STEWOLS

SHAKTIMAN®

STEEL FIBRE

GIVES CONCRETE THE STRENGTH OF STEEL

STEWOLS INDIA (P) LTD.

5-8B, Nagpur Industrial Estate I Kamptee Road I
Uppalwadi I Nagpur-440 026 (MS) I INDIA

Tel: +91-712-2641040, 2640613
Fax No: +91-712-2641760
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E-mail : shaktiman@stewols.com / export@stewols.com

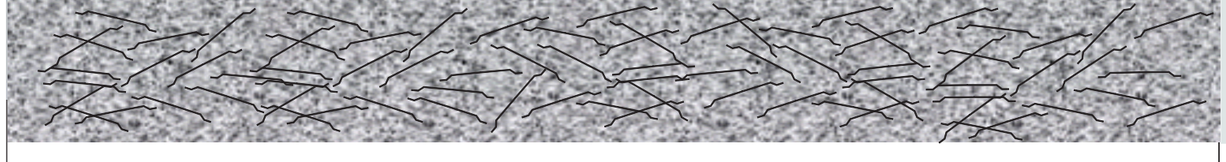
CE
EN 14889-1

ABOUT US

Set up in 1953 with the plant and machinery imported from Germany for the manufacture of Steel Wool, we have come a very long way from our humble origins. Being the pioneers of the field, today we are brand to reckon with and one of India's most reliable and leading manufacturers of Steel Wool, Chopped Steel Wool and Steel Fibres. Our brands Handy® Steel Wool and SHAKTIMAN® Steel Fibres are supplied to major Government and Non-Government organisations in India and the world over. We are also the largest suppliers to various leading OEMs.

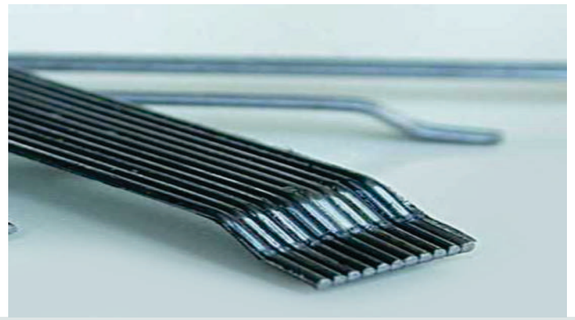
The company has a state-of-the-art equipment for manufacturing, testing and R&D with highly qualified and skilled manpower. Our core competence relies on the quality, service and dedication to provide high quality products and optimum service to each and every customer.

Their brand of SHAKTIMAN® Steel Fibres are made in accordance with ASTM A820/A820M-06 and EN 14889-1 06 standards. SHAKTIMAN® Steel Fibres are also CE certified in compliance with the European Union requirement and meet all stringent norms thereby. Manufactured in both, GLUED and LOOSE form, SHAKTIMAN® Steel Fibres are extensively used by leading public and private sector construction companies in building tunnels, roads, heavy duty industrial warehouse and factory floorings, defence structures, precast elements etc.
We have been an ISO 9000 compliant company since the year 2000 and in 2018 has also been certified as an ISO 9001:2015 compliant company.



BUILD ON THE STRENGTHS OF SHAKTIMAN® STEEL FIBRES

Concrete structures have their advantages and just as much are the limitations. Concrete in itself is a very brittle material and needs to be reinforced for enhanced utility. SHAKTIMAN® Steel Fibres bring tremendous ductile, tensile and flexural strength teamed with abrasion and spalling resistance to ordinary concrete. When added to ordinary concrete, the resulting Steel Fibre Reinforced Concrete or SFRC as it is called, has drastically improved crack resistance and crack propagation properties.



Hooked End Loose Fibre (MSH)

Round Crimped Fibre (MSC)

Flat Crimped Fibre (MSCF)

