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Discussion

A discussion of the paper "Concrete strength by combined nondestructive methods simply and reliably predicted" by H.Y. Qasrawi☆

E. Arioğlu[a,]*, N. Arioğlu[b], C. Girgin[a]

[a]R&D Department, Yapi Merkezi Companies Group Inc., Haci Resit Pasa Sok, Blok A, No. 7, Camlica, Istanbul, Turkey
[b]Architectural Faculty, Building Material Division, Istanbul Technical University, Taksim, Istanbul, Turkey

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The author is to be commended for his interesting study describing the prediction of concrete strength by means of combined nondestructive testing in detail. The discussers would like to make the following additional comment.

• The various regression models relating the compressive strength of concrete and rebound number, pulse velocity obtained from combined nondestructive testing were derived (Table 1). In order to assess the fit of the various proposed empirical models, the derivation from experimental results was also compiled in Table 1. Untreated experimental data were obtained from Ref. [1]. It is evident from Table 1, when nonlinearity of rebound number R and pulse velocity V vs. compressive strength f_c in terms of (R^3V^4) was taken into account, the magnitude of the derivation Δ was reduced considerably. In brief, the utilization of regression model, i.e, $f_c = f(R^3V^4)$ (Fig. 1) was more confident and closer results to the experimental results were obtained. In

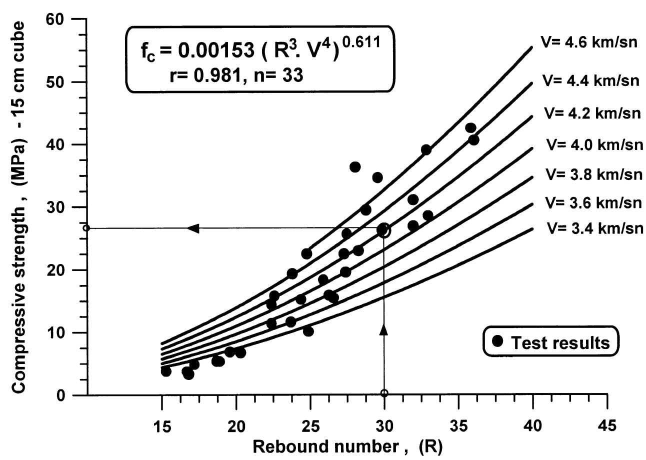

Fig. 1. Nomogram for the estimation of the compressive strength of the concrete by means of the combined methods.

Table 1
Several regression models suggested by different investigators for prediction of compressive strength of concrete

Investigators	Regression model	A	B	C	r	Δ+	Δ−
Wiebenga [6]	$\log f_c = A + BR + CV$	0.132	0.0279	0.342	0.979	11.8	− 15.0
Bellander [7]	$f_c = A + BR^3 + CV$	− 25.568	0.000635	8.397	0.956	18.4	− 14.1
Meynink and Samarin [8]	$f_c = A + BR + CV^4$	− 24.668	1.427	0.0294	0.948	20.9	− 18.7
Tanigawa et al. [9], Ramyar and Kol [10]	$f_c = A + BR + CV$	− 39.570	1.532	5.061	0.942	28.2	− 17.6
Yapi Merkezi [3,4]	$\log f_c = A\sqrt{\log(R^3V^4)} + B$	3.077	− 6.680	–	0.980	11.5	− 13.0
Arioğlu and Köylüoğlu [2], Tanigawa et al. [9]	$f_c = AR^BV^C$	0.016	1.786	2.524	0.981	11.8	− 12.8
Arioğlu and Köylüoğlu [2]	$f_c = A(R^3V^4)^B$	0.00153	0.611	–	0.981	11.9	− 12.5

f_c = compressive strength (MPa) — 15 cm cube; V = ultrasonic pulse velocity (km/sn); R = rebound number; n = number of data used in regression analysis (n = 33); A, B, C, D = regression coefficients; r = coefficient of correlation; Δ^+, Δ^- = deviation (%); $\Delta = \pm((f_o - f_p)/(f_o)) \times 100$ (%); f_o = observed strength (MPa); f_p = predicted strength (MPa).

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* Corresponding author. Tel.: +90-216-3219000; fax: +90-216-3219013.

E-mail address: canan.girgin@ym.com.tr (C. Girgin).

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passing, the same finding was observed, with its details reported in Refs. [2–5]. The regression model defining the best fit to experimental results was displayed in Fig. 1.

For instance, if the rebound number and ultrasonic pulse velocity are determined to be 30 and 4.2 km/sn, respectively, from Fig. 1 the anticipated mean concrete strength — 15 cm cube — may be predicted to be 26 MPa.

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