

# Manufactured Sand and Slag Aggregate for Concrete Applications

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Fact sheet

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## Acknowledgment of Country

We acknowledge that Aboriginal and Torres Strait Islander peoples are the First Peoples and Traditional Custodians of Australia, and the oldest continuing culture in human history.

We pay respect to Elders past and present and commit to respecting the lands we walk on, and the communities we walk with.

We celebrate the deep and enduring connection of Aboriginal and Torres Strait Islander peoples to Country and acknowledge their continuing custodianship of the land, seas and sky.

We acknowledge the ongoing stewardship of Aboriginal and Torres Strait Islander peoples, and the important contribution they make to our communities and economies.

We reflect on the continuing impact of government policies and practices, and recognise our responsibility to work together with and for Aboriginal and Torres Strait Islander peoples, families and communities, towards improved economic, social and cultural outcomes.

Artwork:

*Regeneration* by Josie Rose



## Manufactured Sand Aggregates

Manufactured Sand is purpose-made crushed fine aggregate which is a by-product produced during crushing of rock aggregates in quarries and designed for use in concrete or road construction.

Suitable use: Structural concrete, non-structural concrete, concrete pavement, pavement base and subbase.

### Benefits

- Minimise the extraction of virgin natural sand.
- Reduce the waste of low-value by-products in the quarries.

### Considerations

#### Properties

- Finer than normal sand.
- Free of impurities such as clay, dust and silt.
- Denser particle packing.
- Blends with natural sand are usual.
- Optimisation of concrete mix proportions important to achieve the full benefits of the use of manufactured sand in concrete.
- BAU in many geographical locations across Australia.

#### Mechanical performance

- Concrete performance similar of concrete with natural sand.

*There are no key considerations related to durability and program for use of manufactured sand.*

## Implications

### Designer/ Specifier

- Concrete can have a slight increased risk of plastic cracking, which can be mitigated with adequate curing.

### Construction team

- Risks are low and manufactured sand is used regularly across NSW.
- Can impact workability and ability to achieve a high-quality finish in higher replacement levels (above 50%).
- Can require longer curing if shrinkage of concrete is higher to avoid plastic cracking.

## Slag Aggregates

Air-cooled BF Slag (BFS) Aggregate is a by-product of iron manufacturing. The slag issues from the furnace as a molten stream at 1400–1600°C. If this is allowed to cool slowly, it solidifies to a grey, crystalline, stone-like material, known as air-cooled slag. This product is then crushed and screened to sizes suitable as coarse aggregate.

Suitable use: Structural concrete, non-structural concrete, concrete pavement, pavement base and subbase.

### Benefits

- Reuse of a by-product as a replacement of natural aggregates.
- Can have lower shrinkage due to vesicular nature of the aggregate, which is a significant benefit.
- Can have lower heat of hydration.

### Considerations

#### Properties

- Good grading.
- Higher water absorption, due to the vesicular nature of the aggregate.
- Density varies compared to normal aggregates.
- No forms of minerals which could cause alkali-aggregate reaction.

#### Mechanical performance

- No significant impact to compressive, indirect tensile and flexural strengths.
- Can have higher creep, which needs to be considered in the design.
- Can have lower shrinkage due to vesicular nature of the aggregate, which is a significant benefit for concrete.

#### Durability

- Can have lower shrinkage, which is a significant benefit.
- Can have lower heat of hydration, which is beneficial for large concrete elements or mass concrete.

*There are no key considerations related to program for use of slag aggregate.*

### Implications

#### Designer/ Specifier

- Consider elements that are suitable to undertake slag aggregate due to higher density.
- Consider the potential of slightly higher creep.
- Consider the possibility of lower shrinkage in the design.
- Consider the availability and local supply.

#### Construction team

- Can cause higher slump loss and reduced pumpability due to higher water absorption. The use of admixtures or pre-conditioning in pre-mix plant may be needed to manage this.

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