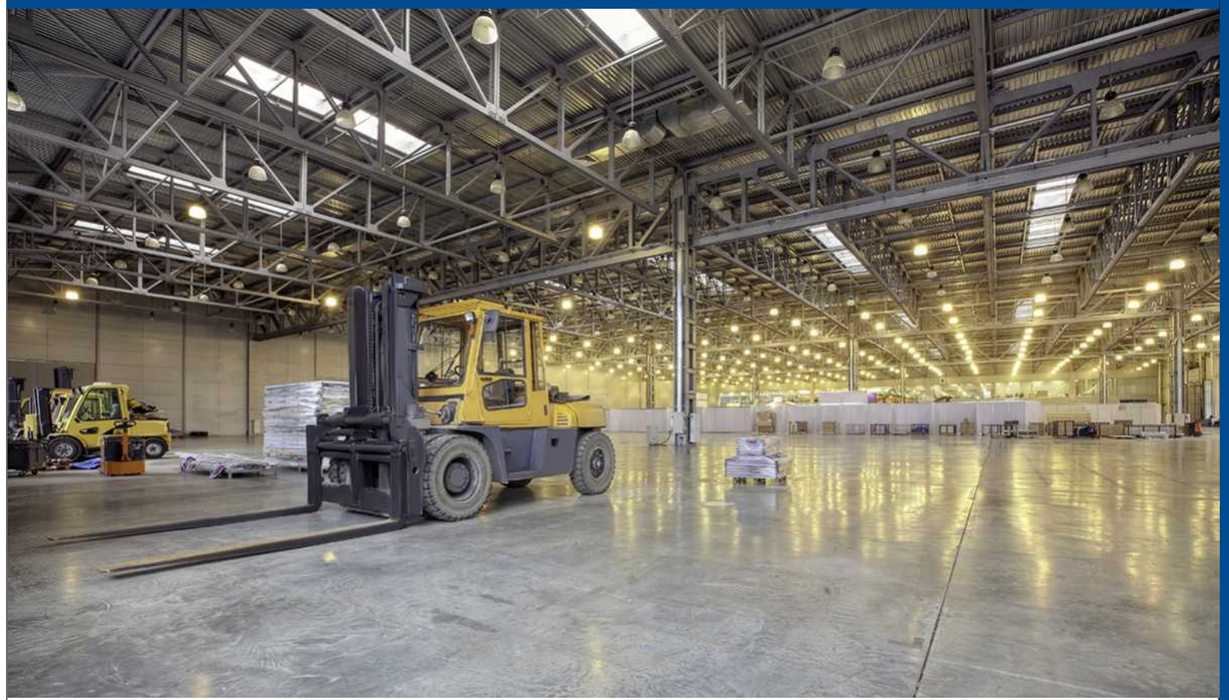
- Hooked End Glued & Loose
- Round Crimped Fibre
- Flat Crimped Fibre

ADVANTAGES WHEN YOU BUILD WITH SHAKTIMAN® SFRC

SHAKTIMAN® Steel Fibres provide 3 dimensional reinforcements as compared to the 2 dimensional reinforcements provided by conventional method. This characteristic not only drastically increases the tensile strength of concrete at both initial and ultimate crack under flexural loading but also have the ability to hold the concrete matrix and not cause sudden failure of the structure.

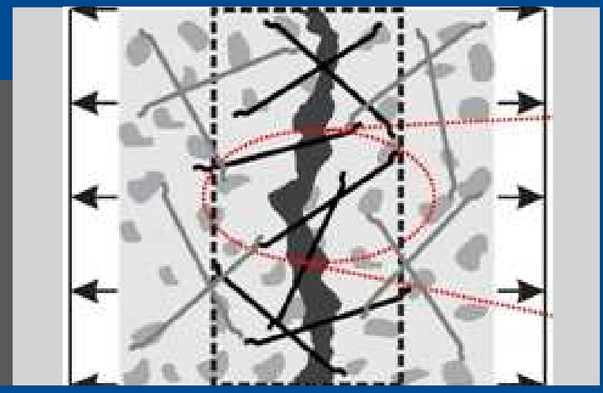
ADVANTAGES

- Enhanced Flexural Strain Capacity
- Adds Ductility
- Provides Joint Stability
- Shear Load Transfer
- Reduces Material Consumption & Saves Cost
- Lesser Time Required
- More Homogeneous Mix in Concrete
- Controls Cracks & provides Post Crack Ductility
- Allows Narrow Joint Width
- Fatigue & Impact Resistance
- Longer Service Life
- Super Flat & Jointless Flooring Possible



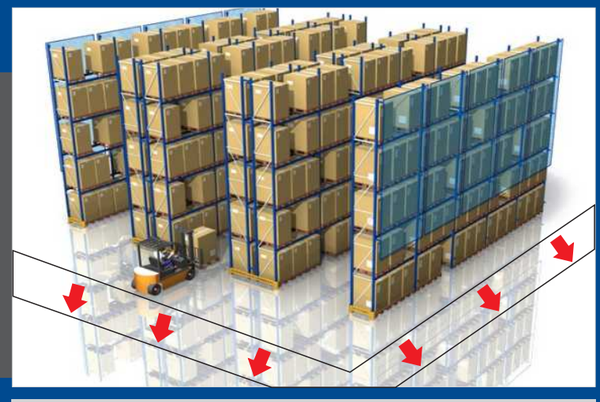
Ideal Crack Control

The biggest advantage of SHAKTIMAN® Steel Fibres is its ability to control even the tiniest of cracks resulting in higher efficiency & safety at all times.



