

Appendix 1.0-D

Tenas Project Orica Canada's Fragmentation Study

**Fragmentation Comparison
for 0.75kg/bcm, 0.65kg/bcm
and 0.5kg/bcm with Blast Design Assistant
(BDA)**

Base case – ucs 125 MPa

Rock properties:

Youngs Modulus (GPa)	40.4	Density (g/cc)	2.90
Poissons ratio	0.23	Compressive strength (MPa)	125.0
<button>Calculate elastic properties</button>		Tensile strength (MPa)	8.0

← ucs

Base case blast pattern:

Hole diameter: 7 7/8"

Spacing: 5.4m

Burden: 5m

Powder factor: 0.75kg/bcm

Case1- 60 MPa

Rock properties:

Youngs Modulus (GPa)	4.9	Density (g/cc)	2.55
Poissons ratio	0.10	Compressive strength (MPa)	52.5
<button>Calculate elastic properties</button>		Tensile strength (MPa)	6.0

← UCS

Case 1 blast pattern:

Hole diameter: 7 7/8"

Spacing: 5.8m

Burden: 5.3m

Powder factor: 0.65kg/bcm

Case 1 blast pattern expansion:

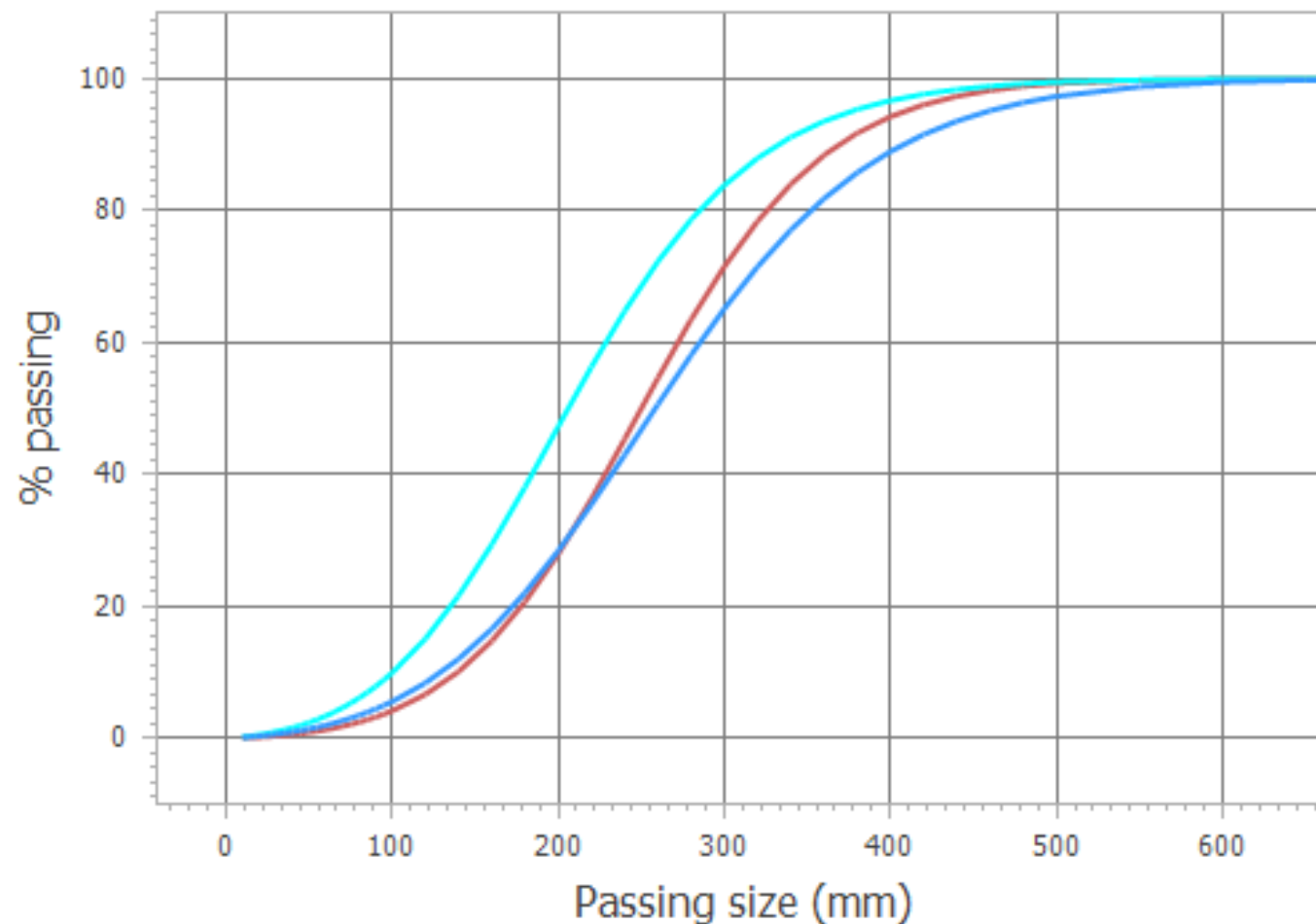
Hole diameter: 7 7/8"

Spacing: 6.8m

Burden: 6m

Powder factor: 0.5kg/bcm

SabFrag fragmentation results



Base case: Base case -
125MPa UCS 0.75kg/bcm
P20 178 mm
P50 250 mm
P80 326 mm
1% < 50 mm
2% < 75 mm
96% > 100 mm

Case1 - 60MPa UCS -
0.65kg/bcm
P20 135 mm
P50 206 mm
P80 285 mm
2% < 50 mm
5% < 75 mm
90% > 100 mm

