

SUPPLEMENTARY MATERIAL – APPENDIX C – EXPERIMENTAL DATA

SOURCES

The unified experimental database (n=251) was compiled from 38 independent peer-reviewed studies. Table C.1 reports the full screened specimen-level database used in the development and assessment of the proposed model. The identification (ID) in the first column links each record to its corresponding bibliographic source listed below, which is presented separately from the main reference list for clarity.

For consistency with the manuscript, it should be noted that Table C.1 represents the observed screened database coverage, rather than the final recommended application domain of Eq. (1). Accordingly, some records fall outside the final recommended interval for f_c and V_f , or correspond to baseline matrix conditions with null or near-null fiber content. These entries were retained for exploratory assessment, baseline stabilization, and sensitivity-related analyses, but they do not define the primary intended validity range of the final formulation.

The “Usage” column reproduces the original observation-level Modeling/Validation split adopted in the initial holdout framework. Because some source studies contributed records to both subsets, these labels should be interpreted as point-wise split assignments rather than as grouped study-wise partitioning.

Only records satisfying the present inclusion criteria for hooked-end steel fibers and complete predictor availability were retained in the unified database. In studies involving broader experimental programs or mixed fiber families, only the subset compatible with the scope of the present article was included.

Table C.1 — Unified Database (n=251)

ID	Source / Author	f_c (MPa)	V_f (%)	L/D (-)	E_{c_exp} (GPa)	Usage
C1	Abbass et al.	73.3	1	55	37.7	Modeling
C1	Abbass et al.	61.7	0.5	55	35.79	Modeling
C1	Abbass et al.	73.4	1.5	55	36.78	Modeling
C2	Alshahrani & Kulasegaram	69.3	0.5	54.55	41.62	Modeling
C2	Alshahrani & Kulasegaram	66.7	0.5	78.95	41.56	Modeling
C2	Alshahrani & Kulasegaram	66.1	1	54.55	38.55	Modeling
C2	Alshahrani & Kulasegaram	66.4	0.5	54.55	37.06	Modeling
C2	Alshahrani & Kulasegaram	68.2	0.5	78.95	37.07	Modeling
C2	Alshahrani & Kulasegaram	67.6	1	78.95	38.43	Modeling
C2	Alshahrani & Kulasegaram	64.4	0.25	78.95	36.94	Modeling
C2	Alshahrani & Kulasegaram	65.6	0.25	54.55	36.2	Modeling
C3	Alshahrani et al.	69.2	0.5	54.55	41.62	Modeling
C3	Alshahrani et al.	73.7	1	54.55	38.55	Modeling
C3	Alshahrani et al.	69.2	0.5	55	41.62	Validation
C3	Alshahrani et al.	73.7	1	55	38.55	Validation
C4	Aslani & Nejadi	38	2	80	35.76	Modeling
C5	Atiş & Karahan	72.7	1.5	64	31.6	Validation
C5	Atiş & Karahan	60.7	1.5	64	31.3	Validation
C5	Atiş & Karahan	78.2	0.5	64	41.6	Validation
C5	Atiş & Karahan	65	1	64	33.5	Validation
C5	Atiş & Karahan	61.8	0.25	64	33.3	Validation
C5	Atiş & Karahan	81	1.5	64	36.6	Validation
C5	Atiş & Karahan	71.7	1	64	35.5	Validation
C5	Atiş & Karahan	80.5	1	64	38	Validation
C5	Atiş & Karahan	69.4	0.25	64	37.8	Validation
C5	Atiş & Karahan	79.4	0.25	64	39.3	Validation
C5	Atiş & Karahan	68.3	0.5	64	37.1	Validation
C5	Atiş & Karahan	64.4	0.5	64	36.2	Validation
C6	Bao et al.	43.7	0.51	67	30.9	Modeling
C7	Buratti et al.	41.7	0.45	50	31.9	Validation
C7	Buratti et al.	41.6	0.26	50	30.9	Validation
C7	Buratti et al.	33.36	0.45	50	31.9	Validation
C7	Buratti et al.	33.28	0.26	50	30.9	Validation
C8	Carneiro et al.	36.9	0.75	65	28.5	Modeling
C8	Carneiro et al.	40.5	0.75	65	30.2	Modeling
C8	Carneiro et al.	34.3	0.75	65	30.9	Modeling
C8	Carneiro et al.	41.5	0.75	65	32.1	Modeling
C9	Conforti et al., 2013	36.9	0.45	62.5	30.3	Validation
C9	Conforti et al., 2013	38	0.32	62.5	31.1	Validation
C10	Dadmand et al.	113	2	39.47	39.4	Modeling
C10	Dadmand et al.	156	2	39.47	47.36	Modeling
C11	Fang et al.	131.46	1	59.09	42.06	Validation
C11	Fang et al.	135.09	2	72.73	43.05	Validation
C11	Fang et al.	135.07	2	59.09	42.78	Validation

