

No-fines concrete

Cement and Concrete Association of Australia

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Introduction

No-fines concrete is a concrete containing little or no fine aggregate. The coarse aggregate should preferably be a single-size material (nominal maximum sizes 10 mm and 20 mm being the most common). However, blended aggregates (10 and 7 mm; and 20 and 14 mm) have been found to perform satisfactorily. Because it is characterised by uniformly distributed voids, it is not suitable for reinforced or prestressed concrete construction.



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Applications

- **Walls in buildings**
Primarily in external and internal walls of low-rise and multi-storey flats/units.
- **Car park paving**
Provides free-draining pavements for light traffic
- **Tennis courts**
Using a small nominal aggregate size, eg 5 mm, a free-draining playing surface is achieved.
- **Drainage layers**
Used as drainage layers on civil engineering projects. 20-mm aggregate size is preferred but the surface finish is poorer than that achieved using 10-mm aggregate.
- **Levelling courses**
Has been used as a lightweight screed for levelling on floors and roofs.

Mix Proportions

Generally, the cement:aggregate ratio by volume is in the range 1:6 to 1:8. Leaner mixes (1:8 to 1:10) reduce the likelihood of the pores being blocked by cement paste. Thus for drainage layers where lower strength can be tolerated, 1:10 is preferred. The water-cement ratio needs to be kept low, eg 0.4–0.45, to ensure the cement paste coats the aggregates and does not run off.

No-fines concrete

Materials

- **Cement**
Type GP (General purpose portland) cements are suitable.
Extra care with curing is required if Type GB (General purpose blended) cements are used.
- **Aggregates**
Aggregates should comply with AS 2858.1 and the particles should not be flaky or excessively elongated (Flakiness index $\leq 30\%$)

Properties

- **Compressive Strength**
This is lower than conventional concrete and is a function of the aggregate:cement ratio, the water-cement ratio, and the degree of compaction (the density). Typical strengths are in the range 5 to 13 MPa. A mix with an aggregate:cement ratio of 8:1; a water-cement ratio of 0.4; and a density of 1850 kg/m³ has a strength of approximately 7.5 MPa.
- **Drying Shrinkage**
Much lower than conventional concrete, eg in range 0.0002–0.0003 microstrain.
- **Permeability**
High. Water and air flow easily through it but no quantitative data is available. As noted above, blocking of the pores is more likely to occur the smaller the aggregate size.

Bibliography

Brook K M *No-Fines Concrete* Current Practice Sheet No. 77 Concrete (UK) Concrete Society, August 1982, pp 27,28. (A concise yet comprehensive review of the use, properties, production and applications of no-fines concrete in the UK. Note: British test procedures and values used.)

Malhotra V M *No-Fines Concrete – Its Properties and Applications* ACI Journal, November 1976, pp 628–644. (Paper provides a summary of use and properties of no-fines concrete drawn from European experience and supplemented by test data from CANMET on freeze-thaw resistance. Has an extensive list of references.)

Croswell S F *No-Fines Concrete* Chapter 21 in *Fultons Concrete Technology*, 1994, pp 291–296. (A comprehensive summary of overseas and South African information. Particular emphasis is given to South African applications, materials, and test data.)

Atkinson G *No cause for complaint* Building (UK), 30 November 1984, pp 42–43. (Gives historical perspective of use of no-fines concrete in buildings and reviews experience of the Scottish Special Housing Association and George Wimpey in using the material. Comment is offered on the factors to make its use successful. Reference is made to the findings* of ‘The Bootle explosion’ which unlike the Roman Point explosion did not lead to collapse.)

*RJ Mainstone *Report of an explosion at Mersey House, Bootle* BRS Current Paper CP34/76, 1979.