Case1 expansion - 60MPa
UCS - 0.5kg/bcm
P20 172 mm
P50 258 mm
P80 352 mm
1% < 50 mm
3% < 75 mm
94% > 100 mm

Case2 – 30 MPa

Rock properties:

Youngs Modulus (GPa)	3.2	Density (g/cc)	2.47	
Poissons ratio	0.10	Compressive strength (MPa)	31.1	← UCS
Calculate elastic properties		Tensile strength (MPa)	3.0	

Case2 Blast pattern:

Hole diameter: 7 7/8"

Spacing: 5.8m

Burden: 5.3m

Powder factor: 0.65kg/bcm

Case2 Blast pattern expansion:

Hole diameter: 7 7/8"

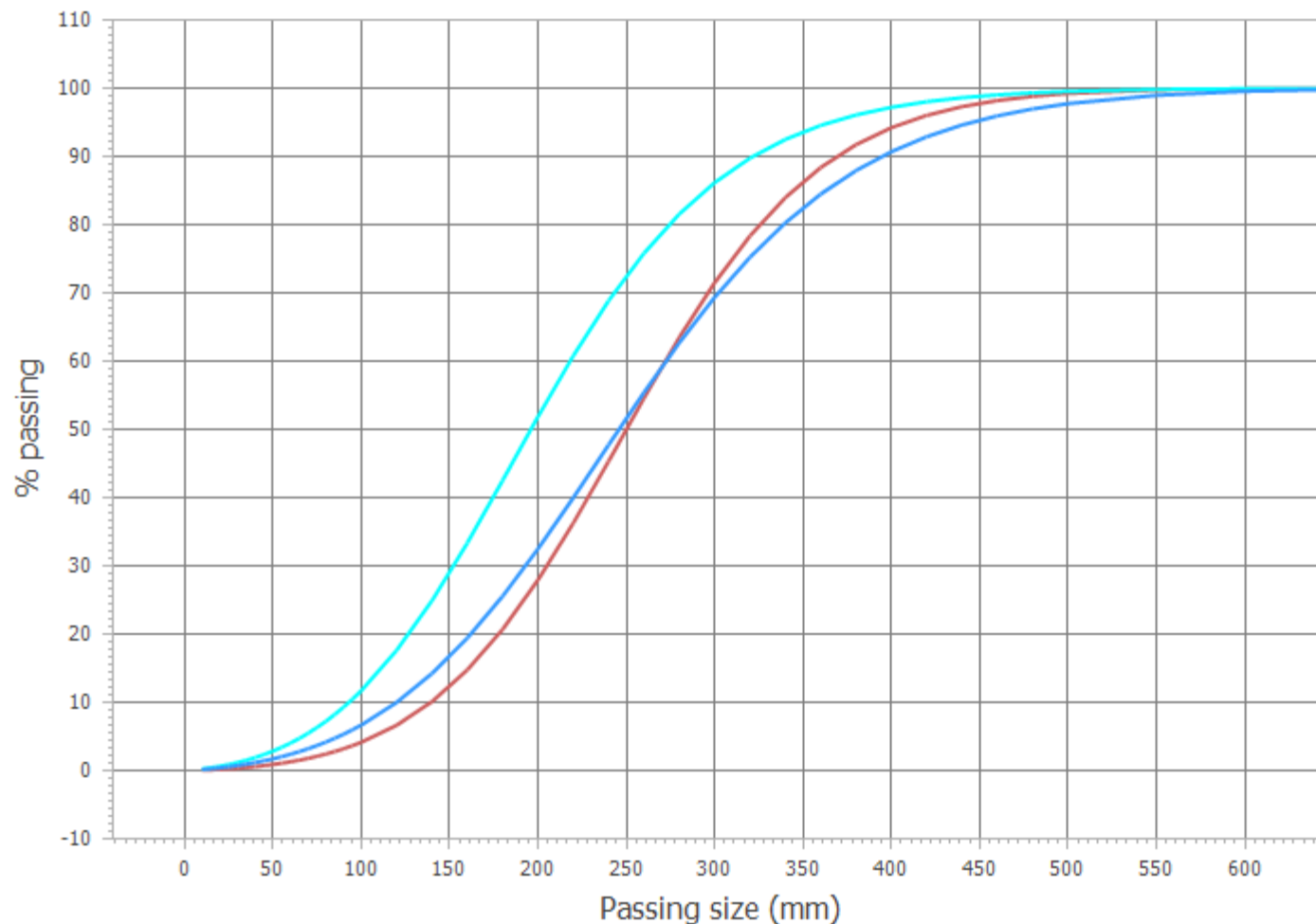
Spacing: 6.8m

Burden: 6m

Powder factor: 0.5kg/bcm

Fragmentation results from BDA

SabFrag fragmentation results



- Base case: Base case- 125MPa
0.75kg/bcm
P20 178 mm
P50 250 mm
P80 326 mm
1% < 50 mm
2% < 75 mm
96% > 100 mm
- Case2- 30MPa UCS - 0.65kg/bcm
P20 127 mm
P50 196 mm
P80 274 mm
3% < 50 mm
6% < 75 mm
88% > 100 mm
- Case2 expansion- 30MPa UCS - 0.5kg/bcm
P20 162 mm
P50 246 mm
P80 339 mm
2% < 50 mm
4% < 75 mm
93% > 100 mm

Initial Findings

- It is possible to reduce the powder factor to 0.5 kg/bcm for 60 MPa and 30 MPa rock types and obtain similar fragmentation with the rock type of 125 MPa with 0.75kg/bcm powder factor.
- Geology significantly impacts fragmentation with BDA simulation.
- In order to make the simulation results closer to actual field results, it is suggested to collect fragmentation data in the field to calibrate simulation results.