C11	Fang et al.	134.86	2	64	44.24	Validation
C11	Fang et al.	138.45	3	59.09	44.11	Validation
C12	Gul et al., 2014	32.4	1.5	50	33.6	Modeling
C12	Gul et al., 2014	43.2	1.5	71.43	36.5	Modeling
C12	Gul et al., 2014	36.1	1.5	50	33.4	Modeling
C12	Gul et al., 2014	45.2	1.5	71.43	36.7	Modeling
C12	Gul et al., 2014	39.5	1.5	50	33.7	Modeling
C12	Gul et al., 2014	35.5	1	71.43	34.3	Modeling
C12	Gul et al., 2014	48.8	0.5	71.43	30.7	Modeling
C12	Gul et al., 2014	38.2	1	50	32.8	Modeling
C12	Gul et al., 2014	38.6	1	71.43	33.9	Modeling
C12	Gul et al., 2014	50.3	1.5	50	34.6	Modeling
C12	Gul et al., 2014	34.9	1	50	31.3	Modeling
C12	Gul et al., 2014	31.8	0.5	50	30.7	Modeling
C12	Gul et al., 2014	40.8	1.5	71.43	33.7	Modeling
C12	Gul et al., 2014	36.3	1	50	31.1	Modeling
C12	Gul et al., 2014	33.7	0.5	50	30.4	Modeling
C12	Gul et al., 2014	33.4	0.5	50	30.2	Modeling
C12	Gul et al., 2014	36.1	0.5	71.43	30.2	Modeling
C12	Gul et al., 2014	40.9	1	71.43	32.9	Modeling
C12	Gul et al., 2014	43.3	1	71.43	33.3	Modeling
C12	Gul et al., 2014	46.4	1.5	71.43	33.7	Modeling
C12	Gul et al., 2014	42	0.5	50	30.4	Modeling
C12	Gul et al., 2014	35	0.5	71.43	30.4	Modeling
C12	Gul et al., 2014	46.7	1	50	31.4	Modeling
C12	Gul et al., 2014	37.9	0.5	71.43	31.7	Modeling
C13	Ibrahim & Bakar	34.6	1.25	80	33.65	Modeling
C13	Ibrahim & Bakar	32.8	0.75	80	28.75	Modeling
C13	Ibrahim & Bakar	31.9	0.5	80	28.9	Modeling
C13	Ibrahim & Bakar	34.2	1	80	32.3	Modeling
C13	Ibrahim & Bakar	28.01	1.25	80	33.65	Validation
C13	Ibrahim & Bakar	27.65	1	80	32.3	Validation
C13	Ibrahim & Bakar	26.4	0.75	80	28.75	Validation
C13	Ibrahim & Bakar	25.6	0.5	80	28.9	Validation
C14	Jang et al.	22.9	0.76	80	22.2	Validation
C14	Jang et al.	21.5	0.51	80	22.3	Validation
C14	Jang et al.	24.2	0.76	64	22.7	Validation
C14	Jang et al.	22.7	0.51	64	22.9	Validation
C14	Jang et al.	24.3	0.25	64	31.6	Validation
C14	Jang et al.	21.7	0.25	80	25.6	Validation
C14	Jang et al.	30.2	0.76	67	26.9	Validation
C14	Jang et al.	22.3	0.25	64	25	Validation
C14	Jang et al.	24.6	0.51	80	30	Validation
C14	Jang et al.	24.8	0.76	67	26.9	Validation

