

NZ Concrete Conference 09

Steel Fibre Reinforced Concrete Quality, performance and specification

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Overview

- History of SFRC design rules
- Performance Class concept
- Quality control
- Project examples

History of SFRC design rules

National standards on beam test:
DBV, CUR, NBN, NF, UNE,

NZS3101 adopts RILEM design rules

ACI 318 Building Code contains definition of structural SFRC for shear reinforcement (2008)

1980...

Test methods to determine SFRC performance:
JSCE-SF4 (1983)
ASTM C 1018

1995

Dramix Guideline

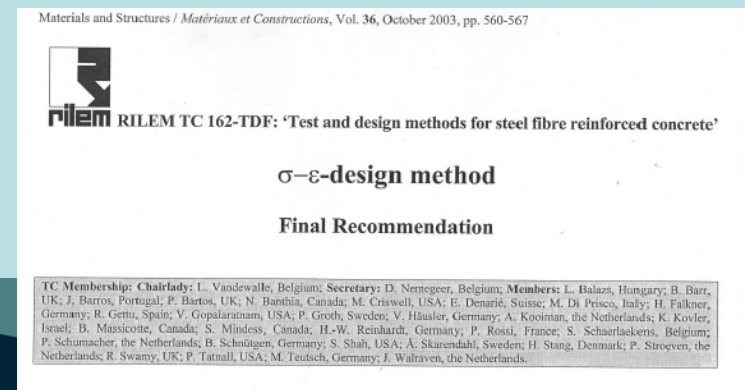
(Belgian initiative:
Bekaert, UGent,
KULeuven, WTCB)



2003

Rilem TC162-TDF

(International group of Universities)



2009

Model Code

FIB TG 8.3. Bulletin
Design of FRC structures
FIB TG 8.6. Design of
ultra high strength fibre concrete

Performance Class concept

Concrete grades	20MPa
	30MPa
	35MPa

Performance Class concept

SFRC concrete grades	20MPa	2.0 / 1.5
	20MPa	3.0 / 2.5
	20MPa	FL _{0.5} / FL _{3.5}
	30MPa	FL _{0.5} / FL _{3.5}
	35MPa	FL _{0.5} / FL _{3.5}

Performance Class concept

- National design Standards which include design rules using standardised SFRC grades or *performance classes*
- Engineers can design structures using SFRC performance class

Performance Class concept

- Performance classes will be supplied to the market by concrete companies
- Deliver specified performance class, consistently
- Quality control in the manufacture of SFRC

Quality control

- Develop manufacturing process for SFRC that is under control
- Concrete strength
- Fibre batching – dosage
- Fibre mixing – distribution
- Performance Class – testing

Quality control

- Develop manufacturing process for SFRC that is under control



Quality control

- Develop manufacturing process for SFRC that is under control
- Concrete strength
- Fibre batching – dosage
- Fibre mixing – distribution
- Performance Class – testing
- Fibre quality

Quality control, fibre quality

What fibre properties influence performance of SFRC?

Fibre length

Quality control, fibre quality

What fibre properties influence performance of SFRC?

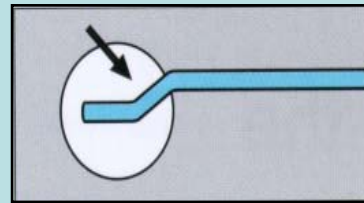
Fibre diameter
drives aspect ratio
of fibres / kg



Quality control, fibre quality

What fibre properties influence performance of SFRC?

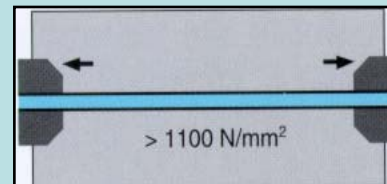
Fibre shape, anchorage



Quality control, fibre quality

What fibre properties influence performance of SFRC?

Fibre tensile strength



Fibre quality

EN14889-1 and CE label

- EN 14889-1 fibres for concrete, part 1 steel fibres, Definitions, specifications and conformity
- Currently the only performance based quality control manufacturing standard for steel fibres
- Compulsory in EU member states
- Outside EU, engineers specify compliance

Fibre quality


EN14889-1 and CE label

- Product submitted to continuous quality control
- Class 1, steel fibres for structural use
- Externally audited

- Every bag of product supplied to market has CE label

Fibre quality

EN14889-1 and CE label


 0749-CPD
 EN 14889-1
 06

Certificate: BC1 - 251 - 0024 - 004 - 001

DRAMIX® RC-65/35-BN
 Steel fibres for structural use in concrete,
 mortar and grout
 Group 1: cold-drawn wire
 Information and regulated characteristics

