

Fibre for concrete

customer recommendations
for succesful dosing



Table of contents:

Fiber performance versus workability..... 3

SeverstalMetiz fiber type 3

Mechanism which creates dry balls 4

Fiber packaging options..... 4

Suitability of integration method for certain fiber types 4

Recommendations for integration of fiber into concrete with different dosing methods..... 5

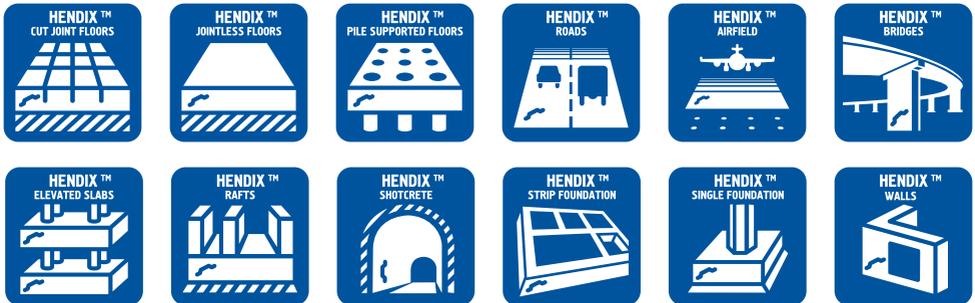
Manual integration of fiber from boxes into the truck mixer or plantmixer..... 5

Integration of fiber into the truck mixer by elevators..... 5

Integration of fiber from boxes into the truck mixer by conveyor belt..... 5

Integration of fiber from boxes into the truck mixer by blast machine 6

Integration of fiber into the plant mixer by conveyor belt 7



Fiber performance versus workability

Steel fiber reinforced concrete has successfully been used meanwhile for many years. Based on the experiences with traditional industrial floors with saw cut joints new applications were developed where steel fiber reinforced concrete was successfully used. Due to a worldwide trend of standardization of this material and its design more and more fields are covered by this innovative and advantageous method. Depending on the impact on a structure, loads and of course also the complexity of a structure and its design the properties of the steel fiber reinforced concrete have to vary. Therefore different fibers have been developed which provide different performance and parameters. The parameters which improve the efficiency of the fiber in the concrete simultaneously increase the tendency to form dry balls which must be avoided to provide a good pumpability and workability as well as effective dosage according to the design.

The performance of fiber reinforced concrete is improved by:

- increasing length of the fiber
- the shape of the fiber (better anchorage / friction)
- increasing number of fiber per volume unit
- increasing strength of the fiber material

The workability of fiber reinforced concrete is improved by:

- shorter fiber
- the shape of the fiber (weaker anchorage / friction)
- less fiber per volume unit
- thicker fiber



Dry balls in concrete due to wrong integration method and/or wrong concrete design.

SeverstalMetiz offers fiber for all types of applications and demands on performance. Although the integration of SeverstalMetiz performance fiber is due to its parameter optimized a greater efficiency of the fiber reinforced concrete implies a higher duty of care in integrating the fiber into the concrete and in some cases the adaption of the concrete design.

If the following recommendations are regarded while integrating fiber into concrete, dry balls like shown on the photo can be avoided.

SeverstalMetiz fiber

Hendix 1/50	Hendix prime 75/52	Hendix ultra 75/52
standard fiber for normal efficiency d=1 mm, l=50 mm $f_{yk}^f = 1150 \text{ N/mm}^2$ endhooked	performance fiber for high efficiency in structural applications d=0,75 mm, l=52 mm $f_{yk}^f = 1500 \text{ N/mm}^2$ endhooked	high performance fiber for very high efficiency in special applications d=0,75 mm, l=52 mm $f_{yk}^f = 1800 \text{ N/mm}^2$ endhooked

Mechanism which creates dry balls

When fiber are laying chaotically on one heap the anchorage mechanism of a single fiber is hooking up in the remaining heap. The more fiber are placed unaligned on one heap the larger becomes the ball. Once a ball is created it cannot be dissolved by standard plant concrete mixers or truck mixers. So the creation of balls must be avoided already during the integration process.