C14	Jang et al.	24.9	0.76	80	27.8	Validation
C14	Jang et al.	23.9	0.51	67	26.8	Validation
C14	Jang et al.	23	0.25	80	27.7	Validation
C14	Jang et al.	27.3	0.51	67	28	Validation
C14	Jang et al.	24.5	0.25	67	27.4	Validation
C14	Jang et al.	21.8	0.51	64	27.3	Validation
C14	Jang et al.	24.5	0.76	64	27.5	Validation
C14	Jang et al.	25.1	0.25	67	28.2	Validation
C15	Kassimi & Khayat	55.6	0.8	54.55	24.2	Validation
C15	Kassimi & Khayat	47.5	1.4	54.55	23.5	Validation
C15	Kassimi & Khayat	50	0.8	54.55	25.6	Validation
C15	Kassimi & Khayat	56.4	0.8	54.55	27.8	Validation
C15	Kassimi & Khayat	42.2	0.75	54.55	25.5	Validation
C15	Kassimi & Khayat	46.1	0.8	54.55	28.2	Validation
C15	Kassimi & Khayat	53	0.5	54.55	30.1	Validation
C15	Kassimi & Khayat	47.7	0.5	54.55	34.1	Validation
C15	Kassimi & Khayat	46.7	0.5	54.55	31	Validation
C15	Kassimi & Khayat	30.6	0.5	54.55	29.6	Validation
C16	Kazemi et al.	86.32	0.2	51.43	37.6	Validation
C16	Kazemi et al.	87.07	0.8	51.43	38.2	Validation
C16	Kazemi et al.	86.22	0.3	51.43	38.5	Validation
C16	Kazemi et al.	85.73	0.4	51.43	38.4	Validation
C16	Kazemi et al.	91.18	1.6	51.43	38.8	Validation
C17	Kim et al.	64.4	1	60	27.5	Validation
C17	Kim et al.	62.5	1	60	27.4	Validation
C17	Kim et al.	64.1	1	60	28.1	Validation
C17	Kim et al.	64.4	0.5	60	28.5	Validation
C17	Kim et al.	66.6	2	60	28.9	Validation
C17	Kim et al.	64.2	1.5	60	28.8	Validation
C17	Kim et al.	64.5	1.5	60	29.1	Validation
C17	Kim et al.	65.2	2	60	29.2	Validation
C17	Kim et al.	64.4	2	60	29.6	Validation
C17	Kim et al.	65.1	0.5	60	30.7	Validation
C17	Kim et al.	63.1	1.5	60	30.4	Validation
C17	Kim et al.	64.1	0.5	60	32.7	Validation
C18	Köksal et al.	48	4.29	67	29.3	Modeling
C18	Köksal et al.	47.8	3.45	67	29.8	Modeling
C18	Köksal et al.	45.2	2.6	67	30.1	Modeling
C18	Köksal et al.	44.3	1.75	67	30.8	Modeling
C18	Köksal et al.	42.4	0.88	67	31.6	Modeling
C19	LaHucik et al.	46.3	0.4	55	30.8	Modeling
C19	LaHucik et al.	50.3	0.2	55	32	Modeling
C20	Marčiukaitis et al.	56.37	2	66.67	39.8	Validation
C20	Marčiukaitis et al.	54.03	1.5	66.67	39.3	Validation

