



PRACTICAL INSIGHTS INTO SIMPLE ALTERNATIVES TO THE TRIAXIAL TEST FOR BSM

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TRIAXIAL TEST



8 SPECIMENS (DRY)

Cohesion & Internal friction angle

+

2 SPECIMENS (WET)

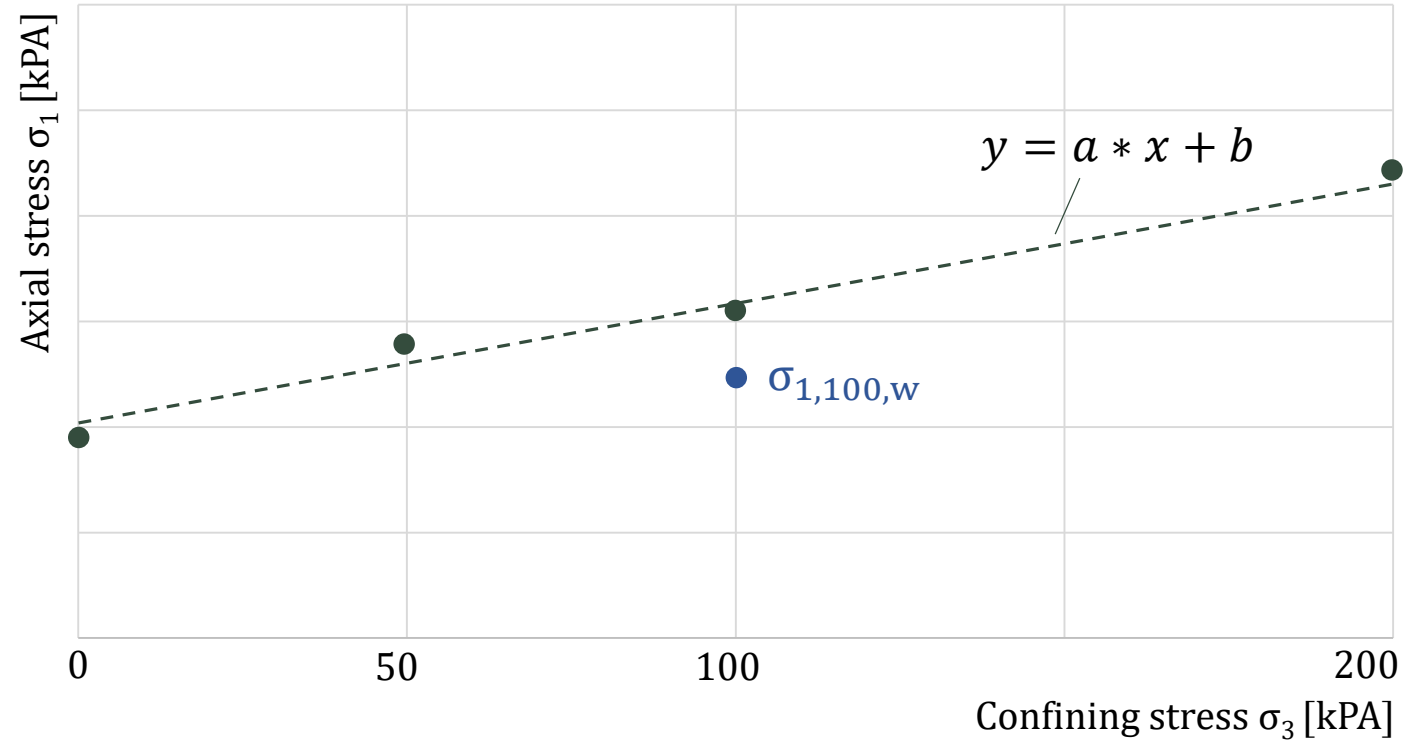
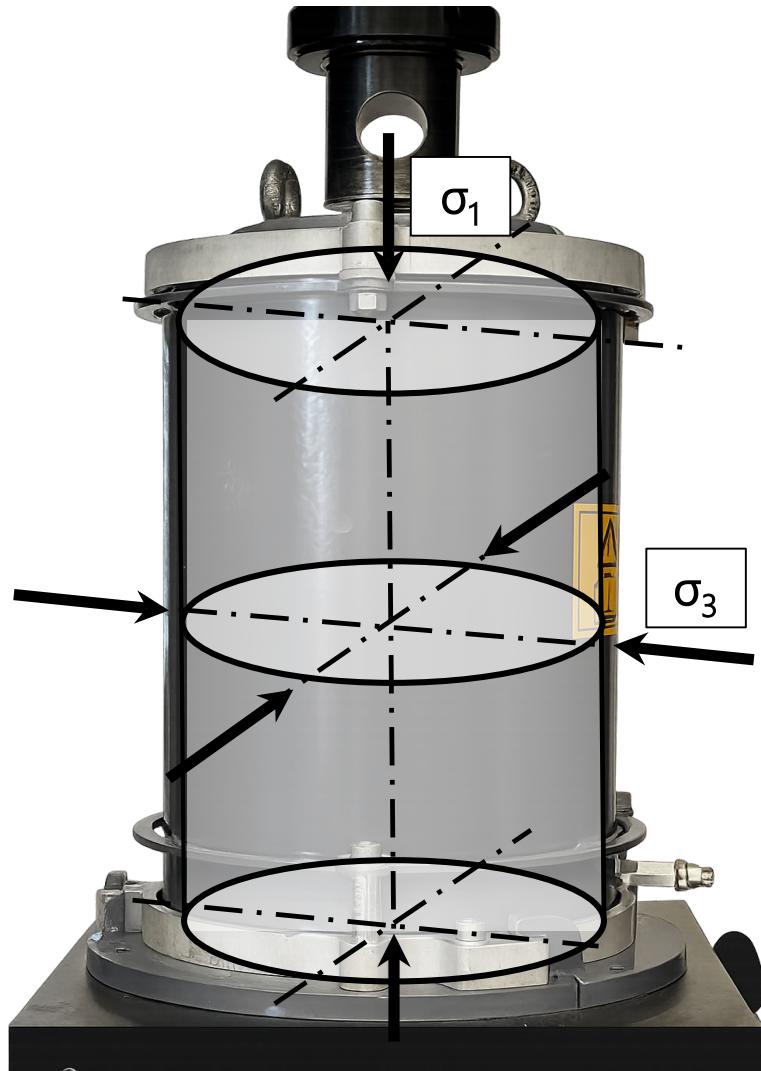
Retained Cohesion

