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.

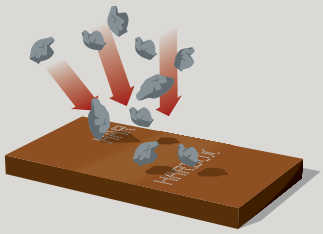
Originally intended as a wear plate, it turned out that the unique combination of hardness and toughness allows Hardox to perform as a load-carrying part in many applications. With Hardox, you can design structures that are wear-resistant, strong and lightweight at the same time.

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.

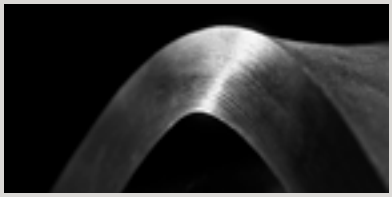
If you are a cost-sensitive and performance-oriented steel user, Hardox is all good news! Visit hardox.com for more information about how hard and tough turns into payload and service life.

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.







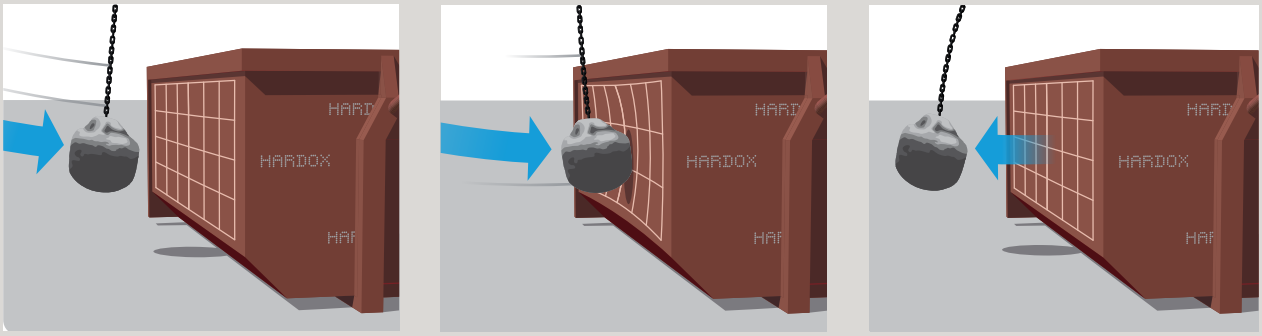




HARDOX AT THE BLINK OF AN EYE

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.

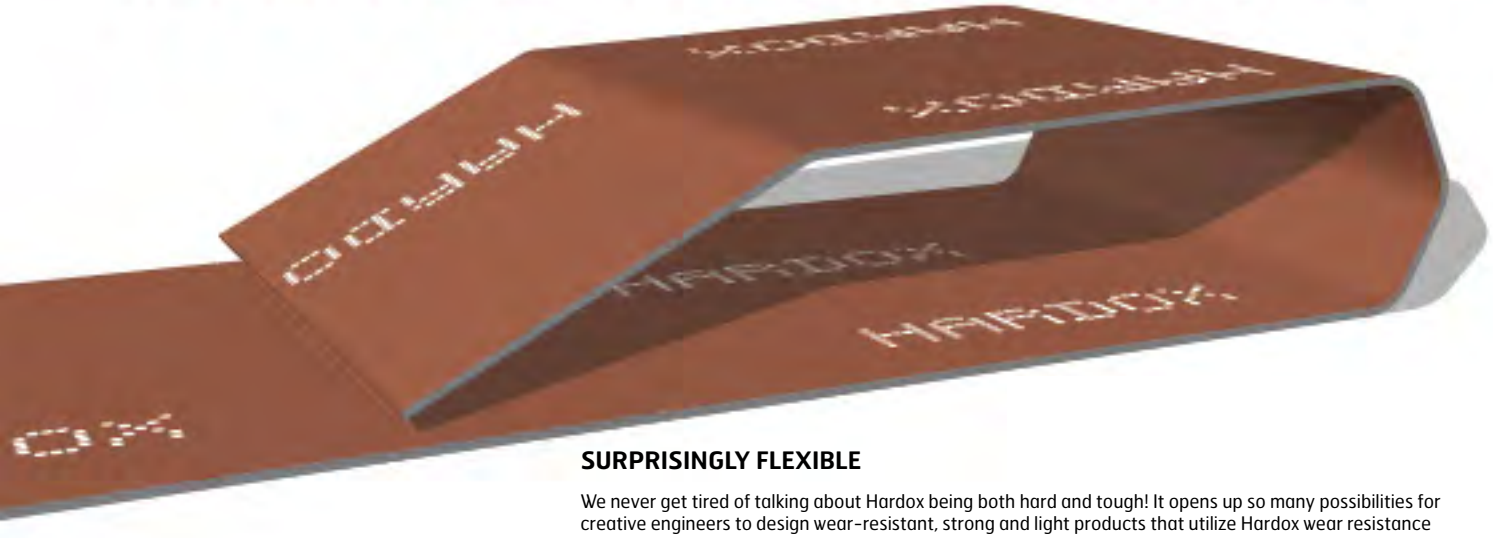
Why? Because the combination of hardness and toughness allows for new innovative ways of designing steel structures and components. Your products will perform better and last longer—giving your business an extra edge. And who doesn't want that.

