



Ruredil 
Construction chemicals and building technologies

Ruredil **X Fiber 54**

Structural synthetic fiber for industrial flooring
and high strength concrete



RUREDIL X FIBER 54

hybrid synthetic fiber for structural reinforcement

RUREDIL X FIBER 54 (RXF 54) is a structural synthetic fiber specially designed to improve concrete durability and mechanical properties. RXF 54 is a hybrid fiber composed of a non-fibrillated single-filament made of a special polyolefin-based polymer mixture and a polypropylene fibrillated fiber. This type of fiber has been designed to reduce or even eliminate plastic shrinkage. RXF 54 increases concrete bending resistance, ductility, fatigue strength and durability.



In accordance with
Standard EN 14889-2
for structural applications
in concrete, mortars
and injection mortars.

Industrial flooring

The new design of civil and industrial floors offered by Ruredil focuses on the use of fiber reinforced concrete utilizing hybrid structural polymer fibers called Ruredil X Fiber 54 (RXF 54) in place of the electrowelded mesh. RXF 54 consists of hybrid polymer fibers used for structural reinforcement and fibrillated polypropylene fibers for reducing the plastic shrinkage of concrete. Contrary to popular belief, metallic reinforcement (meshes, wires, etc.) is not used as structural reinforcement to achieve even load distribution when correctly positioned but rather to keep under control any floor movement originated by thermohygrometric variations and prevent the expansion of cracks and fissures which may compromise concrete durability. Concrete shrinkage causes the formation of surface cracks due to the sudden evaporation of mixing water provoked by thermo-hygrometric variations. In addition, thermal gradient between top and bottom surface of concrete casting produces stress and strain effects in the hardened concrete slab with consequent formation of cracks, ripping and the most common effect known as floor "curling".

The polymer fibers called RFX 54 used for concrete reinforcement having high mechanical performance certainly constitute the modern alternative to traditional wire meshes and fibers, offering outstanding quality improvement for industrial and civil flooring surfaces.

New solutions for solving cracking problems

It is well known that concrete has **low** tensile strength and **limited** crack resistance.

Research has been carried out to compensate said limitations by increasing concrete ductility and the capacity to absorb energy while increasing durability. **Said advancement in high performance concrete has been achieved with the structural fibers RXF 54. The uniform distribution of said fibers form a three-dimensional reinforcement that efficiently distributes the internal/external stress to which concrete is normally subjected.**

Fiber reinforced concrete provides **greater impact and fatigue resistance**, apart from **ductility increase**, that is the capacity to bear larger loads, even after the first crack.



Easy cast-in-place



Economical concrete casting



Excellent aesthetic finish





Easy preparation



Durability in aggressive environments

The solution: Ruredil X Fiber 54 for technologically advanced fiber reinforced concrete

With over 10 years of experience in the field of concrete reinforcement, this product has been used for more than 10 million sq.m. of industrial floors, having received no complaint whatsoever up to the present.

Ruredil X Fiber 54 consists of a mixture of polyolefin and copolymer-based fibers and fibrillated polypropylene fibers, available in 1 or 2 kg bags, ready for use during cement mixing. Ruredil X Fiber 54 is a synthetic and chemically inert structural fiber which does not undergo deterioration as in the case of metallic fibers.

In fact, this reinforcement **does not deteriorate** in chemically aggressive environments and ensures **maximum concrete duration** to project engineers.

Unlike metallic fibers, this type of concrete reinforcement prevents stress corrosion.

It is very well known that stress corrosion (e.g. corrosion of wire mesh placed in load-carrying concrete) does not only affect the aesthetic quality of concrete (rust stains) but rather the structural deterioration of the pavement.

Metallic fibers improve tensile strength by developing the load-carrying and energy dissipation capacities of concrete.

Fiber oxidation mainly depends on the penetration of corrosive agents such as acid rain and thawing salts but said phenomenon is further increased by the formation of microscopic cracks in load-bearing concrete (motor vehicles) with consequent reduction of the resistant section and load-carrying capacity of the metallic fiber itself.



Economic and easy cast-in-place



High outdoor casting quality

Guaranteed results





Results guaranteed under difficult conditions



Optimum concrete placement with casting equipment

Mechanical properties of concrete reinforced with Ruredil X Fiber 54 (RXF 54)

A series of tests have been carried out to determine the mechanical properties of concrete reinforced with Ruredil X Fiber 54, as shown in the following tables:

POST-CRACKING RESISTANCE AND DUCTILITY INDEX IN ACCORDANCE WITH UNI 11039

Classification according to UNI 11039 $R_{ck} = 40$ MPa					
	V_f (%)	$f_{eq(0-0,6)}$ (MPa)	$f_{eq(0,6-3,0)}$ (MPa)	D_0	D_1
CONCRETE with no fiber reinforcement		1,118	–	0,283	–
CONCRETE + RXF 54	0,3	1,477	1,092	0,415	0,740
CONCRETE + RXF 54	0,5	2,035	1,864	0,562	0,917
Classification according UNI 11039 $R_{ck} = 55$ MPa					
	V_f (%)	$f_{eq(0-0,6)}$ (MPa)	$f_{eq(0,6-3,0)}$ (MPa)	D_0	D_1
CONCRETE with no fiber reinforcement		1,137	–	0,274	–
CONCRETE + RXF 54	0,3	1,848	1,240	0,501	0,684
CONCRETE + RXF 54	0,5	2,248	1,953	0,533	0,865

• V_f = volume of fibers expressed in %.
 • $f_{eq(0-0,6)}$ e $f_{eq(0,6-3,0)}$ = post-cracking resistance, the first under working conditions, the second in limit state.
 • D_0 e D_1 = ductility index.

