

QUALITY CONTROL

Production control comprises all measures necessary to maintain and regulate the quality of the sprayed concrete in conformity with the specified requirements.

Production control includes:

- Inspection of constituent materials
- Inspection of the basic mix
- Inspection of sprayed concrete properties

The characterization tests concerning the materials, the freshly mixed concrete and the hardened concrete all constitute the full identity sheet for a given SFRC. They are performed once only at the beginning of each job site which uses SFRC. These tests are executed in laboratory.

Table - Control fibres sprayed concrete properties - Extract from EN 14487-1

TYPE OF TEST	INSPECTION/TEST ACCORDING TO	Minimum sampling frequency									
		Strengthening of ground			Repair and upgrading			Free standing structures			
		Category 1	Category 2	Category 3	Category 1	Category 2	Category 3	Category 1	Category 2	Category 3	
CONTROL OF FRESH CONCRETE											
1	Water/cement ratio of fresh concrete when using wet mix ratio	By calculation or by test method			Daily			Daily		Daily	
2	Accelerator	From record of quantity added			Daily			Daily		Daily	
3	Fibre content in the fresh concrete	According to prEN 14488-7	min 1	1/200 m ³ or 1/100 m ²	1/100 m ³ or 1/500 m ²	min 1	1/500 m ² min 2	1/250 m ³ min 3	1/200 m ³ or 1/1.000 m ² or min 1	1/100 m ³ or 1/500 m ² or min 2	1/50 m ³ or 1/250 m ² or min 3
CONTROL OF HARDENED CONCRETE											
4	Strength test of young sprayed concrete	prEN 14488-2	1/5000 m ² or 1/2 months	1/2500 m ² or 1/month	1/250 m ² or 2/month						
5	Compressive strength	EN 12504-1	1/1.000 m ³ or 1/5.000 m ²	1/500 m ³ or 1/2.500 m ²	1/250 m ³ or 1/1.250 m ²	1/500 m ³ or 1/2.500 m ² or min 1	1/100 m ³ or 1/500 or min 2	1/50 m ³ or 1/250 or min 3	1/500 m ³ or 1/2.500 m ² or min 1	1/100 m ³ or 1/500 or min 1	1/50 m ³ or 1/250 or min 3
6	Density of hardened concrete	EN 12390-7	When testing compressive strength			When testing compressive strength			When testing compressive strength		
7	Resistance to water penetration	EN 12390-8				1/1.000 m ² or min 1	1/500 m ² or min 2	1/250 m ² or min 3	1/1.000 m ² or min 1	1/500 m ² or min 2	1/250 m ² or min 3
8	Freeze/thaw resistance	See footnote (4)				1/1.000 m ² or min 1	1/500 m ² or min 2	1/250 m ² or min 3	1/1.000 m ² or min 1	1/500 m ² or min 2	1/250 m ² or min 3
9	Bond strength	EN 14488-4 ⁽¹⁾ EN 1542 ⁽²⁾		1/2.500 m ²	1/1.250 m ²	1/1.000 m ² or min 1	1/500 m ² or min 2	1/250 m ² or min 3			
CONTROL OF FIBRE REINFORCED SPRAYED CONCRETE											
10	Fibre content of hardened concrete ⁽³⁾	prEN 14488-7	When testing residual strength or energy absorption capacity			When testing residual strength			When testing residual strength		
11	Residual strength or energy absorption capacity	prEN 14488-3 or prEN 14488-5	1/2.000 m ³ or 1/10.000 m ²	1/400 m ³ or 1/2.000 m ²	1/100 m ³ or 1/500 m ²	min 1	1/2.000 m ² or min 2	1/500 m ² or min 3		1/2.000 m ² or min 2	1/500 m ² or min 3
12	Ultimate flexural strength	prEN 14488-3	When testing residual strength			When testing residual strength			When testing residual strength		
13	First peak flexural strength	prEN 14488-3	When testing residual strength			When testing residual strength			When testing residual strength		

Footnotes:

- (1) For ground strengthening
- (2) For repair
- (3) This test is alternative to the one in line 4 when it is not practical to determine the fibre content from the fresh sprayed concrete.
- (4) As no European Standard on this issue is available at the publication of this document, national standards apply.

Main requirements for hardened steel fibre reinforced concrete characterisation test:

Fibre content: The fibre content shall be determined from a hardened sample in accordance with EN 14 488-7, when it is not practical to determine it from the fresh sprayed concrete. The sample shall be taken from in situ material unless otherwise specified.

Energy absorption capacity: The energy absorption capacity shall be expressed as the average energy absorption capacity, determined in accordance to EN 14 488-5. The specified energy absorption for the required class shall meet the requirements of the project. Usually, the test is performed at 28 days.

Residual strength (if required by the project):

- The residual strength class of fibre reinforced concrete shall be determined for a specified deformation level. The stress-deflection curve shall be determined in accordance with EN 14 488-3 or ASTM C1609/C1609M or a three-point bending test on a plate (600 x 600 x 100) sprayed in situ
- The specified residual strength for the required class shall meet the requirements of the project
- The test is normally performed at 28 days, and this before the start and during the construction period