

ARC INNOVATIONS

A yellow swoosh graphic element, consisting of a smooth, upward-curving line that starts below the 'C' in 'ARC' and extends to the right, ending under the 'S' in 'INNOVATIONS'.

# Zero and Low Cement Mining Applications

# Shotcrete



- **40MPa at 28 days**
- **1MPa at 1 Hour**
- **Blend of Wet Tailings and Binder**
- **Blended material open time longer than 1 week**
- **Energy Absorption 900J**

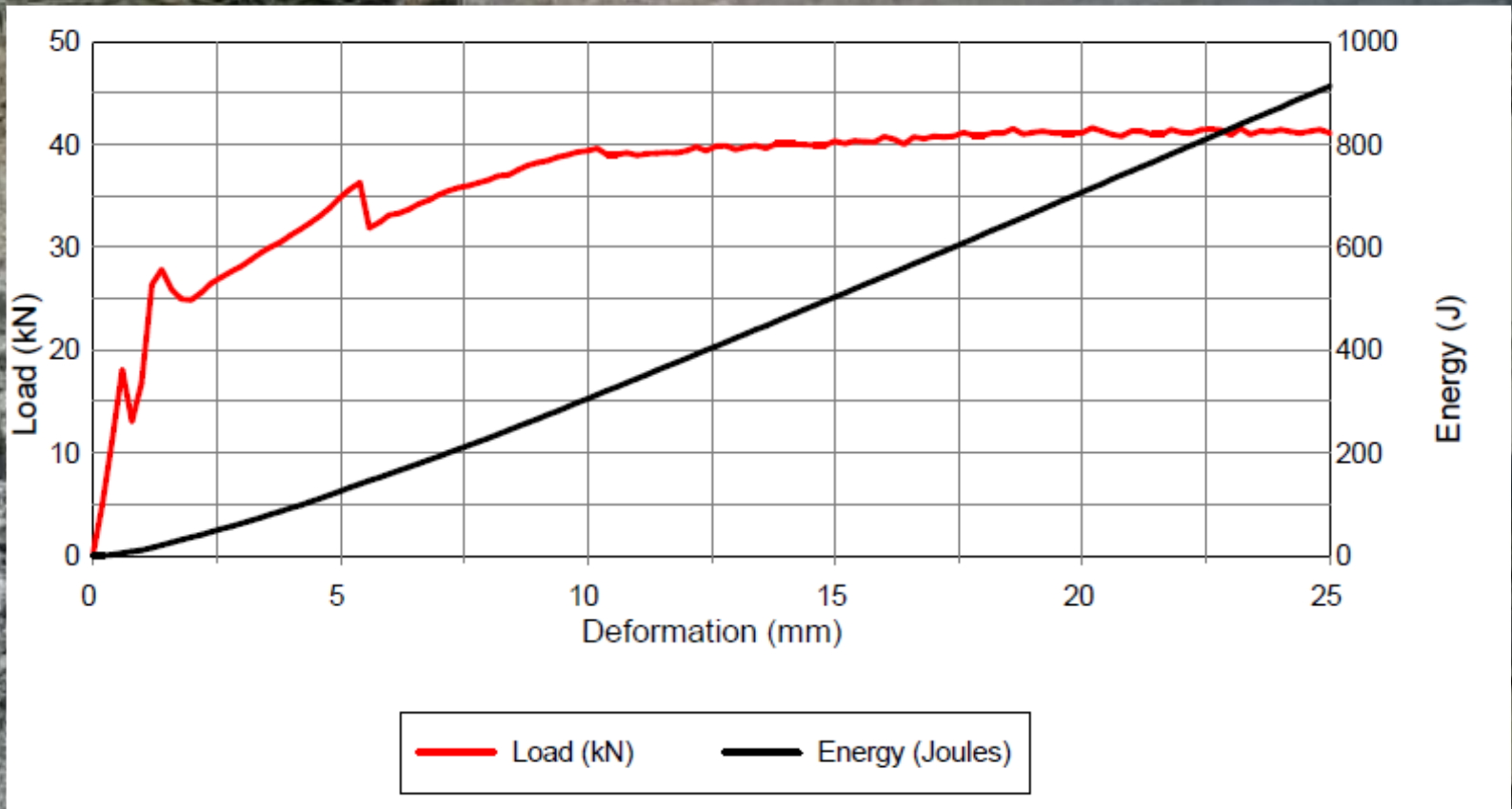
# Shotcrete

Flexural Strengths  
7MPa at 7 days  
12MPa at 28 days

Compressive Strengths  
40MPa at 7 days  
55MPa at 28 days

Saving on carbon emissions  
 $\pm 500 \text{ kg.CO}_2/\text{m}^3$

# Shotcrete



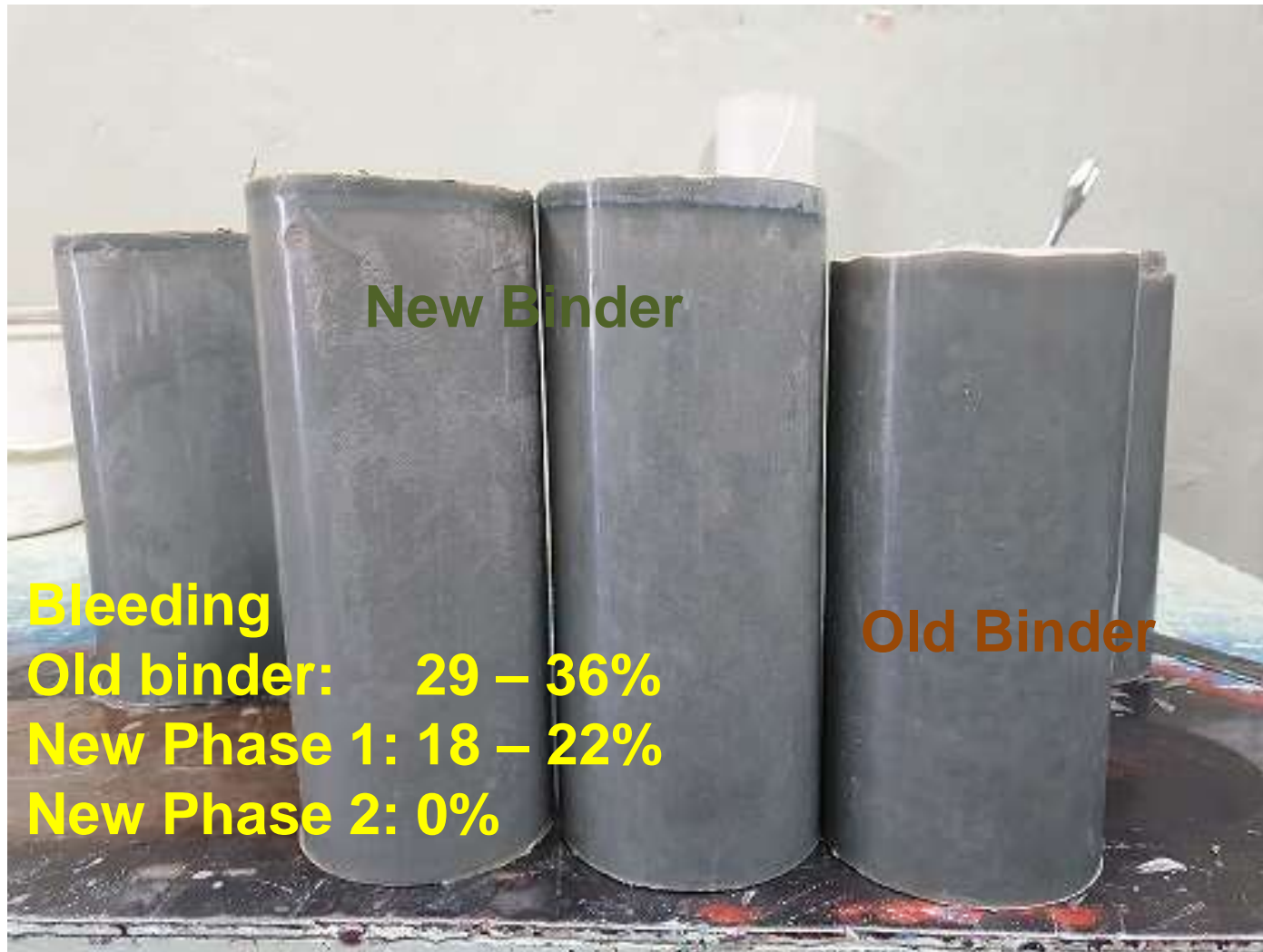


# Backfill



- **0.55MPa at 7 days**
- **1.2MPa at 28 days**
- **1700 – 1850 kg/m<sup>3</sup>**
- **6.5 – 12 seconds**
- **Minimum bleed**