It must be avoided to through a big number of fiber on one place because this heap will immediately create a ball. Therefore fiber must be integrated into the concrete material continuously without heaps. Then the fiber will be distributed well in the concrete without balls.



Fiber packaging options

To optimize the integratability of fiber into concrete SeverstalMetiz supplies its fiberproducts either in handy cardboardboxes or in big bags for automatic cyclon dosing systems with separating mechanism. Fiber in cardboard boxes are filled paralely aligned in the boxes to allow a continously integration of fiber into the concrete.

Suitability of integration method for certain fiber types

		Hendix 1/50	Hendix prime 75/52	Hendix ultra 75/52	Hendix prime 60/32
manually		+	0	0	0
elevator		0	-	-	0
conveyor belt to truck		+	+	+	+
blast-machine to truck		++	+	+	++
dosing equipment + conveyor belt		++	++	++	++

- difficult
- 0 acceptable
- + good
- ++ excellent

Recommendations for integration of fiber into concrete with different dosing methods

Manual integration of fiber from boxes into the truck mixer or plant mixer

When integrating fiber manually into the truck mixer the workman has to take care to integrate the fiber slowly and scattered. He has to avoid to throw the content of a box in one step into the hopper of the truckmixer.

When dosing into the truckmixer please have in mind, that the fiber concentration will vary in the drum. The dosage in the front will be lower than in the back.

The mixer drum must rotate on maximum speed while dosing. 2 minutes mixing time per 10kg of fiber is the minimum duration. If needed, superplasticizer is to be added during the integration of the fiber.

Manual dosing into the plant mixer provides generally very good results and very good distribution of fiber in the concrete.

Fiber must not be integrated in empty mixer but only after at least 50% of aggregates or sand have been filled.

Integration of fiber from boxes into the truck mixer by conveyor belt

When integrating fiber manually into the truck mixer the workman has to take care to integrate the fiber slowly and scattered. He has to avoid conglomerates or heaps of fiber on the belt. As the fiber finally fall into the hopper of the truckmixer they can cause balls in this moment.

When dosing into the truckmixer please have in mind, that the fiber concentration will vary in the drum. The dosage in the front will be lower than in the back.

The mixer drum must rotate on maximum speed while dosing. 2 minutes mixing time per 10kg of fiber is the minimum duration. If needed, superplasticizer is to be added during the integration of the fiber.

Fiber must not be integrated in empty mixer. Dosing of fiber only on fresh concrete.

Integration of fiber into the truck mixer by elevators

When integrating fiber into the truck mixer with an elevator, the workman places the fiber into the elevator bucket from where the fiber will be thrown into the hopper of the truck mixer. Generally some balls will occur. This dosing method is generally not fully recommendable. Only easy to use fiber can be integrated with this method.

When dosing into the truckmixer please have in mind, that the fiber concentration will vary in the drum. The dosage in the front will be lower than in the back.

The mixer drum must rotate on maximum speed while dosing. 2 minutes mixing time per 10kg of fiber is the minimum duration. If needed, superplasticizer is to be added during the integration of the fiber.

Fiber must not be integrated in empty mixer. Dosing of fiber only on fresh concrete.



When integrating fiber into the truck mixer the fiber will not be uniformly distributed in the concrete. Therefore it's strongly recommended to integrate fiber in the mixer of the concrete plant!

According to some meanwhile published standards on Steel fiber reinforced concrete the integration of fiber in the truck mixer is even prohibited!

Integration of fiber from boxes into the truck mixer **by blast machine**

Blast machines is an easy to use tool to singulize fibers and transport them into the drum of the truck mixer. The fiber are blown inside the drum almost to the front of the drum so the fiber distribution will be far better than with the above mentioned dosing methods.

