**Appendix A. Experimental database**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Specimen** | **Do (mm)** | **to (mm)** | **Di (mm)** | **ti (mm)** | **fc' (MPa)** | **fyo (MPa)** | **fyi (MPa)** | **L (mm)** | **Pu (kN)** | **Refs.** |
| cc2a | 180.00 | 3.00 | 48.00 | 3.00 | 36.10 | 275.90 | 396.10 | 540.00 | 1790.00 | [1] |
| cc2b | 180.00 | 3.00 | 48.00 | 3.00 | 36.10 | 275.90 | 396.10 | 540.00 | 1791.00 |
| cc3a | 180.00 | 3.00 | 88.00 | 3.00 | 36.10 | 275.90 | 370.20 | 540.00 | 1648.00 |
| cc3b | 180.00 | 3.00 | 88.00 | 3.00 | 36.10 | 275.90 | 370.20 | 540.00 | 1650.00 |
| cc4a | 180.00 | 3.00 | 140.00 | 3.00 | 36.10 | 275.90 | 342.00 | 540.00 | 1435.00 |
| cc4b | 180.00 | 3.00 | 140.00 | 3.00 | 36.10 | 275.90 | 342.00 | 540.00 | 1358.00 |
| cc5a | 114.00 | 3.00 | 58.00 | 3.00 | 36.10 | 294.50 | 374.50 | 342.00 | 904.00 |
| cc5b | 114.00 | 3.00 | 58.00 | 3.00 | 36.10 | 294.50 | 374.50 | 342.00 | 898.00 |
| cc6a | 240.00 | 3.00 | 114.00 | 3.00 | 36.10 | 275.90 | 294.50 | 720.00 | 2421.00 |
| cc6b | 240.00 | 3.00 | 114.00 | 3.00 | 36.10 | 275.90 | 294.50 | 720.00 | 2460.00 |
| cc7a | 300.00 | 3.00 | 165.00 | 3.00 | 36.10 | 275.90 | 320.50 | 900.00 | 3331.00 |
| cc7b | 300.00 | 3.00 | 165.00 | 3.00 | 36.10 | 275.90 | 320.50 | 900.00 | 3266.00 |
| O1I1 | 114.30 | 6.00 | 48.30 | 2.90 | 63.40 | 454.00 | 425.00 | 400.00 | 1665.00 | [2] |
| O2I1 | 114.30 | 4.80 | 48.30 | 2.90 | 63.40 | 416.00 | 425.00 | 400.00 | 1441.00 |
| O3I1 | 114.30 | 3.60 | 48.30 | 2.90 | 63.40 | 453.00 | 425.00 | 400.00 | 1243.00 |
| O4I1 | 114.30 | 3.20 | 48.30 | 2.90 | 63.40 | 430.00 | 425.00 | 400.00 | 1145.00 |
| O5I2 | 165.10 | 3.50 | 101.60 | 3.30 | 63.40 | 433.00 | 394.00 | 400.00 | 1629.00 |
| O6I2 | 165.10 | 3.00 | 101.60 | 3.20 | 63.40 | 395.00 | 394.00 | 500.00 | 1613.00 |
| O7I2 | 163.80 | 2.35 | 101.60 | 3.20 | 63.40 | 395.00 | 394.00 | 500.00 | 1487.00 |
| O8I2 | 163.00 | 1.95 | 101.60 | 3.20 | 63.40 | 395.00 | 394.00 | 500.00 | 1328.00 |
| O9I2 | 162.50 | 1.70 | 101.60 | 3.20 | 63.40 | 395.00 | 394.00 | 500.00 | 1236.00 |
| S139.2–1.0 | 139.20 | 3.00 | 76.00 | 2.00 | 21.81 | 418.00 | 418.00 | 998.00 | 1059.20 | [3] |
| S139.2–1.0 | 139.20 | 3.00 | 76.00 | 2.00 | 21.81 | 418.00 | 418.00 | 1001.00 | 1056.10 |