TOUGHNESS IN ACCORDANCE WITH STANDARD EN 14488-5

Classification according to Standard EN 14488-5 with RXF 54 dosage rate 3,5 kg/m ³		
	Maximum flexural strength	Absorption energy
CONCRETE + RXF 54	403 kN	630 J

IMPACT RESISTANCE IN ACCORDANCE WITH ACI 544 METHOD

Classification according to ACI 544 method	
	N° strokes required to determine sample breakage
CONCRETE+RXF 54 dosage ratio 0,3% volume	320
CONCRETE+RXF 54 dosage ratio 0,4% volume	435

Test results refer to 28 days - Mean value.



Optimum surface finish

Concrete reinforced with RXF 54 has been certified with Distart - Laboratory for Material Strength Testing of Bologna: Official certification above available upon request. What's more, another certification is available certifying the fracture behaviour of concrete reinforced with RXF 54 (UNI 10039), issued by the Department of Civil Engineering of the University of Brescia.

References

- Logistica del freddo "Frigotecnica" "Refrigeration Engineering", Chiari (BS)
- Ipercoop, Peschiera Borromeo (MI)
- COMET Logistics, Budrio (BO)
- Trade fair of Parma, Parma
- Military Airport of Cameri, Novara





High quality concrete finish

The advantages of using Ruredil X Fiber 54

- ELIMINATES** the use of electrowelded mesh and metallic fibers.
- REDUCES** floor thickness.
- EFFICIENTLY COMPENSATES** concrete shrinkage.
- INCREASES** concrete tensile strength, final resistance and stress resistance caused by dynamic and static overloading.
- GUARANTEES** outstanding homogeneity and dispersion performance.
- MAINTAINS** concrete mix workability unvaried.
- SOLVES** any metallic fiber corrosion problem with significant optimization of pavement durability.
- MAKES** work site activities simpler, avoiding mistakes and providing time saving benefits.

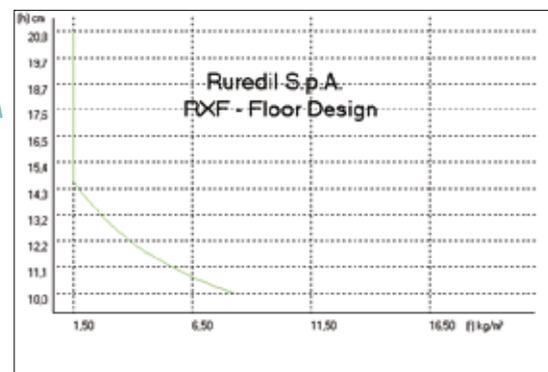
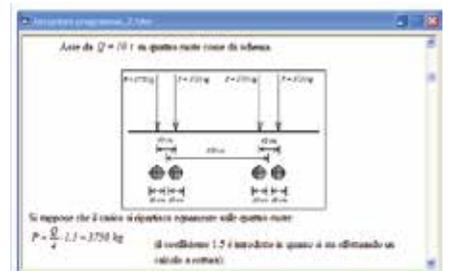
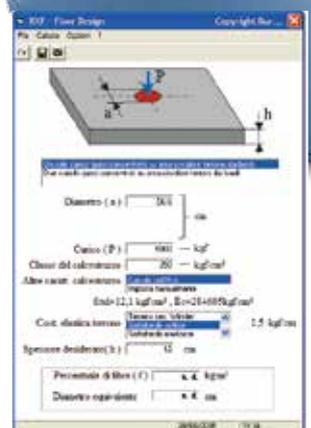


How to design pavements with Ruredil X Floor Design

Ruredil has developed a specific software for pavement design based on the experience gained working side by side with design engineers. In fact, the use of this software makes it easy to calculate the precise quantity of **Ruredil X Fiber 54** required for each project taking into consideration design variables such as working loads (whether concentrated or not), Winkler's constant of the foundation, pavement thickness, etc. This software allows technicians to safely design any type of floor utilizing the **Yield Line Theory**, that is the calculation system referred to in the new standards for industrial flooring (**UNI 11146**).

The dimensions supplied by the technical department of Ruredil are also guaranteed by the insurance policy issued by Unipol.

Ruredil X Fiber 54 is supplied with the corresponding performance certificates issued by Autonomous bodies such as Universities and Ministerial Departments, having been successfully used at numerous worksites all over the world.



Outstanding surface finish



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