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Erratum: Visualization and evaluation of concrete damage in-service headworks by X-ray CT and non-destructive inspection methods

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An Erratum on
Visualization and evaluation of concrete damage in-service headworks by X-ray CT and non-destructive inspection methods

by Morozova, N., Shibano, K., Shimamoto, Y., Tayfur, S., Alver, N., and Suzuki, T. (2022). Front. Built Environ. 8:947759. doi: 10.3389/fbuil.2022.947759

Due to a production error, there was a mistake in Tables 3,4,6,7 as published. The table columns were left aligned instead of right aligned. The corrected tables appear below.

Due to a production error, the text of the last paragraph of the **Introduction** on page 3 was duplicated.

The corrected paragraph is as follows:

"In this study, damage evaluation of concrete core samples is investigated by applying NDT parameters. The samples were taken from an in-service reinforced concrete structure, which has been subjected to the influence of aggressive environmental effects. Then, X-ray CT procedure was conducted on the specimens to detect and visualize the crack distributions After scanning, concrete damage was evaluated by the dynamic modulus of elasticity measured by UPV and resonant frequency tests. Results indicate that the decrease in mechanical properties of the concrete could be evaluated by comparing the geometrical properties of cracks with the dynamic modulus of elasticity, because both these parameters are affected by the internal actual cracks, thus, the damage of concrete could be quantitatively evaluated."

The publisher apologizes for these mistakes. The original version of this article has been updated.

TABLE 3 Physical properties of testing concrete samples.

Sample name	Length (mm)	Diameter (mm)	Mass (kg)	Area (mm^2)	Density (g/m^3)	Pulse velocity (m/s)	E_d (GPa)	Wavelength (mm)	Resonant frequency (Hz)	E_D (GPa)
No. 1	161	100.6	2.93	7,953.9	2.28×10^{-6}	1,262	3.9	8.4	8,625	17.6
No. 2	213	100.8	3.85	7,974.9	2.26×10^{-6}	1,719	6.0	11.5	5,567	12.7
No. 3	174	100.7	3.12	7,964.3	2.25×10^{-6}	2,559	13.3	17.1	7,478	15.2
No. 4	169	100.8	3.00	7,985.4	2.22×10^{-6}	1,852	6.9	12.3	7,369	13.8
No. 5	152	100.8	2.79	7,985.4	2.30×10^{-6}	3,730	28.7	24.9	11,249	26.8
No. 6	150	100.8	2.64	7,980.2	2.21×10^{-6}	2,233	9.9	14.9	8,333	13.8
No. 7	174	100.8	3.15	7,985.4	2.26×10^{-6}	1,582	5.1	10.6	6,679	12.2
No. 8	180	100.8	3.22	7,985.4	2.24×10^{-6}	2,035	8.4	13.6	7,261	15.3
No. 9	190	100.8	3.43	7,985.4	2.26×10^{-6}	1,226	3.1	8.2	6,421	13.4
No. 10	153.5	100.8	2.76	7,980.2	2.25×10^{-6}	1,593	5.1	10.6	7,015	10.4
No. 11	156	100.6	2.81	7,951.2	2.27×10^{-6}	2,650	14.3	17.7	9,195	18.7
No. 12	204	100.9	3.66	7,996.0	2.24×10^{-6}	977	1.9	6.5	5,353	10.7
Average	173	100.8	3.11	7,977.3	2.25×10^{-6}	1,951	8.8	13.0	7,545	15.1
Max	213	100.9	3.85	7,996.0	2.30×10^{-6}	3,730	28.7	24.9	11,249	26.8
Min	150	100.6	2.64	7,951.1	2.21×10^{-6}	977	1.9	6.5	5,353	10.4
SD	20	0.1	0.36	13.3	2.33×10^{-6}	730	7.1	4.9	1,564	4.3

TABLE 4 Geometric properties of concrete components.