| S139.2–1.5 | 139.20 | 3.00 | 76.00 | 2.00 | 21.81 | 418.00 | 418.00 | 1500.00 | 905.50 |
| S139.2–1.5 | 139.20 | 3.00 | 76.00 | 2.00 | 21.81 | 418.00 | 418.00 | 1503.00 | 901.60 |
| S139.2–2.0 | 139.20 | 3.00 | 76.00 | 2.00 | 21.81 | 418.00 | 418.00 | 2000.00 | 831.70 |
| S139.2–2.0 | 139.20 | 3.00 | 76.00 | 2.00 | 21.81 | 418.00 | 418.00 | 1998.00 | 837.40 |
| S139.2–2.5 | 139.20 | 3.00 | 76.00 | 2.00 | 21.81 | 418.00 | 418.00 | 2502.00 | 732.10 |
| S139.2–2.5 | 139.20 | 3.00 | 76.00 | 2.00 | 21.81 | 418.00 | 418.00 | 2498.00 | 729.00 |
| S152.4–1.0 | 152.40 | 3.00 | 76.00 | 2.00 | 21.81 | 549.00 | 549.00 | 1003.00 | 1263.50 |
| S152.4–1.0 | 152.40 | 3.00 | 76.00 | 2.00 | 21.81 | 549.00 | 549.00 | 1002.00 | 1254.90 |
| S152.4–1.5 | 152.40 | 3.00 | 76.00 | 2.00 | 21.81 | 549.00 | 549.00 | 1497.00 | 1195.60 |
| S152.4–1.5 | 152.40 | 3.00 | 76.00 | 2.00 | 21.81 | 549.00 | 549.00 | 1503.00 | 1191.20 |
| S152.4–2.0 | 152.40 | 3.00 | 76.00 | 2.00 | 21.81 | 549.00 | 549.00 | 1997.00 | 1047.30 |
| S152.4–2.0 | 152.40 | 3.00 | 76.00 | 2.00 | 21.81 | 549.00 | 549.00 | 2000.00 | 1041.60 |
| S152.4–2.5 | 152.40 | 3.00 | 76.00 | 2.00 | 21.81 | 549.00 | 549.00 | 2498.00 | 941.40 |
| S152.4–2.5 | 152.40 | 3.00 | 76.00 | 2.00 | 21.81 | 549.00 | 549.00 | 2500.00 | 949.00 |
| S165.1–1.0 | 165.10 | 3.00 | 76.00 | 2.00 | 21.81 | 516.00 | 516.00 | 998.00 | 1512.30 |
| S165.1–1.0 | 165.10 | 3.00 | 76.00 | 2.00 | 21.81 | 516.00 | 516.00 | 999.00 | 1510.60 |
| S165.1–1.5 | 165.10 | 3.00 | 76.00 | 2.00 | 21.81 | 516.00 | 516.00 | 1504.00 | 1286.40 |
| S165.1–1.5 | 165.10 | 3.00 | 76.00 | 2.00 | 21.81 | 516.00 | 516.00 | 1498.00 | 1275.10 |
| S165.1–2.0 | 165.10 | 3.00 | 76.00 | 2.00 | 21.81 | 516.00 | 516.00 | 2003.00 | 1187.20 |
| S165.1–2.0 | 165.10 | 3.00 | 76.00 | 2.00 | 21.81 | 516.00 | 516.00 | 1998.00 | 1199.80 |
| S165.1–2.5 | 165.10 | 3.00 | 76.00 | 2.00 | 21.81 | 516.00 | 516.00 | 2498.00 | 1028.00 |
| S165.1–2.5 | 165.10 | 3.00 | 76.00 | 2.00 | 21.81 | 516.00 | 516.00 | 2502.00 | 1036.50 |
| S193.7–1.0 | 193.70 | 3.50 | 76.00 | 2.00 | 21.81 | 391.00 | 391.00 | 1003.00 | 2010.00 |
| S193.7–1.0 | 193.70 | 3.50 | 76.00 | 2.00 | 21.81 | 391.00 | 391.00 | 1000.00 | 2030.00 |
| S193.7–1.5 | 193.70 | 3.50 | 76.00 | 2.00 | 21.81 | 391.00 | 391.00 | 1502.00 | 1730.00 |
