HARDOX®
WEAR PLATE

HARD AND TOUGH

SSAB

PAYLOAD AND SERVICE LIFE

Hardox cuts down on weight and extends the service life of steel structures in comparison with regular steel. A lighter truck container made of Hardox means an increased load capacity of 10–20% and even more in some applications. Not only does it reduce the number of trucks on our roads, it also saves fuel and reduces emissions. Whatever the application, Hardox contributes to a stronger, lighter and more sustainable world. And when the product reaches its final expiration date, 100% of it can be recycled into new strong and energy-saving products.

The extreme wear resistance has always been key to the success of Hardox. Today it is harder and tougher than ever, and able to withstand heavy impact without permanent deformation or cracking.

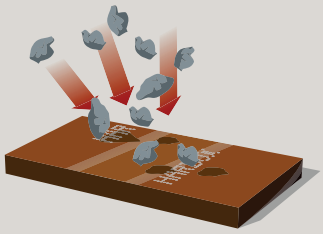
Originally intended as a wear plate, it turned out that the unique combination of hardness and toughness allows Hardox to perform as a load-carrying part in many applications. With Hardox, you can design structures that are wear-resistant, strong and lightweight at the same time.

Today, Hardox has come a long way from its early years. It comes in a much wider range, and the traditional Hardox wear plate is also available as wear-resistant tubes.

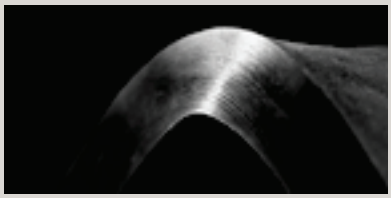
If you are a cost-sensitive and performance-oriented steel user, Hardox is all good news! Visit hardox.com for more information about how hard and tough turns into payload and service life.

HARDNESS AND TOUGHNESS WORKING TOGETHER

Hardness is what gives Hardox its unique wear resistance and structural strength. Hardness minimizes wear since it is difficult for the 'edges' of abrasive material to cut into the material. Hardox delivers the same wear resistance during the plate's entire service life, since it remains equally hard throughout. Hardness also means it has excellent yield and tensile strength, properties that keep a structure in shape without being deformed.



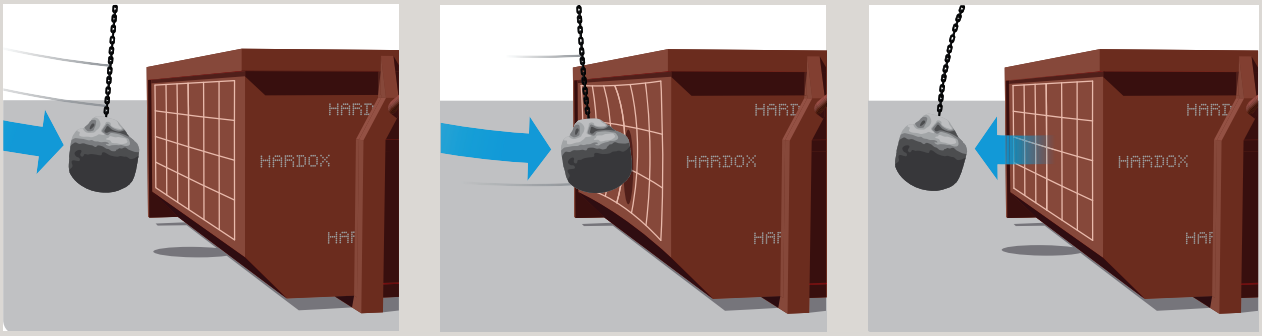
Toughness is the other strong point of Hardox. When hardness makes it wear resistant and strong, toughness is what makes it possible for Hardox to be bent, formed and welded without cracking. If a Hardox wear plate is stressed beyond its yield point and plastically deformed—on purpose in the workshop or when hit by a heavy rock on site—it will resist cracking and if a localized crack should occur it will resist propagation.



HARDOX AT THE BLINK OF AN EYE

It only takes a fraction of a second to discover the unique performance of Hardox. The impact force from large and heavy objects is distributed over the plate, resisting dents and cracking.

The metal absorbs the energy and returns to its original shape in the same way as when a tennis racket hits a ball.



DESIGN AND APPLICATION EXPERTISE

Whatever your application, SSAB will support you in selecting the right Hardox quality for optimal performance and service life. We are happy to be your material expert partner when developing new and improved applications. Using the WearCalc 2.0 software you can predict the wear for all types of Hardox wear plate. Relative service life is calculated based on the wear plate hardness, the wear conditions and the type of abrasive material impacting on the surface. To access WearCalc 2.0, contact your SSAB representative.

You will gain a lot by thinking about Hardox as more than a wear plate. If you are wondering why and how, then here is the explanation.

Why? Because the combination of hardness and toughness allows for new innovative ways of designing steel structures and components. Your products will perform better and last longer—giving your business an extra edge. And who doesn't want that.

How? By thinking differently. Which is usually easier said than done. Changing the way steel structures are made involves a new way of thinking for the people in design, production and sales.

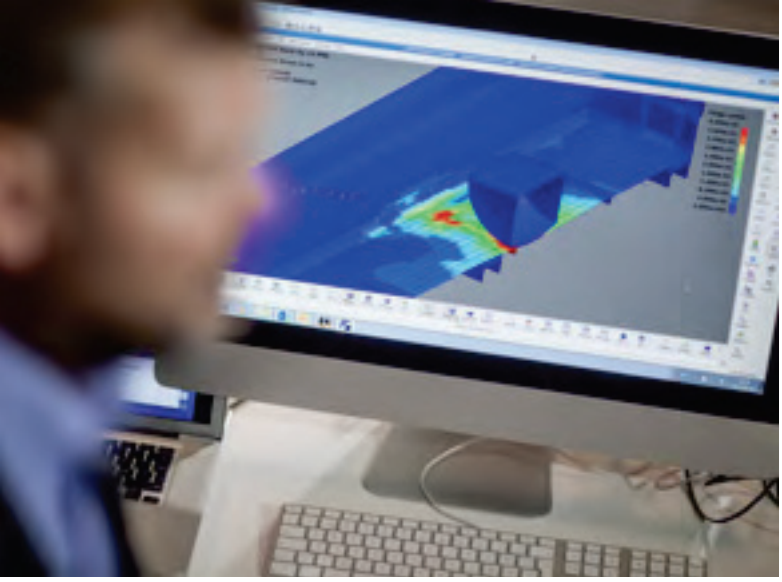
To make change easier, you have access to all the support you need. SSAB has now been a world-leading supplier of wear steel for more than 40 years. Our dedication in this area provides unparalleled power to drive the research and development of wear solutions.

Our materials and design experts at SSAB work closely with customers to create new and smarter ways of using Hardox. Challenge them with your applications and you will be greatly rewarded.

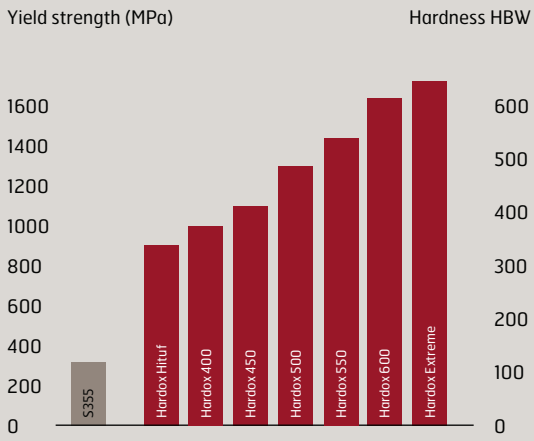
A TOUGH WEAR PLATE MADE FOR INNOVATIONS

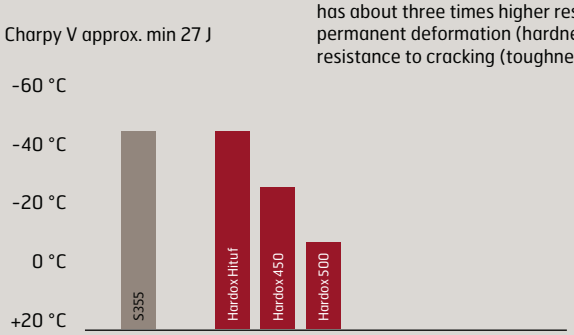
SURPRISINGLY FLEXIBLE

We never get tired of talking about Hardox being both hard and tough! It opens up so many possibilities for creative engineers to design wear-resistant, strong and light products that utilize Hardox wear resistance as well as its potential to perform as a structural steel. Our most popular Hardox grades even come with a guaranteed minimum toughness value, making them particularly designer-friendly.



STRENGTH, HARDNESS AND GUARANTEED TOUGHNESS

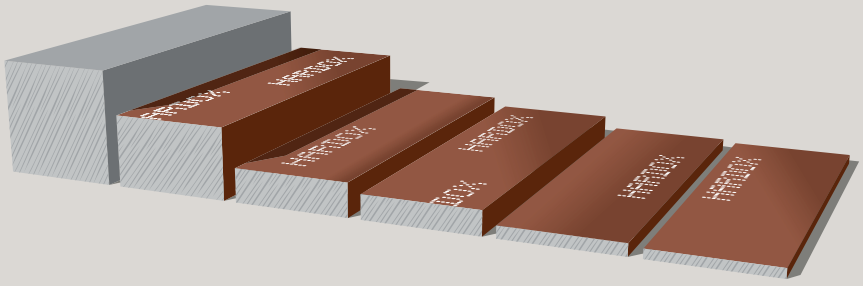




The toughness values for Hardox HiTuf, 450 and 500 are guaranteed minimum values at -40°C, -20°C and 0°C respectively. Compared to a standard S355 steel, Hardox HiTuf for example has about three times higher resistance to permanent deformation (hardness) and an equal resistance to cracking (toughness).

FIGHTING WEAR AND WEIGHT

Mild steel S355	Hardox 400	Hardox 500	Hardox 550	Hardox 600	Hardox Extreme
80 mm	50 mm	23.5 mm	17 mm	8.5 mm	6.5 mm



What hardness is right for you? Probably a combination of grades, fighting different wear conditions. A tipper body might have one Hardox grade in the base and another on the sides in order to provide even service life for the entire body. When calculating relative service life with WearCalc 2.0 as shown in the illustration, Hardox Extreme will last 12 times longer than mild steel in similar wear conditions.

HARDNESS COMPARISON OF SOME HARDOX GRADES*

Brinell HBW 10 mm 29.4 kN	Vickers 98 N	Rockwell HRC	Approximate tensile strength MPa	Approximate corresponding grade
400	401	40	1245	Hardox 400
450	458	44.5	1412	Hardox 450
500	514	49	1580	Hardox 500
600	627	55	1940	Hardox 600

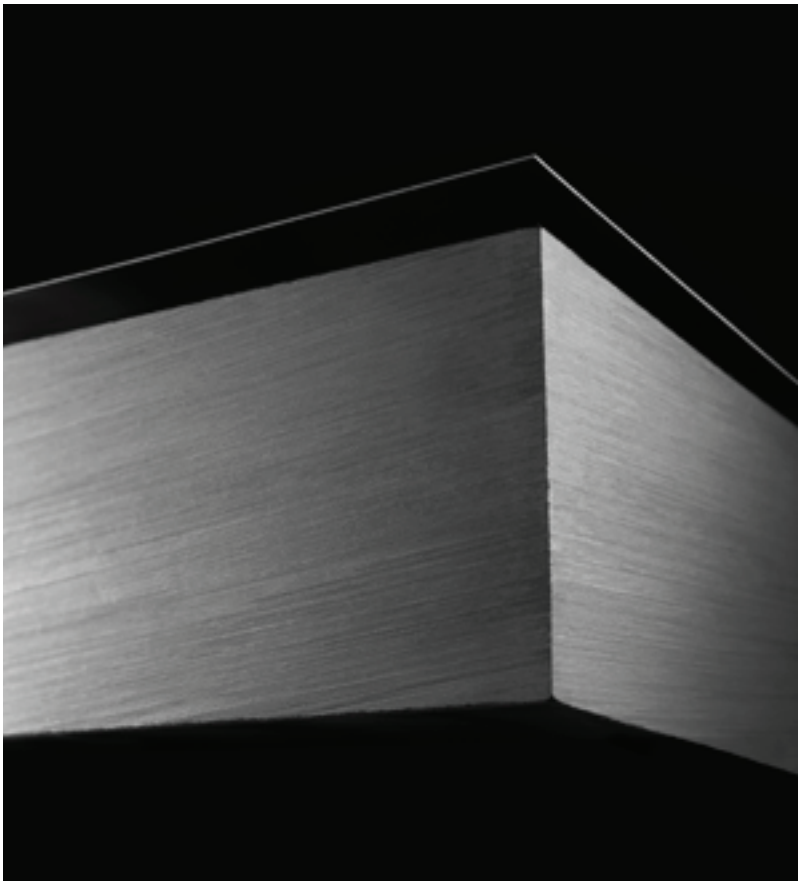
* Tested by SSAB on standard production samples. The data is to be used as a guidance and not as a basis for design and acceptance testing.

AT YOUR SERVICE 24/7

Local availability on a global scale, a fast track supply chain and personal commitment are key factors in our efforts to satisfy our customers.