=

10 SPECIMENS

≈150 kg

TRIAXIAL TEST



INTERNAL FRICTION ANGLE

$$\varphi = \sin^{-1} \left(\frac{a - 1}{a + 1} \right) [^\circ]$$

COHESION

$$c = \frac{b * (1 - \sin(\varphi))}{2 * \cos(\varphi)} \text{ [kPa]}$$

RETAINED COHESION

$$\text{RetC} = \frac{\sigma_{1,100,w} - 100}{\sigma_{1,100,d} - 100} * 100 \text{ [%]}$$

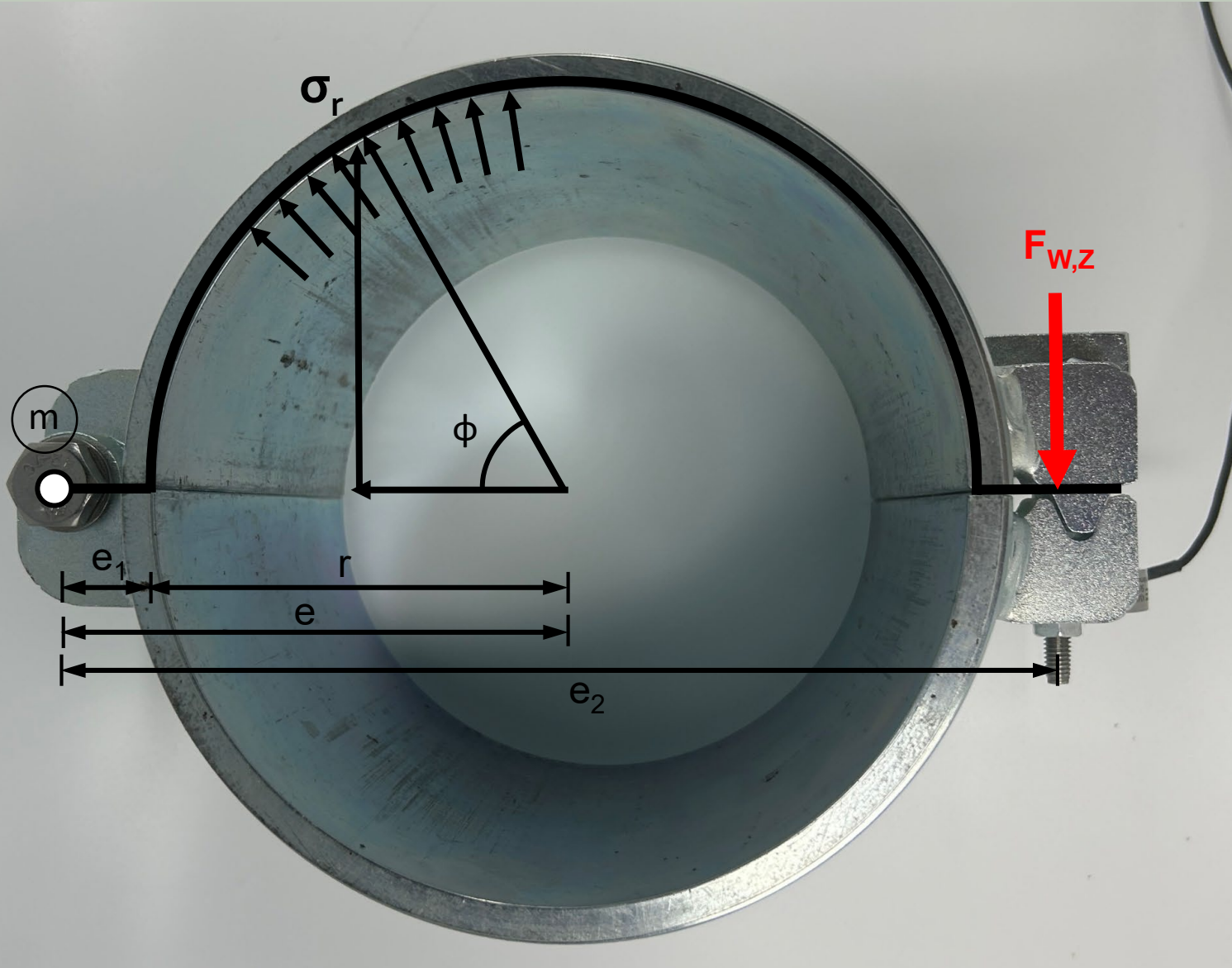
ALTERNATIVE TEST



TEST MOULD = COMPACTION MOULD

- Hinged mould with load cell quantifies closing force under vertical load
- Enables measurement of radial forces