| S193.7–1.5 | 193.70 | 3.50 | 76.00 | 2.00 | 21.81 | 391.00 | 391.00 | 1500.00 | 1720.00 |
| S193.7–2.0 | 193.70 | 3.50 | 76.00 | 2.00 | 21.81 | 391.00 | 391.00 | 1998.00 | 1581.60 |
| S193.7–2.0 | 193.70 | 3.50 | 76.00 | 2.00 | 21.81 | 391.00 | 391.00 | 2003.00 | 1584.10 |
| S193.7–2.5 | 193.70 | 3.50 | 76.00 | 2.00 | 21.81 | 391.00 | 391.00 | 2503.00 | 1451.40 |
| S193.7–2.5 | 193.70 | 3.50 | 76.00 | 2.00 | 21.81 | 391.00 | 391.00 | 2497.00 | 1458.70 |
| c10-375 | 158.00 | 0.90 | 38.00 | 0.90 | 18.70 | 221.00 | 221.00 | 450.00 | 635.00 | [4] |
| c10-750 | 159.00 | 0.90 | 76.00 | 0.90 | 18.70 | 221.00 | 221.00 | 450.00 | 540.00 |
| c16-375 | 158.00 | 1.50 | 39.00 | 1.50 | 18.70 | 308.00 | 308.00 | 450.00 | 851.60 |
| c16-750 | 158.00 | 1.50 | 77.00 | 1.50 | 18.70 | 308.00 | 308.00 | 450.00 | 728.10 |
| c16-1125 | 158.00 | 1.50 | 114.00 | 1.50 | 18.70 | 308.00 | 308.00 | 450.00 | 589.00 |
| c23-375 | 158.00 | 2.14 | 40.00 | 2.14 | 18.70 | 286.00 | 286.00 | 450.00 | 968.20 |
| c23-750 | 158.00 | 2.14 | 77.00 | 2.14 | 18.70 | 286.00 | 286.00 | 450.00 | 879.10 |
| c23-1125 | 157.00 | 2.14 | 115.00 | 2.14 | 18.70 | 286.00 | 286.00 | 450.00 | 703.60 |
| 1 | 220.00 | 3.62 | 159.00 | 3.62 | 52.70 | 319.60 | 319.60 | 660.00 | 2537.00 | [6] |
| 2 | 220.00 | 3.62 | 159.00 | 3.62 | 52.70 | 319.60 | 319.60 | 660.00 | 2566.00 |
| 3 | 220.00 | 3.62 | 106.00 | 3.62 | 52.70 | 319.60 | 319.60 | 660.00 | 3436.00 |
| 4 | 220.00 | 3.62 | 106.00 | 3.62 | 52.70 | 319.60 | 319.60 | 660.00 | 3506.00 |
| 7 | 220.00 | 3.62 | 159.00 | 3.62 | 52.70 | 319.60 | 319.60 | 660.00 | 2908.00 |
| 8 | 220.00 | 3.62 | 159.00 | 3.62 | 52.70 | 319.60 | 319.60 | 660.00 | 2860.00 |
| A2- l | 75.40 | 1.29 | 62.70 | 1.23 | 46.20 | 486.00 | 470.00 | 230.00 | 348.00 | [30] |
| A2-2 | 75.20 | 1.19 | 62.40 | 1.20 | 46.20 | 486.00 | 470.00 | 230.00 | 348.00 |
| A3- l | 76.30 | 1.78 | 62.00 | 1.00 | 46.20 | 486.00 | 470.00 | 230.00 | 395.00 |
| A3-2 | 76.30 | 1.74 | 62.00 | 0.94 | 46.20 | 512.00 | 470.00 | 230.00 | 395.00 |
| B2-1 | 81.50 | 1.11 | 62.70 | 1.14 | 46.20 | 524.00 | 470.00 | 230.00 | 386.00 |
| B2-2 | 81.50 | 1.14 | 62.20 | 1.13 | 46.20 | 524.00 | 470.00 | 230.00 | 395.00 |
| Cl– I | 87.40 | 0.99 | 61.80 | 0.87 | 46.20 | 428.00 | 452.00 | 230.00 | 378.00 |