Quick access to Hardox on your local market means you don't have to make space and tie up capital in an unnecessarily large stock. The most common Hardox grades and dimensions can reach you within 48 hours, directly from an SSAB mill or from local SSAB stock.

Hardox has sales and technical support in 45 countries. Experienced engineers—speaking your local language or English—are on call around the clock, ready to answer your questions and take care of any urgent Hardox needs. Find your local contact at **hardox.com**



HARDOX FROM 0.7 TO 160 MM
Its variety of dimensions makes Hardox suitable for a wide range of designs and products.

The outstanding qualities of Hardox wear plate are also available in the form of Hardox Tube 500. This provides extended service life when pumping abrasive materials such as wet concrete, soil, gravel and ore slurry.

All Hardox products are clearly marked. A unique identification number is stamped on the plates for traceability. Other data such as plate dimensions, serial number of the plate and heat number is printed on each plate before delivery.

Knowing your product's unique identity makes workshop processing and quality control so much easier. The identifying marks also come in handy when storing smaller pieces of Hardox for later use.

HARDOX WEAR PLATES

Product characteristics	Product name	Hardness Nominal [HBW]	Impact toughness CVL typical 20 mm [J at -40°C]	Relative service life interval[1]	CEV/CET[2] Typical 20 mm	Thickness [mm]
Thick wear plate for applications demanding extreme toughness and structural properties.	Hardox HiTuf	350	95		0.55/0.36[3]	40-160
Versatile wear plates with high toughness, good bendability and excellent weldability.	Hardox 400	400	45	1	0.43/0.29	4-130[4]
	Hardox 450	450	50	1.1-4.0	0.47/0.34	3-130[4]
					0.39/0.31	0.7-2.1
Hard and yet tough, bendable and weldable plates used in applications requiring high wear resistance.	Hardox 500	500	37	1.3-5.6	0.62/0.41	4-80
	Hardox 550	550	30	1.5-8.1	0.72/0.48	10-50
When hardness and extreme wear resistance are your top priorities.	Hardox 600	600	20	1.8-12.3	0.73/0.55	8-50
	Hardox Extreme	650-700	<15	2.4-17.9	0.84/0.59	8-25

All plates are produced with AccuRollTechTM precision guarantee or better.
1. Max/min sliding wear by SSAB WearCalc (mild steel 0.2-0,8)
2. CEV=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15;CET=C+(Mn+Mo)10+(Cr+Cu)/20+Ni/40
3. 70 mm
4. Up to 160 mm available upon request

HARDOX TUBE 500

Product name	Hardox Tube 500	Hardox Tube 500 is roll formed and plasma welded before quenching. This guarantees that the mechanical properties of the weld are the same as in the rest of the material.
Hardness	470-530 HBW	
Yield strength	1250 MPa, typical value	
Tensile strength	1600 MPa, typical value	
Diameter	70-133* mm	
Wall thickness	2.5-6.0 mm	

* A selected range of dimensions are available from stock. Other dimensions can also be produced. Contact SSAB for more information.





HARDOX











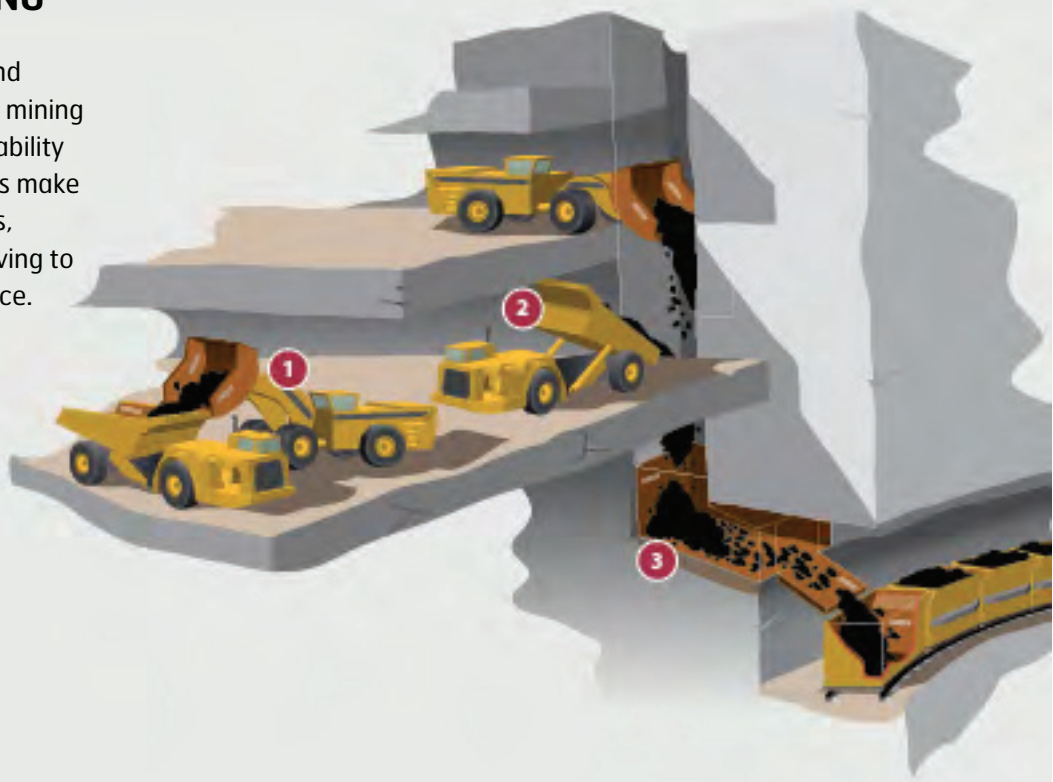
ONSITE






UNDERGROUND MINING

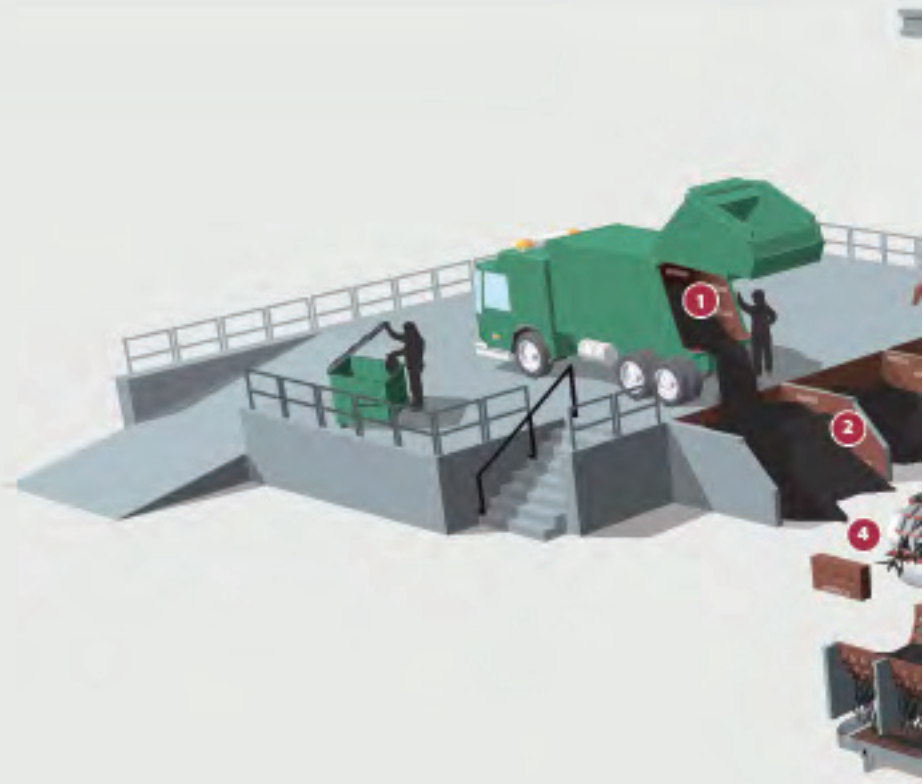
Hardox wear plate is a reliable and flexible solution for underground mining operations. Its outstanding weldability and workshop-friendly properties make it easy to perform on-site repairs, often inside the mine without having to bring the equipment to the surface. This keeps production up and maintenance costs down.



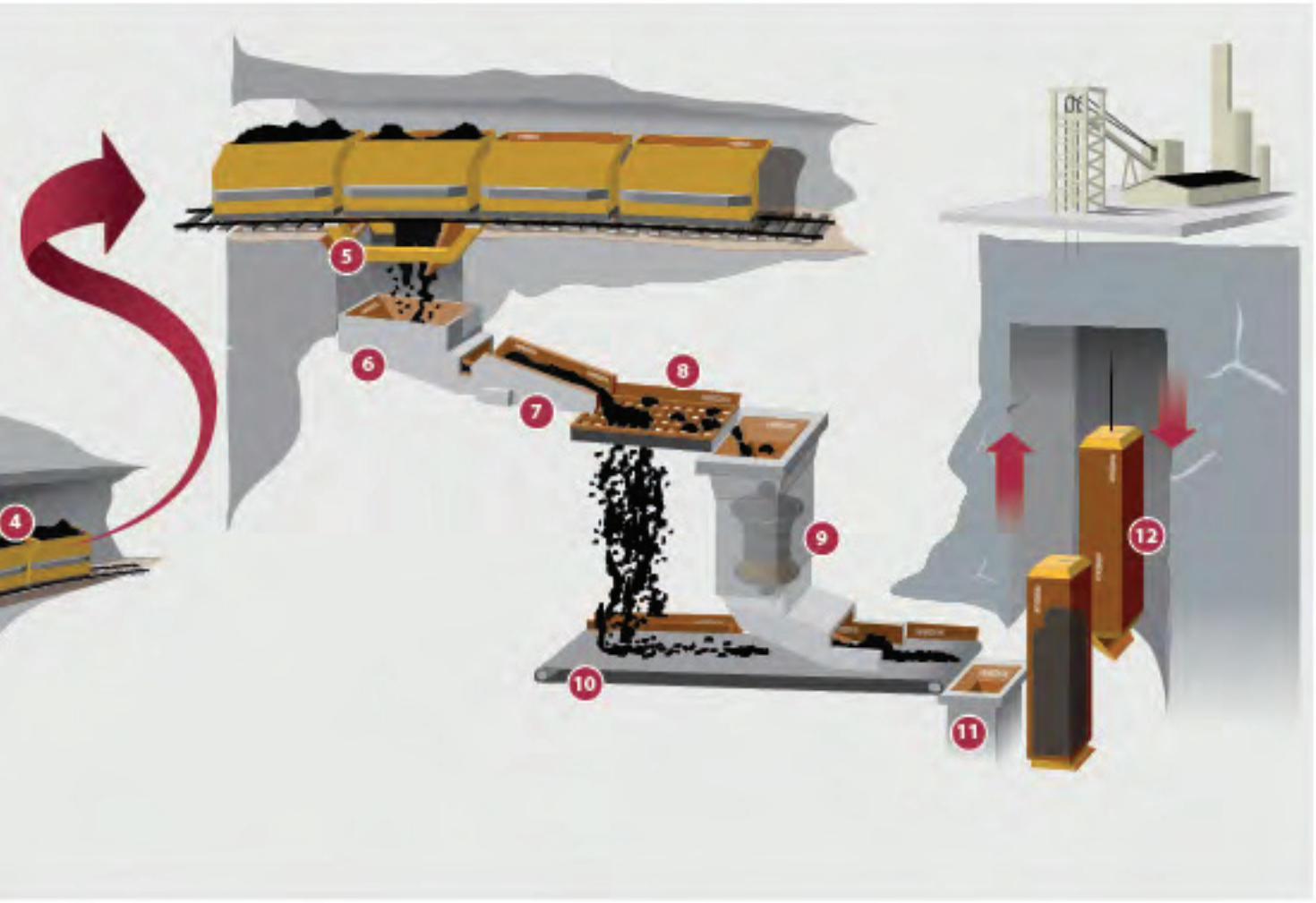
1. Front loader
2. Dump truck
3. Buffer bin
4. Rail road car
5. Discharge site
6. Transfer chute
7. Feeder
8. Screener
9. Crusher
10. Conveyor
11. Measuring bin
12. Skip

