



SSAB Wear Resistant Steel Tubes

Hardox Tubes

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It is not that hard to make hard steel. However, it's really tough to keep it **tough** throughout the steelmaking process.

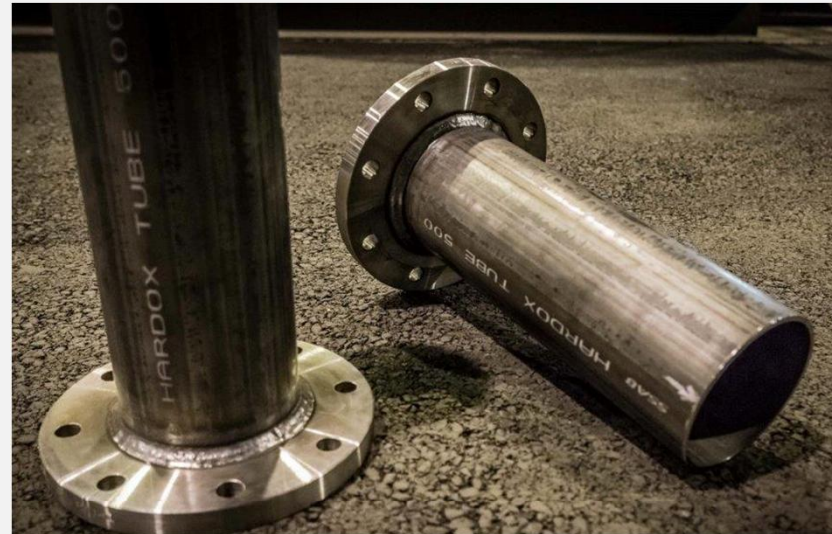
The most important difference between Hardox and just "some hard steel" is the toughness. That is what makes it possible to use it as a structural steel. It can be **bent, formed and welded** without losing its properties.

Hardox tubes provide the perfect solution every time **abrasive fluids need to be transported**, as the wear resistance will make your tubes last longer.



Wear Resistant Steel Tubes

- ▶ Transportation and handling of
 - semi-fluids
 - sludge and dirt
 - sand, gravel and rock materials
 - grain and other agricultural products
- ▶ Pumping systems for wet concrete
- ▶ Wearing parts for
 - mining machinery
 - handling machinery for timber and timber materials
- ▶ Excavation and dredging equipment



Hardox Tubes

All Hardox tubes have



- ▶ Martensitic homogeneous microstructure through out the thickness of the steel guarantees high hardness and strength
- ▶ High hardness and tensile strength give high resistance to abrasion and loadings
- ▶ Are tested at extremely demanding conditions



Hardox Tubes 400

- ▶ Hardox Tube 400 is simply the hardest cold-formed steel tube in the world. Its martensitic, homogenous microstructure throughout the tube wall guarantees a long lifetime in abrasive materials pumping applications



Dimension	3 mm	4 mm	5 mm	6 mm
76.1	5.41			
88.9	6.36	8.38		
101,6		9.63		
108		10.33		
114.3		10.9		
127		12.1		
133		12.7		
139		13.4	16.6	19.8
152.4		11.1		
159		15.3	19.0	22.6
168.3			20.1	24
193.7			23.3	27.8
219.1				31.5

 In stock program
 Weight, in kg/m

Hardox Tubes 500

- ▶ Hardox Tube 500 is a hot formed product.
- ▶ Due to process it is low on internal stresses and hence a good choice no matter if the wear is on the inside or outside.

Dimension	2 mm	3 mm	4 mm	5 mm	6.0 mm
76.2			7.12	8.79	
88.9	4.91	6.36	8.38 (DN80)	10.34	12.26
101.6	5.23	7.29	9.63	11.91	14.14
108.0	5.5	7.8	10.3 (DN100)	12.7	15.0
114.3		8.2	10.8	13.4	16.0
133.0	6.5	9.6	12.7 (DN125)	15.9	19.7

 In stock program
 Weight, in kg/m

Mechanical Properties & Dimensions

Hardox Tubes

Tube Steel Grade	Yield (MPa) Typical	Tensile (MPa) Typical	Hardness (HBW)	Comment	Thicknesses	Dimensions
Hardox 400	1 000 - 1 300	1 250 - 1 400	380-430	Cold formed welded, produced in Pulkkila	3 - 6 mm	88,9 - 219.1 mm (DN65 - DN200)
Hardox 450	1 100 - 1 300		425-475	Hot formed welded, with Quenching on full tube, produced in Borlänge	Upon request	< 133 mm Upon request
Hardox Tube 500	> 1 200		475-525	Hot formed welded, with Quenching on full tube, produced in Borlänge	3 - 6.3 mm	30,0* – 133 mm (DN80 – DN125)

- ▶ Hardox Tube 450 is a hot formed product and only produced on request, min volume 20 tons/thickness

Cutting and Welding

Hardox Tubes have the same cutting and welding instructions as Hardox plates.

