

Biax Experiment (rev. 1 March 2019)

Exp. Name: 95272 N210
Operator: Sharon
Example name: pXXXXBttMatNN

Date/Time: 18 April 2019
Hydraulics start: 253.7
Hydraulics end: 257.1

Sample Block Thickness w/ no gouge:

___ Steel 5x5 cm, _____ mm
___ Titanium 5x5 cm, _____ mm
___ Steel 10x10 cm, _____ mm
___ Titanium 10x10 cm, _____ mm

___ Vessel (Small Single Direct)-Frits: yes 6 x 5
___ Vessel (Large Single Direct)
___ Vessel (5x5 Grooved)-Frits: _____
Vessel Side Blocks: _____ Empty Block + frits: _____

For Current Calibrations see: ~barre/s0/data/calibrations/MasterCalibrationsFile.xlsx

Vertical Load Cell:

___ 62mm hollow (19.7298 mV/kN)
X 44mm solid "V" (11.3519 mV/kN)
___ 22mm Vert. (0.7321 V/kN)

Horizontal Load Cell:

___ 62mm hollow (Low Gain: 18.561 mV/kN; High Gain: 172.099 mV/kN)
X 44mm solid "H" (Low Gain: 11.626 mV/kN; High Gain: 105.9 mV/kN)
___ 22mm Horiz. (0.7736 V/kN)

Example conversion to stress (e.g., 62 mm Horizontal Cell, Low Gain, 5cm x 5cm sample)

$(18.722 \text{ mV/kN}) * (1000 \text{ kN/MN}) * (1 \text{ V}/1000 \text{ mV}) = (1/18.722 \text{ V/MN}) / (2.5 \text{ e-}3 \text{ m}^2) = 21.365238 \text{ MPa/V}$ or 0.046805 V/MPa

Layer Thickness (total on bench): _____ mm Under Load: _____ mm @ sample
Material (Qtz, Granite, ?): _____
Particle Size, Size Distribution: _____

Vert. Load Initial Voltage -4.807
DPM readouts (kN)
Vertical @ Zero Load: 115
Horizontal @ Zero Load: 33

Horz. Load Initial Voltage -4.679
Normal Stress(es): 10 (MPa)
Voltage(s) at load: -1.939 V
Calibration(V/MPa): 0.274 V/MPa

Vessel Pressure: Pore Fluid:

*(0.1461 V/MPa) Pore Pressure A: _____ Initial Voltage: _____ Voltage at load: _____
High gain: 1.4702 V/MPa Gain: High/Low
*(0.1460 V/MPa) Pore Pressure B: _____ Initial Voltage: _____ Voltage at load: _____
High gain: 1.4743 V/MPa Gain: High/Low
(0.1471 V/MPa) Confining Pressure: _____ Initial Voltage: _____ Voltage at load: _____
*Calibration reflects current location of pressure transducer (A is on B and vice versa)
(0.412 V/kPa) Differential Press: _____ Initial Voltage: _____ Voltage at load: _____

Data Logger Used: 8ch

95268-500
Control File

Horz. DCDT: X Long rod ___ Short rod ___ Vert. DCDT: ___ TT1"/Transtek 2" Gain: High/Med/Low

Purpose/Description: 10 MPa LHA 3.5 x 3.5

Acoustics blocks used 3C

Temperature (°C): 23.1 Relative Humidity (%): 44.3

@ Hyd. Power Supply (HPS)

14. Tank Temp (°C): _____
15. Temp. Out (°C): _____
16. Pres. Out (psi): _____

Chilled water at HPS

1. Temp In (°F): _____
2. Pres. In (psi): _____
3. Temp Out (°F): _____
4. Pres. Out (psi): _____
5. Flow (lpm): _____

Chiller Unit

6. Panel Temp (°F): _____
7. Panel Pres. (psi): _____
8. Near Pres. In (psi): _____
9. Near Pres. Out (psi): _____

Process water at Chiller

10. Temp In (°F): _____
11. Pres. In (psi): _____
12. Temp Out (°F): _____
13. Pres. Out (psi): _____

2200 σ τ prishun (1266W @ load)