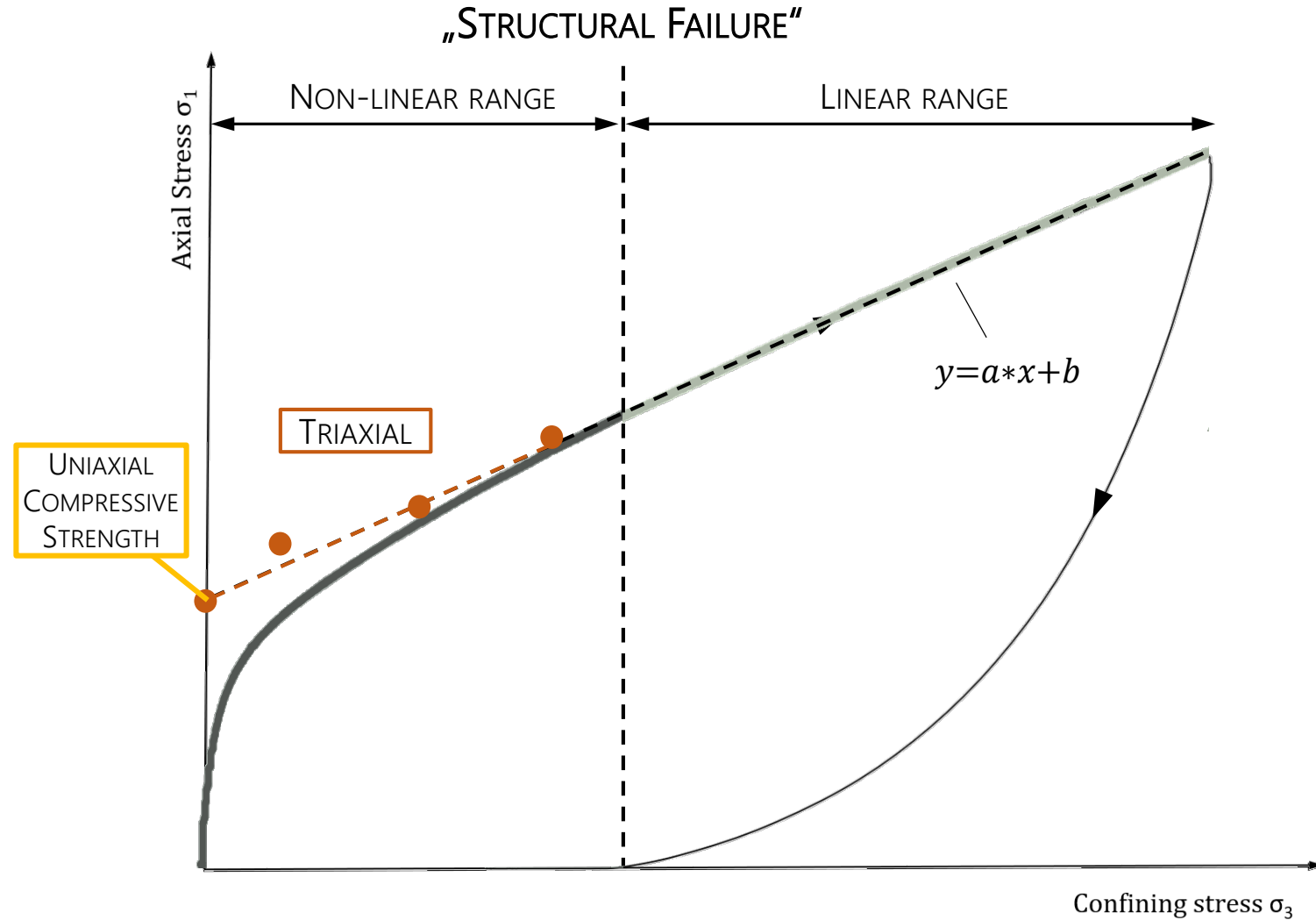
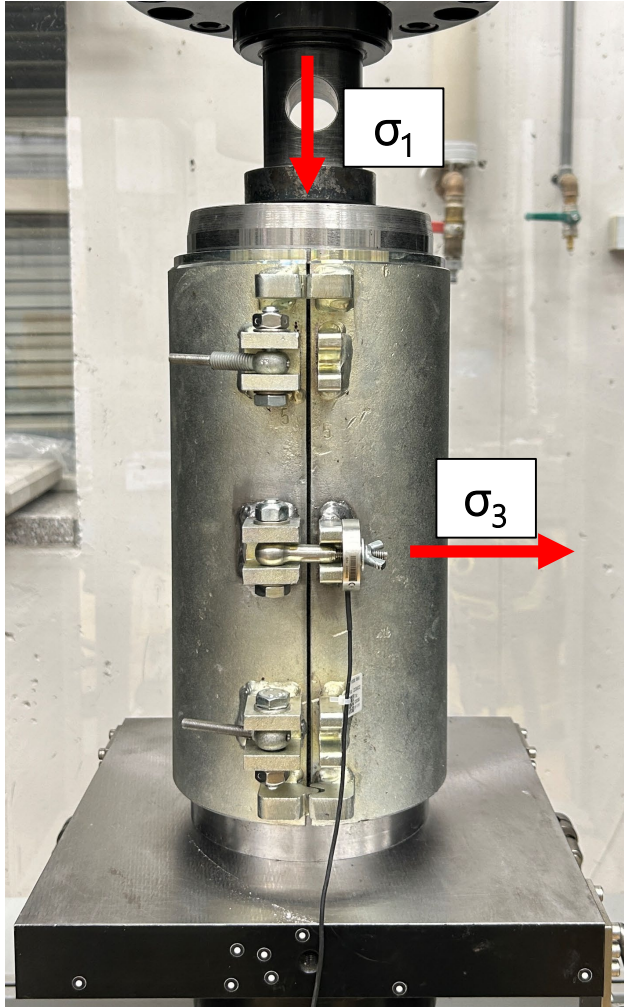
ALTERNATIVE TEST