C20	Marčiukaitis et al.	53.78	1	66.67	38.2	Validation
C20	Marčiukaitis et al.	46.04	2	66.67	35.93	Validation
C20	Marčiukaitis et al.	40.29	1.5	66.67	34.67	Validation
C20	Marčiukaitis et al.	40.1	1	66.67	33.76	Validation
C21	Minelli et al., 2013	33.1	1	62.5	32.1	Validation
C21	Minelli et al., 2013	32.1	0.64	62.5	30.8	Validation
C22	Niu et al., 2019	30.25	1.5	40	33.4	Validation
C22	Niu et al., 2019	27.66	1	40	32.5	Validation
C22	Niu et al., 2019	34.51	2	40	31.9	Validation
C22	Niu et al., 2019	37.03	0.5	40	30.9	Validation
C23	Okay & Engin	31.6	0.3	80	27.5	Validation
C23	Okay & Engin	31.9	0.3	80	27.9	Validation
C23	Okay & Engin	31.3	0.6	40	29.9	Validation
C23	Okay & Engin	30	0.6	80	28.7	Validation
C23	Okay & Engin	31.7	0.3	40	29.6	Validation
C23	Okay & Engin	33.4	0.3	40	30	Validation
C23	Okay & Engin	30.9	0.6	55	29.9	Validation
C23	Okay & Engin	32.7	0.3	67	31.2	Validation
C23	Okay & Engin	31	0.3	55	27.9	Validation
C23	Okay & Engin	29.5	0.6	67	28.5	Validation
C24	Özcan et al.	22.59	2.54	80	26	Modeling
C24	Özcan et al.	21.8	1.68	80	26.5	Modeling
C24	Özcan et al.	21.34	2.1	80	26.5	Modeling
C24	Özcan et al.	22.48	1.27	80	27.5	Modeling
C25	Ren et al.	118.2	1	50	41.4	Modeling
C25	Ren et al.	120.8	2.5	50	44.5	Modeling
C25	Ren et al.	119.5	2	50	44.3	Modeling
C25	Ren et al.	121.6	1	50	42.5	Modeling
C25	Ren et al.	115.6	1.5	50	43.6	Modeling
C25	Ren et al.	114.6	0.5	50	43.5	Modeling
C25	Ren et al.	114.7	0.5	50	42.3	Modeling
C25	Ren et al.	121.6	1	50	43	Modeling
C25	Ren et al.	111.3	0.5	50	42.1	Modeling
C25	Ren et al.	121	1.5	50	43	Modeling
C25	Ren et al.	122.8	2	50	43.4	Modeling
C25	Ren et al.	122.2	2.5	50	43.1	Modeling
C26	Şahin & Köksal	61.1	1	80	31.8	Modeling
C26	Şahin & Köksal	59.9	1	80	32.3	Modeling
C26	Şahin & Köksal	74.9	0.33	80	42.5	Modeling
C26	Şahin & Köksal	71.3	0.67	80	41.6	Modeling
C26	Şahin & Köksal	60.5	0.67	80	33.5	Modeling
C26	Şahin & Köksal	73	1	80	41.4	Modeling
C26	Şahin & Köksal	71.9	0.67	80	40.7	Modeling
C26	Şahin & Köksal	50.9	1	80	32.7	Modeling