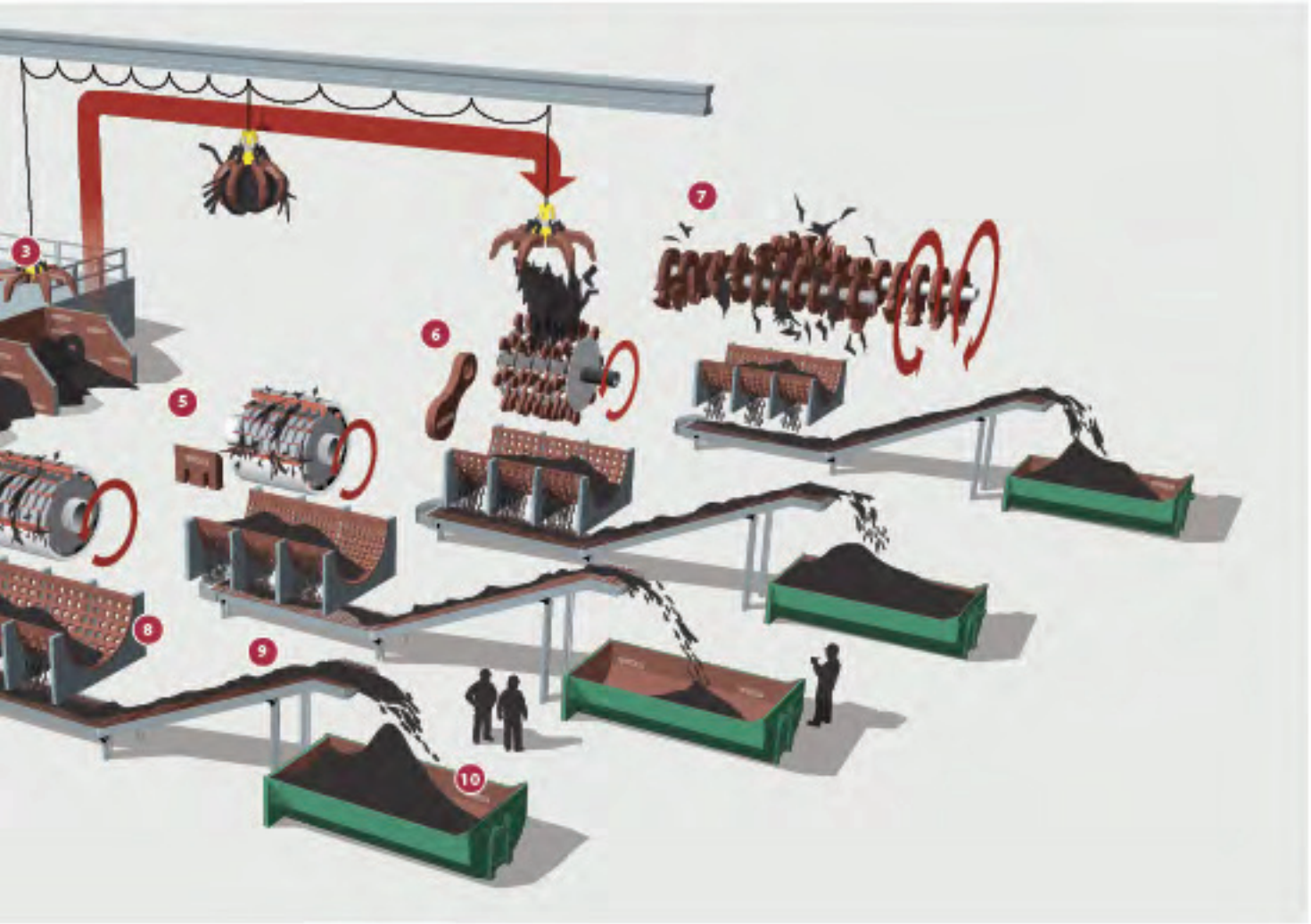
RECYCLING

Recycling processes such as the fragmentizing of waste places enormous demands on equipment. In order to stay productive and competitive it is vital to use materials that withstand the abuse. Hardox wear plate is the solution. Developed specifically for tough demands, Hardox wear plate allows recyclers and recycling equipment manufacturers to cut costs, improve service life, and optimize production.



1. Garbage truck
2. Liner plates
3. Grapples
4. Prismatic knives
5. Granulator knives
6. Hammer mills
7. Shredders
8. Sieves/screen
9. Conveyor belt
10. Containers


4
5
6
7
8
9
10
11
12


3
5
6
7
8
9
10

QUARRYING AND OPEN PIT MINING

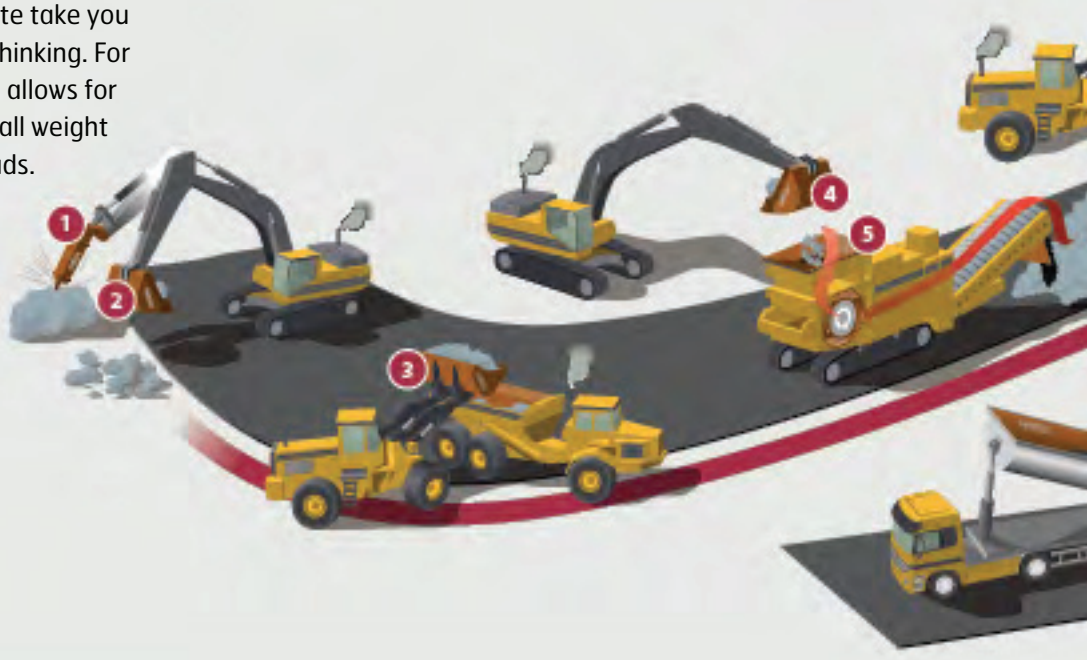
Quarrying and open pit mining operations deliver some of the world's toughest wear challenges. Throughout the whole production flow, Hardox wear plate's superior wear resistance translates to extended service life between repairs or the replacement of parts.

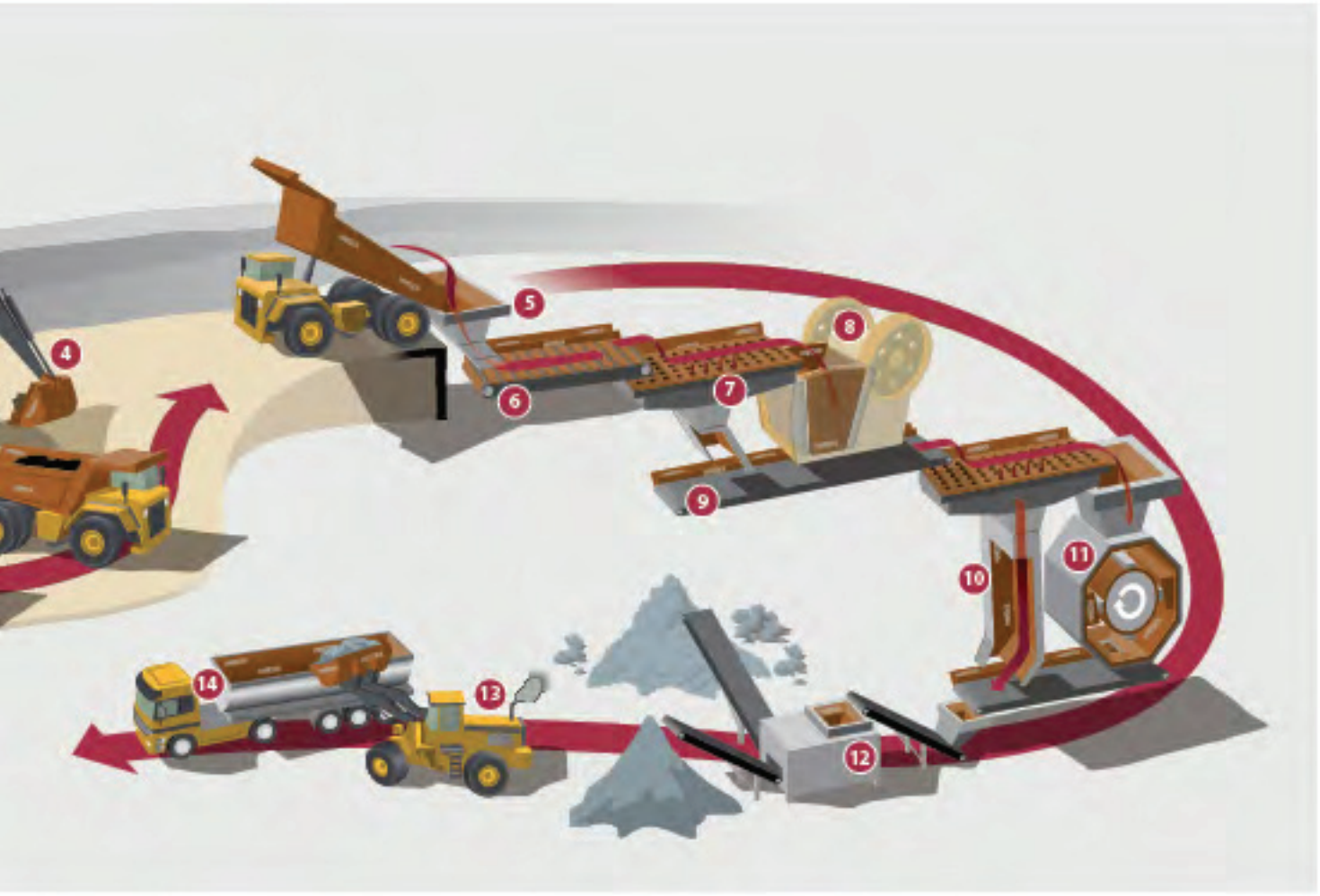
1. Shovel
2. Bulldozer
3. Dump truck
4. Excavator
5. Dump pocket
6. Feeder
7. Screener
8. Jaw crusher
9. Conveyor
10. Transfer chute
11. Hammer crusher
12. Final screening
13. Loader
14. Tipper

ROAD BUILDING

Road building needs a variety of equipment, from trucks that transport heavy material long distances to machines that withstand extreme wear when breaking ground. The unique properties of Hardox wear plate take you beyond conventional design thinking. For example, its superior strength allows for thinner plates that lower overall weight and enables increased payloads.

1. Hydraulic hammer
2. Excavator bucket
3. Bucket
4. Excavator bucket
5. Crusher
6. Bucket
7. Bucket
8. Asphalt Plant
9. Tipper (asphalt)
10. Tipper (gravel)
11. Bulldozer
12. Motor Grader
13. Asphalt Roller
14. Asphalt Paver
15. Tipper (asphalt)
16. Asphalt milling machine




4
5
6
7
8
9
10
11
12
13
14


6
7
8
9
10
11
12
13
14
15
16

MAKING FRIENDS IN THE WORKSHOP

Extreme consistency is a trademark of Hardox. Whether you are going to weld, bend or machine the material, you can expect Hardox to deliver predictable performance within plates, between plates and over time. That's a good start for making friends in the workshop.

Using Hardox wear plate often lead to questions about production processes, workshop methods and material properties.

To ensure your day-to-day operation runs smoothly, you have direct access to our technical support team for advice and troubleshooting in the workshop and on site.

At hardox.com you will find in-depth information about Hardox workshop procedures, covering preheating, welding, cutting, bending and machining.

TECHNICAL SUPPORT

SSAB customers have quick access to hands-on support and recommendations from local engineers, usually providing assistance in your own language. Our technical support team is backed up by SSAB's worldwide network of sales offices and representatives.

CUTTING EDGE PROPERTIES

FLATNESS

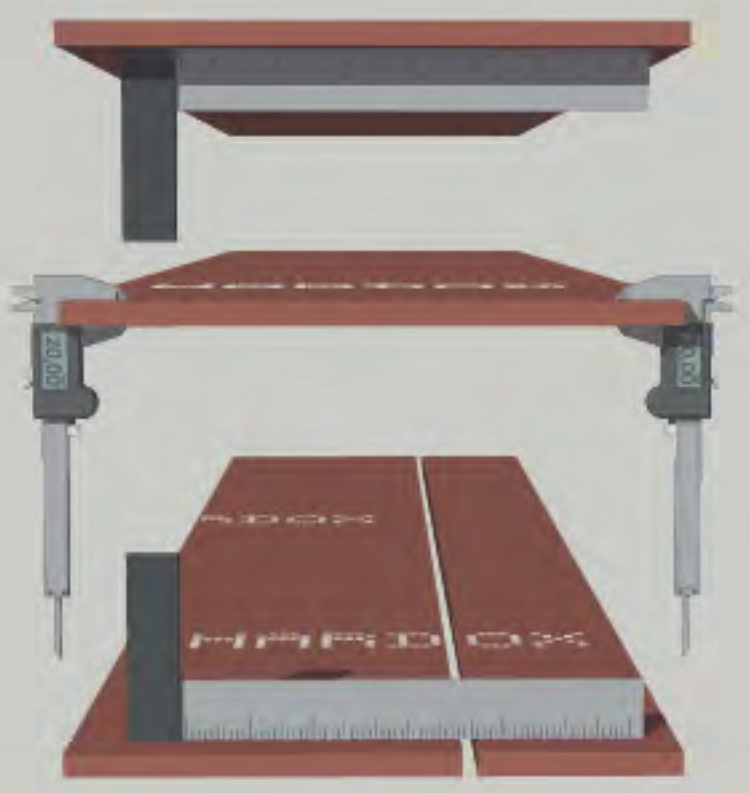
Flatness is good for both production and appearance. Flat plates can easily be welded to each other without problems with the welding gap. And if you are producing equipment with large flat surfaces they look great when painted or used as 'billboards'.