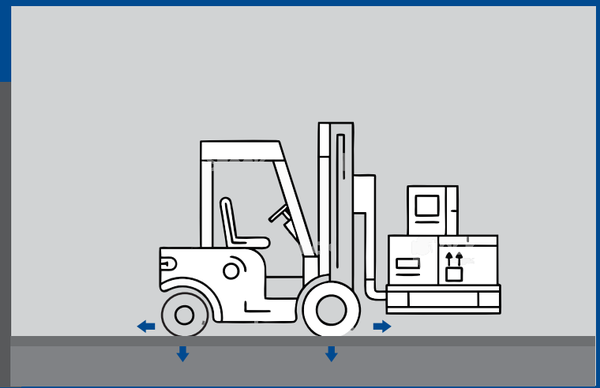
Ideal Load Bearing

SHAKTIMAN® Steel Fibres being evenly spread reinforce the entire concrete matrix so no matter where the load or stress occurs the structures retains its stability.



Fatigue Fighter

SHAKTIMAN® Steel Fibres drastically reduce maintenance & repair expenses and greatly increase the life of the structure because it offers higher fatigue resistance than conventional methods.



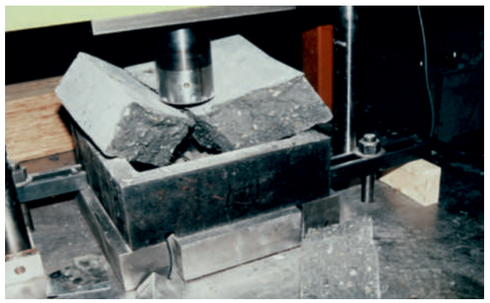
Maximum Joint Stability

SHAKTIMAN® Steel Fibres reduce joint opening and improve load transfer at joints and cracks. By eliminating the risk of joint spalling in concrete, it helps in minimizing its deformation and damage while maximizing the durability and performance.

Nemkumar (Nemy) Banthia
Ph.D., P.Eng., FACI, FCSCE, FCAE, FICI
Professor,
Distinguished University Scholar &
Canada Research Chair in Infrastructure
Rehabilitation Department of Civil Engineering
The University of British Columbia, Vancouver, Canada.

In 30 years of experience in the field of fibre reinforced concrete, rarely have I come across a more forward looking and progressive fibre manufacturer like Stewols. Through consistent research and development efforts with experts in the field has brought its Shaktiman fibre to a world-class level and attained a product performance which is at part with other leading international brands. The product has been tested in our laboratory under strictest of conditions to reveal high performance characteristics consistently.
I believe the construction industry in India could benefit significantly from steel fibre technology, and in particular from the product produced by Stewols India(P) Ltd. which is the first ISO 9001-2008 fibre manufacturing company in India.

TESTING



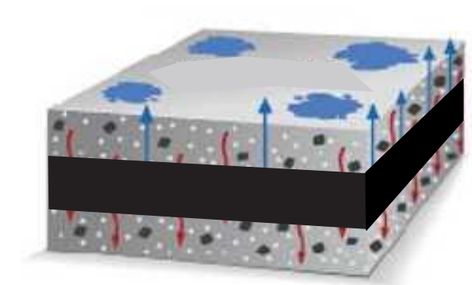
Flexural

With Fibers

Compression

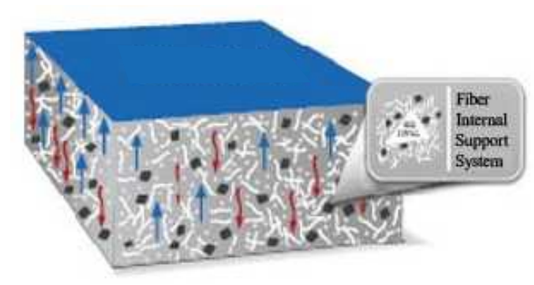
Without Fibers

Flexural



Without fibre

Compression



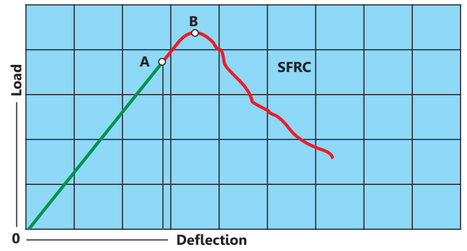
With Shaktiman Steel Fibers

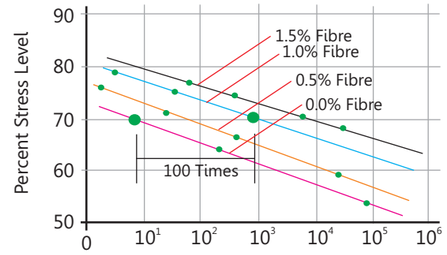
SHAKTIMAN® STEEL FIBRE

LOAD VS. DEFLECTION

Typical load vs. deflection behaviour of plain concrete SRFC illustrating the ductile behaviour and SRFC. The curve demonstrates 'post-failure strength in red.