C26	Şahin & Köksal	59.6	0.33	80	34.8	Modeling
C26	Şahin & Köksal	49.4	0.33	80	36.2	Modeling
C26	Şahin & Köksal	71.5	0.33	80	37.2	Modeling
C26	Şahin & Köksal	49.2	1	80	32.9	Modeling
C26	Şahin & Köksal	72.3	1	80	39.5	Modeling
C26	Şahin & Köksal	56.9	0.33	80	35.3	Modeling
C26	Şahin & Köksal	48.3	0.67	80	35	Modeling
C26	Şahin & Köksal	59.4	0.67	80	36.9	Modeling
C26	Şahin & Köksal	47.5	0.67	80	33.7	Modeling
C26	Şahin & Köksal	47.9	0.33	80	34.3	Modeling
C27	Sandoval-Siesquen & Muñoz-Pérez	24.46	1	80	20.97	Validation
C27	Sandoval-Siesquen & Muñoz-Pérez	22.87	4	80	19.6	Validation
C27	Sandoval-Siesquen & Muñoz-Pérez	27.56	1	80	22.97	Validation
C27	Sandoval-Siesquen & Muñoz-Pérez	27.01	2	80	23.16	Validation
C27	Sandoval-Siesquen & Muñoz-Pérez	25.5	3	80	22.4	Validation
C27	Sandoval-Siesquen & Muñoz-Pérez	28.84	2	80	24.95	Validation
C27	Sandoval-Siesquen & Muñoz-Pérez	33.17	3	80	28.25	Validation
C27	Sandoval-Siesquen & Muñoz-Pérez	33.76	4	80	28.79	Validation
C28	Sivakumar & Santhanam	59.2	0.5	60	33.2	Modeling
C29	Tahenni et al.	63.1	2	80	45.1	Validation
C29	Tahenni et al.	64	1	65	43.6	Validation
C29	Tahenni et al.	60	1	65	42.7	Validation
C29	Tahenni et al.	36.5	1	65	37.8	Validation
C29	Tahenni et al.	39.3	2	80	38.7	Validation
C29	Tahenni et al.	65	2	80	42.7	Validation
C30	Thomas & Ramaswamy	77	1.5	55	45.1	Modeling
C30	Thomas & Ramaswamy	74.8	1	55	44	Modeling
C30	Thomas & Ramaswamy	59.4	1.5	55	41	Modeling
C30	Thomas & Ramaswamy	73.6	0.5	55	43	Modeling
C30	Thomas & Ramaswamy	57.8	1	55	39.8	Modeling
C30	Thomas & Ramaswamy	57	0.5	55	38.6	Modeling
C30	Thomas & Ramaswamy	32.3	1.5	55	31.1	Modeling
C30	Thomas & Ramaswamy	31.2	1	55	30.2	Modeling
C30	Thomas & Ramaswamy	30.5	0.5	55	29.4	Modeling
C31	Tipka & Vaskova	98.6	3	50	50.5	Validation
C31	Tipka & Vaskova	78.1	1	50	39.9	Validation
C31	Tipka & Vaskova	80.2	0.5	50	40	Validation
C32	WIT Transactions (2016)	83	0.38	65	39.6	Modeling
C32	WIT Transactions (2016)	79.9	0.76	65	40.3	Modeling
C33	Yang et al. (2017)	35.6	0.5	80	27.47	Validation

C33	Yang et al. (2017)	35.7	0.5	65	28.32	Validation
C33	Yang et al. (2017)	36.6	0.75	65	30.94	Validation
C34	Yoo et al.	190.94	2	60	47.23	Modeling
C34	Yoo et al.	95.01	1	60	37.19	Modeling
C34	Yoo et al.	40.77	1	60	28.64	Modeling
C34	Yoo et al.	39.14	0.5	60	28.67	Modeling
C34	Yoo et al.	90.76	0.5	60	38.45	Modeling
C34	Yoo et al.	40.61	2	60	29.23	Modeling
C34	Yoo et al.	96.54	2	60	38.95	Modeling
C35	Yue et al., 2021	41.04	1.5	42.67	34.77	Validation
C35	Yue et al., 2021	33.84	1	42.67	33.1	Validation
C35	Yue et al., 2021	50.56	1.5	42.67	36.37	Validation
C35	Yue et al., 2021	42.4	0.5	42.67	35.03	Validation
C35	Yue et al., 2021	32.56	0.5	42.67	32.77	Validation
C35	Yue et al., 2021	48.96	1	42.67	36.15	Validation
C35	Yue et al., 2021	53.84	1	42.67	36.83	Validation
C35	Yue et al., 2021	58.48	1.5	42.67	37.39	Validation
C35	Yue et al., 2021	52.48	0.5	42.67	36.65	Validation
C36	Yun et al. (2019)	67.04	0.75	80	31.3	Validation
C36	Yun et al. (2019)	68.4	0.75	80	32.7	Validation
C36	Yun et al. (2019)	62	0.00	80	32	Validation
C36	Yun et al. (2019)	65.6	0.75	80	32.4	Validation
C36	Yun et al. (2019)	60.6	0.00	80	32	Validation
C36	Yun et al. (2019)	62.8	0.75	80	32.4	Validation
C36	Yun et al. (2019)	67.5	0.38	80	35	Validation
C36	Yun et al. (2019)	67.5	0.38	80	35.9	Validation
C37	Yun et al. (2023)	64.5	0.75	64	31.3	Validation
C37	Yun et al. (2023)	67.2	0.75	64	33.6	Validation
C38	Zhao et al.	34.45	0.5	35	24.86	Modeling
C38	Zhao et al.	36.08	1	35	25.97	Modeling
C38	Zhao et al.	37.13	1.5	35	27.21	Modeling
C38	Zhao et al.	35.26	2	35	26.8	Modeling
C38	Zhao et al.	54.87	2.5	40	38.47	Validation
C38	Zhao et al.	73.07	1.5	40	34.53	Validation
C38	Zhao et al.	82.2	3.5	40	36.43	Validation

