39/37/35/33	70/30/70/70	38.0/37.6/38.1/39.7
	5/10/15/20	0.55	38/36/34/32	50/40/50/45	41.7/42.3/43.8/44.1
47.8	5/10/15/20	0.50	40	65/90/65/60	46.7/49.3/45.3/44.8
	5/10/15/20	0.50	40	55/65/50/40	46.9/49.3/51.7/48.2
	5/10/15/20	0.50	40	60/65/45/30	51.6/46.3/46.9/46.5
	0/5/10	0.46	43	80/100/130	43.8/47.2/50.2
	15/10/10	0.46	43	95/120/130	45.2/49.9/46.1
	1.3/5/7/10/15	0.44	41	30/50/40/30/20	46.2/50.4/46.4/47.5/47.3
	10/8.2	0.50/0.46	49/38	195/160	39.5/42.1
	9.1/10.3	0.49/0.52	45/42	175/150	38.9/37.1
56.2	1	0.33/0.32	42	120/155	55.2/60.4
45.8	8.2	0.31	34/36	60/45	68.1/70.1
	8.2	0.32/0.33	36	65/105	68.1/62.4
	8.2	0.33	38	115/105	68.1/64.5
	8.2	0.34	40	90	55.3
63.4	3.5	0.30/0.32/0.34	41/42/43	205/210/215	84.6/84.4/82.8
	7/10.5/14	0.32	42/40/39	195/210/215	81.5/84.3/87.6
52.3	7	0.42	35	35/45/30/50	49.7/47.7/50.8/47.4
49.0	8.2	0.38	38	85	54.7
45.8	8.2	0.32	36	123	59.3
48.6	8.2	0.32	36	87	63.8
49.2	8.2	0.32	36	145	71.2
55.4	5.8	0.39/0.41/0.43	39	200/200/190	57.1/54.3/50.3
	5.8	0.32/0.34	38	195/210	69.0/64.0
	5.8	0.36/0.38	38	230/220	65.6/64.3
	5.8	0.34/0.36/0.36	37/38/38	165/220/190	61.6/67.7/66.7
	5.8	0.35/0.36	39	200/195	65.2/67.7
49.3	5.8	0.32	38	210/220/120	71.0/68.4/66.7
	5.8	0.34	38	210/230/170	65.8/67.7/60.6
	5.8	0.36	38	180/190/195/200	65.8/65.5/68.4/65.5
	5.8	0.37/0.37/0.36	38/38/39	230/185/200	66.1/63.7/66.7
		0.37/0.39/0.37	38	220/205/180	63.4/60.7/64.7

Table 4 (*continued*)

f_{ce} (MPa)	Stone powder content (%)	Water-to-cement ratio	Sand ratio (%)	Slump (mm)	Compressive strength at 28 days (MPa)
47.8	5/5/10/10	0.46	43	125/125/120/130	43.0/40.2/39.2/45.1
44.8	7/10/15/20	0.48	42	170/180/170/120	52.3/54.0/54.4/55.1
	10/15/20	0.5	38	130/125/75	44.8/44.0/44.8
	5/10/15/20	0.55	42	155/180/190/160	35.9/35.9/35.9/35.5
56.8	5/7/10/14	0.32	42	225/220/230/230	74.1/76.3/78.9/77.0
45.3	7	0.70/0.6	37/40	10/10	25.0/32.3
	0/7	0.5	37	15/15	38.6/38.7
	0/7	0.45	39/37	15/20	44.3/43.8
	0/7	0.4	38	20/25	45.5/46.5
	0/7	0.35	37	10/20	51.5/52.9
63.1	3.5/10.5	0.32	42	210/220	83.5/81.9
61.1	10/15/20	0.65	41.5	35/40/40	37.1/38.1/38.5
44.8	10/15	0.4	45	170/175	49.6/48.6
49.6	–	0.6	46/44/46	200/200/200	29.6/29.1/28.6
	–	0.62/0.58	46	180/160	28.2/30.5

Acknowledgments

The study was financially supported by the NCWU Innovation Funds for Doctoral Candidate (201515601), the Science and Technology Innovation Team of Eco-building Material and Structural Engineering in the University of Henan Province, China (13IRTSTHN002), and the Fund of Leading Personnel of Science and Technology of Zhengzhou City, China (096SYJH23105).

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2016.01.065.

References

[1] X.X. Ding, C.Y. Li, Y.Y. Xu, et al., Experimental study on long-term compressive strength of concrete with manufactured sand, Constr Build Mater 108 (2016) 67–73.
[2] F.L. Li, Q. Zhu, Strength development of concrete with proto-machine-made sand, Adv. Mater. Res. 152–153 (2011) 1479–1482. http://dx.doi.org/10.4028/www.scientific.net/AMR.152-153.1479.
[3] F.L. Li, Q. Zhu, Z.F. Ge, Study on strength developing regularity of concrete with proto-machine-made sand, Geotechnical Special Publication, ©ASCE, 219, 2011, 137–143.
[4] GB/T 50081-2002, Standard for test method of mechanical properties on ordinary concrete. Beijing, China. ⟨http://www.standardcn.com⟩.
[5] BS EN 12390-3-2009, Testing hardened concrete-Compressive strength of test specimens, 2009.
[6] S.B. Zhao, X.X. Ding, C.Y. Li, Method of mix proportion design for concrete with machine-made sand, in: Proceedings of the 2011 IEEE International Conference on Transportation and Mechanical & Electrical Engineering TMEE, 16–8, 2011, pp. 2017–2020.
[7] F.L. Li, C.J. Liu, L.Y. Pan, et al., Machine-made sand concrete, China Water Power Press, Beijing, 2014 (in Chinese with English abstract).
[8] prEN ISO 679-2002, Methods of testing cement-Determination of strength (ISO/DIS 679:2002), CEN Europaisches Komitee fur Normung*CEN European.