62000 1hr shear after 10 min inspection

338000 offer H DENT, OB DENT

$L_{ny} = 99.58$ mm

$L_y = 99.92$ mm

$A_{ny} = 223.33$ g

$A_y = 223.64$ g

$B_{ny} = 219.76$ g

$B_y = 219.97$ g

$p - p$

$1 - 63$

$thp = 1ms$

16 V

Biax Experiment (rev. 1 March 2019)

Exp. Name: P5271 Wes 10
Operator: Sheron
Example name: pXXXXBttMatNN

Date/Time: 18 April 2019
Hydraulics start: 250.7
Hydraulics end: 253.6

Sample Block Thickness w/ no gouge:

___ Steel 5x5 cm, _____ mm
___ Titanium 5x5 cm, _____ mm
___ Steel 10x10 cm, _____ mm
___ Titanium 10x10 cm, _____ mm

___ Vessel (Small Single Direct)-Frits: Wes & SR5
___ Vessel (Large Single Direct)
___ Vessel (5x5 Grooved)-Frits: _____
Vessel Side Blocks: _____ Empty Block + frits: _____

For Current Calibrations see: ~barre/s0/data/calibrations/MasterCalibrationsFile.xlsx

Vertical Load Cell:

___ 62mm hollow (19.7298 mV/kN)
☒ 44mm solid "V" (11.3519 mV/kN)
___ 22mm Vert. (0.7321 V/kN)

Horizontal Load Cell:

___ 62mm hollow (Low Gain: 18.561 mV/kN; High Gain: 172.099 mV/kN)
☒ 44mm solid "H" (Low Gain: 11.626 mV/kN; High Gain: 105.9 mV/kN)
___ 22mm Horiz. (0.7736 V/kN)

Example conversion to stress (e.g., 62 mm Horizontal Cell, Low Gain, 5cm x 5cm sample)

$(18.722 \text{ mV/kN}) * (1000 \text{ kN/MN}) * (1 \text{ V}/1000 \text{ mV}) = (1/18.722 \text{ V/MN}) / (2.5 \text{ e-}3 \text{ m}^2) = 21.365238 \text{ MPa/V}$ or 0.046805 V/MPa

Layer Thickness (total on bench): _____ mm Under Load: _____ mm @ sample _____
Material (Qtz, Granite, ?): _____
Particle Size, Size Distribution: _____

Vert. Load Initial Voltage -4.8
DPM readouts (kN)
Vertical @ Zero Load: 115
Horizontal @ Zero Load: 35

Horz. Load Initial Voltage -4.63
Normal Stress(es): 10 (MPa)
Voltage(s) at load: -1.89 V
Calibration (V/MPa): 0.274 V/MPa

Vessel Pressure: Pore Fluid:

*(0.1461 V/MPa) Pore Pressure A: _____ Initial Voltage: _____ Voltage at load: _____
High gain: 1.4702 V/MPa Gain: High/Low
*(0.1460 V/MPa) Pore Pressure B: _____ Initial Voltage: _____ Voltage at load: _____
High gain: 1.4743 V/MPa Gain: High/Low
(0.1471 V/MPa) Confining Pressure: _____ Initial Voltage: _____ Voltage at load: _____
*Calibration reflects current location of pressure transducer (A is on B and vice versa)
(0.412 V/kPa) Differential Press: _____ Initial Voltage: _____ Voltage at load: _____

Data Logger Used: 8ch P5265.500 Control File

Horz. DCDT: ☒ Long rod ___ Short rod ___ Vert. DCDT: ___ TT1"/Transtek 2" Gain: High/Med/Low