| Cl-2 | 87.30 | 0.94 | 61.60 | 0.88 | 46.20 | 428.00 | 452.00 | 230.00 | 385.00 |
| D I– I | 99.70 | 0.59 | 80.30 | 0.55 | 46.20 | 409.00 | 474.00 | 230.00 | 283.00 |
| D4-1 | 99.90 | 0.70 | 74.00 | 0.62 | 46.20 | 409.00 | 512.00 | 230.00 | 380.00 |
| D5-1 | 99.80 | 0.66 | 61.40 | 0.55 | 46.20 | 409.00 | 432.00 | 230.00 | 443.00 |
| D6-1 | 101.70 | 1.61 | 61.50 | 0.56 | 46.20 | 409.00 | 432.00 | 230.00 | 644.00 |
| E2- l | 101.40 | 1.56 | 63.40 | 1.15 | 46.20 | 255.00 | 216.00 | 230.00 | 477.00 |
| E3- I | 101.50 | 1.65 | 76.10 | 1.19 | 46.20 | 255.00 | 235.00 | 230.00 | 417.00 |
| E4-I | 114.30 | 1.64 | 63.50 | 1.12 | 46.20 | 262.00 | 216.00 | 230.00 | 598.00 |
| ES-I | 114.30 | 1.64 | 76.10 | 1.14 | 46.20 | 262.00 | 235.00 | 230.00 | 551.00 |
| E6-I | 114.30 | 1.64 | 88.90 | 1.56 | 46.20 | 262.00 | 286.00 | 230.00 | 524.00 |
| DC-1 | 120.00 | 1.96 | 60.00 | 1.96 | 53.45 | 311.00 | 380.00 | 1324.00 | 779.10 | [31] |
| DC-2 | 120.00 | 1.96 | 60.00 | 1.96 | 53.45 | 311.00 | 380.00 | 1324.00 | 836.90 |
| DCc-1 | 120.00 | 1.96 | 60.00 | 1.96 | 53.45 | 311.00 | 380.00 | 1324.00 | 789.90 |
| DCc-2 | 120.00 | 1.96 | 60.00 | 1.96 | 53.45 | 311.00 | 380.00 | 1324.00 | 715.40 |
| C1C7 | 114.50 | 5.90 | 48.40 | 2.80 | 63.40 | 454.00 | 425.00 | 400.00 | 1418.00 | [32] |
| C2C7 | 114.60 | 4.70 | 48.40 | 2.80 | 63.40 | 416.00 | 425.00 | 400.00 | 1390.00 |
| C3C7 | 114.40 | 3.50 | 48.40 | 2.80 | 63.40 | 453.00 | 425.00 | 400.00 | 1191.00 |
| C4C7 | 114.20 | 3.00 | 48.40 | 2.80 | 63.40 | 430.00 | 425.00 | 400.00 | 1100.00 |
| C5C8 | 165.10 | 3.50 | 101.80 | 3.10 | 63.40 | 433.00 | 410.00 | 400.00 | 1700.00 |
| 2 | 160.00 | 1.00 | 75.00 | 1.00 | 23.60 | 220.00 | 220.00 | 400.00 | 540.00 | [33] |
| 5 | 160.00 | 1.50 | 75.00 | 1.50 | 23.60 | 255.00 | 255.00 | 400.00 | 728.00 |
| 6 | 160.00 | 1.50 | 112.00 | 1.50 | 23.60 | 255.00 | 255.00 | 400.00 | 589.00 |
| 8 | 160.00 | 2.10 | 75.00 | 2.10 | 23.60 | 300.00 | 300.00 | 400.00 | 879.00 |
| 9 | 160.00 | 2.10 | 112.00 | 2.10 | 23.60 | 300.00 | 300.00 | 400.00 | 703.00 |
| HA0 | 165.00 | 1.70 | 76.00 | 1.20 | 19.56 | 350.00 | 350.00 | 500.00 | 980.00 | [34] |
| DST1-1 | 140.00 | 3.00 | 60.00 | 2.00 | 47.49 | 369.00 | 369.00 | 360.00 | 676.00 |