Table-1





Number of Cycles to Failure / Flexural Fatigue of Fibre Reinforced Concrete / Refrerance • IRC-SP-4E-1997

Significant improvement obtained in flexural strength of SFRC test specimens for different dosages of steel fibers is shown in the graph.

Dosage :
Normal recommended doses of SHAKTIMAN® Steel Fibers for concrete applications vary from 0.5-2.5% by volume of concrete (app. 8 kg to 60 kg/m3 of concrete)

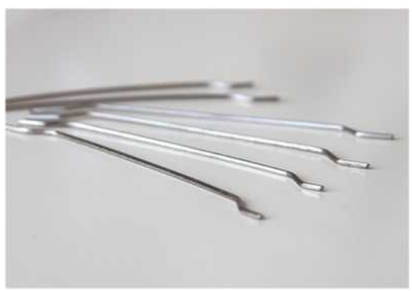
Properties

Strength

SHAKIMAN® Steel Fibers are manufactured as per ASTM-A820 & EN 14889-1 standards
Tension test results on SHAKTIMAN® Steel Fibers. Round Steel Fibers (0.45 to 1.00 mm diameter)

- Range of ultimate strength as per ASTM A820M / EN 14889-1
- 1200 MPa and above

SPECIFICATIONS TO MATCH THE ENTIRE SPECTRUM OF APPLICATIONS



SHAKTIMAN® Steel Fibres are manufactured in wide range of specifications to address a wide variety of applications.
The effectiveness of SFRC is directly in proportion to the fibre aspect ratio and the bonding level of the fibres to the concrete matrix.

SHAKTIMAN® Steel Fiber Specifications
Hooked End & Crimped Steel Fibres

Diameter	0.45mm to 1mm
Length	12.5mm to 50 mm
Aspect Ratio	28 to 133

Higher Aspect Ratio : Higher Flexural & Compressive Strength	**SHAKTIMAN® Steel Fibers**	
Diameter (mm)	Length (mm)	Aspect Ratios
0.45	25, 35, 50, 60	55, 77, 111, 133
0.50	30, 35, 50, 60	60, 70, 100,1 20
0.60	30, 35, 50, 60	50, 58, 83, 100
0.80	35, 50, 60	43, 62, 75
1.00	35, 50, 60	40, 50, 60

The efficiency of SFRC is in proportion to the increasing fibre aspect ratio and the bonding level of the fibers to concrete matrix

CONSTANT R&D FOR CONSISTENT IMPROVEMENT

Research and development (R&D) helps us to realise our ambitions in technological innovation, to support our sustainability goals as well as ensure future growth. Our influence permeates all parts of the business, with the result that innovative thinking is encouraged across the business – at all levels.

Owning to open platform where information, ideas and innovative processes are shared freely for better performance of the company and enhancement of products. Over the years we have taken steps to reduce the time, space and energy consumption required by modifying the manufacturing process. Our endeavour is to develop products that create value for the customers and expand the use of the products worldwide.