Some parameters must be regarded:

the longitudinal axis of the truck must be in line with the pipe of the dosing machine!

The pipe of the dosing machine must be fully feeded in the truck mixer drum to blow the fiber up to the front.

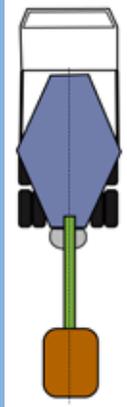
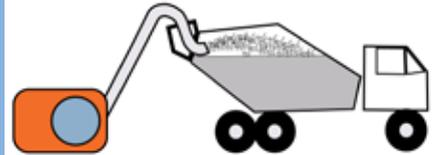
Right positioning of the 2nd and further trucks can be supported by a wooden beam behind and beside the rear wheel.

Changing the truck is easy made by lifting up and lower down the pipe of the dosing machine.

Fiber must be added slowly and scattered into the blower fan. This is supported by vibrating tables.

The mixer drum must rotate on maximum speed while dosing. 2 minutes mixing time per 10kg of fiber is the minimum duration. If needed, superplasticizer is to be added during the integration of the fiber.

Fiber must not be integrated in empty mixer. Dosing of fiber only on fresh concrete.



Blast machine in action, adjusted to truck mixer; drawings show the principle and the right adjustment



Vibration table of the blast machine to scatter the fiber before they fall into the airstream of the fiber blower

Integration of fiber into the plant mixer by conveyor belt

Generally the same rules as in 5.3 must be regarded when dosing fiber by conveyor belt into the plant mixer:

the fiber must be integrated slowly and scattered onto the concrete material without conglomerates or heaps while the mixer is active.

When integrating fiber manually onto the conveyor belt the workman has to take care to avoid heaps and conglomerates on the belt. Therefore fiber are supplied alligned in boxes with a content of 25kg fiber in each box. This allows the workman to hold the box and help the fiber flow out of the box slowly and scattered onto the running conveyor belt. Dosing the fiber together with the aggregates is an option to speed up the production process.

The spacing where the workman doses the fiber on the belt must be large enough to move freely. Enough overhead space will avoid uncomfortable positioning of the workman. The area where the workman doses the fiber onto the belt should have direct access to the place where fiber are stored to allow continous dosing. A second person should open the boxes, hand the boxes to the first workman and take the empty boxes away to improve the continous dosing.

An alternative to the manual addition of fiber on the conveyor belt is the installation of an automatic cyclon dosing system. This system works fully automatically and can integrate very exact dosages by negative weighing of the fiber.

The cyclon systems can be filled easily and fast with big bags (see 3.)

While dosing the cyclon system shall also be adjusted to dose slowly to avoid heaps and conglomerates on the belt. This can either be obtained by using buckets with slim spirals or by a rather low vibration speed (please refer to the manual of the cyclon system how to adjust).

Not mattering if the fiber are dosed on the belt manually or by cyclon equipment, the fiber must not be dosed into an empty plant mixer. The mixer must contain already approximately 20% of the aggregates when fiber are dosed. Fiber must only be dosed on a running mixer.

An additional mixing time of 3 minutes per batch is to be applied after all fiber have been integrated.



Manual dosing of fiber on conveyor belt



Cyclon system to dose fiber on conveyor belt

Achieve more together

Our contacts:

JSC Severstal-metiz

2/3 Klara-Tsetkin str., Moscow,
127299 Russian Federation

Commercial Department

Low Carbon Product Division

Dipl.-Ing. Jürgen Mandl

Head of fiber group + R&D

Our partner contact:

LCC TempleSteelInvest

27-21 Budennov str., Moscow
105275 Russian Federation

Trade Department

Samsonova Irina Director

Morozov Igor CEO

Tel: +7(499)390-88-68

+7(925)319-96-68

+7(499)390-52-85

+7(925)782-30-80

E-mail: templesteelinvest@gmail.com

TSI.MOSCOW@gmail.com

