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number 1273310

| | |
|--|-------------------|
| TEST REPORT | LFD018C170 |
| ASTM C170- STANDARD TEST METHOD FOR COMPRESSIVE STRENGTH OF DIMENSION STONE | |

| | |
|---|--|
| CLIENT | Namibia Marble and Granite (Pty) Ltd. P.O.Box 69 Karibib Namibia Tel +264 64 550201 (W) |
| PETROGRAPHIC NAME [ASTM C119] | Marble |
| TRADE NAME | White Rhino |
| SPECIMEN QUANTITIES | 5 DRY 5 WET |
| SUMMARY OF TEST | COMPRESSIVE STRENGTH DRY: 174 MPa [25286 psi] WET: 75 MPa [10865 psi] |
| MINIMUM VALUE REQUIRED (ASTM C503 Standard Specification for Marble Dimension Stone) | 52 MPa [7500 psi] |

Carrara - January 25, 2019

Apparatus

The testing machine is a special rigid machine "Bombardieri", with a MOOG servovalve, controlled by a real time digital platform C-Rio with FPGA technology.

The load is measured twice, the feedback signal is from an HBM load cell model C4 (2204600 lbf of nominal load) while the calibration cell is an Metior Load Cell model CVP (2204600 lbf of nominal load). Load cell data acquisition (A/D) and displacement is performed by National Instruments NI 9237 24-Bit module. Sample frequency is 2 milliseconds. The displacement is measured by 2 linear potentiometer.





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Support blocks

The support for the specimens is installed on 2 special ball bearing.

Measuring instruments

Specimen size has been measured by a digital caliber "Mitutoyo Absolute" model CD-15PKX (serial no. 13185236) with a precision of 0.01 mm (0.39 mil). Measurements have been made using the international system of units (SI).

Conditioning

Dry conditions - before testing the specimens have been conditioned for 49 h at $140^{\circ}\text{F} \pm 4^{\circ}\text{F}$ [60 ± 2] $^{\circ}\text{C}$. The temperature in the climatic chamber is controlled by a West 6500 temperature controller with PID logical and a PT100 temperature sensor. After dry periods the specimens are kept at room temperature in a dessicator.

Wet conditions - before testing the specimens have been conditioned for 48 h in water at $72^{\circ}\text{F} \pm 4^{\circ}\text{F}$ [22 ± 2] $^{\circ}\text{C}$

Load gradient

Strain gradient is kept under 100 psi/s [690 kPa/s] until specimen failure.

The laboratory technician
dott. Gabriele Pinelli

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membership number
1273310

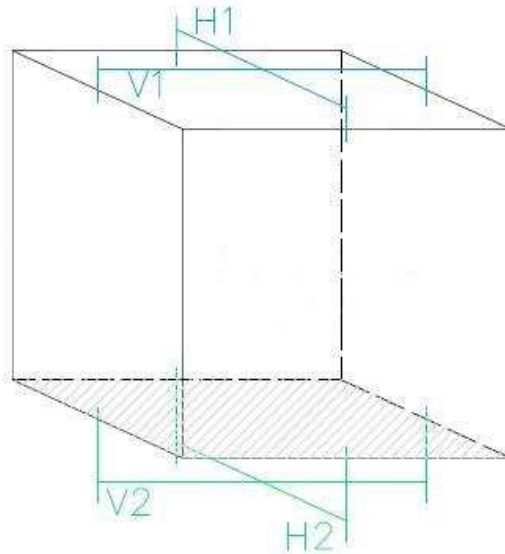
C 170

DRY

NONE

| | |
|-----------------------------|------------|
| Number of specimens | 5 |
| Date of conditioning | 21/12/2018 |
| Date of measurement | 27/12/2018 |
| Date of test | 27/12/2018 |

| | |
|------------------------------|----|
| Conditioning operator | 11 |
| Measurement operator | 11 |
| Test operator | 11 |



| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170D_01 | 1,96 | 1,97 | 3,86 | 1,96 | 1,97 | 3,86 | 3,86 | 100.812 | 26.130 |
| LFD018C170D_02 | 1,96 | 1,97 | 3,85 | 1,97 | 1,97 | 3,87 | 3,86 | 98.041 | 25.419 |
| LFD018C170D_03 | 1,97 | 1,96 | 3,86 | 1,97 | 1,95 | 3,84 | 3,85 | 98.032 | 25.491 |
| LFD018C170D_04 | 1,96 | 1,97 | 3,87 | 1,95 | 1,97 | 3,84 | 3,86 | 105.278 | 27.307 |
| LFD018C170D_05 | 1,96 | 1,97 | 3,87 | 1,96 | 1,98 | 3,87 | 3,87 | 85.486 | 22.084 |

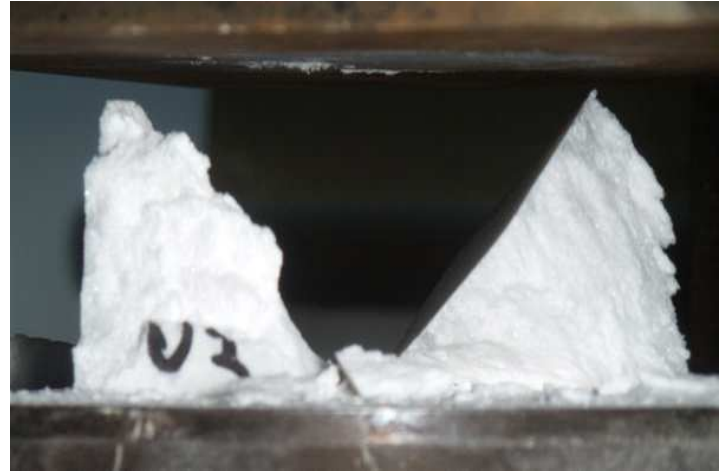
C average 25.277 psi **C std. dev.** 1.943 psi

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170D_01 | 49,72 | 50,10 | 2.490,97 | 49,77 | 50,01 | 2.489,00 | 2.489,98 | 45.728 | 448.592 | 180,2 |
| LFD018C170D_02 | 49,71 | 49,95 | 2.483,01 | 49,99 | 49,92 | 2.495,50 | 2.489,26 | 44.471 | 436.261 | 175,3 |
| LFD018C170D_03 | 49,92 | 49,85 | 2.488,51 | 49,93 | 49,58 | 2.475,53 | 2.482,02 | 44.467 | 436.221 | 175,8 |
| LFD018C170D_04 | 49,85 | 50,11 | 2.497,98 | 49,60 | 49,97 | 2.478,51 | 2.488,25 | 47.754 | 468.467 | 188,3 |
| LFD018C170D_05 | 49,82 | 50,14 | 2.497,97 | 49,79 | 50,18 | 2.498,46 | 2.498,22 | 38.776 | 380.393 | 152,3 |