SHAKTIMAN®
Steel Fiber Mixing & Dosing

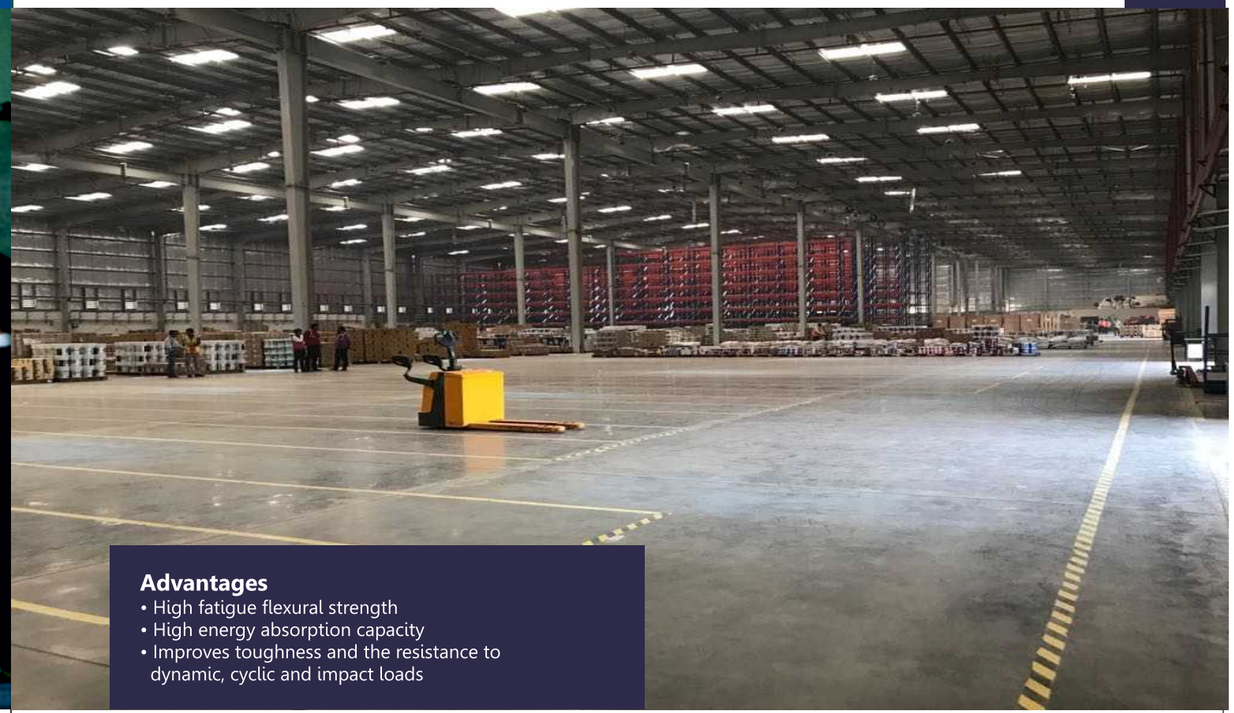
- SHAKTIMAN® Steel Fiber are spread on to a conveyor / fiber dosing machine, which distributes them into the truck mixer / on site ready mix plant / or disbursed manually
- **SHAKTIMAN® Steel Fibers should never be added as the first ingredient.**

WAREHOUSING

SHAKTIMAN® Steel Fibres provide a 3D type of reinforcement which has superior strength and resilience as compared to conventionally reinforced concrete. This feature enables reinforcement of every square inch of the floor especially including the corners and joints which are otherwise prone to curling and cracking, and which can be totally overcome with this technology. SHAKTIMAN® Steel Fibre Reinforced Concrete creates new possibilities for warehouses with its exceptional load-bearing capacities. It is easy to achieve super-flat and jointless floors which are best suited for warehouses where hazardous material can be moved around without jerks and spillage. SHAKTIMAN® SFRC floors are also easy to polish or layer with epoxy coating to provide a dust free and hygienic environment.

Fibres to be used
MSH-G 10050 or 7560

Dosage
10 to 30 kg per cubic metre



Advantages
- High fatigue flexural strength
- High energy absorption capacity
- Improves toughness and the resistance to dynamic, cyclic and impact loads

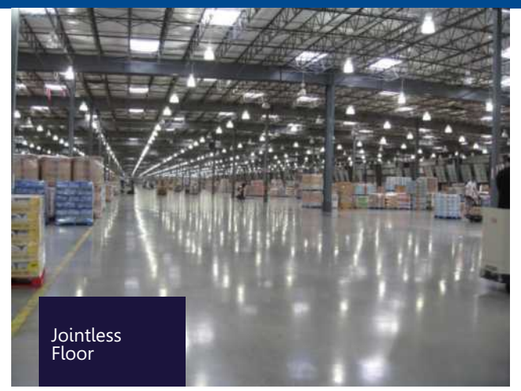
FLOORINGS

SHAKTIMAN® Steel Fibre Reinforced Concrete controls cracking, provides optimized thickness, and ensures excellent performance as well as durability of the industrial floors. It is also economically competitive as compared to conventional reinforced concrete. Since concrete floors are subject to cyclic and impact loads, they require an adequate fatigue flexural strength and energy absorption capacity, which SHAKTIMAN® SFRC renders significantly. In comparison to the plain concrete solution, SHAKTIMAN® SFRC pavement can be 30-40% thinner, resulting in further savings. Toughness is another major advantage of SHAKTIMAN® SFRC, which enables the capacity of the floor to bear loads even after the formation of cracks.

Advantages

- Faster & cheaper construction • Reduced thickness, hence requires lesser concrete
- No wire mesh installation, so reduced labour requirement • Faster concrete pouring and placing, especially with laser screed equipment • Lesser joint spacing • Cleaner, sharper edges
- Less maintenance of the slab (less cracks, less saw-cuts, better fatigue and impact resistance, etc.)

Polished Floor



Jointless Floor

Other SFRC uses :

- **Shopping Malls**
- **Distribution Centres**
- **Parking Lots**
- **Chemical Industries**
- **Food Industries**
- **Medical & Healthcare**
- **Cold Storage**
- **Bus Parking terminals**

ROADS

Bitumen road uses between 4-5% of binding material (bitumen), a concrete road uses between 17-18% binder (cement). Hence, a concrete road is inherently designed for a longer and more trouble-free life.