Purpose/Description: 10 MPa with 4.5 x 4.5

Acoustics blocks used 3C

Temperature (°C): 22.2 Relative Humidity (%): 41.7

@ Hyd. Power Supply (HPS)

14. Tank Temp (°C): _____
15. Temp. Out (°C): _____
16. Pres. Out (psi): _____

Chilled water at HPS

1. Temp In (°F): _____
2. Pres. In (psi): _____
3. Temp Out (°F): _____
4. Pres. Out (psi): _____
5. Flow (lpm): _____

Chiller Unit

6. Panel Temp (°F): _____
7. Panel Pres. (psi): _____
8. Near Pres. In (psi): _____
9. Near Pres. Out (psi): _____

Process water at Chiller

10. Temp In (°F): _____
11. Pres. In (psi): _____
12. Temp Out (°F): _____
13. Pres. Out (psi): _____

1600 5 9 prisms. (129 we had)

20000 start sheering

34000 @ 38 min, start c.f.

$L_{NY} = 99.63 \text{ mm}$

$L_y = 100.0 \text{ mm}$

$A_{NY} = 223.16 \text{ g}$

$A_y = 223.41 \text{ g}$

$B_{NY} = 219.77 \text{ g}$

$B_y = 219.97 \text{ g}$

1-63

P-P

16V

1 tbp

Biax Experiment (rev. 1 March 2019)

Exp. Name: 15270 Wes 10
Operator: Sheran

Date/Time: 12 Apr 2019
Hydraulics start: 250.2
Hydraulics end: 252.0

Example name: pXXXXBttMatNN

Sample Block Thickness w/ no gouge:

☐ Steel 5x5 cm, _____ mm
☐ Titanium 5x5 cm, _____ mm
☐ Steel 10x10 cm, _____ mm
☐ Titanium 10x10 cm, _____ mm

☐ Vessel (Small Single Direct)-Frits: Wes. 6 5x5
☐ Vessel (Large Single Direct)
☐ Vessel (5x5 Grooved)-Frits: _____
Vessel Side Blocks: _____ Empty Block + frits: _____

For Current Calibrations see: ~barre/s0/data/calibrations/MasterCalibrationsFile.xlsx

Vertical Load Cell:

☐ 62mm hollow (19.7298 mV/kN)
☒ 44mm solid "V" (11.3519 mV/kN)
☐ 22mm Vert. (0.7321 V/kN)

Horizontal Load Cell:

☐ 62mm hollow (Low Gain: 18.561 mV/kN; High Gain: 172.099 mV/kN)
☒ 44mm solid "H" (Low Gain: 11.626 mV/kN; High Gain: 105.9 mV/kN)
☐ 22mm Horiz. (0.7736 V/kN)

Example conversion to stress (e.g., 62 mm Horizontal Cell, Low Gain, 5cm x 5cm sample)

$(18.722 \text{ mV/kN}) * (1000 \text{ kN/MN}) * (1 \text{ V}/1000 \text{ mV}) = (1/18.722 \text{ V/MN}) / (2.5 \text{ e-}3 \text{ m}^2) = 21.365238 \text{ MPa/V}$ or 0.046805 V/MPa

Layer Thickness (total on bench): _____ mm Under Load: _____ mm@sample _____

Material (Qtz, Granite, ?): _____

Particle Size, Size Distribution: _____

Vert. Load Initial Voltage -4.799

DPM readouts (kN)

Vertical @ Zero Load: 115

Horizontal @ Zero Load: 32

Horz. Load Initial Voltage -4.7036

Normal Stress(es): 10 (MPa)

Voltage(s) at load: -1.9636 V

Calibration(V/MPa): 0.274 V/MPa

Vessel Pressure: Pore Fluid:

*(0.1461 V/MPa) Pore Pressure A: _____ Initial Voltage: _____ Voltage at load: _____

High gain: 1.4702 V/MPa Gain: High/Low

*(0.1460 V/MPa) Pore Pressure B: _____ Initial Voltage: _____ Voltage at load: _____