UNIFORM THICKNESS

The narrow tolerances for thickness guarantees your finished structure will be as light as you expect. And when processing the plate even a fraction of a millimeter counts, since bending force and springback are directly related to the thickness. SSAB was first in the world to introduce a precision guarantee on the thickness of heavy plate–AccuRollTech™.

INTERNALLY RELAXED

Thanks to careful heat treatment during production, Hardox wear plates have uniform internal properties. This means that a plate will stay flat when cut into smaller pieces, whether it's cut cold or hot.



MACHINING
Hardox wear plate is easy to machine. Drilling, countersinking, tapping, turning, and milling are made with high-speed steel tools.

WELDING
Hardox has great weldability to any type of weldable steel. Flatness and narrow thickness tolerances make automatic welding easy, and shorten the time for fit up and tacking.

BENDING
The uniform properties, close thickness tolerances and smooth surface make Hardox well suited to free bending and roll bending.

CUTTING
Hardox wear plates are suitable for both hot and cold cutting. Recommended hot methods are oxy-fuel, plasma and laser cutting. For optimal laser-cutting performance you can order Hardox unpainted and with an enhanced surface finish. When heating is not desired, Hardox can be cut cold by water jet, shearing, sawing or grinding.

THE NAKED TRUTH ABOUT HARDOX IN MY BODY

BUCKETS
Hardox wear plate has great structural properties for excavator buckets. The buckets last longer, keep their shape and the wear parts will be easy to change.

CONTAINERS
Wood chips one day, demolition rubble the next—a Hardox container handles the toughest of loads and still returns in good shape at the end of the day.

HARDOX®

IN MY BODY

This sign confirms that this product is made of genuine Hardox wear plate.
Hardox is a registered trademark of SSAB. www.hardox.com

Hardox In My Body is a trademark sign only used on products from manufacturers certified by SSAB. It's a guarantee that the manufacturer has extensive knowledge of steel production and that the signed product is made with genuine Hardox wear plate. **hardoxinmybody.com**

If you want a body that's hard, tough and cost-efficient, it's a good idea to turn to a Hardox In My Body manufacturer.

They are dedicated to supplying Hardox bodies that will weigh less, perform better, last longer, carry more payloads and give better fuel economy.

The combination of hardness and toughness is what makes Hardox outstanding. It's extremely resistant to wear, and its structural properties allow it to perform as a load-carrying part in many applications.

Hardox In My Body manufacturers have priority access to SSAB's latest expertise in material technology, applications and manufacturing methods, all of which rapidly translate into better products for you as a customer.

TIPPER BODIES
Hardox is perfect for designing low-weight and wear-resistant equipment for quarrying, mining and other applications involving the moving of rocks and earth.

TRUCK BODIES
Hardox allows for a design with a minimum of reinforcing beams. Lower air resistance and more load-carrying capacity give better transport economy.

HARDOX WEARPARTS, YOUR ONE STOP WEAR SHOP

What do we mean by calling it a 'one-stop wear shop'? Simply that Hardox Wearparts is the place to go for all your wear-related needs.

Companies around the world depend on Hardox Wearparts to keep their operations running smoothly, without costly disturbances or downtime.

As a customer of Hardox Wearparts, you can order new Hardox wear parts based on your drawings and instructions. You can also select from a wide range of other replacement parts for your equipment. And you have access to tried-and-tested services for cost-saving pro-active maintenance and repair strategies.

Depending on the situation, using Hardox for your wear parts can increase performance and service life dramatically. Two to three times is standard—even ten times or more has been reported compared with regular steel.

THE MASTERS OF UPTIME

A Hardox Wearparts shop has access to Hardox engineers at SSAB for the latest methods and processes in making wear parts that perform better and last longer.
hardoxwearparts.com

HARDOX®
WEAR PLATE

SSAB is a Nordic and US-based steel company. SSAB offers value added products and services developed in close cooperation with its customers to create a stronger, lighter and more sustainable world.

SSAB has employees in over 50 countries. SSAB has production facilities in Sweden, Finland and the US. SSAB is listed on the NASDAQ OMX Nordic Exchange in Stockholm and has a secondary listing on the NASDAQ OMX in Helsinki. www.ssab.com

154-en-Hardox: Hard and tough V1-2014 AplusM

SSAB
SE-613 80 Oxelösund
Sweden

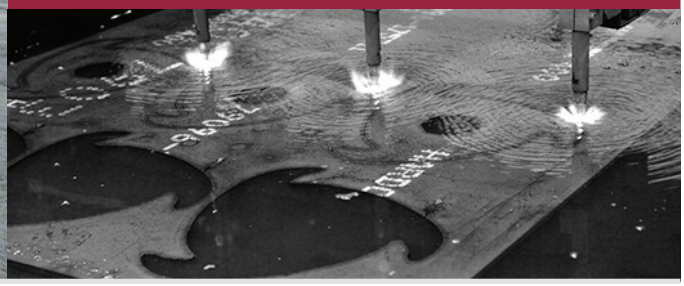
T +46 155 25 40 00
F +46 155 25 40 73
contact@ssab.com

www.hardox.com

SSAB

HARDOX®
WEAR PLATE

HARDOX HITUF



HARDOX HITUF

General Product Description

The extra-high tough steel for structural wear parts
Hardox® HiTuf is an abrasion-resistant plate with guaranteed impact toughness. With a nominal hardness of 350 HBW, it's a good choice for structural wear parts like thick cutting edges, demolition tools and rippers.

Dimension Range
Hardox HiTuf is available in thicknesses of 40 – 160 mm. Hardox HiTuf is available in widths up to 3350 mm and lengths up to 14630 mm. For thicknesses over 125 mm preferred width is 1650 mm. More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Thickness (mm)	Hardness (HBW) Min - Max [1)]	Typical yield strength, not guaranteed (MPa)
40.0- 160.0	310- 370	850

[1)] Brinell hardness, HBW, according to EN ISO 6506-1, on a milled surface 0.5 – 3 mm below surface. At least one test specimen per heat and 40 tons.
The nominal material thickness will not deviate more than + 15 mm from that of the test specimen.
Hardox is through-hardened. Minimum core hardness is 90 % of the guaranteed minimum surface hardness.

Impact Properties

Grade	Min. Impact energy (J) for transverse tests Charpy V 10x10 mm test specimen[2)]
Hardox HiTuf	40 J /- 40 C

[2)] Impact testing according to ISO EN 148 per heat and thickness group. Average of three tests. Single value minimum 70% of specified average.

SSAB

HARDOX HITUF

Chemical Composition (heat analysis)

C *) (max %)	Si *) (max %)	Mn *) (max %)	P (max %)	S (max %)	Cr *) (max %)	Ni *) (max %)	Mo *) (max %)	B *) (max %)
0.20	0.60	1.60	0.050	0.020	0.70	2.0	0.70	0.005

The steel is grain refined. *) Intentional alloying elements.

Carbon Equivalent CET(CEV)

Thickness (mm)	40.00 - 70.00	70.10 - 160.00
Max CET(CEV)	0.38 (0.56)	0.41 (0.66)

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40} \qquad CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

More details are given in SSAB´s brochure 41-General product information Strenx, Hardox, Armox and Toolox-UK and Hardox® Guarantees or on www.ssab.com.

Thickness
Tolerances according to Hardox Thickness Guarantees. Hardox® Guarantees meets the requirements of EN 10 029 Class A but offers more narrow tolerances.

Length and Width
According to SSAB's dimension program. Tolerances conforms to EN 10 029 or to SSAB's standard after agreement.

Shape
Tolerances according to EN 10 029

Flatness
Tolerances according to Hardox Flatness Guarantee class C, which are more restrictive than EN 10 029 Class N.

Surface Properties
EN 10 163-2 Class A Subclass 1

Delivery Conditions

The delivery condition is Quenched. The plates are delivered with sheared or thermally cut edges. Untrimmed edges after agreement. Delivery requirements can be found in SSAB's brochure 41-General product information Strenx, Hardox, Armox and Toolox-UK or www.ssab.com.

HARDOX HITUF

Fabrication and Other Recommendations

Welding, bending and machining.
Recommendations can be found in our brochures on www.hardox.com or consult Tech Support, techsupport@ssab.com.

Hardox HiTuf is not intend for further heat treatment. It has obtained its mechanical properties by quenching and when necessary by means of subsequent tempering. The properties of the delivery condition cannot be retained after exposure to temperatures in excess of 450ºC .

Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on this product. Grinding, especially of primer coated plates, may produce dust with a high particle concentration.

HARDOX HiTuf

2015-06-05

The table shows available dimensions for direct order including the maximum length (mm)

Some restrictions, contact your local sales representative for more information

Only 1650 mm width, mill edges. Other dimensions must be approved by Product Manager Hardox
For thermally cut edges, contact local sales force

Outside the range of dimensions

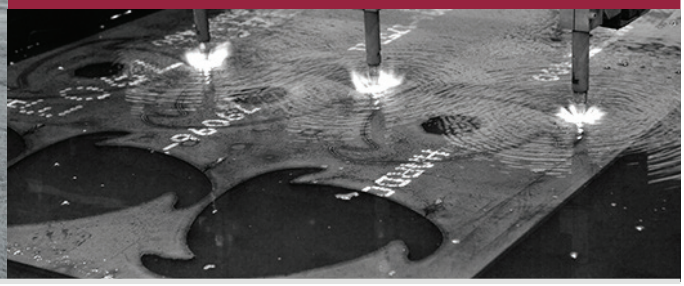
Minimum lenght: 2000 mm
Minimum quantities:

Thickness:	Minimum position weight:
3.0-60.0	2.5 tons
60.1-100,0	3.5 tons
100.1-120.0	4.0 tons
120.1-	5.0 tons

Width (mm)	1000-	-1351	-1501	-1601	-1701	-1801	-1901	-2001	-2101	-2201	-2301	-2401	-2501	-2601	-2701	-2801	-2901	-3001	-3101	-3201	-3301
Thickness (mm)	1350	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3350
40.0-45	10400	14630	14630	14630	14630	14630	14100	13400	12800	12300	11700	11300	10800	10400	10100	9700	9400	9100	8800	8500	8400
45.1-50	9100	14630	14630	14630	14100	13400	12700	12100	11500	11000	10600	10100	9800	9400	9100	8700	8500	8200	7900	7700	7600
50.1-55	9000	14630	14400	13600	12800	12100	11500	11000	10500	10000	9600	9200	9000	9000	9000	7900	7700	7400	7200	7000	6900
55.1-60	8300	14100	13200	12400	11800	11100	10600	10000	9600	9200	9000	9000	8900	8600	8300	7300	7000	6800	6600	6400	6300
60.1-65	7600	11200	11200	11500	10800	10300	9800	9300	9000	9000	8900	8500	8200	7900	7600	6700	6500	6300			
65.1-70	7000	11200	11200	11000	10100	9500	9100	9000	8900	8600	8200	7900	7600	7300	7000	6200					
70.1-75	6500	11200	10600	11000	9400	9000	9000	8700	8300	8000	7600	7300	7000	6800	6500						
75.1-80	6100	10600	9900	11000	9000	9000	8500	8100	7800	7000	7100	6800	6600	6300	6100						
80.1-85	5900	10000	9300	11000	8800	8400	8000	7600	7300	7000	6700	6400	6100	5900	5700						
85.1-90	5600	9400	9000	11000	8300	7900	7500	7200	6800	6500	6300	6000	5800	5600	5400						
90.1-95	5200	9000	8800	11000	7900	7500	7100	6800	6400	6200	6000	5700	5400	5200	5100						
95.1-100	5000	8900	8300	11000	7400	7100	6700	6400	6100	5800	5600	5400	5100	5000	4800						
100.1-105	4700	8400	8000	10500	7100	6700	6400	6100	5800	5500	5300	5100	4900	4700	4500						
105.1-110	4400	8000	7500	10500	6700	6400	6000	5800	5500	5300	5000	4800	4700	4400	4300						
110.1-115	4200	7600	7200	10500	6400	6100	5800	5500	5200	5000	4800	4600	4000	4200	4100						
115.1-120	4000	7300	6900	10500	6100	5800	5500	5200	5000	4800	4600	4400	4200	4000	3900						
120.1-125	3900	7000	6600	10500	5800	5500	5300	5000	4800	4600	4400	4200	4000	3900	3700						
125.1-130	3700	6700	6300	10500	5600	5300	5000	4800	4600	4400	4200	4000	3800	3700							
130.1-135				9900																	
135.1-140				9900																	
140.1-145				9300																	
145.1-150				9300																	
150.1-155				8700																	
155.1-160				8700																	

HARDOX®
WEAR PLATE

HARDOX 400 SHEET



HARDOX 400 SHEET

General Product Description

The all-around steel that resists wear and abrasion.
Hardox 400 is an abrasion-resistant steel with a nominal hardness of 400 HBW. Hardox 400 is an all-around wear resistant steel. Thanks to its high toughness, good bendability and weldability, this steel can be used in structures with moderate wear.