SHAKTIMAN® Steel Fibre Reinforced Concrete is an excellent composite material compared to ordinary concrete and provides higher tensile, bending, cracking & wear resistance as well as toughness, thus extending the life of the pavement, saving costs and shortening construction time.

Some specific locations where concrete roads are superior in this respect are:

- The road itself acting as a drain at times
- Pavements of submersible causeways
- Roads likely to be snowbound Roads in delta regions
- Roads in flood plains, and Roads in high rainfall areas.

Advantages

- Long life
- Practically maintenance free performance
- Good riding quality
- Good abrasion resistance
- Concrete roads can withstand extremes of weather
- Exclusion of water
- Effect of oil spillage avoided
- Skid-resistant
- Can be used in areas where soils have poor engineering properties
- Fuel savings
- Availability of binder
- Reflectivity characteristics
- Safer driving
- Actual cost comparisons- bitumen & concrete
- Design precision

OTHER APPLICATIONS

SFRC is particularly well suited for structures that are required to exhibit:

- Resistance to high impact, blast and shock waves
- Shrinkage control of concrete
- High flexural, shear & tensile strength
- Resistance to spalling of concrete & abrasion
- High thermal impact resistance
- Resistance to seismic hazards

• Container Terminal

• Runways & Airport Hangars

• Tank Testing Floor

• **Bunkers**

SHAKTIMAN®
STEEL FIBRE

• **Cotton Mills**

• **Factory Pavement**

• **Basketball Courts**

• **Railway Platforms**

• **Residential Parking**

• **Parking Lots**

SHOTCRETING

Steel Fibre Reinforced Shotcrete plays an integral part in today's civil construction and mining segments. Being a versatile material, it can be applied easily and rapidly to provide cost-effective means of construction. Shotcrete provides an efficient way of placing concrete providing a superior bond to many substrates like rock, concrete, masonry and steel. Shotcrete has traditionally been used in mining and tunnelling, rock stabilization, irrigation canal construction and water storage tank construction, to name the most important uses. More recently shotcrete has been used in concrete restoration

Shotcrete thickness can vary from 50mm to 500mm and can be applied in several layers. The permanent support lining may take the form of shotcrete, precast concrete segments or cast in situ concrete. Underground Caverns for storage of commodities and materials such as gas, oil, effluents, nuclear waste etc have been built with the use of permanent shotcrete linings Fibres can be introduced to shotcrete for reasons other than structural reinforcement, such as control of rebound and plastic shrinkage, and enhancing fire resistance. The structural role of fibre reinforcement in shotcrete is to provide toughness (post-crack load capacity). They are not included to increase the tensile or flexural strength of the uncracked concrete matrix. Toughness describes the ability of fibre-reinforced shotcrete to sustain and potentially redistribute load actions after cracking.

1. The level of ground support achieved with FRS and post-bolting significantly exceeds the level of ground support achieved with bolts and mesh.
2. Increased safety is achieved by not exposing personnel to unsupported ground.
3. The speed of mining development is improved by using shotcrete.
4. The need for rehabilitation of ground support was reduced significantly.

Fibres to be used
MSH-G 6535 or 5530

Dosage
30 to 50 kg per cubic metre

TUNNEL LINING

Steel fibres introduce a ductile post-cracking and a favourable crack distribution behaviour of the concrete. Due to the fact that they do not require a concrete cover, they help to prevent local damage like wear, spalling at edges and chipping of corners. Furthermore, they increase the impact resistance of the concrete. One major advantage of SFRC compared to conventionally reinforced concrete is its corrosion resistance and the resulting improved durability. Although individual fibres close to the surface can rust (which may give an aesthetic problem), the corrosion cannot propagate. SFRC is further characterised by low production costs, which is particularly relevant for lining segments with complicated and time-consuming reinforcement cages.

Advantages
- Improves toughness and flexural resistance
- Increases tensile strength and shear resistance
- Reduces shrinkage cracking
- Improves safety (as it does not require human labour for the welded mesh reinforcement and reduces the risk of unexpected collapse or failure of the vault)
- Optimizes sprayed lining thickness
- Reduces permeability
- Reduces rebound
- Reduces tunnel lining construction time

BRIDGES AND OVERLAYS

SHAKTIMAN® Steel Fibres are being successfully used worldwide for bridges & overlays.

- **Bridges**
- **Overlays**

Bridges

SHAKTIMAN® Steel Fibre Reinforced Concrete is ideal for construction of hardwearing bridges, characterized by a highly compact matrix and the absence of capillary pores. It also greatly reduces the erection costs and construction time, as well as saves resources.