High gain: 1.4743 V/MPa Gain: High/Low

(0.1471 V/MPa) Confining Pressure: _____ Initial Voltage: _____ Voltage at load: _____

*Calibration reflects current location of pressure transducer (A is on B and vice versa)

(0.412 V/kPa) Differential Press: _____ Initial Voltage: _____ Voltage at load: _____

Data Logger Used: 82h

15268.500 Control File

Horz. DCDT: ☒ Long rod ☐ Short rod Vert. DCDT: ☐ TT1"/Transtek 2" Gain: High/Med/Low

Purpose/Description: 10 MPa with 5x5 Spring

Acoustics blocks used

3 C

Temperature (°C): 23.1 Relative Humidity (%): 36.8

@ Hyd. Power Supply (HPS)

14. Tank Temp (°C): _____

15. Temp. Out (°C): _____

16. Pres. Out (psi): _____

Chilled water at HPS

1. Temp In (°F): _____

2. Pres. In (psi): _____

3. Temp Out (°F): _____

4. Pres. Out (psi): _____

5. Flow (lpm): _____

Chiller Unit

6. Panel Temp (°F): _____

7. Panel Pres. (psi): _____

8. Near Pres. In (psi): _____

9. Near Pres. Out (psi): _____

Process water at Chiller

10. Temp In (°F): _____

11. Pres. In (psi): _____

12. Temp Out (°F): _____

13. Pres. Out (psi): _____

1620 σ τ pushmm (175 kN @ load)

62000 shear shear

0.015 - 0.035 V $\Delta 2$ @ 30 mins

309000 offset OB / V.D. on 1

$$L_{N4} = 99.59 \text{ mm}$$

$$L_4 = 99.84 \text{ mm}$$

$$A_{N4} = 223.36 \text{ g}$$

$$A_4 = 223.61 \text{ g}$$

$$B_{N4} = 2219.51 \text{ g}$$

$$B_4 = 2220.06 \text{ g}$$

$$I \rightarrow 63$$

$$P \rightarrow P$$

$$V = 56 \text{ V}$$

$$H_{bp} = 1 \text{ ms}$$

Biax Experiment (rev. 1 March 2019)

Exp. Name: P5269 Wes10
Operator: Sharan
Example name: pXXXXBttMatNN

Date/Time: 17 Apr 2019
Hydraulics start: 248.6
Hydraulics end: 250.4

Sample Block Thickness w/ no gouge:

___ Steel 5x5 cm, _____ mm
___ Titanium 5x5 cm, _____ mm
___ Steel 10x10 cm, _____ mm
___ Titanium 10x10 cm, _____ mm

___ Vessel (Small Single Direct)-Frits: _____
___ Vessel (Large Single Direct)
___ Vessel (5x5 Grooved)-Frits: _____
Vessel Side Blocks: _____ Empty Block + frits: _____

Wes 4 5x5

For Current Calibrations see: ~barre/s0/data/calibrations/MasterCalibrationsFile.xlsx

Vertical Load Cell:

___ 62mm hollow (19.7298 mV/kN)
___ 44mm solid "V" (11.3519 mV/kN)
___ 22mm Vert. (0.7321 V/kN)

Horizontal Load Cell:

___ 62mm hollow (Low Gain: 18.561 mV/kN; High Gain: 172.099 mV/kN)
___ 44mm solid "H" (Low Gain: 11.626 mV/kN; High Gain: 105.9 mV/kN)
___ 22mm Horiz. (0.7736 V/kN)

Example conversion to stress (e.g., 62 mm Horizontal Cell, Low Gain, 5cm x 5cm sample)
 $(18.722 \text{ mV/kN}) * (1000 \text{ kN/MN}) * (1 \text{ V}/1000 \text{ mV}) = (1/18.722 \text{ V/MN}) / (2.5 \text{ e-}3 \text{ m}^2) = 21.365238 \text{ MPa/V or } 0.046805 \text{ V/MPa}$