Dimension Range
Hardox 400 Sheet is available in thicknesses between 2- 8 mm. Hardox 400 Sheet is available in widths up to 1860 mm and lengths up to 16000 mm. More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Thickness (mm)	Hardness [1] (HBW)	Typical yield strength (MPa), not guaranteed
2.00- 8.00	370- 430	1100

[1] Brinell hardness, HBW, according to EN ISO 6506-1, on a milled surface 0.5– 3 mm below surface. At least one test specimen per heat and 40 tons.

Impact Properties

Grade	Longitudinal test, typical impact energy, Charpy V 10 x10 mm test specimen
Hardox 400 Sheet	45 J /-40 °C

For thicknesses between 6 - 11.9 mm, sub-size Charpy V-specimens are used. The specified toughness is then proportional to the cross-sectional area of the test specimen, compared to a full-size specimen (10 x 10 mm). Average of three tests.

Chemical Composition (heat analysis)

C *) (max %)	Si *) (max %)	Mn *) (max %)	P (max %)	S (max %)	Cr *) (max %)	Ni *) (max %)	Mo *) (max %)	B *) (max %)
0.32	0.70	1.60	0.025	0.010	1.40	1.50	0.60	0.004

The steel is grain refined. *) Intentional alloying elements.

SSAB

HARDOX 400 SHEET

Carbon Equivalent CET(CEV)

Thickness (mm)	2.00 - 8.00
Max CET(CEV)	0.39 (0.52)
Typ CET(CEV)	0.30 (0.48)

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40} \qquad CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

Thickness
Tolerances according to Hardox Thickness Guarantees. Hardox® Guarantees meet the requirements of ½ EN 10 051 for cut to length sheet.

Length and Width
According to SSAB's dimension program. Tolerances conform to EN 10 051. Tighter tolerances available on request.

Shape
Tolerances according to EN 10 051.

Flatness
For cut to length sheet the tolerances are according to Hardox Flatness Guarantees Class B, that offers narrower tolerances compared to EN 10 051.

Surface Properties
According to EN 10 163-2, Class A Subclass 1.

Bending
Tolerences for Hardox cut to length sheet are according to Hardox Bending Guarantees Class A.

Delivery Conditions

The delivery condition is Q (Quenched). Cut to length sheet are delivered with an as-rolled surface and mill edges as standard delivery condition. Delivery requirements can be found in SSAB's brochure 41-General Product Information Strenx, Hardox, Armox and Toolox-UK or at www.ssab.com.

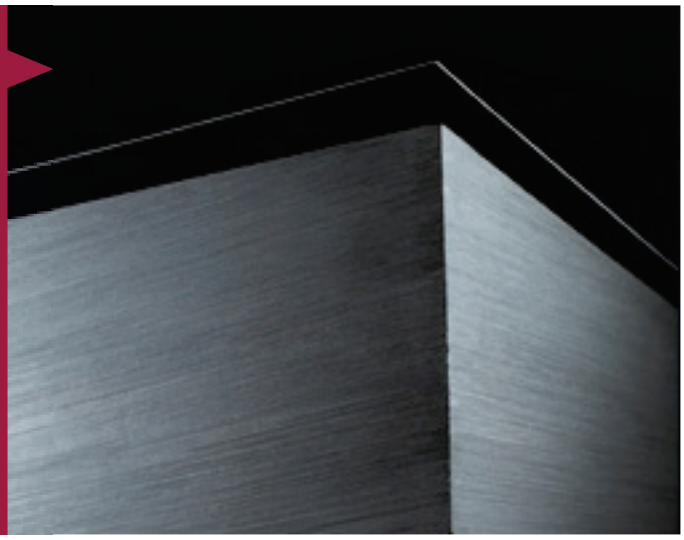
Fabrication and Other Recommendations

Welding, bending and machining.
Recommendations can be found in SSAB's brochures at www.hardox.com or consult Tech Support, techsupport@ssab.com.

HARDOX 400 SHEET

Hardox 400 is not intended for further heat treatment. It has obtained its mechanical properties by quenching and when necessary by means of subsequent tempering. The properties of the delivery condition cannot be retained after exposure to temperatures in excess of 250ºC. Hardox sheets can be welded and thermal cut at room temperature without pre-heating, all common welding and cutting processes can be used.

Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on this product. Grinding, especially of primer coated plates, may produce dust with a high particle concentration.



HARDOX 400 PLATE

2016-04-07

The table shows available dimensions in mm for direct order including the maximum length.

Some restrictions, contact your local sales representative for more information

Some restrictions on dimensions and minimum quantities, contact your sales representative for more

Outside the range of dimensions

Only 1650 mm width, mill edges. Other dimensions must be approved by Product Manager Hardox For thermally cut edges, contact local sales force

Minimum lenght: 2000 mm
Minimum quantities:

Thickness:	Min. position weight:
4.0-60.0	2.5 tons
60.1-100.0	3.5 tons
100.1-120.0	4.0 tons
120.1-	5.0 tons

Width	1000-	-1351	1501	1600	-1601	-1700	-1801	-1901	-2001	-2101	-2201	-2301	-2401	-2501	-2601	-2701	-2801	-2901	-3001	-3101	-3201	-3301
Thickness	1350	1500	1599		1699	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3350
3.2 - 3.9																						
4.0 - 4.7																						
4.8 - 5.7																						
5.8 - 6.0																						
6.1 - 6.7																						
6.8 - 7.7																						
7.8 - 8.7																						
8.8 - 10.0																						
10.1 - 25.0																						
25.1 - 26.0																						14600
26.1 - 27.0																					14200	14000
27.1 - 28.0																				14200	13700	13500
28.1 - 29.0																			14100	13700	13300	13100
29.1 - 30.0																		14100	13600	13200	12800	12600
30.1 - 31.0																	14100	13600	13200	12800	12400	12200
31.1 - 32.0				Maximum length 14630 mm												14200	13700	13200	12800	12400	12000	11800
32.1 - 33.0	14200														14200	13700	13300	12800	12400	12000	11600	11500
33.1 - 34.0	13900													14400	13900	13300	12900	12400	12000	11700	11300	11100
34.1 - 35.0	13400												14500	13900	13400	12900	12500	12100	11700	11300	11000	10800
35.1 - 36.0	13100												14100	13600	13100	12600	12200	11700	11400	11000	10700	10500
36.1 - 37.0	12700											14300	13700	13200	12700	12200	11800	11400	11100	10700	10400	10200
37.1 - 38.0	12400										14500	13900	13400	12800	12400	11900	11500	11100	10800	10400	10100	10000
38.1 - 39.0	12000										14200	13600	13000	12500	12000	11600	11200	10800	10500	10200	9800	9700
39.1 - 40.0	11700									14400	13800	13200	12700	12200	11700	11300	10900	10600	10200	9900	9600	9500
40.1 - 45.0	10400							14100	13400	12800	12300	11700	11300	10800	10400	10100	9700	9400	9100	8800	8500	8400
45.1 - 50.0	9400					14100	13400	12700	12100	11500	11000	10600	10100	9700	9400	9000	8700	8400	8200	7900	7700	7600
50.1 - 55.0	9000		14400	14400	13600	12800	12100	11500	11000	10500	10000	9600	9200	9000	9000	9000	7900	7700	7400	7200	7000	6900
55.1 - 60.0	8600	14100	13200	13200	12400	11700	11100	10600	10100	9600	9200	9000	9000	8900	8600	8300	7300	7000	6800	6600	6400	6300
60.1 - 65.0	7900	13000	11200	11200	11200	10800	10300	9700	9300	9000	9000	8900	8500	8200	7900	7600	6700	6500	6300			
65.1 - 70.0	7300	12100	11200	11200	11000	10100	9500	9000	9000	8900	8600	8200	7900	7600	7300	7000	6200					
70.1 - 75.0	6800	11300	10600	10600	11000	9400	9000	9000	8700	8300	7900	7600	7300	7000	6800	6500						
75.1 - 80.0	6300	10600	9900	9900	11000	9000	8900	8500	8100	7700	7400	7100	6800	6600	6300	6100						
80.1 - 85.0	5900	9900	9300	9300	11000	8800	8400	8000	7600	7300	6900	6700	6400	6100	5900	5700						
85.1 - 90.0	5500	9400	9000	9000	11000	8300	7900	7500	7200	6800	6500	6300	6000	5800	5500	5300						
90.1 - 95.0	5200	9000	8800	8800	11000	7900	7400	7100	6700	6400	6200	5900	5700	5400	5200	5000						
95.1 - 100.0	4900	8900	8300	8300	11000	7400	7000	6700	6400	6100	5800	5600	5300	5100	4900	4800						
100.1 - 105.0	4700	8400	7900	7900	10500	7100	6700	6400	6100	5800	5500	5300	5100	4900	4700	4500						
105.1 - 110.0	4400	8000	7500	7500	10500	6700	6400	6000	5800	5500	5200	5000	4800	4600	4400	4300						
110.1 - 115.0	4200	7600	7200	7200	10500	6400	6100	5800	5500	5200	5000	4800	4600	4400	4200	4100						
115.1 - 120.0	4000	7300	6800	6800	10500	6100	5800	5500	5200	5000	4800	4600	4400	4200	4000	3900						
120.1 - 125.0	3800	7000	6600	6600	10500	5800	5500	5200	5000	4800	4500	4400	4200	4000	3800	3700						
125.1 - 130.0	3700	6700	6300	6300	10500	5600	5300	5000	4800	4600	4400	4200	4000	3800	3700							
130.1 - 135.0																						
135.1 - 140.0																						

HARDOX 400 SHEET

The table shows available dimensions mm for direct order including maximum length.
Cut lengths with mill edges, black

Some restrictions, please contact product manager or Tech support, techsupport@ssab.com

Outside the range of dimensions

Min. length 1500 mm
Max. Length 13000 mm
Min. bundle weight 2 tons

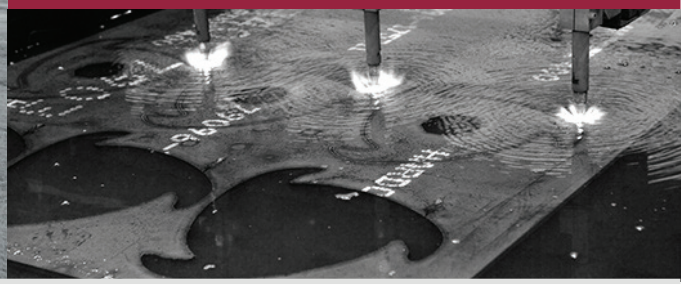
Width	950-	-1001	-1251	-1301	-1501	-1526	-1551	-1576	-1601	-1626	-1651	-1676	-1726	-1751	-1776	-1801	-1826
Thickness	1000	1250	1300	1500	1525	1550	1575	1600	1625	1650	1675	1725	1750	1775	1800	1825	1860
2.00 - 2.49																	
2.50 - 2.99																	
3.00 - 3.19																	
3.20 - 3.49																	
3.50 - 3.99																	
4.00 - 4.49																	
4.50 - 4.79																	
4.80 - 4.99																	
5.00 - 5.99						Maximum length 13 000 mm											
6.00 - 6.40																	
6.41 - 6.50																	
6.51 - 6.99																	
7.00 - 8.00																	
8.10 - 10.0																	
10.1 - 25.0																	
25.1 - 26.0																	
26.1 - 27.0																	

Min position weight is one coil (17 kg/width-mm) cut into cut to length sheets of the same thickness and width.
On special request, length up to 16 000 mm.
Delivery weight accuracy +/- 10 %, at least -2 tons / + 3 tons.

SSAB

HARDOX®
WEAR PLATE

HARDOX 450 SHEET



HARDOX 450 SHEET

General Product Description

The most popular abrasion-resistant steel with excellent structural properties.
Hardox 450 is an abrasion-resistant steel with a nominal hardness of 450 HBW. Hardox 450 combines good bendability and weldability with an option for guaranteed impact toughness (Hardox 450 Tuf).
The products can be used in many different components and structures that are subject to wear. Hardox 450, with an extra 50 Brinell hardness over our 400 grade, provides better dent and abrasion resistance as well as longer wear life, so you can achieve even greater savings.

Dimension Range
Hardox 450 Sheet is available in thicknesses between 2.5- 8 mm. Hardox 450 Sheet is available in widths up to 1775 mm and lengths up to 16000 mm. More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Thickness (mm)	Hardness[1)] (HBW)	Typical yield strength (MPa), not guaranteed
2.50- 8.00	425- 475	1100- 1300

[1)] Brinell hardness, HBW, according to EN ISO 6506-1, on a milled surface 0.5 – 3 mm below surface. At least one test specimen per heat and 40 tons.

Impact Properties

Grade	Longitudinal test, typical impact energy, Charpy V 10x10 mm test specimen.	Transverse test, guaranteed impact energy, Charpy V 10x10 mm test specimen.
Hardox 450	50 J/-40 °C	-
Hardox 450 Tuf [1)]		Min. 27 J /-20 °C [2)]

[1)] Impact testing is performed on thicknesses ≥ 6 mm. For thicknesses between 6 - 11.9 mm, sub-size Charpy V-specimens are used. The specified minimum value is then proportional to the cross-sectional area of the test specimen, compared to a full-size specimen (10 x 10 mm). Impact testing according to ISO EN 148 per heat and thickness group. Average of three tests.

[2)] Single value minimum 70% of specified average.