Notes:

(1) Table C.1 reports the full screened empirical database used in the study. Records outside the final recommended application domain of Eq. (1) were retained for exploratory assessment, baseline stabilization, and sensitivity-related analyses, but they do not define the primary intended validity range of the final formulation.

(2) The “Usage” labels reproduce the original observation-level Modeling/Validation split adopted in the initial holdout framework and should therefore be interpreted as point-wise split assignments rather than as grouped study-wise partitioning.

(3) In studies involving broader experimental programs or mixed fiber families, only the records satisfying the present inclusion criteria for hooked-end steel fibers and complete predictor availability were retained in the unified database.

- 1 **C1.** Abbass, W.; Khan, M.I.; e Mourad, S., 2018, "Evaluation of mechanical properties of steel fiber reinforced
2 concrete with different strengths of concrete," *Construction and Building Materials*, V. 165, pp. 18-26. doi:
3 10.1016/j.conbuildmat.2017.12.183
- 4 **C2.** Alshahrani, S., e Kulasegaram, S., 2017, "Mechanical properties of steel fiber reinforced concrete," *Procedia*
5 *Engineering*, V. 14, pp. 2654-2661.
- 6 **C3.** Alshahrani, S., et al., 2017, "Experimental and numerical analysis of mechanical properties of steel fiber
7 reinforced concrete," *Construction and Building Materials*, V. 135, pp. 440-446.
- 8 **C4.** Aslani, F., e Nejadi, S., 2012, "Mechanical properties of conventional and self-compacting concrete: An
9 analytical study," *Structural Engineering and Mechanics*, V. 43, No. 4, pp. 411-447. doi:
10 10.12989/sem.2012.43.4.411
- 11 **C5.** Atiş, C.D., e Karahan, O., 2009, "Properties of steel fiber reinforced fly ash concrete," *Construction and*
12 *Building Materials*, V. 23, No. 1, pp. 392-399. doi: 10.1016/j.conbuildmat.2007.11.002
- 13 **C6.** Bao, Y., et al., 2021, "Compressive behavior of steel fiber reinforced concrete with coarse aggregate,"
14 *Construction and Building Materials*, V. 270, 121438. doi: 10.1016/j.conbuildmat.2020.121438
- 15 **C7.** Buratti, N.; Mazzotti, C.; e Savoia, M., 2011, "Post-cracking behaviour of steel and macro-synthetic fibre-
16 reinforced concretes," *Construction and Building Materials*, V. 25, No. 5, pp. 2713-2722. doi:
17 10.1016/j.conbuildmat.2010.10.012
- 18 **C8.** Carneiro, J.A., et al., 2014, "Compressive stress-strain behavior of steel fiber reinforced-concrete,"
19 *Construction and Building Materials*, V. 64, pp. 226-234. doi: 10.1016/j.conbuildmat.2014.04.058
- 20 **C9.** Conforti, A., et al., 2013, "Evaluation of contribution of fiber reinforcement in concrete," *Construction and*
21 *Building Materials*, V. 48, pp. 401-408. doi: 10.1016/j.conbuildmat.2013.06.071
- 22 **C10.** Dadmand, B., et al., 2020, "Mechanical properties of steel fiber reinforced concrete," *Construction and*
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