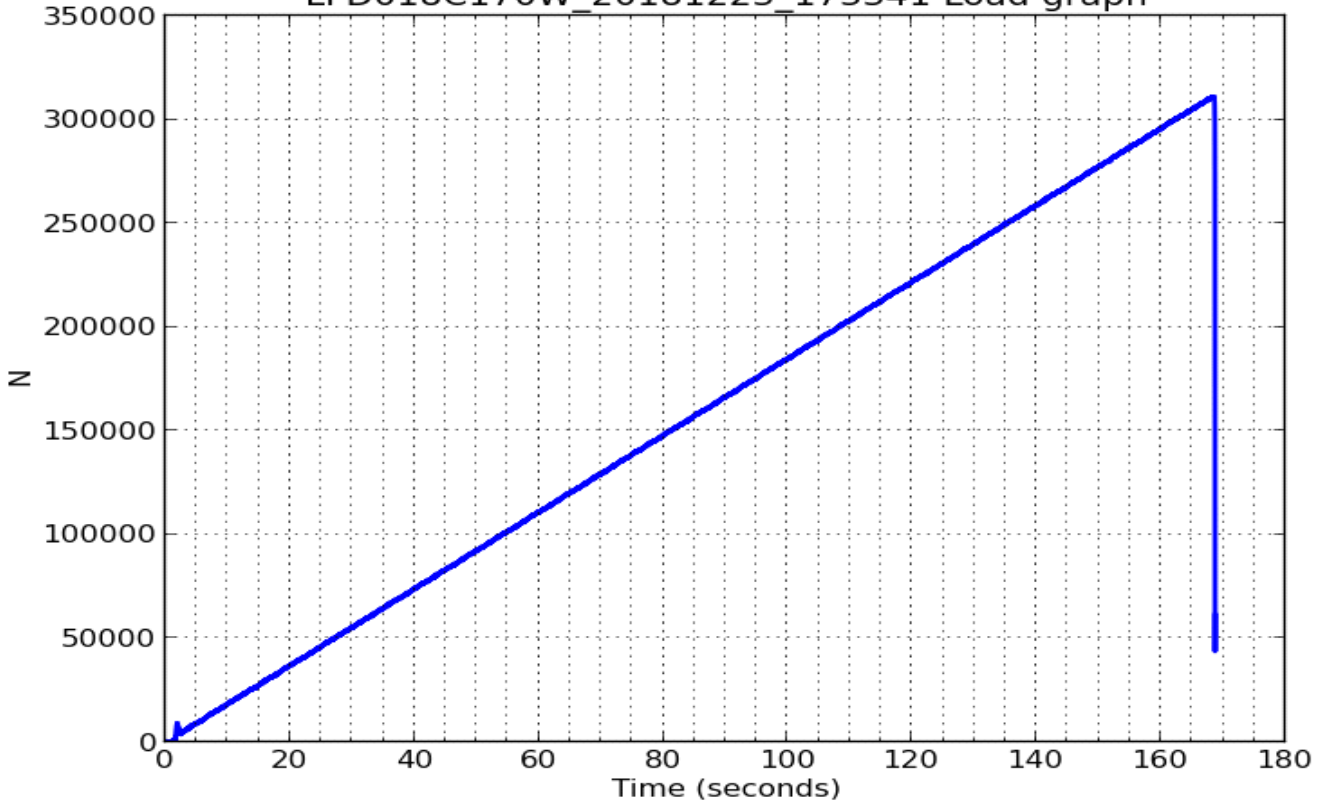
C average 174,3 MPa **C std. dev.** 13,4 MPa

NOTES

Specimen LFD018C170D_01 test result



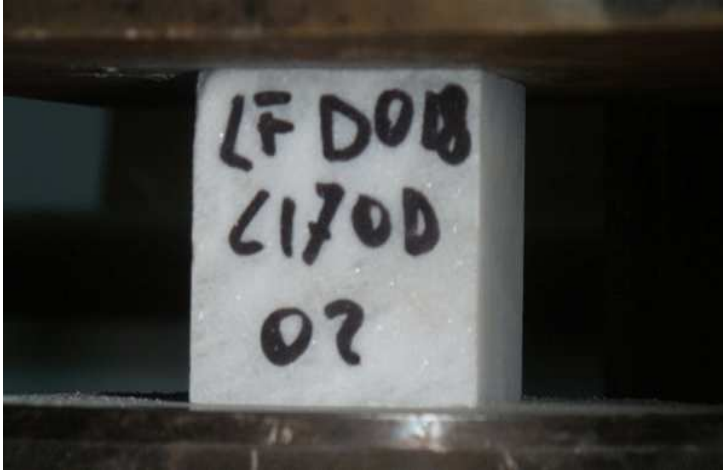
LFD018C170W_20181223_173341 Load graph



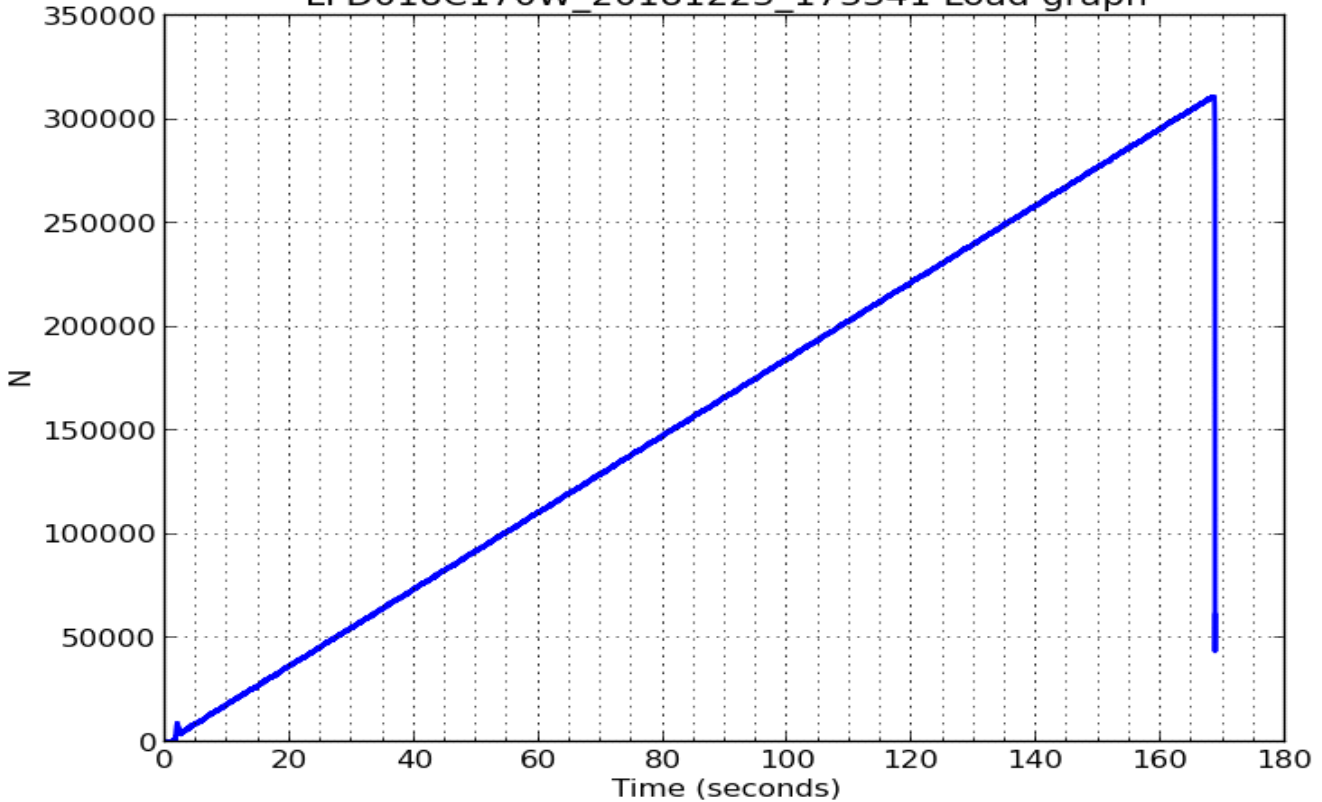
| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170D_01 | 1,96 | 1,97 | 3,86 | 1,96 | 1,97 | 3,86 | 3,86 | 100.812 | 26.130 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170D_01 | 49,72 | 50,10 | 2.490,97 | 49,77 | 50,01 | 2.489,00 | 2.489,98 | 45.728 | 448.592 | 180,2 |