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.

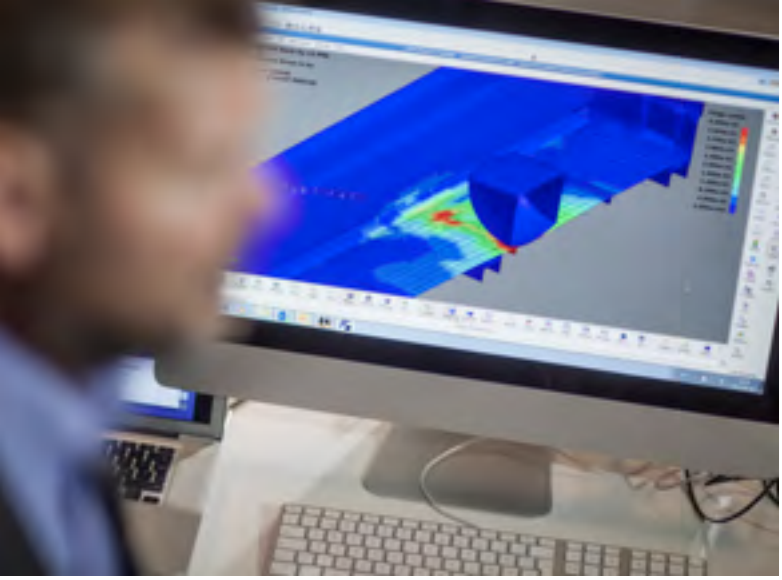
Our materials and design experts at SSAB work closely with customers to create new and smarter ways of using Hardox. Challenge them with your applications and you will be greatly rewarded.