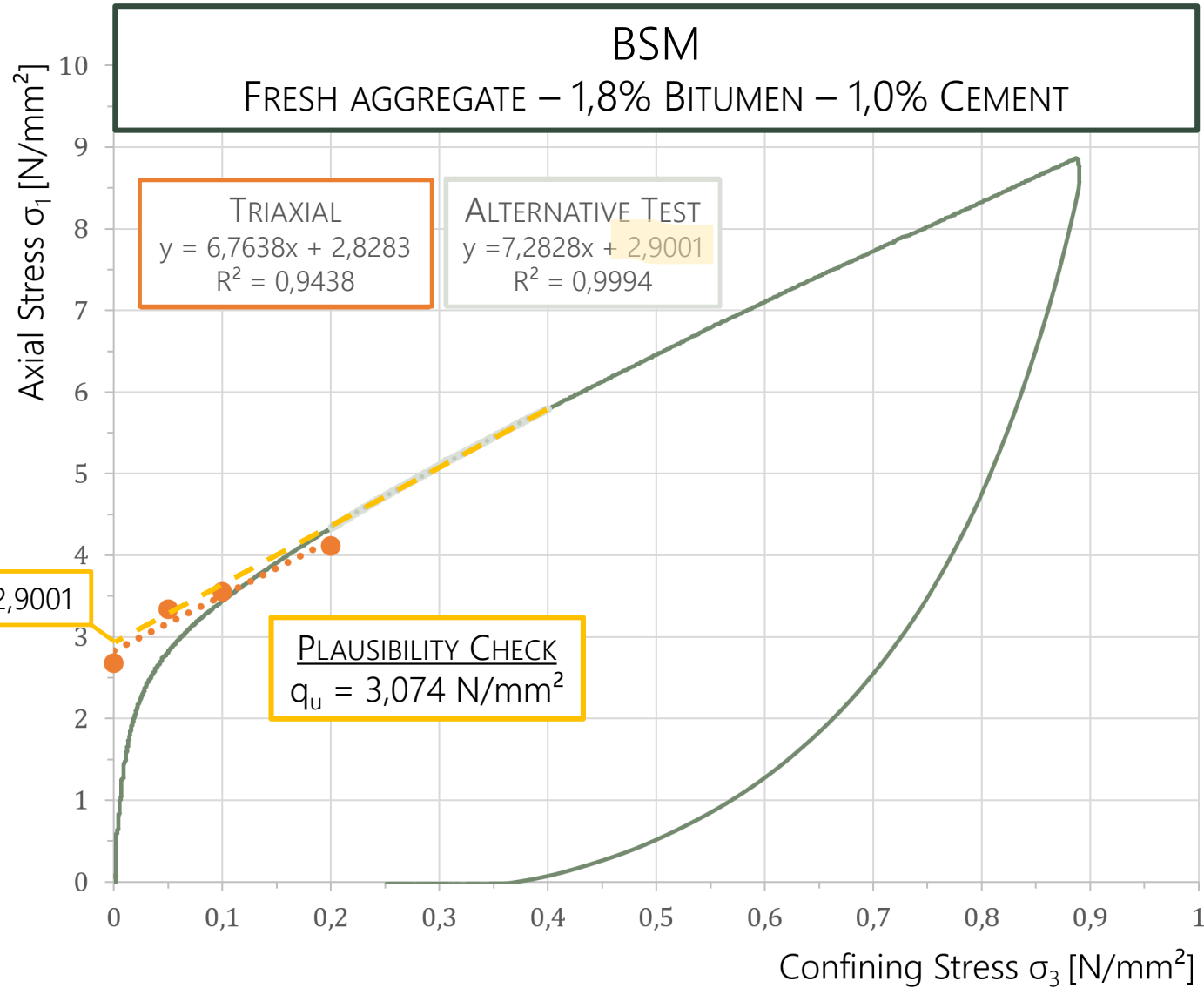
RADIAL STRESS

$$\sigma_r = \frac{F_{w,z} * e_2}{h * (r * e_1 + r^2) * 2}$$

ALTERNATIVE TEST



EXAMPLE - SHEAR PARAMETER



543,75

537,32

TRIAXIAL TEST

ALTERNATIVE TEST

C [kPa]