Specimen LFD018C170D_02 test result



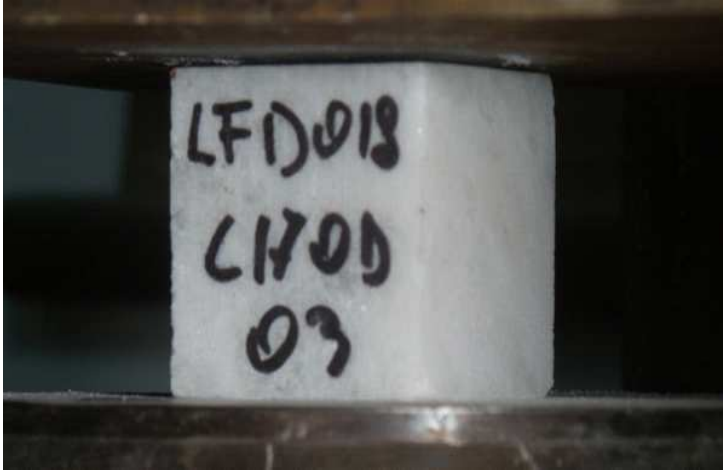
LFD018C170W_20181223_173341 Load graph



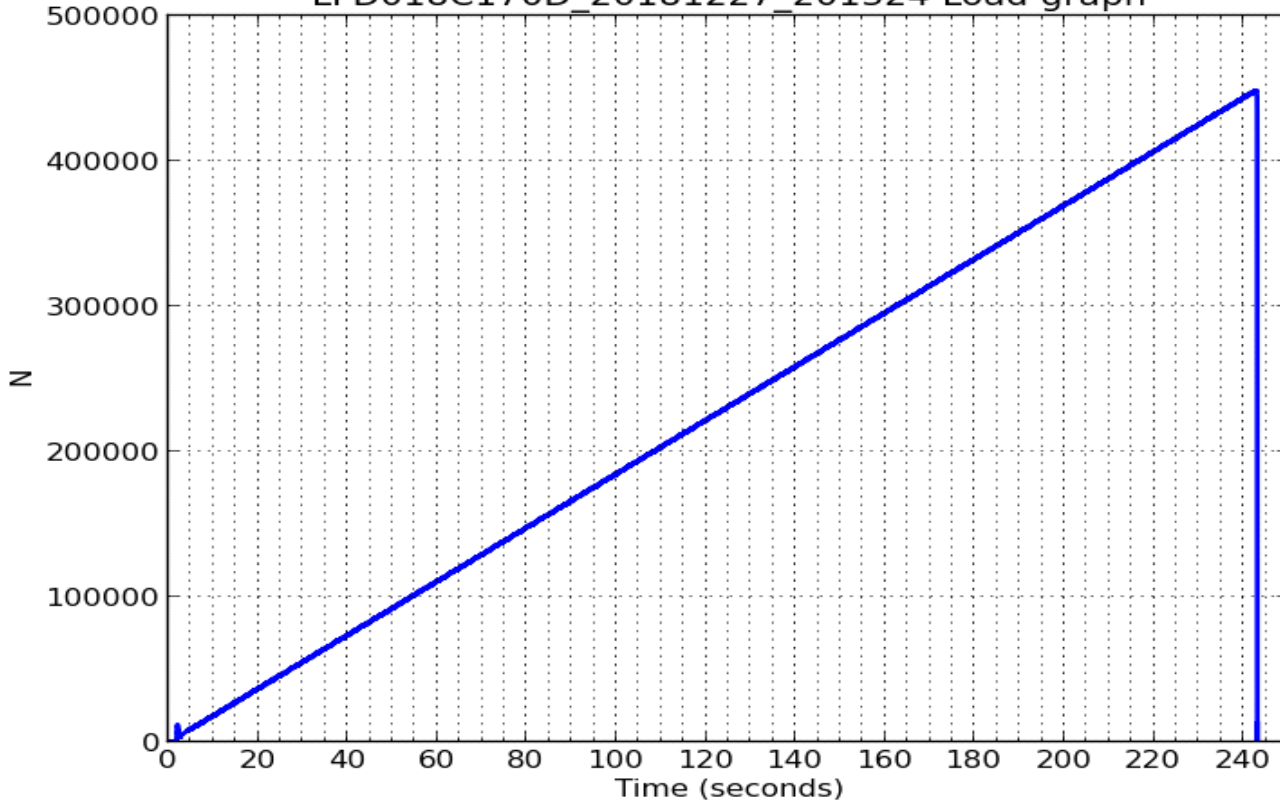
| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170D_02 | 1,96 | 1,97 | 3,85 | 1,97 | 1,97 | 3,87 | 3,86 | 98.041 | 25.419 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170D_02 | 49,71 | 49,95 | 2.483,01 | 49,99 | 49,92 | 2.495,50 | 2.489,26 | 44.471 | 436.261 | 175,3 |