Layer Thickness (total on bench): _____ mm Under Load: _____ mm@sample _____
Material (Qtz, Granite, ?): _____
Particle Size, Size Distribution: _____

Vert. Load Initial Voltage -4.299
DPM readouts (kN)
Vertical @ Zero Load: 115
Horizontal @ Zero Load: 33

Horz. Load Initial Voltage -4.616
Normal Stress(es): 10 (MPa)
Voltage(s) at load: -1.936 V
Calibration(V/MPa): 0.274 V/MPa

Vessel Pressure:

Pore Fluid: _____

*(0.1461 V/MPa) Pore Pressure A: _____ Initial Voltage: _____ Voltage at load: _____
High gain: 1.4702 V/MPa Gain: High/Low
*(0.1460 V/MPa) Pore Pressure B: _____ Initial Voltage: _____ Voltage at load: _____
High gain: 1.4743 V/MPa Gain: High/Low
(0.1471 V/MPa) Confining Pressure: _____ Initial Voltage: _____ Voltage at load: _____
*Calibration reflects current location of pressure transducer (A is on B and vice versa)
(0.412 V/kPa) Differential Press: _____ Initial Voltage: _____ Voltage at load: _____

Data Logger Used: 8uh Control File 75268-500

Horz. DCDT: Long rod Short rod Vert. DCDT: _____ TTI"/Transtek 2" Gain: High/Med/Low

Purpose/Description: 10 MPa with 3x3 sp.

Acoustics blocks used 3C

Temperature (°C): 23.1 Relative Humidity (%): 36.8

@ Hyd. Power Supply (HPS)	Chilled water at HPS	Chiller Unit	Process water at Chiller
14. Tank Temp (°C): _____	1. Temp In (°F): _____	6. Panel Temp (°F): _____	10. Temp In (°F): _____
15. Temp. Out (°C): _____	2. Pres. In (psi): _____	7. Panel Pres. (psi): _____	11. Pres. In (psi): _____
16. Pres. Out (psi): _____	3. Temp Out (°F): _____	8. Near Pres. In (psi): _____	12. Temp Out (°F): _____
	4. Pres. Out (psi): _____	9. Near Pres. Out (psi): _____	13. Pres. Out (psi): _____
	5. Flow (lpm): _____		

3830 T a piston

176 kW @ load

67800 shear shear.

196000 audible shock steps

0.041V Δz @ 30 mm mark.

350250 ~ 37 mm mark, shear on front. le

p 5263.500

345000 offset v. DUT

400000 offset OB

$$L_{ny} = 99.65 \text{ mm}$$

$$L_y = 99.95 \text{ mm}$$

$$A_{ny} = 223.28 \text{ g}$$

$$A_y = 223.44 \text{ g}$$

$$B_{ny} = 219.77 \text{ g}$$

$$B_y = 219.98 \text{ g}$$

r r

1 → 63

thp 21ms

$$V = 56 \text{ V}$$

Biax Experiment (rev. 1 March 2019)

Exp. Name: P5268 Wes 10

Date/Time: 16 Apr 2019

Operator: Sharan

Hydraulics start: 239.0

Example name: pXXXXBttMatNN

Hydraulics end: 240.5

Sample Block Thickness w/ no gouge:

___ Steel 5x5 cm, _____ mm

___ Vessel (Small Single Direct)-Frits: Wes. 9 5x5

___ Titanium 5x5 cm, _____ mm

___ Vessel (Large Single Direct)

___ Steel 10x10 cm, _____ mm

___ Vessel (5x5 Grooved)-Frits: _____

___ Titanium 10x10 cm, _____ mm

Vessel Side Blocks: _____ Empty Block + frits: _____

For Current Calibrations see: ~barre/s0/data/calibrations/MasterCalibrationsFile.xlsx