47,94

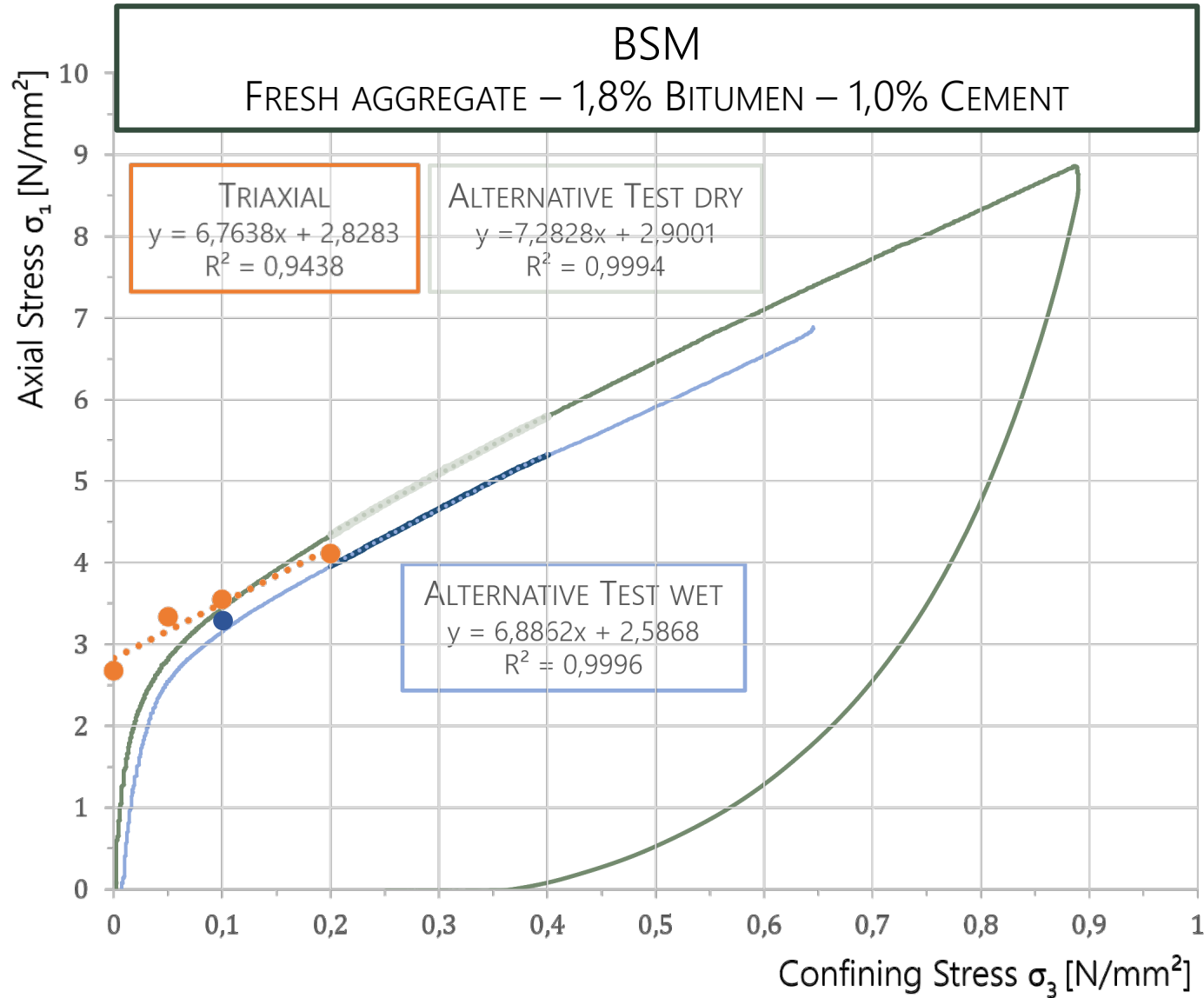
49,34

TRIAXIAL TEST

ALTERNATIVE TEST

ϕ [°]