Specimen LFD018C170D_03 test result



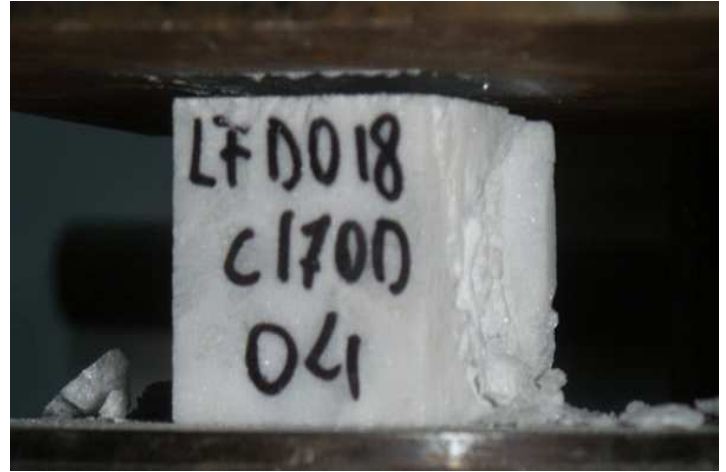
LFD018C170D_20181227_201324 Load graph



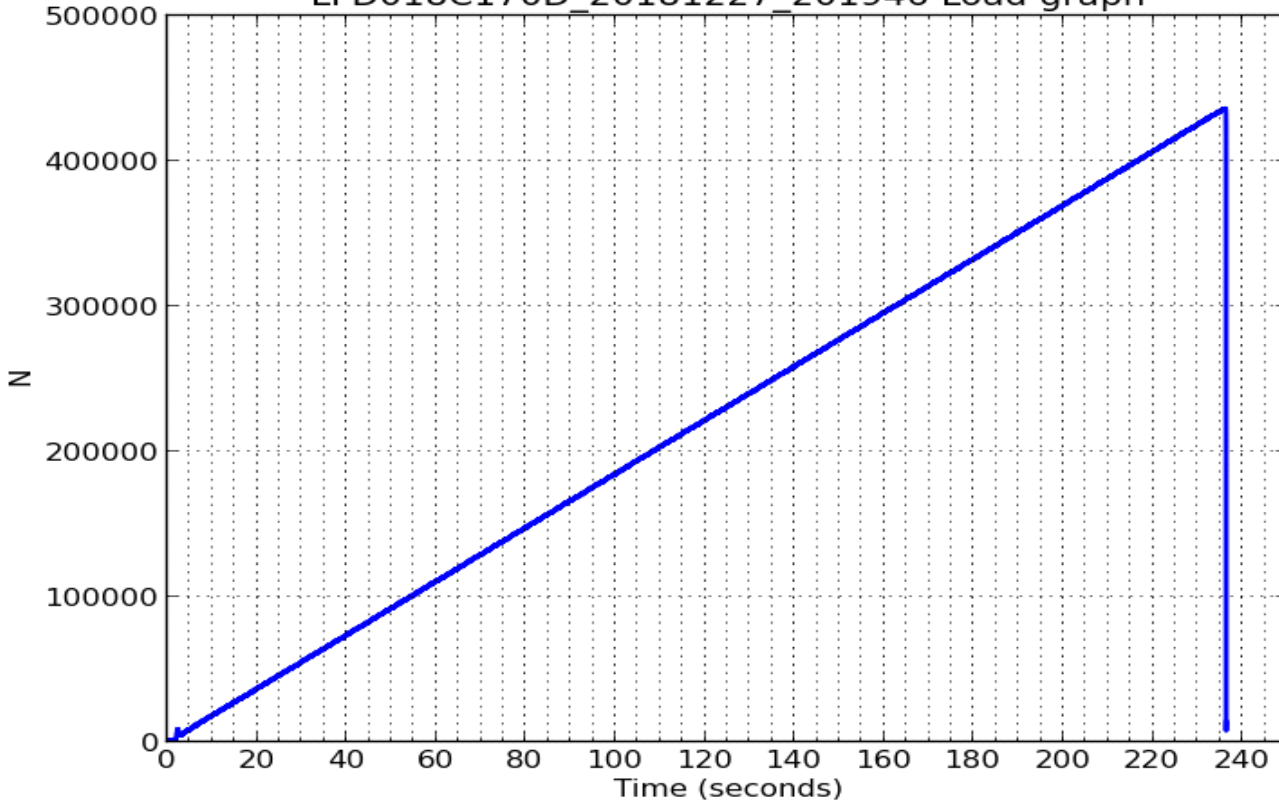
| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170D_03 | 1,97 | 1,96 | 3,86 | 1,97 | 1,95 | 3,84 | 3,85 | 98.032 | 25.491 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170D_03 | 49,92 | 49,85 | 2.488,51 | 49,93 | 49,58 | 2.475,53 | 2.482,02 | 44.467 | 436.221 | 175,8 |

Specimen LFD018C170D_04 test result



LFD018C170D_20181227_201946 Load graph



| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170D_04 | 1,96 | 1,97 | 3,87 | 1,95 | 1,97 | 3,84 | 3,86 | 105.278 | 27.307 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170D_04 | 49,85 | 50,11 | 2.497,98 | 49,60 | 49,97 | 2.478,51 | 2.488,25 | 47.754 | 468.467 | 188,3 |



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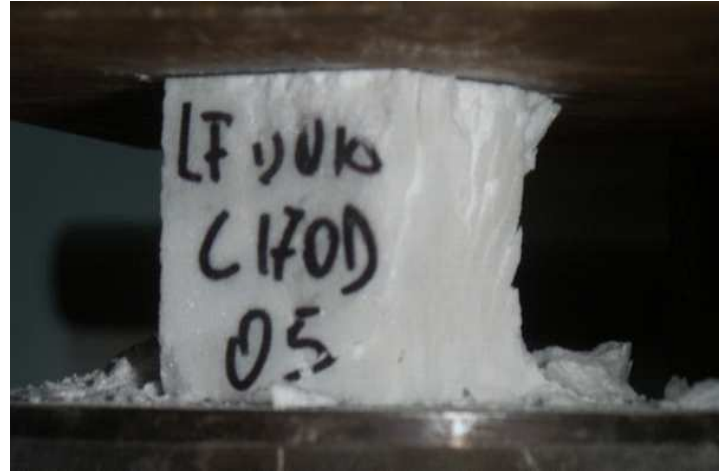
skype: marmotest