Vertical Load Cell:

___ 62mm hollow (19.7298 mV/kN)

Horizontal Load Cell:

___ 62mm hollow (Low Gain: 18.561 mV/kN; High Gain: 172.099 mV/kN)

☒ 44mm solid "V" (11.3519 mV/kN)

☒ 44mm solid "H" (Low Gain: 11.626 mV/kN; High Gain: 105.9 mV/kN)

___ 22mm Vert. (0.7321 V/kN)

___ 22mm Horiz. (0.7736 V/kN)

Example conversion to stress (e.g., 62 mm Horizontal Cell, Low Gain, 5cm x 5cm sample)

$(18.722 \text{ mV/kN}) * (1000 \text{ kN/MN}) * (1 \text{ V}/1000 \text{ mV}) = (1/18.722 \text{ V/MN}) / (2.5 \text{ e-}3 \text{ m}^2) = 21.365238 \text{ MPa/V}$ or 0.046805 V/MPa

Layer Thickness (total on bench): _____ mm Under Load: _____ mm @ sample _____

Material (Qtz, Granite, ?): _____

Particle Size, Size Distribution: _____

Vert. Load Initial Voltage -4.776

Horz. Load Initial Voltage -4.7009

DPM readouts (kN)

Normal Stress(es): 10 (MPa)

Vertical @ Zero Load: 115

Voltage(s) at load: -1.9609 ✓

Horizontal @ Zero Load: 32

Calibration(V/MPa): 0.274 V/MPa

Vessel Pressure: Pore Fluid:

*(0.1461 V/MPa) Pore Pressure A: _____

Initial Voltage: _____

Voltage at load: _____

High gain: 1.4702 V/MPa

Gain: High/Low

*(0.1460 V/MPa) Pore Pressure B: _____

Initial Voltage: _____

Voltage at load: _____

High gain: 1.4743 V/MPa

Gain: High/Low

(0.1471 V/MPa) Confining Pressure: _____

Initial Voltage: _____

Voltage at load: _____

*Calibration reflects current location of pressure transducer (A is on B and vice versa)

(0.412 V/kPa) Differential Press: _____

Initial Voltage: _____

Voltage at load: _____

Data Logger Used: P2H

P5268.500 Control File

Horz. DCDT: ☒ Long rod ___ Short rod

Vert. DCDT: ___ TT1"/Transtek 2" Gain: High/Med/Low

Purpose/Description: 10 MPa with 4x4 spring

Acoustics blocks used 3C

Temperature (°C): 23.5 Relative Humidity (%): 21.6

@ Hyd. Power Supply (HPS)

Chilled water at HPS

Chiller Unit

Process water at Chiller

14. Tank Temp (°C): _____

1. Temp In (°F): 50

6. Panel Temp (°F): 56

10. Temp In (°F): 50

15. Temp. Out (°C): _____

2. Pres. In (psi): 6

7. Panel Pres. (psi): 44

11. Pres. In (psi): 2

16. Pres. Out (psi): 2850

3. Temp Out (°F): 72

8. Near Pres. In (psi): 2

12. Temp Out (°F): 48

4. Pres. Out (psi): 2

9. Near Pres. Out (psi): 6

13. Pres. Out (psi): 10

5. Flow (lpm): 16

200 σ & pressure (174 kN @ 10 MPa)

$L_{m1} = 99.58 \text{ mm}$

Shear after 10 min compaction

$L_u = 99.95 \text{ mm}$

62500 static shearing (132 kN @ 62500)

$A_{m1} = 223.31 \text{ g}$

0.024 V ΔZ @ 30 min mark $\rightarrow$

$A_u = 223.55 \text{ g}$

transition &
audible.

~ 332000 , @ 38:00

start control file,

after V.DUT, DB.

$B_{m1} = 219.8 \text{ g}$

$B_u = 220.04 \text{ g}$