SSAB

HARDOX 450 SHEET

Chemical Composition (heat analysis)

C*) (max %)	Si*) (max %)	Mn*) (max %)	P (max %)	S (max %)	Cr*) (max %)	Ni*) (max %)	Mo*) (max %)	B*) (max %)
0.23	0.50	1.60	0.025	0.010	1.20	0.25	0.25	0.005

The steel is grain refined. *) Intentional alloying elements.

Carbon Equivalent CET(CEV)

Thickness (mm)	2.50 - 8.00
Max CET(CEV)	0.43 (0.55)
Typ CET(CEV)	0.35 (0.52)

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40} \qquad CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

Thickness
Tolerances according to Hardox Thickness Guarantees. Hardox® Guarantees meets the requirements of ½ EN 10 051 for cut to length sheet.

Length and Width
According to SSAB's dimension program. Tolerances conform to EN 10 051. Tighter tolerances available on request.

Shape
Tolerances according to EN 10 051.

Flatness
For cut to length sheet the tolerances are according to Hardox Flatness Guarantees Class B, that offers narrower tolerances compared to EN 10 051.

Surface Properties
According to EN 10 163-2, Class A Subclass 1.

Bending
Tolerances for Hardox cut to length sheet are according to Hardox Bending Guarantees Class B. All Classes are closer than the requirements in EN 10 025-6.

HARDOX 450 SHEET

Delivery Conditions

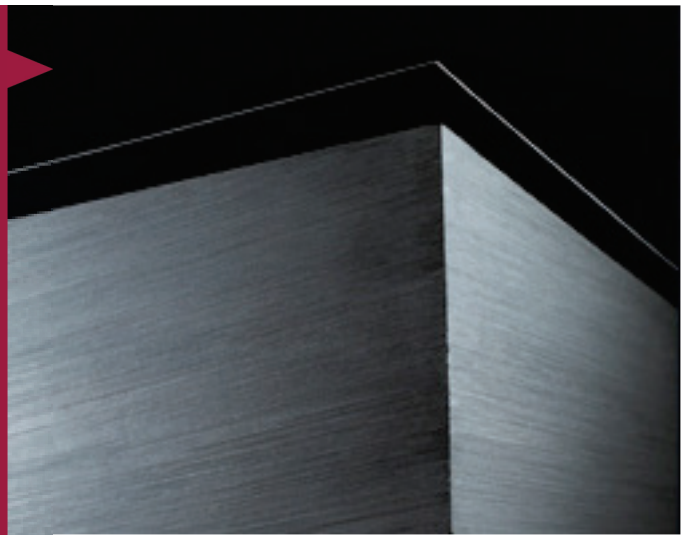
The delivery condition is Q (Quenched). Cut to length sheet are delivered with an as-rolled surface and mill edges as standard delivery condition. Delivery requirements can be found in SSAB's brochure 41-General Product Information Strenx, Hardox, Armox and Toolox-UK or at www.ssab.com.

Fabrication and Other Recommendations

Welding, bending and machining.
Recommendations can be found in SSAB's brochures at www.hardox.com or consult Tech Support, techsupport@ssab.com.

Hardox 450 and Hardox 450 Tuf are not intended for further heat treatment. Mechanical properties are achieved by quenching and when necessary by means of subsequent tempering. The properties of the delivery condition cannot be retained after exposure to temperatures in excess of 250 ºC. Hardox sheets can be welded and thermal cut at room temperature without pre-heating, all common welding and cutting processes can be used.

Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on this product. Grinding, especially of primer coated plates, may produce dust with a high particle concentration.



HARDOX 450 PLATE

2016-04-07

The table shows available dimensions in mm for direct order including the maximum length.

Some restrictions, contact your local sales representative for more information

Some restrictions on dimensions and minimum quantities, contact your sales representative for more information.

Outside the range of dimensions

Only 1650 mm width, mill edges. Other dimensions must be approved by Product Manager Hardox. For thermally cut edges, contact local sales force

Minimum lenght: 2000 mm
Minimum quantities:

Thickness:	Min. position weight:
3.0-60.0	2.5 tons
60.1-100,0	3.5 tons
100.1-120.0	4.0 tons
120.1-	5.0 tons

Width	1000-	-1351	1501	1600	-1601	-1701	-1801	-1901	-2001	-2101	-2201	-2301	-2401	-2501	-2601	-2701	-2801	-2901	-3001	-3101	-3201	-3301
Thickness	1350	1499	1599		1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3350
3.2 - 3.9																						
4.0 - 4.7																						
4.8 - 5.7																						
5.8 - 6.0																						
6.1 - 6.7																						
6.8 - 7.7																						
7.8 - 8.7																						
8.8 - 10.0																						
10.1 - 25.0																						
25.1 - 26.0																						14600
26.1 - 27.0					Maximum length 14630 mm																14200	14000
27.1 - 28.0																				14200	13700	13500
28.1 - 29.0																			14100	13700	13300	13100
29.1 - 30.0																		14100	13600	13200	12800	12600
30.1 - 31.0																	14100	13600	13200	12800	12400	12200
31.1 - 32.0																14200	13700	13200	12800	12400	12000	11800
32.1 - 33.0	14200														14200	13700	13300	12800	12400	12000	11600	11500
33.1 - 34.0	13800													14400	13800	13300	12900	12400	12000	11700	11300	11100
34.1 - 35.0	13400												14500	13900	13400	12900	12500	12100	11700	11300	11000	10800
35.1 - 36.0	13100												14100	13600	13100	12600	12200	11700	11400	11000	10700	10500
36.1 - 37.0	12700											14300	13700	13200	12700	12200	11800	11400	11100	10700	10400	10200
37.1 - 38.0	12400										14500	13900	13400	12800	12400	11900	11500	11100	10800	10400	10100	10000
38.1 - 39.0	12000										14200	13600	13000	12500	12000	11600	11200	10800	10500	10200	9800	9700
39.1 - 40.0	11700									14400	13800	13200	12700	12200	11700	11300	10900	10600	10200	9900	9600	9500
40.1 - 45.0	10400							14100	13400	12800	12300	11700	11300	10800	10400	10100	9700	9400	9100	8800	8500	8400
45.1 - 50.0	9400					14100	13400	12700	12100	11500	11000	10600	10100	9700	9400	9000	8700	8400	8200	7900	7700	7600
50.1 - 55.0	9000		14400	14400	13600	12800	12100	11500	11000	10500	10000	9600	9200	9000	9000	9000	7900	7700	7400	7200	7000	6900
55.1 - 60.0	8600	14100	13200	13200	12400	11700	11100	10600	10100	9600	9200	9000	9000	8900	8600	8300	7300	7000	6800	6600	6400	6300
60.1 - 65.0	7900	13000	11200	11200	11200	10800	10300	9700	9300	9000	9000	8900	8500	8200	7900	7600	6700	6500	6300			
65.1 - 70.0	7300	12100	11200	11200	11000	10100	9500	9000	9000	8900	8600	8200	7900	7600	7300	7000	6200					
70.1 - 75.0	6800	11300	10600	10600	11000	9400	9000	9000	8700	8300	7900	7600	7300	7000	6800	6500						
75.1 - 80.0	6300	10600	9900	9900	11000	9000	8900	8500	8100	7700	7400	7100	6800	6600	6300	6100						
80.1 - 85.0					11000	8800	8400	8000	7600	7300	7000	6700	6400	6100								
85.1 - 90.0					11000	8300	7900	7500	7200	6800	6500	6300	6000	5800								
90.1 - 95.0					11000	7900	7500	7100	6800	6400	6200	6000	5700	5400								
95.1 - 100.0					11000	7400	7100	6700	6400	6100	5800	5600	5400	5100								
100.1 - 105.0					10500	7100	6700	6400	6100	5800	5500	5300	5100	4900								
105.1 - 110.0					10500	6700	6400	6000	5800	5500	5300	5000	4800	4700								
110.1 - 115.0					10500	6400	6100	5800	5500	5200	5000	4800	4600	4300								
115.1 - 120.0					10500	6100	5800	5500	5200	5000	4800	4600	4400	4200								
120.1 - 125.0					10500	5800	5500	5300	5000	4800	4600	4400	4200	4000								
125.1 - 130.0					10500	5600	5300	5000	4800	4600	4400	4200	4000	3800								

HARDOX 450 SHEET

The table shows available dimensions in mm for direct order including the maximum length.
Cut lengths with mill edges, black

Some restrictions, please contact product manager or Tech support, techsupport@ssab.com

Outside the range of dimensions

Min. length 1500mm
Max. length 13 000 mm
Min. bundle weight 2 ton

Width	950-	-1001	-1251	-1301	-1501	-1526	-1553	-1601	-1651	-1676	-1701	-1726	-1756	-1776	-1800
Thickness	1000	1250	1300	1500	1525	1552	1600	1650	1675	1700	1725	1750	1775	1800	1860
2.00 - 2.49															
2.50 - 2.99															
3.00 - 3.19															
3.20 - 3.99															
4.00 - 4.49															
4.50 - 4.79															
4.80 - 4.99															
5.00 - 5.99					Maximum length 13 000 mm										
6.00 - 6.40															
6.41 - 6.50															
6.51 - 6.99															
7.00 - 8.00															
7.00 - 8.00															
8.10 - 10.0															
10.1 - 25.0															
25.1 - 26.0															
26.1 - 27.0															

Min position weight is one coil (17 kg/width-mm) cut into cut to length sheets of the same thickness and width.
On special request, length up to 16 000 mm.
Delivery weight accuracy +/- 10 %, at least -2 tons / + 3 tons.

HARDOX 450 Cold Rolled SHEET

The table shows available dimensions for direct order including the maximum length (mm)

Preferred length 1000 - 8000 mm

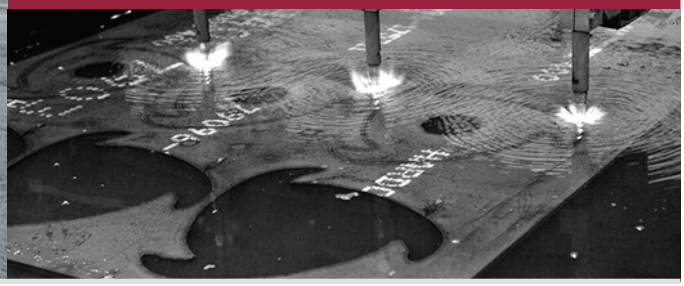
Outside the range of dimension

Width	800	1001-	1251-	>1500
Thickness	1000	1250	1500	
0.70 - 0.90				
1.00 - 1.39				
1.40 - 1.99				
2.00 - 2.10				
>2.10				

SSAB

HARDOX®
WEAR PLATE

HARDOX 500 SHEET



HARDOX 500 SHEET

General Product Description

The bendable, weldable and highly abrasion-resistant steel.
Hardox 500 is a bendable and weldable abrasion-resistant steel, with a nominal hardness of 500 HBW. Suitable for applications that demand higher wear resistance.
Hardox 500 increases payload and increases service life while maintaining good processability and toughness.

Dimension Range
Hardox 500 sheet are available in thicknesses 3.0- 6.5 mm. Hardox 500 Sheet is available in widths up to 1725 mm and lengths up to 16000 mm. More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Thickness (mm)	Hardness [1] (HBW)	Typical yield strength (MPa), not guaranteed
3.00- 6.50	470- 530	1400

[1] Brinell hardness, HBW, according to EN ISO 6506-1, on a milled surface 0.5 – 3 mm below surface. At least one test specimen per heat and 40 tons.

Impact Properties

Grade	Longitudinal test, typical impact energy, Charpy V 10x10 mm test specimen.
Hardox 500	37 J /-40 °C

For thicknesses between 6 - 11.9 mm, subsize Charpy V-specimens are used. The specified toughness is then proportional to the cross-sectional area of the test specimen, compared to a full-size specimen (10 x 10 mm). Impact testing according to ISO EN 148 per heat and thickness group. Average of three tests.

Chemical Composition (heat analysis)

C *) (max %)	Si *) (max %)	Mn *) (max %)	P (max %)	S (max %)	Cr *) (max %)	Ni *) (max %)	Mo *) (max %)	B *) (max %)
0.27	0.50	1.60	0.025	0.010	1.20	0.25	0.25	0.005

The steel is grain refined. *) Intentional alloying elements.

SSAB

HARDOX 500 SHEET

Carbon Equivalent CET (CEV)

Thickness (mm)	3.00 - 6.50
Max CET(CEV)	0.46 (0.58)
Typ CET(CEV)	0.40 (0.55)

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40} \qquad CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

Thickness
Tolerances according to Hardox Thickness Guarantees. Hardox® Guarantees meets the requirements of ½ EN 10 051 for cut to length sheet.

Length and Width
According to SSAB's dimension program. Tolerances conform to EN 10 051. Tighter tolerances available on request.

Shape
Tolerances according to EN 10 051.

Flatness
For cut to length sheet the tolerances are according to Hardox Flatness Guarantees Class B, that offers narrower tolerances compared to EN 10 051.

Surface Properties
According to EN 10 163-2, Class A Subclass 1.

Bending
Tolerances for Hardox cut to length sheet are according to Hardox Bending Guarantees Class C.