info@marmotest.com

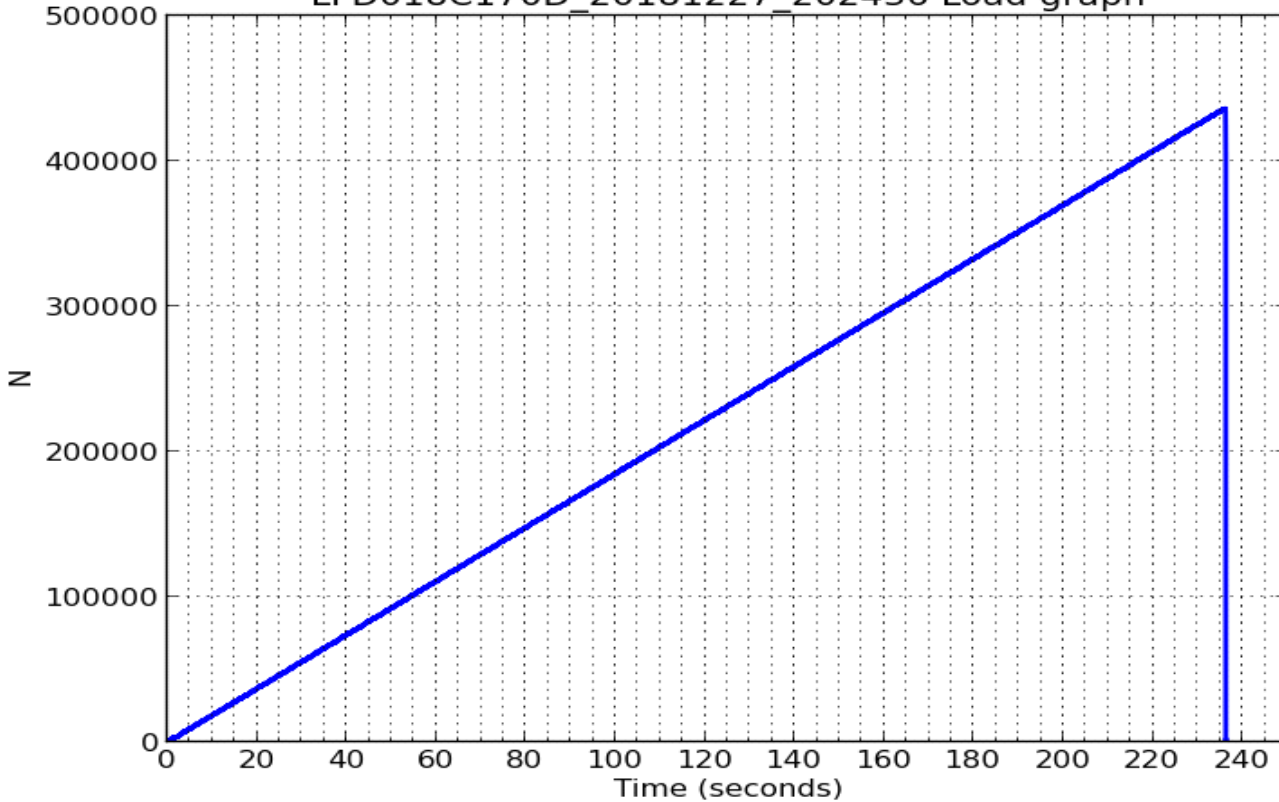


membership number
1273310

Specimen LFD018C170D_05 test result



LFD018C170D_20181227_202436 Load graph



| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170D_05 | 1,96 | 1,97 | 3,87 | 1,96 | 1,98 | 3,87 | 3,87 | 85.486 | 22.084 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170D_05 | 49,82 | 50,14 | 2.497,97 | 49,79 | 50,18 | 2.498,46 | 2.498,22 | 38.776 | 380.393 | 152,3 |



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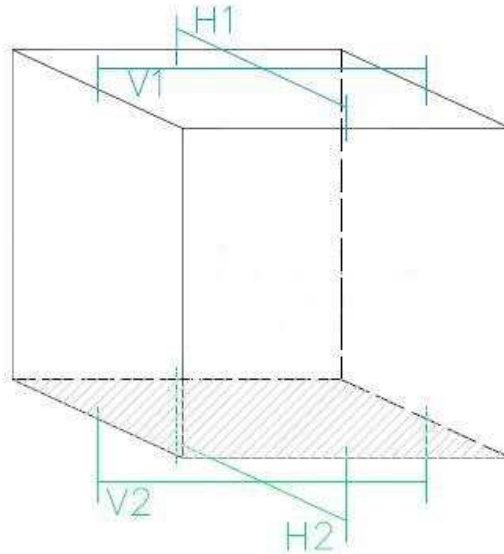
C 170

WET

NONE

| | |
|-----------------------------|------------|
| Number of specimens | 5 |
| Date of conditioning | 21/12/2018 |
| Date of measurement | 23/12/2018 |
| Date of test | 23/12/2018 |

| | |
|------------------------------|----|
| Conditioning operator | 11 |
| Measurement operator | 11 |
| Test operator | 11 |



| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170W_01 | 1,95 | 1,97 | 3,84 | 1,97 | 1,97 | 3,87 | 3,86 | 22.117 | 5.735 |
| LFD018C170W_02 | 1,96 | 1,97 | 3,85 | 1,96 | 1,97 | 3,85 | 3,85 | 24.852 | 6.453 |
| LFD018C170W_03 | 1,97 | 1,96 | 3,87 | 1,97 | 1,97 | 3,89 | 3,88 | 51.429 | 13.274 |
| LFD018C170W_04 | 1,97 | 1,98 | 3,90 | 1,96 | 1,97 | 3,87 | 3,89 | 41.755 | 10.747 |
| LFD018C170W_05 | 1,96 | 1,97 | 3,87 | 1,97 | 1,96 | 3,85 | 3,86 | 69.923 | 18.115 |

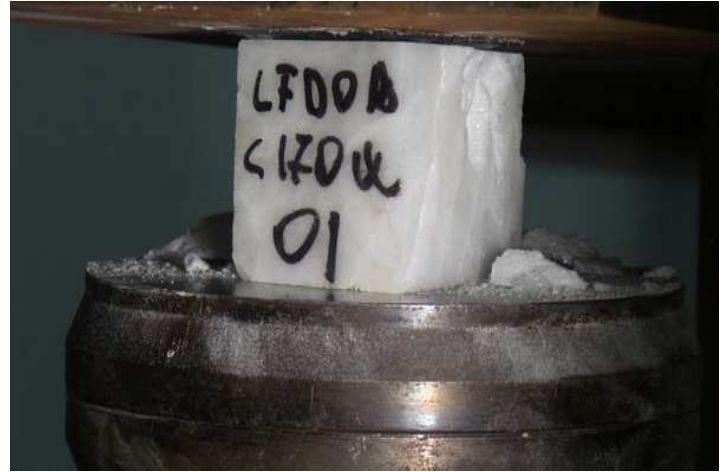
C average 10.861 psi **C std. dev.** 5.101 psi

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170W_01 | 49,62 | 49,98 | 2.480,01 | 49,96 | 49,99 | 2.497,50 | 2.488,75 | 10.032 | 98.414 | 39,5 |
| LFD018C170W_02 | 49,78 | 49,94 | 2.486,01 | 49,72 | 49,99 | 2.485,50 | 2.485,76 | 11.273 | 110.588 | 44,5 |
| LFD018C170W_03 | 50,02 | 49,86 | 2.494,00 | 50,01 | 50,13 | 2.507,00 | 2.500,50 | 23.328 | 228.848 | 91,5 |
| LFD018C170W_04 | 50,16 | 50,19 | 2.517,53 | 49,90 | 50,05 | 2.497,50 | 2.507,51 | 18.940 | 185.801 | 74,1 |
| LFD018C170W_05 | 49,87 | 50,05 | 2.495,99 | 50,06 | 49,67 | 2.486,48 | 2.491,24 | 31.717 | 311.144 | 124,9 |