- ▶ The weldability of Hardox tubes are good and they can be welded using all common welding procedures.
- ▶ For more information see www.ssab.com



Bending

- ▶ SSAB does not supply Hardox elbows. Wear in the elbow is generally 3-5 times higher than in the straight tube so most of the cases martensitic tubes are not enough
- ▶ Hardox Tubes can be bent in a roll forming machine with accurate tool. Our recommendation for the radi is 10 x Diameter



Hardox Tube 500 30 x 3 mm with radius 270 mm

The Wear resistant Tube business



Coal powder injection – Blast furnace Luleå

- ▶ Dimension 30x 3 mm
- ▶ Previous material ST52 lasted approximately 3 months
- ▶ Hardox Tube 500 lasted > 24 months
- ▶ Greatest saving—reduced downtime!
- ▶ Delivered volume 1500 m



Concrete Pump trucks

- ▶ Hardox is a perfect choice for transport of concrete.
- ▶ Field tests give min 2,5 times better than mild steel for HX 400 and min 4 times better for HX 500.
- ▶ Sometimes the number can be doubled, however there are many parameters that influence the wear life., the pressure, types of aggregates, laminar or turbulent flow (common just 5-10 cm after an elbow) , volume, cleaning etc...
- ▶ That HX tubes exist in 3 mm can be used as an advantage on the last boom sections where weight savings is more important.

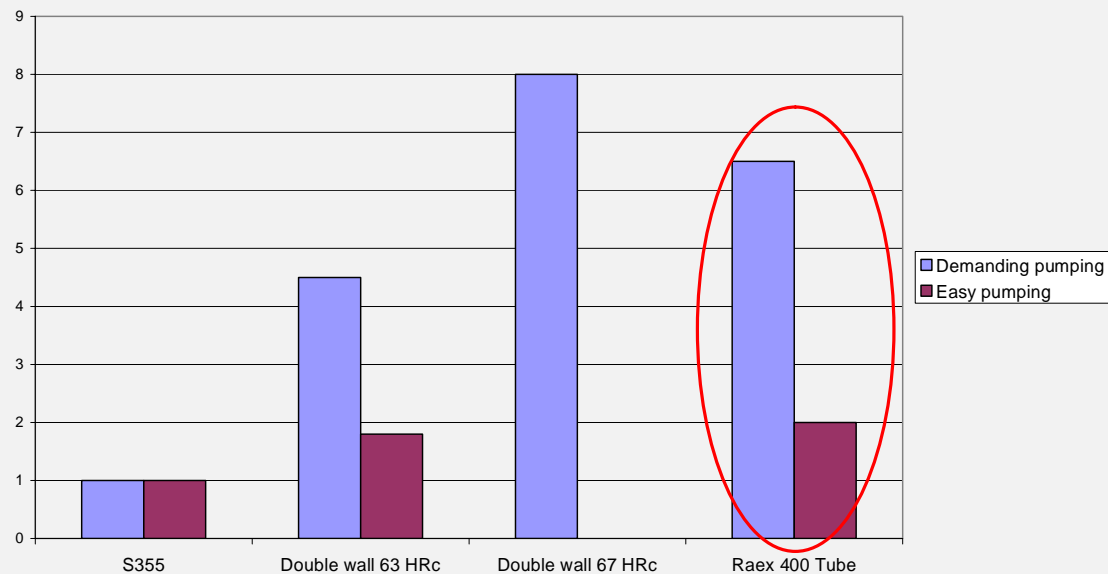


Concrete pumping tests

- ▶ Hardox 400 Tubes are tested in real life conditions in collaboration with concrete pumping companies
 - Whole wall thickness can be utilized unlike with double wall tubes and coated tubes
 - Wearing of tube can be monitored to avoid accidental breaks
- ▶ Wall thicknesses were measured with thickness gauge, good results and feedback reported.
 - **Benefits of Hardox Tubes are biggest in most demanding conditions**



Relative lifetime in concrete pumping



Case: Betonstar

- ▶ "2,5x lifetime compared to old tubes"
- ▶ "We have achieved our leading role on the Turkish market and in the countries we export to by focusing on quality. SSAB's products have not only increased the total useful life of our products, but have also decreased the total weight of the concrete pumps we manufacture. SSAB's sales and technical team also provides us with support in the sales and production phases of the process." Oğuz Diken, owner of Betonstar



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*A stronger,
lighter and more
sustainable world*