A TOUGH WEAR PLATE MADE FOR INNOVATIONS



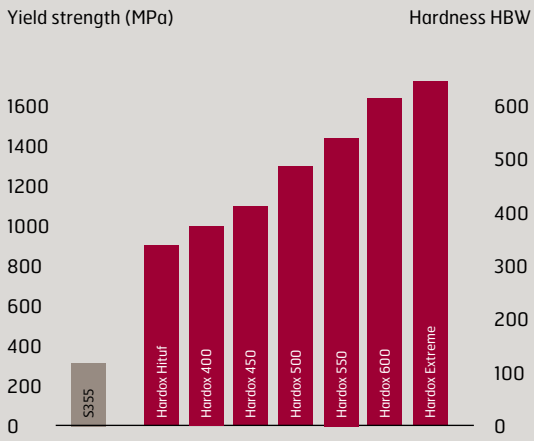
SURPRISINGLY FLEXIBLE

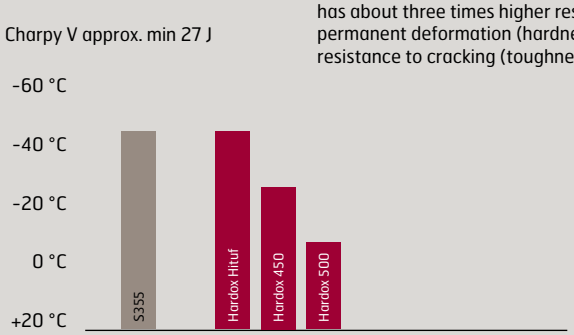
We never get tired of talking about Hardox being both hard and tough! It opens up so many possibilities for creative engineers to design wear-resistant, strong and light products that utilize Hardox wear resistance as well as its potential to perform as a structural steel. Our most popular Hardox grades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





STRENGTH, HARDNESS AND GUARANTEED TOUGHNESS

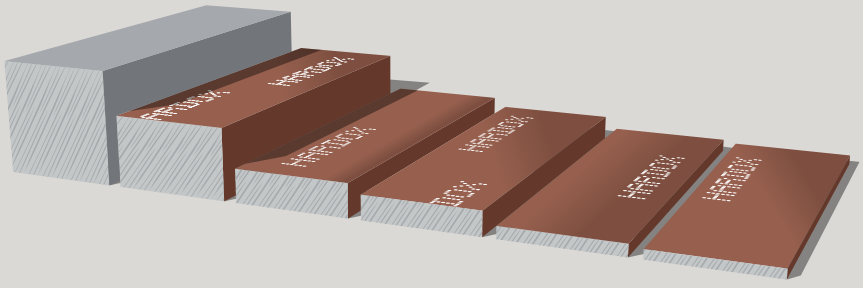




The toughness values for Hardox HiTuf, 450 and 500 are guaranteed minimum values at -40°C, -20°C and 0°C respectively. Compared to a standard S355 steel, Hardox HiTuf for example has about three times higher resistance to permanent deformation (hardness) and an equal resistance to cracking (toughness).

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.