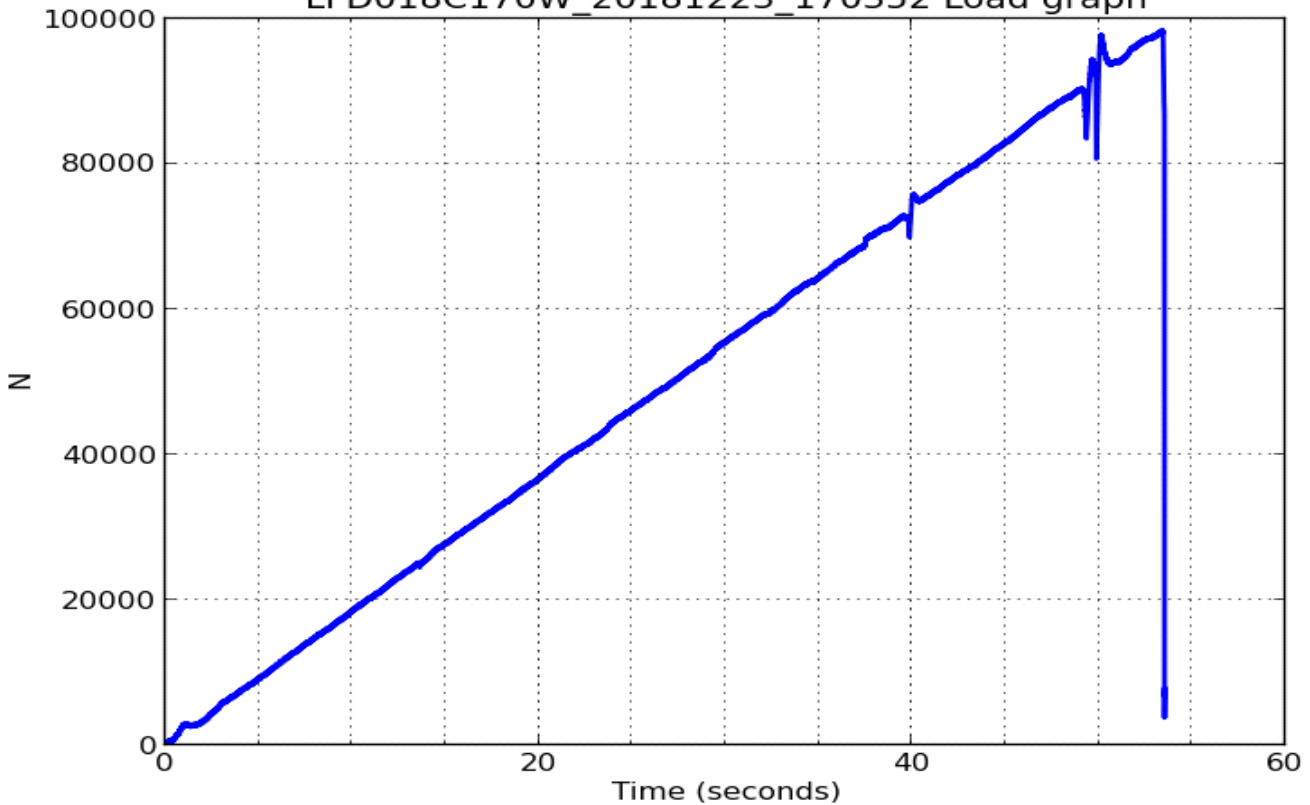
C average 74,9 MPa **C std. dev.** 35,2 MPa

NOTES

Specimen LFD018C170W_01 test result



LFD018C170W_20181223_170352 Load graph



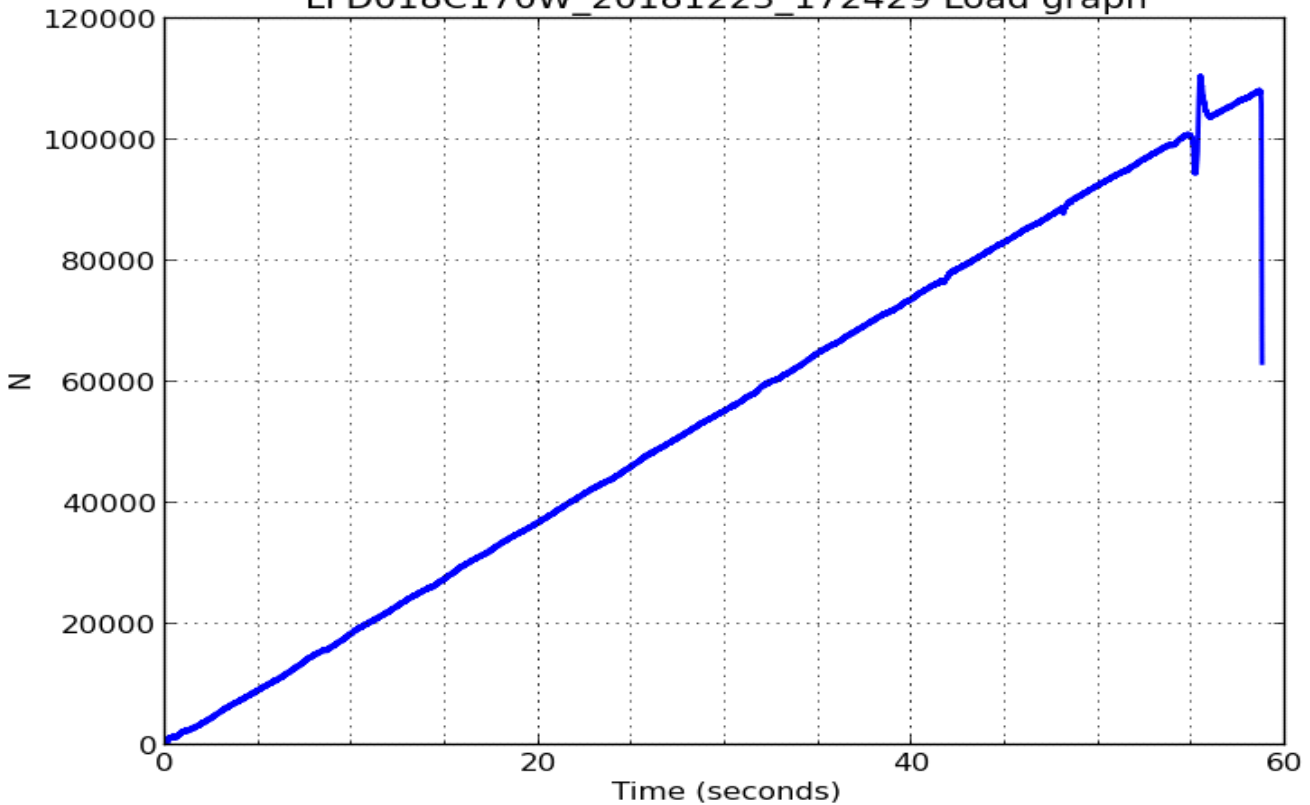
| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170W_01 | 1,95 | 1,97 | 3,84 | 1,97 | 1,97 | 3,87 | 3,86 | 22.117 | 5.735 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170W_01 | 49,62 | 49,98 | 2.480,01 | 49,96 | 49,99 | 2.497,50 | 2.488,75 | 10.032 | 98.414 | 39,5 |