EXAMPLE – RETAINED SHEAR PARAMETER



TRIAXIAL TEST	
$\sigma_{1,100,d} = 3550$ kPa	$\sigma_{1,100,w} = 3256$ kPa
Ret. C	91,48 %

ALTERNATIVE TEST	
$C_{dry} = 537,32$ kPa	$C_{wet} = 492,88$ kPa
Ret. C	91,73 %
$\varphi_{dry} = 49,34^\circ$	$\varphi_{wet} = 48,28^\circ$
Ret. φ	97,86 %

ALTERNATIVE TEST – SPECIMENS



2 SPECIMENS (DRY)

Cohesion & Internal friction angle

+

2 SPECIMENS (WET)

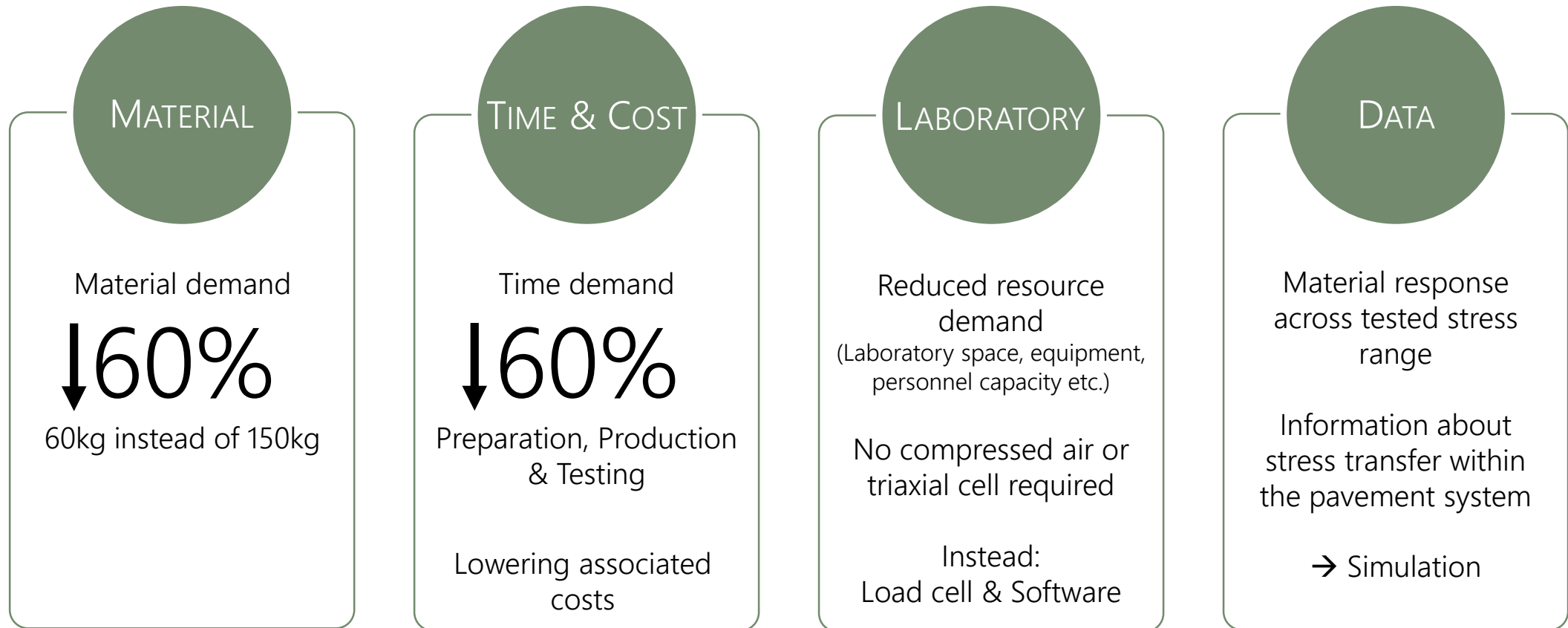
Retained Shear Parameter

=

4 SPECIMENS

≈60 kg

ALTERNATIVE TEST – BENEFITS



OUTLOOK



- Extended parameter determination
(e.g. stiffness, Poisson's ratio, numerical simulation)
- Assessment of specimen size effects
- Further optimizations of test setup
- Interpretation within Soil mechanics



THANK YOU!