# Backfill



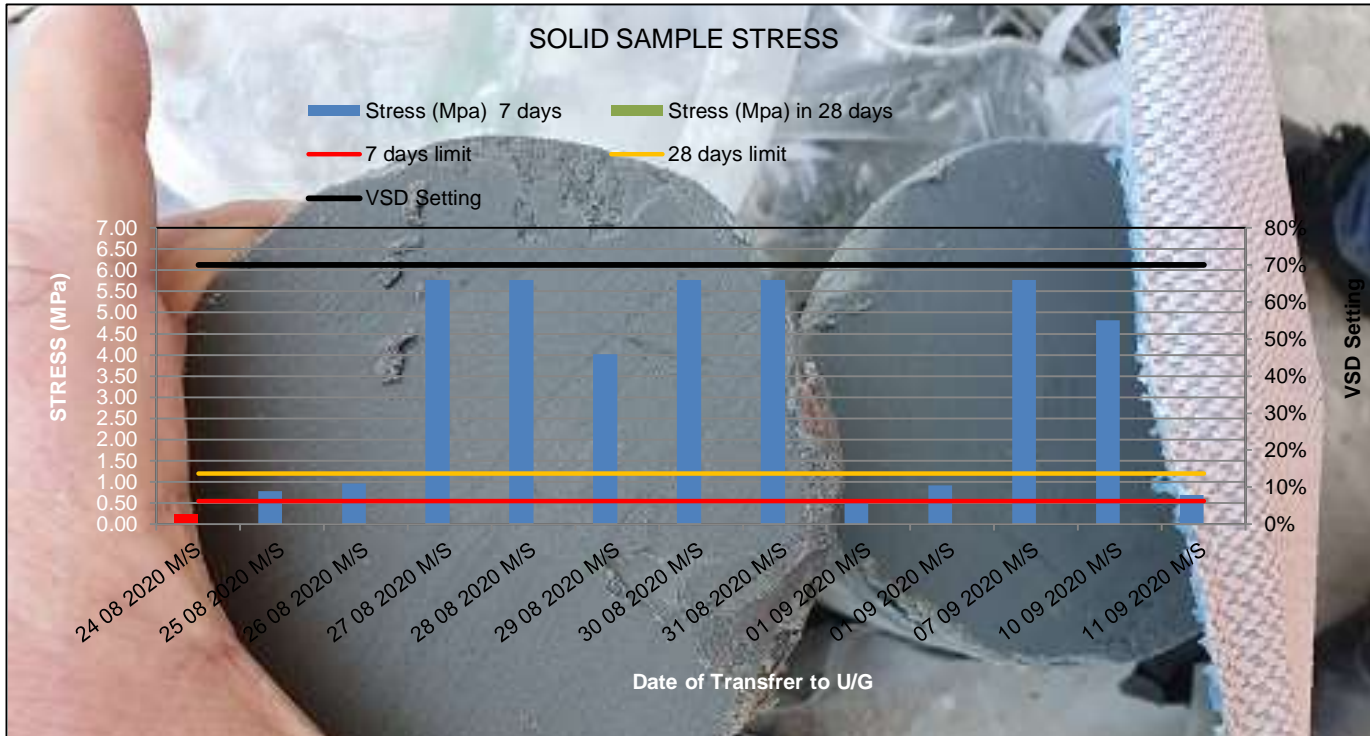
## Bleeding

Old binder: 29 – 36%

New Phase 1: 18 – 22%

New Phase 2: 0%

# Backfill



Costing Differential  
Saving R2.6M



# Roadway



Vehicle Traffic 2 hours

Good drainage

Non-slip

Low wear

# Roadway

45 – 55% material sourced from underground

Optimal usage of the upgraded pipe network

Compressive Strengths of 1 – 100MPa

Massive Reduction of carbon emission

Low wear

# City Deep Container Terminal

	40MPa	40MPa
42.5 CEM II A-M(V-L)	203	0
PFA	238	240
GGBS	0	360
38mm Granite	828	0
19mm Granite	207	925
Andesite Crusher Sand	783	480
Vaal River Sand	80	185
Water (ℓ)	175	200
Sodium Silicate (ℓ)	-	20
Sodium Hydroxide (ℓ)	-	20
w/c ratio	0.39	0.33
Slump (±25mm)	150	150
Compressive strength @ 28 days (MPa)	55	51
Compressive strength @ 1 year (MPa)	125	70
Compressive strength @ 2 years (MPa)	-	75
Compressive strength @ 3 years (MPa)	-	76
Oxygen Permeability Index @ 28 days	9.77	9.7
Oxygen Permeability Index @ 1 year	10.22	10.82
Shrinkage (%)	0.044 – 0.049	0.022 – 0.028



- Background
- Crack/Hole
- Cement: Lime/Periclase
- Cement: Calcium Silicate
- Cement: Calcium Aluminium Silicate
- Cement: Calcium Fe-Al- Silicate
- Cement: Calcium Aluminate
- Cement: Sulphur Enriched
- Cement: Calcium Silicate - K (ASR)
- Aggregate: Muscovite
- Aggregate: Sand(Quartz)
- Aggregate: Clay(Kaolinite)
- Aggregate: Clay(Swelling)
- Dolerite: Clinopyroxene
- Dolerite Orthopyroxene
- Dolerite: Anorthite
- Dolerite: Ilmenite
- Dolerite: Magnetite(Ti)
- Hematite/Iron Oxide
- Pyrite
- Zircon
- Others

2.67mm

3.71mm

**Strength**  
**51MPa @ 28 days – Compressive**  
**4.2MPa @ 28 days – Flexural**



# Chemical Plants



# Precast