Specimen LFD018C170W_02 test result



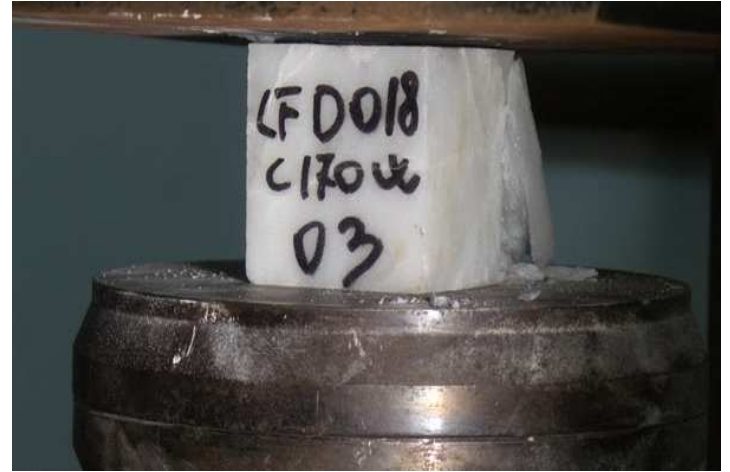
LFD018C170W_20181223_172429 Load graph



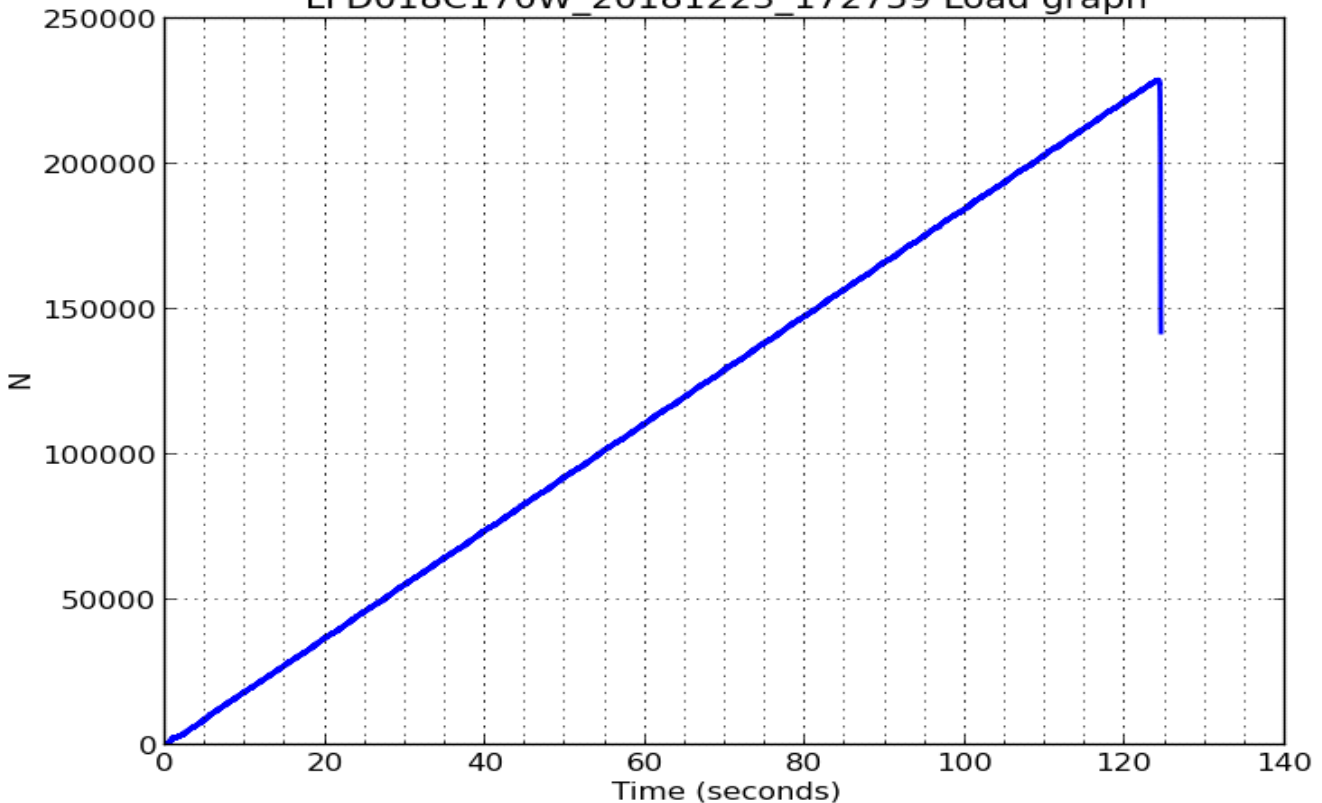
| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170W_02 | 1,96 | 1,97 | 3,85 | 1,96 | 1,97 | 3,85 | 3,85 | 24.852 | 6.453 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170W_02 | 49,78 | 49,94 | 2.486,01 | 49,72 | 49,99 | 2.485,50 | 2.485,76 | 11.273 | 110.588 | 44,5 |

Specimen LFD018C170W_03 test result



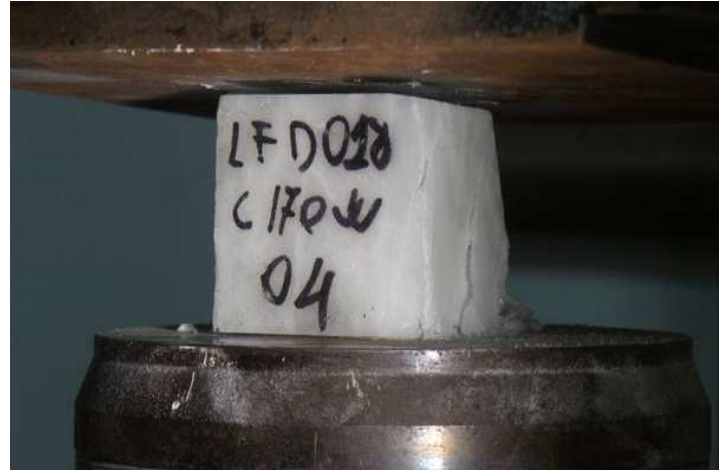
LFD018C170W_20181223_172759 Load graph



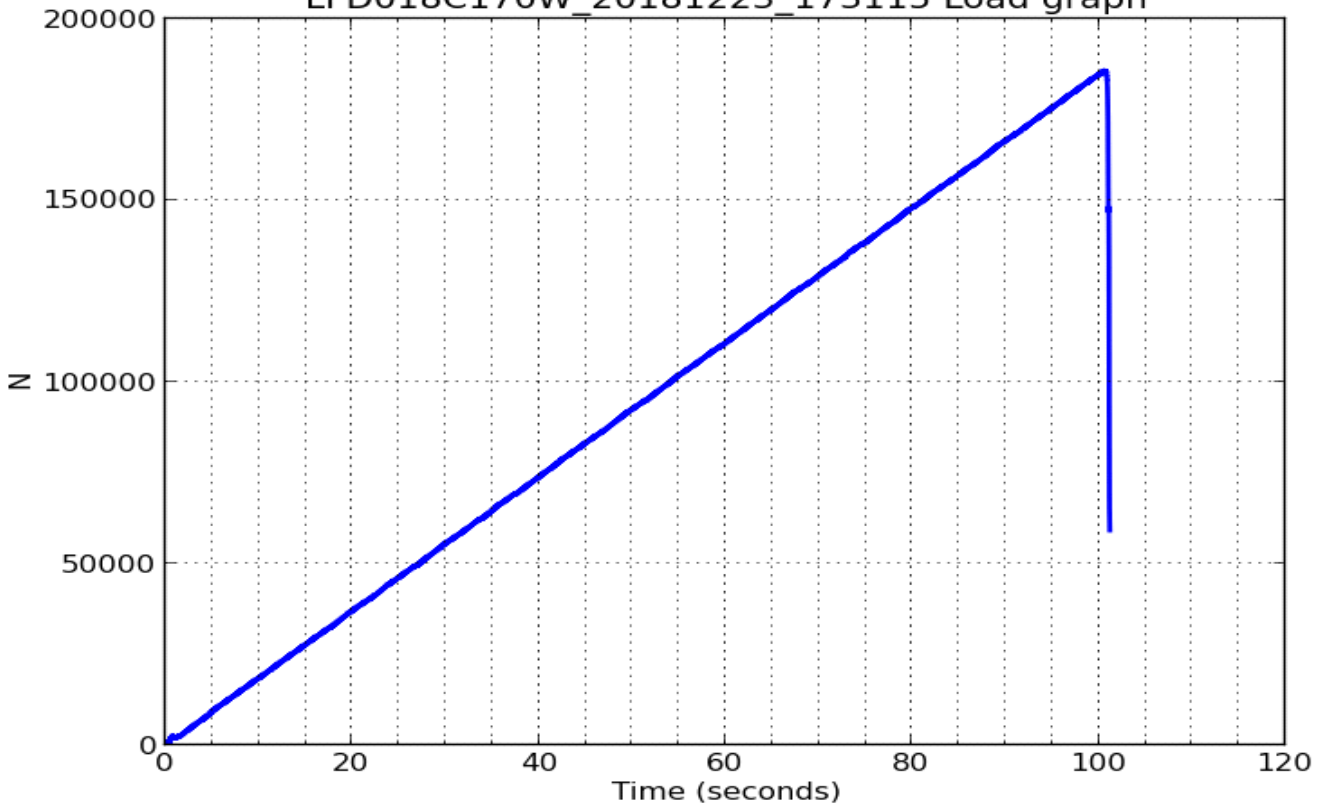
| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170W_03 | 1,97 | 1,96 | 3,87 | 1,97 | 1,97 | 3,89 | 3,88 | 51.429 | 13.274 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170W_03 | 50,02 | 49,86 | 2.494,00 | 50,01 | 50,13 | 2.507,00 | 2.500,50 | 23.328 | 228.848 | 91,5 |