Delivery Conditions

The delivery condition is Q (Quenched). Cut to length sheet are delivered with an as-rolled surface and mill edges as standard delivery condition. Delivery requirements can be found in SSAB's brochure 41-General Product Information Strenx, Hardox, Armox and Toolox-UK or at www.ssab.com.

Fabrication and Other Recommendations

Welding, bending and machining.
Recommendations can be found in SSAB's brochures at www.hardox.com or consult Tech Support, techsupport@ssab.com.

HARDOX 500 SHEET

Hardox 500 is not intended for further heat treatment. It has obtained its mechanical properties by quenching. The properties of the delivery condition cannot be retained after exposure to temperatures in excess of 250ºC. Hardox sheets can be welded and thermal cut at room temperature without pre-heating, all common welding and cutting processes can be used.

Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on this product. Grinding, especially of primer coated plates, may produce dust with a high particle concentration.

HARDOX 500 PLATE

2016-04-07

The table shows available dimensions in mm for direct order including the maximum length

Some restrictions, contact your local sales representative for information

Outside the range of dimensions

Only 1650 mm width, mill edges. Other dimensions must be approved by Product Manager Hardox. For thermally cut edges, contact local sales force

Minimum lenght: 2000 mm
Minimum quantities:

Thickness:	Min. position weight:
3.0-60.0	2.5 tons
60.1-100,0	3.5 tons
100.1-120.0	4.0 tons
120.1-	5.0 tons

Width	1000-	-1351	-1500	-1601	-1701	-1801	-1901	-2001	-2101	-2201	-2301	-2401	-2501	-2601	-2701	-2801	-2901	-3001	-3101	-3201	-3301
Thickness	1350	1499	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3350
3.0 - 3.7																					
3.8 - 4.7																					
4.8 - 5.7																					
5.8 - 6.7																					
6.8 - 7.7																					
7.8 - 8.7																					
8.8 - 10.0																					
10.1 - 24.0																					
24.1 - 25.0																					
25.1 - 26.0																					14400
26.1 - 27.0	14000																			14200	13800
27.1 - 28.0	13400					Maximum length 14630 mm													14200	13700	13300
28.1 - 29.0	13000																	14100	13700	13300	12900
29.1 - 30.0	12500																14100	13600	13200	12800	12400
30.1 - 31.0	12100															14100	13600	13200	12800	12400	12000
31.1 - 32.0	11800														14200	13700	13200	12800	12400	12000	11700
32.1 - 33.0	11400													14200	13700	13300	12800	12400	12000	11600	11300
33.1 - 34.0	11100												14400	13800	13300	12900	12400	12000	11700	11300	11000
34.1 - 35.0	10700												13900	13400	12900	12500	12100	11700	11300	10000	10700
35.1 - 36.0	10400											14100	13600	13100	12600	12200	11700	11400	11000	10700	10500
36.1 - 37.0	10200										14300	13700	13200	12700	12200	11800	11400	11100	10700	10400	10200
37.1 - 38.0	9900										13900	13400	12800	12400	11900	11500	11100	10800	10400	10100	10000
38.1 - 39.0	9600									14200	13600	13000	12500	12000	11600	11200	10800	10500	10200	9800	9700
39.1 - 40.0	9400								14400	13800	13200	12700	12200	11700	11300	10900	10600	10200	9900	9600	9500
40.1 - 45.0	8300						14100	13400	12800	12300	11700	11300	10800	10400	10100	9700	9400	9100	8800	8500	8400
45.1 - 50.0	7500	13500	13500	13500	13500	13400	12700	12100	11500	11000	10600	10100	9700	9400	9000	8700	8400	8200	7900	7700	7600
50.1 - 55.0	6800	11200	11200	11200	11200	11200	11200	11000	10500	10000	9600	9200	8900	8500	8200	7900	7700	7400	7200	7000	6900
55.1 - 60.0	7800	11200	11200	11200	11200	11100	10600	10100	9600	9200	8800	8400	8100	7800	7500	7300	7000	6800	6600	6400	6300
60.1 - 65.0	7200	11200	11200	11200	10800	10300	9700	9300	8900	8500	8100	7800	7500	7200	6900	6700	6500	6300			
65.1 - 70.0	6700	10800	10800	10700	10100	9500	9000	8600	8200	7900	7500	7200	6900	6700	6400	6200					
70.1 - 75.0	6200	10100	10100	1000	9400	8900	8400	8000	7700	7300	7000	6700	6500	6200							
75.1 - 80.0	5900	9400	9400	9300	8800	8300	7900	7500	7200	6900	6600	6300									
80.1 - 100.0	8400	8400	7900	11000	7100	6700	6400	6100	5800												
100.1 - 103.0	8400	8400	7900	10500	7100	6700	6400	6100	5800												
103.1 - 115.0																					
115.1 - 130.0																					
130.1 - 150.0																					

HARDOX 500 SHEET

The table shows available dimensions in mm for direct order including maximum length
Cut lengths with mill edges, black

Some restrictions, please contact product manager or Tech support, techsupport@ssab.com

Outside the range of dimensions

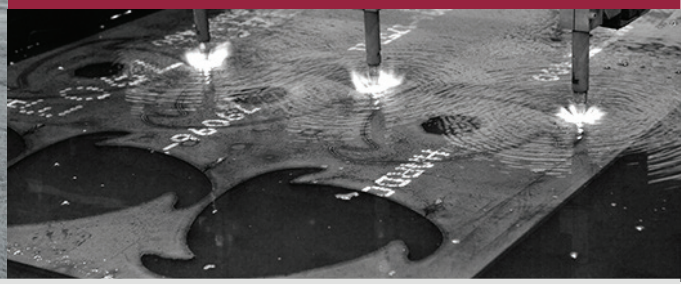
Min. length 1500 mm
Max. Length 13000 mm
Min. bundle weight 2 ton

Width	950-	-1001	-1301	-1461	-1481	-1501	-1526	-1553	-1576	-1601	-1626	-1651	-1676	-1701	-1726	-1751
Thickness	1000	1300	1460	1480	1500	1525	1552	1575	1600	1625	1650	1675	1700	1725	1750	1860
2.00 - 2.49																
2.50 - 2.99																
3.00 - 3.09																
3.10 - 3.19																
3.20 - 3.99																
4.00 - 4.49																
4.50 - 4.79																
4.80 - 4.99				Maximum length 13 000 mm												
5.00 - 5.99																
6.00 - 6.40																
6.41 - 6.50																
6.51 - 7.00																
7.10 - 8.00																
8.10 - 10.0																
10.1 - 25.0																
25.1 - 26.0																
26.1 - 27.0																

Min position weight is one coil (17 kg/width-mm) cut into cut to length sheets of the same thickness and width.
On special request, length up to 16 000 mm.
Delivery weight accuracy +/- 10 %, at least -2 tons / + 3 tons.

HARDOX®
WEAR PLATE

HARDOX 550



HARDOX 550

General Product Description

At 550 HBW and with a toughness close to Hardox 500
Hardox® 550, with a nominal hardness of 550 HBW and toughness close to Hardox 500, increases wear life but not at the expense of crack integrity.

Dimension Range
Hardox 550 is supplied in plate thickness of 8.0 – 65 mm, up to 2900 mm in width and up to 14630 mm in length. More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Thickness (mm)	Hardness [1] (HBW)
8.00- 65.00	525- 575

[1] Brinell hardness, HBW, according to EN ISO 6506-1, on a milled surface 0.5 – 3 mm below surface. At least one test specimen per heat and 40 tons. The nominal material thickness will not deviate more than ± 15 mm from that of the test specimen.

Hardox is through-hardened. Minimum core hardness is 90% of the guaranteed minimum surface hardness.

Impact Properties

Grade	Longitudinal test, Typical Impact energy, Charpy V 10 x10 mm test specimen
Hardox 550	30 J /-40 °C

SSAB

HARDOX 550

Chemical Composition

C *) (max %)	Si *) (max %)	Mn *) (max %)	P (max %)	S (max %)	Cr *) (max %)	Ni *) (max %)	Mo *) (max %)	B *) (max %)
0.37	0.50	1.30	0.020	0.010	1.40	1.40	0.60	0.004

The steel is grain refined. *) Intentional alloying elements.

Carbon Equivalent CET(CEV)

Thickness (mm)	8.00 - 65.00
Max CET(CEV)	0.51 (0.76)
Typ CET(CEV)	0.48 (0.72)

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40} \qquad CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

More details are given in SSAB´s brochure 41-General product information Strenx, Hardox, Armox and Toolox-UK and Hardox® Guarantees or on www.ssab.com.

Thickness
Tolerances according to Hardox Thickness Guarantees. Hardox® Guarantees meets the requirements of EN 10 029 Class A but offers more narrow tolerances.

Length and Width
According to SSAB´s dimensions program. Tolerances according to SSAB´s mill edge standards or tolerances that conform to EN 10 029.

Shape
Tolerance according to EN 10 029.

Flatness
Tolerances according to Hardox Flatness Guarantee class E, which are more restrictive than EN 10 029 Class N.

Surface Properties
EN 10163-2 Class A Subclass 1.

Delivery Conditions

The delivery condition is Q or QT (Quenched or Quenched and Tempered). The plates are delivered with sheared or thermally cut edges. Untrimmed mill edges available by agreement.
Delivery requirements can be found in SSAB´s brochure 41-General product information Strenx, Hardox, Armox and Toolox-UK or at

HARDOX 550

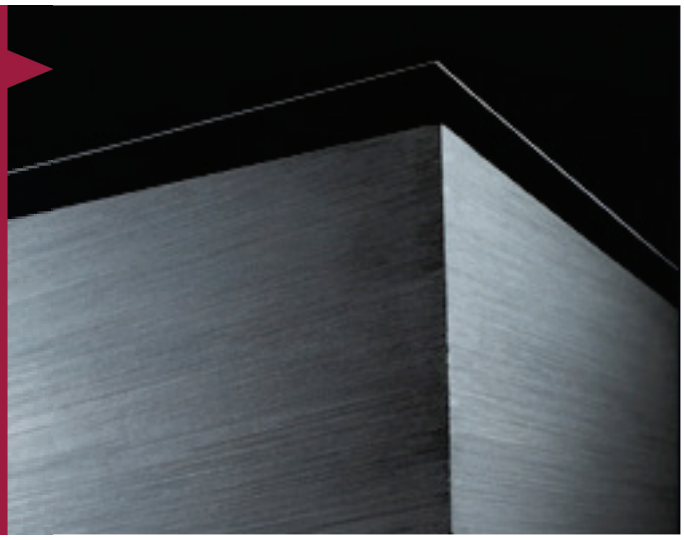
www.ssab.com.

Fabrication and Other Recommendations

Welding, bending and machining.
Recommendations can be found in SSAB's brochures at www.hardox.com or consult Tech Support, techsupport@ssab.com.

Hardox 550 is not intended for further heat treatment. It has obtained its mechanical properties by quenching and when necessary by means of subsequent tempering. The properties of the delivery condition cannot be retained after exposure to temperatures in excess of 250ºC .

Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on this product. Grinding, especially of primer coated plates, may produce dust with a high particle concentration.



HARDOX 550

2015-12-03

The table shows available dimensions for direct order including the maximum length (mm)

Some restrictions on dimensions, contact your local sales representative for information

Some restrictions on dimensions and quantities, contact your local sales representative for information

Outside the range of dimension

Minimum length: 2000 mm
Minimum quantities:

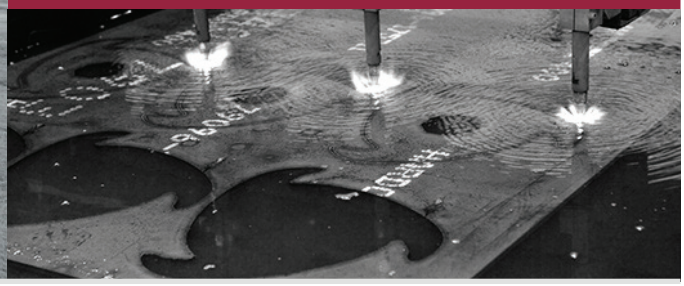
Thickness:	Minimum position weight:
3.0-60.0	2.5 tons
60.1-100,0	3.5 tons
100.1-120.0	4.0 tons
120.1-	5.0 tons

Width (mm)	1000-1350	-1351 1499	-1500 1600	-1601 1700	-1701 1800	-1801 1900	-1901 2000	-2001 2100	-2101 2200	-2201 2300	-2301 2400	-2401 2500	-2501 2600	-2601 2700	-2701 2800	-2801 2900	-2901 3000	-3001 3100	-3101 3200	-3201 3300	-3301 3350
3.0-3.7*																					
3.8-4.7*																					
4.8-5.7*																					
5.8-7.9																					
8.0-9.9																					
10.0-24																					
24.1-25																					
25.1-26																					
26.1-27	14000																				
27.1-28	13400																				
28.1-29	13000					Maximum length 14500 mm															
29.1-30	12500															14500					
30.1 31	12100															14100					
31.1-32	11800														14200	13700					
32.1-33	11400													14200	13700	13300					
33.1-34	11100												14400	13800	13300	12900					
34.1-35	10700												13900	13400	12900	12500					
35.1-36	10400											14100	13600	13100	12600	12200					
36.1-37	10200										14300	13700	13200	12700	12200	11800					
37.1-38	9900										13900	13400	12800	12400	11900	11500					
38.1-39	9600									14200	13600	13000	12500	12000	11600	11200					
39.1-40	9400								14400	13800	13200	12700	12200	11700	11300	10900					
40.1-45	8300						14100	13400	12800	12300	11700	11300	10800	10400	10100	9700					
45.1-50	7500	13500	13500	13500	13500	13400	12700	12100	11500	11000	10600	10100	9700	9400	9000	8700					
50.1-51	6800	11200	11200	11200	11200	11200	11200	11000	10500	10000	9600	9200	8900	8500	8200	7900					
51.1-60	7800	11200	11200	11200	11200	11100	10600	10100	9600	9200	8800	8400	8100	7800	7500	7300					
60.1-65	7200	11200	11200	11200	10800	10300	9700	9300	8900	8500	8100	7800	7500	7200	6900	6700					
65.1-70																					
70.1-75																					
75.1-80																					
80.1-102																					
102.1-115																					
115.1-130																					
130.1-150																					

SSAB

HARDOX®
WEAR PLATE

HARDOX 600



HARDOX 600

General Product Description

The extra hard and tough steel for extreme wear
At a nominal hardness of 600 HBW, Hardox® 600 has a uniquely high impact toughness.
Especially suited for extreme wear conditions, it can still be cut and welded, making it an excellent choice for high-performance applications.