In comparison with the conventional steel-concrete composite decks, SHAKTIMAN® SFRC solution is highly advantageous due to its high compression strength and low creep coefficient, resulting in a far longer lifespan of bridges.

Overlays

Overlays are used either to increase the load bearing capacity of existing structure, improving the surface finish, rehabilitation or resistance to abrasion. Even a thin overlay of SHAKTIMAN® SFRC provides an ideal solution to repair and reinforce your structures.

Fibres to be used	**Dosage**
MSH-G 10050 or 7560	15 to 30 kg per cubic metre

DAMS AND CANAL LININGS

SHAKTIMAN® Steel Fibres are being optimally and successfully used worldwide for dams & canals.

- **Dams**
- **Canals**

SHAKTIMAN® SFRC Dams & Canals

SHAKTIMAN® Steel Fibre Reinforced Concrete is popular among constructors engaged in the building or repairing of dams and canals. Together with shotcrete, SFRC is a secured solution against unstable slopes, landslides, and road embankments.

Advantages

- Prevents growth of vegetation & rocky strata removal
- Seepage reduction
- Durability
- Low maintenance
- High benefit/cost ratio

PRECAST STRUCTURES

Shaktiman® Steel Fibres are an excellent additive for precast structures which are widely and universally accepted due to their strength, preciseness, cost and time saving factors.


• Walls


• Manhole Covers


• Precast sections of bridges


• Pipes

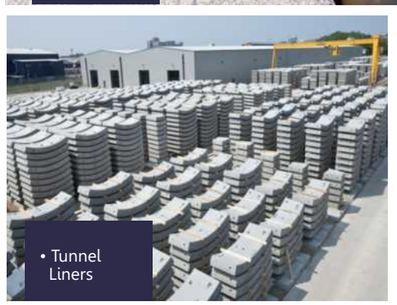
Fibres to be used
MSH-G 7535 OR 10050

Dosage
12 to 30 kg per cubic metre

Benefits of Shaktiman® SFRC precast products:

1. Appearance with options of colours and textures
2. Superior strength and durability
3. Excellent protection and safety
4. Ease of installation
5. Consistent quality
6. Reduced weather dependency
7. Environmentally friendly,
8. UV resistant
9. Energy savings
10. Modularity
11. Availability
12. Efficiency
13. Low maintenance


• Water breakers


• Tunnel Liners


• Crash barriers

SHAKTIMAN® STEEL FIBRE

STAINLESS STEEL FIBRES

SHAKTIMAN® Stainless Steel Fibre CD/SS-310/25

Metallurgy

310	C	Si	Mn	P	S	Cr	Ni
Minimum		-		-	-	24.00	19.00
Maximum	0.25	1.50	2.00	0.045	0.030	26.00	22.00

Service Temperature

Melting Temperature	Cyclic Heating	Continuous Service
1399 - 1454°C	1040°C	1150°C
(2550-2650°F)	(1905°F)	(2100°F)

Dimensions : Standard lengths are 25mm. Non-standard length will be manufactured specifically to suit customer's requirements. Equivalent diameter 0.45-1.00mm

Packing: Fibers are packed in 20 kg cardboard boxes as standard packing. Other packaging can be supplied if requested

SHAKTIMAN® Stainless Steel Fibre CD/SS-304/25

Metallurgy

304	C	Si	Mn	P	S	Cr	Ni
Minimum	-	-	-	-	-	18.00	8.00
Maximum	0.08	1.00	2.00	0.045	0.030	20.00	10.50

Service Temperature

Melting Temperature	Recommended Maximum Service Temperature	
1400-1455°C	870°C	982°C
(2550-2650°F)	(1600°F)	(1800°F)

OUR OTHER PRODUCTS

STEELWOOL

Stewols is the largest manufacturer of Steel wool in India and can supply Steel wool in various grades as per customers' requirements. For Industrial and Heavy Duty use, they produce Steel wool rolls in 5 kgs and 10 kgs in grades '00, 0, 1, 2, 4 and 6' with grade '00' being the finest. Steel wool being a good scouring agent is an excellent product for scouring, cleaning, polishing and descaling surfaces

Steel Wool

STEELWOOL POWDER/ CHOPPED STEELWOOL

Stewols are the pioneer and largest manufacturer of Steel wool Powder/ chopped steel wool in India. The company is a major supplier to "Original Equipment Manufacturers" and exporters of brake liners in India and overseas. The consistent quality and on-line testing is the hallmark of Handy Steel wool Powder which helps in enhancing the quality of the brake linings and increase brake strength, power and longevity in brake liner life. It is also an excellent replacement of asbestos which is a cancer causing substance. Being the largest manufacturer, they are in a position to supply Steel wool Powder as per customer specification and quantity

Steel Powder

PACKAGING

- SHAKTIMAN® Steel Fiber are packed in heavy duty HDPE waterproof bags/Paper bages of 15/25 kg each, with 40 bags per pallet for easy handling or in jumbo bags of 500/1000kgs.