Sample name	Observation area (mm^2)	Aggregate		Void		Crack	
		Total area of aggregate (mm^2)	Total perimeter of aggregate (mm)	Total area of void (mm^2)	Total perimeter of void (mm)	Total area of crack (mm^2)	Total perimeter of crack (mm)
No. 1	16,196.6	7,867.3	2,659.3	94.1	259.5	219.8	623.7
No. 2	21,470.4	10,799.6	3,052.5	102.0	296.6	287.1	808.0
No. 3	17,521.8	8,123.5	2,999.7	147.3	351.6	137.3	277.0
No. 4	17,035.2	6,809.5	2,930.7	185.4	355.2	328.3	719.5
No. 5	15,321.6	7,961.6	2,668.5	69.4	191.9	49.1	187.5
No. 6	15,120.0	5,398.8	2,079.7	134.2	305.8	270.2	791.8
No. 7	17,539.2	7,895.8	3,007.0	164.0	414.6	407.5	1016.2
No. 8	18,144.0	7,629.2	2,776.3	142.0	365.5	271.3	804.5
No. 9	19,152.0	9,039.9	3,307.8	152.9	377.1	469.6	1513.1
No. 10	15,472.8	6,272.9	2,369.7	134.9	339.0	285.0	923.8
No. 11	15,693.6	7,073.9	2,423.3	114.3	304.9	230.6	707.1
No. 12	20,583.6	8,277.0	3,340.0	197.3	487.4	326.5	1102.8
Average	17,437.6	7,762.4	2,801.2	136.5	337.4	273.5	789.6
Max	21,470.4	10,799.6	3,340.0	197.3	487.4	469.6	1513.1
Min	15,120.0	5,398.8	2,079.7	69.4	191.9	49.1	187.5
SD	2001.4	1,307.8	364.7	35.6	72.0	106.5	336.2

*Data: Average of A and B observation surfaces.

TABLE 6 Correlation between NDT parameters and proportions parameters of concrete components.

Parameter	Aggregate		Void		Crack	
	Total area of aggregate/ Observation area	**Total perimeter of aggregate/ Observation area**	**Total area of void/ Observation area**	**Total perimeter of void/ Observation area**	**Total area of crack/ Observation area**	**Total perimeter of crack/ Observation area**
Pulse velocity (m/s)	0.29	0.08	−0.40	−0.50	−0.72	−0.72
E_d (GPa)	0.38	0.17	−0.46	−0.55	−0.76	−0.72
Resonant frequency (Hz)	0.28	−0.17	−0.42	−0.52	−0.58	−0.55
E_D (GPa)	0.57	−0.29	−0.63	-0.71	−0.72	−0.66

*-*p*-value > 0.05 (The result is not statistically significant).
**-*p*-value < 0.05 (The result is statistically significant).
***- *p*-value < 0.01 (The result is highly statistically significant).

TABLE 7 Correlation between proportions parameters of concrete components and AU parameters.

Parameter	Aggregate		Void		Crack	
	Total area of aggregate/ Observation area	**Total perimeter of aggregate/ Observation area**	**Total area of void/ Observation area**	**Total perimeter of void/ Observation area**	**Total area of crack/ Observation area**	**Total perimeter of crack/ Observation area**
Voltage (V)	0.43	0.24	−0.50	−0.62	−0.77	−0.72
RMS	−0.02	−0.10	−0.21	−0.38	−0.47	−0.41
Energy (V^2)	0.50	0.32	−0.44	−0.65	−0.76	−0.77
Peak FRQ (kHz)	0.11	0.00	−0.10	−0.26	0.28	0.19
Centroid FRQ (kHz)	0.25	0.01	−0.21	−0.33	0.15	0.06

*-*p*-value > 0.05 (The result is not statistically significant).
**-*p*-value < 0.05 (The result is statistically significant).
***- *p*-value < 0.01 (The result is highly statistically significant).