Dimension Range
Hardox 600 is available in thicknesses of 6 – 65 mm. Hardox 600 is available in widths up to 2000 mm and lengths up to 14630 mm. Preferred dimensions are 2000 x 4000 mm, other dimensons on request. More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Thickness (mm)	Hardness [1)] (HBW)
6.0- 51	570- 640
51.1- 65	550- 640

[1)] Brinell hardness, HBW, according to EN ISO 6506-1, on a milled surface 0.5 – 3 mm below surface. At least one test specimen per heat and 40 tons. The nominal material thickness will not deviate more than ± 15 mm from that of the test specimen.
The plates are through-hardened to a minimum of 90 % of the guaranteed minimum surface hardness.

Chemical Composition

C [*)] (max %)	Si [*)] (max %)	Mn [*)] (max %)	P (max %)	S (max %)	Cr [*)] (max %)	Ni [*)] (max %)	Mo [*)] (max %)	B [*)] (max %)
0.47	0.70	1.4	0.015	0.010	1.20	2.50	0.70	0.005

The steel is grain refined. [*)] Intentional alloying elements.

SSAB

HARDOX 600

Carbon Equivalent CET(CEV)

Thickness (mm)	6.0 - 24.9	25.0 - 65
Max CET(CEV)	0.58 (0.76)	0.61 (0.87)

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40} \qquad CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

More details are given in SSAB´s brochure 41-General product information Strenx, Hardox, Armox and Toolox-UK and Hardox® Guarantees or on www.ssab.com.

Thickness
Tolerances according to Hardox Thickness Guarantees. Hardox® Guarantees meets the requirements of EN 10 029 Class A but offers more narrow tolerances.

Length and Width
According to SSAB's dimensions program. Tolerances conforms to EN 10 029 or to SSAB's standard after agreement.

Shape
Tolerance according to EN 10 029.

Flatness
Tolerances according to Hardox Flatness Guarantee class E, which are more restrictive than EN 10 029 Class N.

Surface Properties
According to EN 10163-2 Class A Subclass 1.

Delivery Conditions

The delivery condition is Quenched. The plates are delivered with sheared or thermally cut edges. Untrimmed mill edges available by agreement. Delivery requirements can be found in SSAB's brochure 41-General product information Strenx, Hardox, Armox and Toolox-UK or at www.ssab.com.

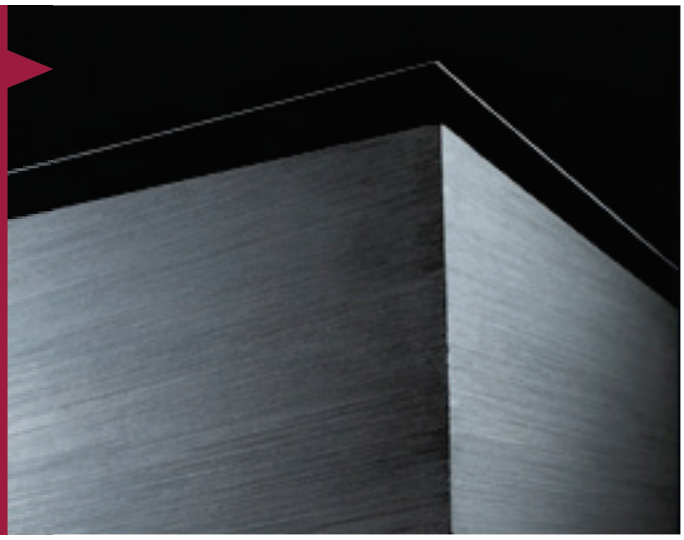
Fabrication and Other Recommendations

Welding, bending and machining.
Recommendations can be found in SSAB's brochures on www.hardox.com or consult Tech Support, techsupport@ssab.com.

Hardox 600 is not intended for further heat treatment. It has obtained its mechanical properties by quenching and when necessary by means of subsequent tempering. The properties of the delivery condition cannot be retained after exposure to temperatures in excess of 250ºC .

HARDOX 600

Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on this product. Grinding, especially of primer coated plates, may produce dust with a high particle concentration.



HARDOX 600

2016-09-16

The table shows available dimensions for direct order including the maximum length (mm)

Some restrictions on dimensions, contact your local sales representative for information

Some restrictions on dimensions and quantities, contact your local sales representative for information

Outside the range of dimension

Minimum lenght: 2000 mm

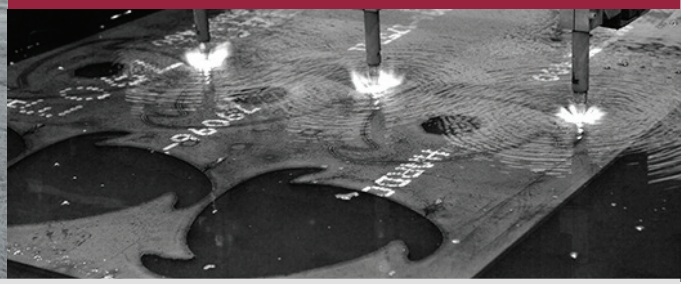
Minimum quantities:

Thickness:	Minimum position weight:
3.0-60.0	2.5 tons
60.1-100,0	3.5 tons
100.1-120.0	4.0 tons
120.1-	5.0 tons

Width (mm)	1000-	-1351	-1500	-1601	-1701	-1801	-1901	-2001	-2101	-2201	-2301	-2401	-2501	-2601	-2701	-2801	-2901	-3001	-3101	-3201	-3301
Thickness (mm)	1350	1499	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3350
3.0-3.7*																					
3.8-4.7*																					
4.8-5.9*																					
6.0-6.7																					
6.8-7.9																					
8.0-8.7																					
8.8-13																					
13.1-24																					
24.1-25																					
25.1-26																					
26.1-27	14000																				
27.1-28	13400		Maximum length 14500 mm																		
28.1-29	13000																				
29.1-30	12500																				
30.1-31	12100																				
31.1-32	11800																				
32.1-33	11400																				
33.1-34	11100																				
34.1-35	10700																				
35.1-36	10400																				
36.1-37	10200																				
37.1-38	9900																				
38.1-39	9600																				
39.1-40	9400																				
40.1-45	8300						14100														
45.1-50	7500	13500	13500	13500	13500	13400	12700														
50.1-51	6800	11200	11200	11200	11200	11200	11200														
51.1-60	7800	11200	11200	11200	11200	11100	10600														
60.1-65	7200	11200	11200	11200	10800	10300	9700														
65.1-70																					
70.1-75																					
75.1-80																					
80.1-102																					
102.1-115																					
115.1-130																					
130.1-150																					

HARDOX®
WEAR PLATE

HARDOX EXTREME



HARDOX EXTREME

General Product Description

Hardox Extreme steel for extreme abrasion resistance
Hardox® Extreme is the world's hardest wear plate with a nominal hardness of 60 HRC (Rockwell) and typical hardness of 650-700 HBW.
Hardox Extreme is an abrasion resistant steel with a nominal hardness of 60 HRC, intended for applications with extreme high demands on abrasion resistance. Typical applications is liner plates, etc.

Dimension Range
Hardox Extreme is supplied in plate thickness of 8 – 19 mm, up to 2000 mm in width and up to 14630 mm in length, preferred widths are 2000 x 4000 mm, other width on request. More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Thickness (mm)	Typical Hardness (HRC)
8.00- 19.00	57- 63

Chemical Composition (ladle analysis)

C (max %)	Si (max %)	Mn (max %)	P (max %)	S (max %)	Cr (max %)	Ni (max %)	Mo (max %)	B (max %)
0.47	0.50	1.40	0.015	0.010	1.20	2.50	0.80	0.005

The steel is grain refined.

Typical Welding Equivalent CET(CEV)

Thickness (mm)	10.00	20.00
Typical CET(CEV)	0.54(0.65)	0.54(0.65)

SSAB

HARDOX EXTREME

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40} \qquad CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

More details are given in SSAB´s brochure 41-General product information Strenx, Hardox, Armox and Toolox-UK and Hardox® Guarantees or on www.ssab.com.

Thickness
Tolerances according to Hardox Thickness Guarantees. Hardox® Guarantees meets the requirements of EN 10 029 Class A but offers more narrow tolerances.

Length and Width
According to SSAB's dimensions program. Tolerances conforms to EN 10 029 or to SSAB's standard after agreement.

Shape
Tolerance according to EN 10 029.

Flatness
Tolerances according to Hardox Flatness Guarantee class E, which are more restrictive than EN 10 029.

Surface Properties
EN 10163-2 Class A Subclass 1

Delivery Conditions

The delivery condition is Q (Quenched). The plates are delivered with sheared or thermally cut edges. Untrimmed edges after agreement. Delivery requirements can be found in SSAB's brochure 41-General product information Strenx, Hardox, Armox and Toolox-UK or at www.ssab.com.

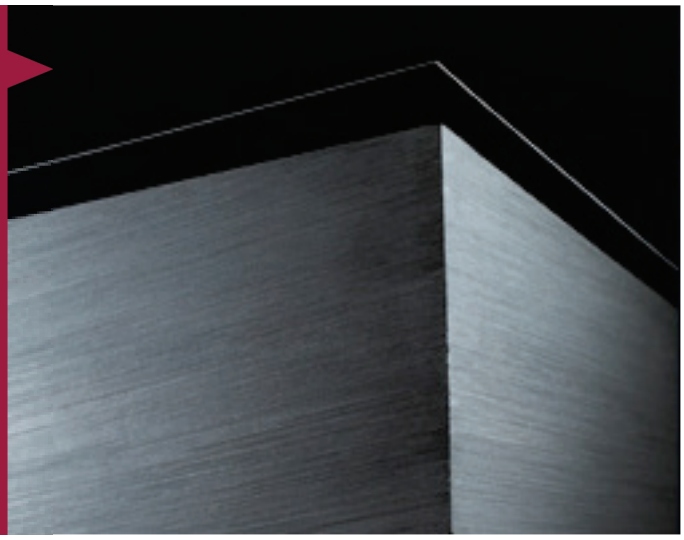
Fabrication and Other Recommendations

Welding, bending and machining.
Recommendations can be found in SSAB's brochures on www.hardox.com or consult Tech Support, techsupport@ssab.com.

Hardox Extreme is not intended for further heat treatment. It has obtained its mechanical properties by quenching and when necessary by means of subsequent tempering. The properties of the delivery condition cannot be retained after exposure to temperatures in excess of 150ºC.

Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on the product. Grinding, especially of primer coated plates, may produce dust with high particle concentration.

HARDOX EXTREME



HARDOX EXTREME 2015-06-05

The table shows available dimensions for direct order including the maximum length (mm)

Minimum lenght: 2000 mm
Minimum quantities:

Thickness:	Minimum position weight:
3.0-60.0	2.5 tons
60.1-100,0	3.5 tons
100.1-120.0	4.0 tons
120.1-	5.0 tons

Some restrictions on dimensions, contact your local sales representative for information

Outside the range of dimension

Width (mm)	1000-1350	-1351 1499	-1500 1600	-1601 1700	-1701 1800	-1801 1900	-1901 2000	-2001 2100	-2101 2200	-2201 2300	-2301 2400	-2401 2500	-2501 2600	-2601 2700	-2701 2800	-2801 2900	-2901 3000	-3001 3100	-3101 3200	-3201 3300	-3301 3350
3.0-3.7*																					
3.8-4.7*																					
4.8-5.7*																					
5.8-6.7																					
6.8-7.7																					
8.0-8.7																					
8.8-10																					
10.1-13																					
13.1-19					Maximum length 14500 mm																
19.1-26																					
26.1-27																					
27.1-28																					
28.1-29																					
29.1-30																					
30.1-31																					
31.1-32																					
32.1-33																					
33.1-34																					
34.1-35																					
35.1-36																					
36.1-37																					
37.1-38																					
38.1-39																					
39.1-40																					
40.1-45																					
45.1-50																					
50.1-55																					
55.1-60																					
60.1-65																					
65.1-70																					
70.1-75																					
75.1-80																					
80.1-102																					
102.1-115																					
115.1-130																					
130.1-150																					