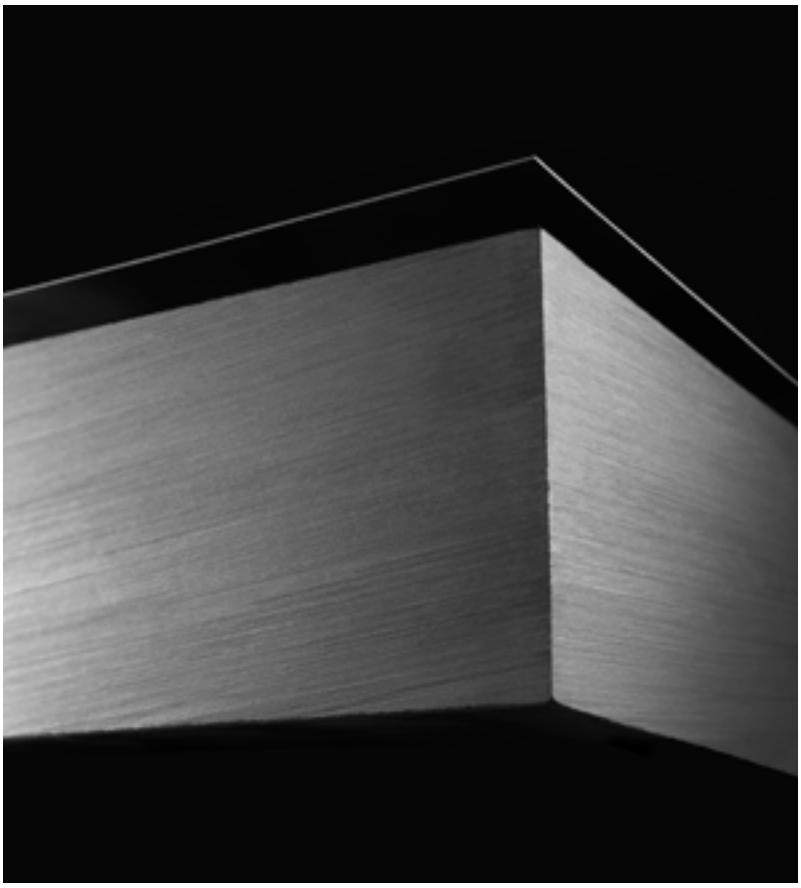
AT YOUR SERVICE 24/7

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 Hardness Yield strength Tensile strength Diameter Wall thickness	Hardox Tube 500 470-530 HBW 1250 MPa, typical value 1600 MPa, typical value 70-133* mm 2.5-6.0 mm	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.

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











HARDOX















ONSITE

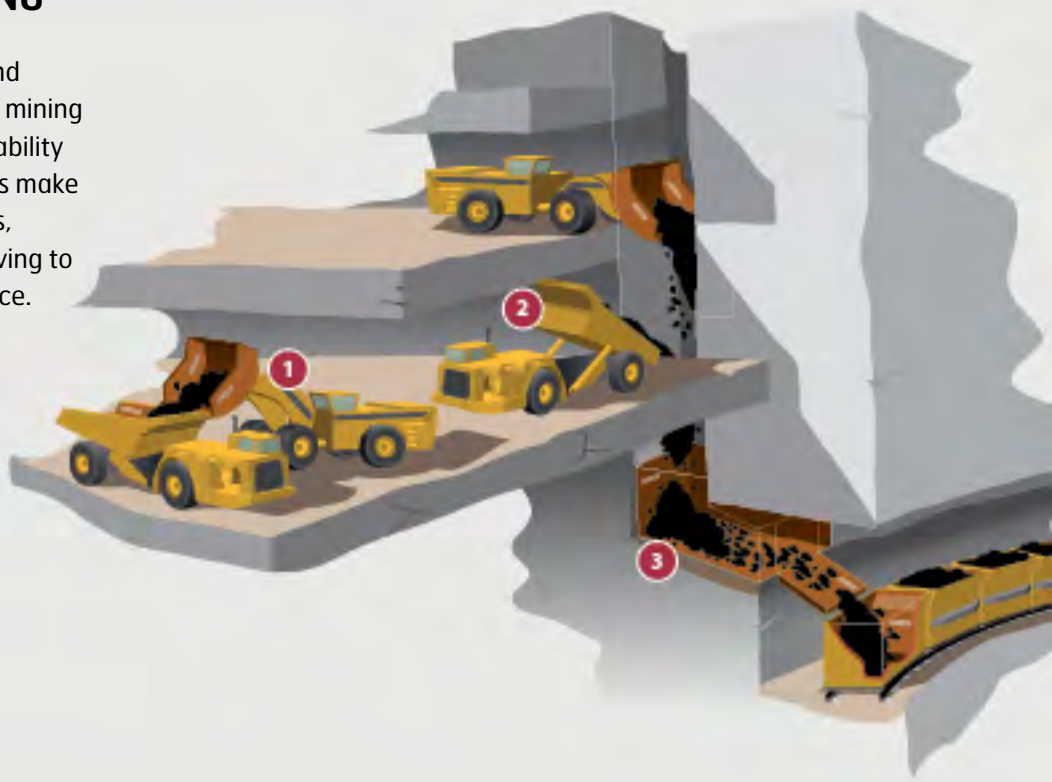







UNDERGROUND MINING

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.