STORAGE

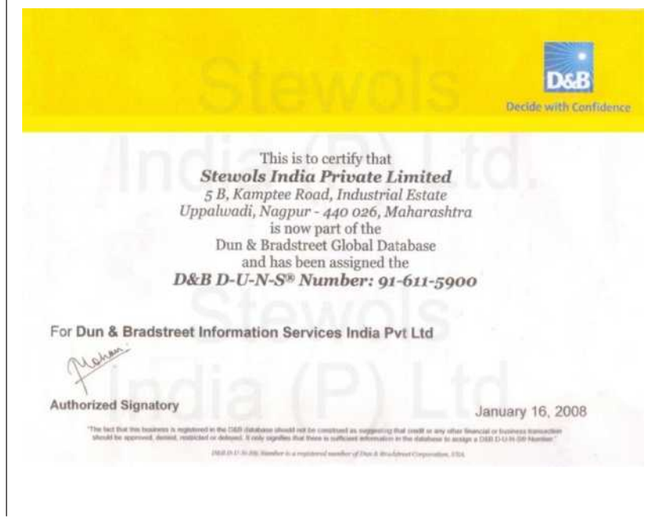
15/20 kgs.

Jumbo bag 1000kgs.

SHAKTIMAN®
STEEL FIBRE

CERTIFICATIONS

D&B Certificate



D&B
Decide with Confidence

This is to certify that
Stewols India Private Limited
5 B, Kamptee Road, Industrial Estate
Uppalwadi, Nagpur - 440 026, Maharashtra
is now part of the
Dun & Bradstreet Global Database
and has been assigned the
D&B D-U-N-S® Number: 91-611-5900

For **Dun & Bradstreet Information Services India Pvt Ltd**

Authorized Signatory

January 16, 2008

DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of
Stewols India (P) Ltd.
H.O. Unit I: 58-61B, Nagpur Industrial Estate, Uppalwadi, Kamptee Road, Nagpur - 440 026, Maharashtra, India
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
ISO 9001:2015

This certificate is valid for the following scope:
Manufacture of steel wool, steel wool powder / fibre (chopped steel wool) and steel fibres

ISO 9001:2015 Certification

TOLS

Certificate of constancy of performance

1301 – CPR – 1282

CE Certificate

STEWOLS

Some Presegious Clients

HCC	TATA BLUESCOPE STEEL	LARSEN & TOUBRO LIMITED	SHAPOORJI PALLONJI
JAYPEE GROUP	AFCONS INFRASTRUCTURE LIMITED	NAVAYUGA ENGINEERING COMPANY	GANNON DUNKERLEY & CO. LTD.
GAMMON INDIA LTD.	IRCON INTERNATIONAL LIMITED	IVRCL	DAIMLER
NATIONAL THERMAL POWER CORPORATION	NATIONAL HYDRO POWER CORPORATION	HINDUSTAN PETROLEUM CORPORATION LIMITED	HONDA
NSL GROUP	MANGANESE ORE INDIA LIMITED	THDC INDIA LTD.	Gubba COLD STORAGE
SELI OSSA J VPANAMA	SINOHYDRO CORPORATION	COAL INDIA LIMITED	Border Roads Organization
Patel	Kumar Properties	meil Megha Engineering & Infrastructures Limited	MPS

SHAKTIMAN® STEEL FIBRE

asianpaints	Nestlé	ANTARIKSH GROUP — Antariksh Group	amazon
ITD Cem — ITD CEMENTATION	SELZER — SELZER INNOVEX PRIVATE LIMITED	unitygroup — UNITY GROUP	JAIN Jain Irrigation Systems Ltd. — JAIN IRRIGATION
IndianOil — IOCL	DRDO	BITS PILANI	AKSHAYA PATRA — AKSHAY PATRA FOUNDATION
HIMALAYAN — HIMALAYAN FOOD PARK	Flipkart — FLIPKART	Haldiram's — HALDIRAM	AMITASHA — AMITASHA ENTERPRISES PRIVATE LIMITED
Walmart	Dinshaw's — DINSHAWS	ABCI	SIMPLEX INFRASTRUCTURES — SIMPLEX INFRASTRUCTURES LIMITED
GIMATEX INDUSTRIES PVT. LTD.	IMT — Institute of Management Technology	MangeSpace — MANGE SPACE	भा रा रा मा NHAI
VENSAR	FWS	JCB	CGD SPACECORE — WAREHOUSING & INDUSTRIAL PARK