Specimen LFD018C170W_04 test result



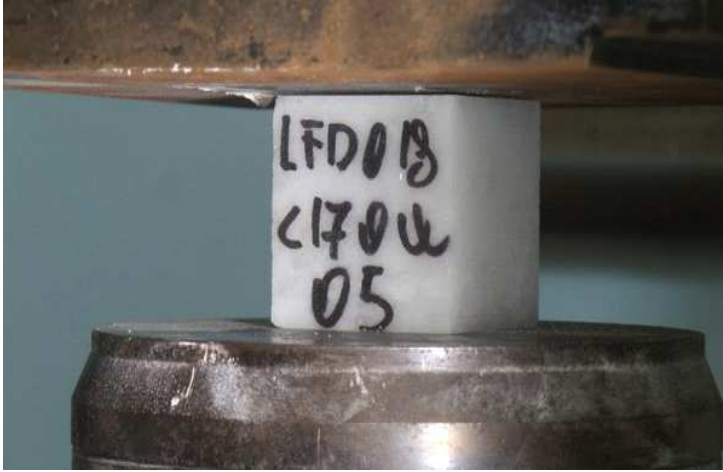
LFD018C170W_20181223_173115 Load graph



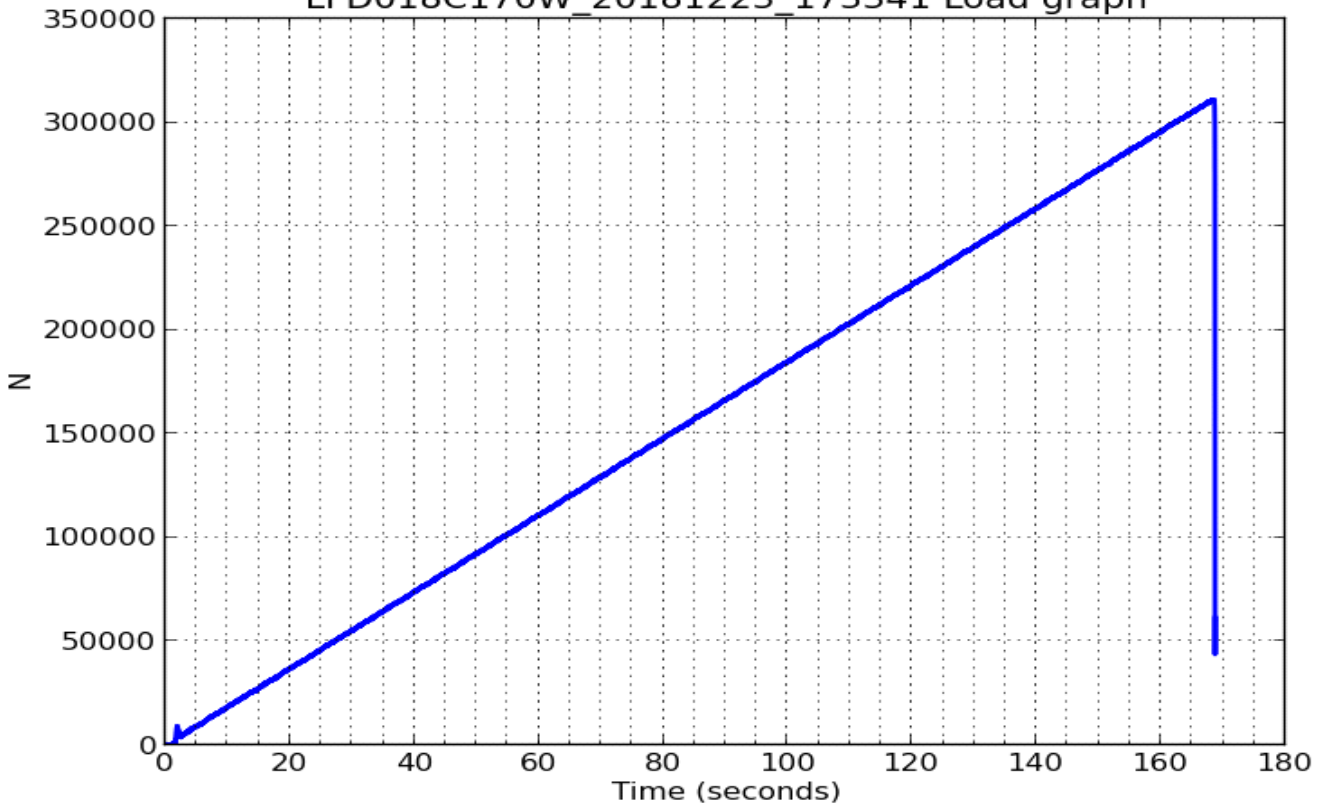
| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170W_04 | 1,97 | 1,98 | 3,90 | 1,96 | 1,97 | 3,87 | 3,89 | 41.755 | 10.747 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170W_04 | 50,16 | 50,19 | 2.517,53 | 49,90 | 50,05 | 2.497,50 | 2.507,51 | 18.940 | 185.801 | 74,1 |

Specimen LFD018C170W_05 test result



LFD018C170W_20181223_173341 Load graph



| Name | H1 [in] | V1 [in] | SURF1 [in ²] | H2 [in] | V2 [in] | SURF2 [in ²] | AVG SURF [in ²] | BRK LOAD [lbf] | C [psi] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|----------------|---------|
| LFD018C170W_05 | 1,96 | 1,97 | 3,87 | 1,97 | 1,96 | 3,85 | 3,86 | 69.923 | 18.115 |

| Name | H1 [mm] | V1 [mm] | SURF1 [mm ²] | H2 [mm] | V2 [mm] | SURF2 [mm ²] | AVG SURF [mm ²] | LOAD [Kg] | LOAD [N] | C [MPa] |
|----------------|---------|---------|--------------------------|---------|---------|--------------------------|-----------------------------|-----------|----------|---------|
| LFD018C170W_05 | 49,87 | 50,05 | 2.495,99 | 50,06 | 49,67 | 2.486,48 | 2.491,24 | 31.717 | 311.144 | 124,9 |