| DST1-2 | 140.00 | 3.00 | 60.00 | 2.00 | 47.49 | 371.00 | 369.00 | 360.00 | 672.00 |
| DST7-2 | 140.00 | 2.00 | 60.00 | 2.00 | 47.49 | 369.00 | 369.00 | 360.00 | 473.00 |
| DCS500-4-300A | 500.20 | 4.02 | 301.60 | 3.02 | 25.32 | 366.00 | 366.00 | 998.00 | 4206.00 | [35] |
| DCS500-4-300B | 500.30 | 4.03 | 302.10 | 3.01 | 25.32 | 366.00 | 366.00 | 1001.00 | 4606.00 |
| DCS500-4-300C | 500.10 | 4.01 | 300.90 | 3.00 | 25.32 | 366.00 | 366.00 | 1000.00 | 4789.00 |
| DCS500-3-300A | 498.90 | 3.01 | 299.80 | 3.00 | 25.32 | 366.00 | 366.00 | 1001.00 | 4162.00 |
| DCS500-3-300B | 498.50 | 2.99 | 302.10 | 2.98 | 25.32 | 366.00 | 366.00 | 1002.00 | 3886.50 |
| DCS500-3-300C | 499.60 | 3.02 | 301.50 | 2.99 | 25.32 | 366.00 | 366.00 | 1000.00 | 3882.00 |
| DCS600-4-400A | 601.10 | 4.01 | 401.20 | 2.98 | 25.32 | 366.00 | 366.00 | 1001.00 | 5383.50 |
| DCS600-4-400B | 602.30 | 4.02 | 402.10 | 2.97 | 25.32 | 366.00 | 366.00 | 1003.00 | 5370.50 |
| DCS600-4-400C | 603.40 | 3.98 | 401.50 | 3.02 | 25.32 | 366.00 | 366.00 | 1001.00 | 4820.00 |
| DCS600-3-400A | 601.50 | 2.98 | 399.80 | 3.01 | 25.32 | 366.00 | 366.00 | 999.00 | 4415.00 |
| DCS600-3-400B | 601.20 | 3.02 | 400.10 | 3.02 | 25.32 | 366.00 | 366.00 | 999.00 | 4084.50 |
| CDCS400-3-1000 | 400.20 | 3.01 | 241.20 | 3.01 | 25.32 | 366.00 | 366.00 | 1002.00 | 3423.00 |
| CDCS400-3-2000 | 400.60 | 3.02 | 240.50 | 3.00 | 25.32 | 366.00 | 366.00 | 2003.00 | 3013.00 |
| CDCS400-3-2500 | 398.20 | 3.00 | 239.80 | 3.00 | 25.32 | 366.00 | 366.00 | 2501.00 | 3256.50 |
| CDCS400-3-3500 | 398.60 | 3.00 | 239.60 | 3.02 | 25.32 | 366.00 | 366.00 | 3502.00 | 2923.00 |
| DCS400-4-1000 | 401.20 | 4.00 | 240.20 | 3.00 | 25.32 | 366.00 | 366.00 | 1001.00 | 3828.00 |
| DCS400-4-2000B | 400.70 | 4.02 | 240.10 | 3.02 | 25.32 | 366.00 | 366.00 | 2005.00 | 3542.00 |
| DCS400-4-2500 | 400.30 | 4.05 | 240.00 | 3.05 | 25.32 | 366.00 | 366.00 | 2502.00 | 3790.00 |
| DCS400-3-1000 | 401.20 | 3.02 | 240.00 | 2.99 | 25.32 | 366.00 | 366.00 | 1002.00 | 2990.00 |
| DCS400-3-2500 | 400.10 | 2.98 | 240.20 | 2.98 | 25.32 | 366.00 | 366.00 | 2498.00 | 3490.00 |
| C76 | 114.00 | 2.00 | 76.00 | 1.60 | 45.64 | 205.00 | 205.00 | 342.00 | 619.00 | [36] |
| C46.5 | 114.00 | 2.00 | 46.50 | 1.80 | 45.64 | 205.00 | 205.00 | 342.00 | 669.00 |