Shape	deformed
Bundling	glued
Coating	-
Fibre Length (mm)	35
Diameter (mm)	0.55
Aspect Ratio	64
Tensile strength (N/mm ²)	1345
E-modulus (N/mm ²)	185000

Consistence with 25 kg/m³ fibres
 -> Vebe time = 8 s

Effect on strength of concrete with 25 kg/m³
 to obtain: 1.5 N/mm² at CMOD = 0.5 mm and
 1.0 N/mm² at COMD = 3.5 mm

number of EC certificate of conformity
(System 1)

relevant essential characteristics
which are to be declared

Minimum fibre dosage to achieve
nominated post crack strength



MAX BÖGL

Fortschritt baut man aus Ideen.



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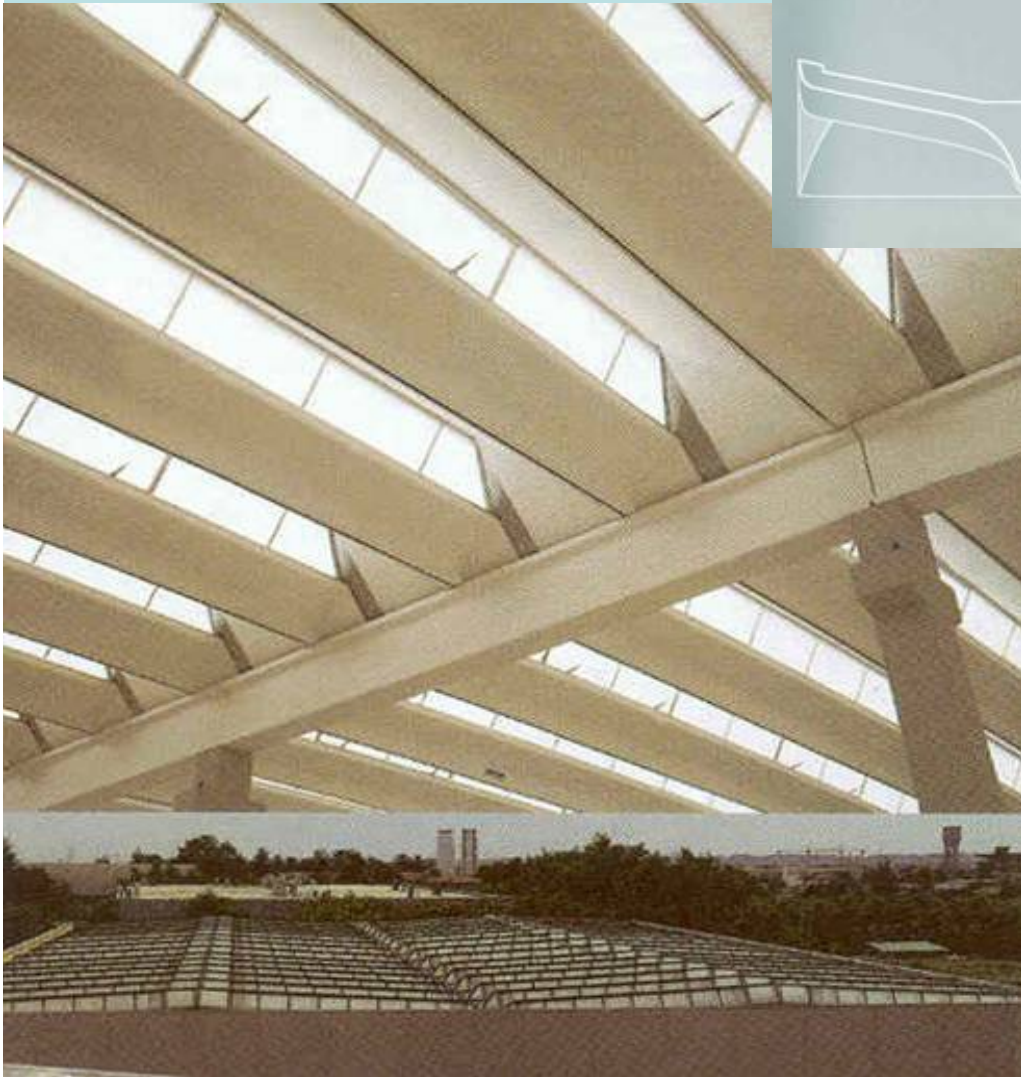
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Future outlook for NZ

- EN 14889-1 and CE label compulsory
- Design rules for SFRC progress
- Concrete companies may offer Certified Grades for SFRC.....



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Dramix
FIBRESTEEL

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