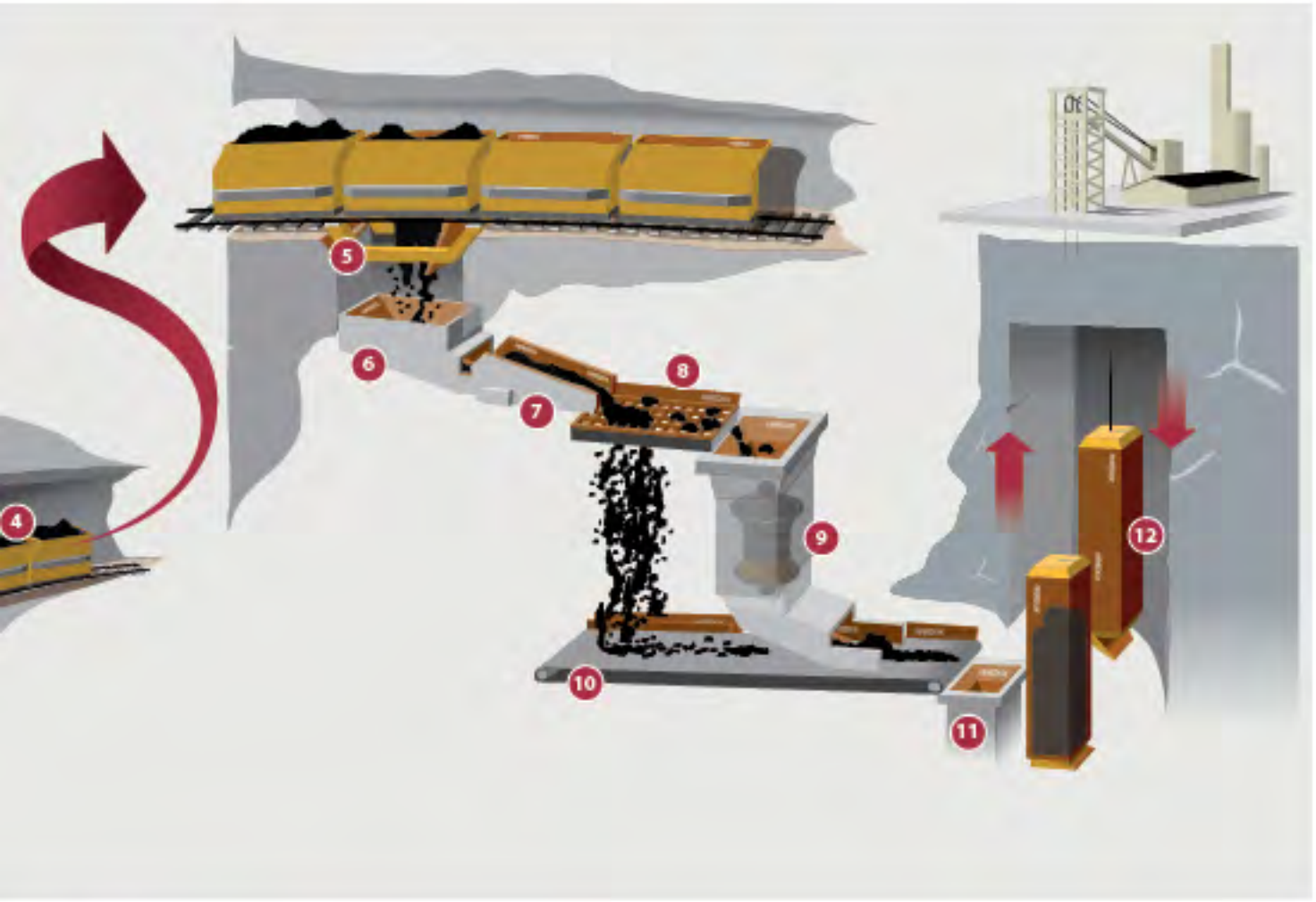
1. Front loader
2. Dump truck
3. Buffer bin
4. Rail road car
5. Discharge site
6. Transfer chute
7. Feeder
8. Screener
9. Crusher
10. Conveyor
11. Measuring bin
12. Skip

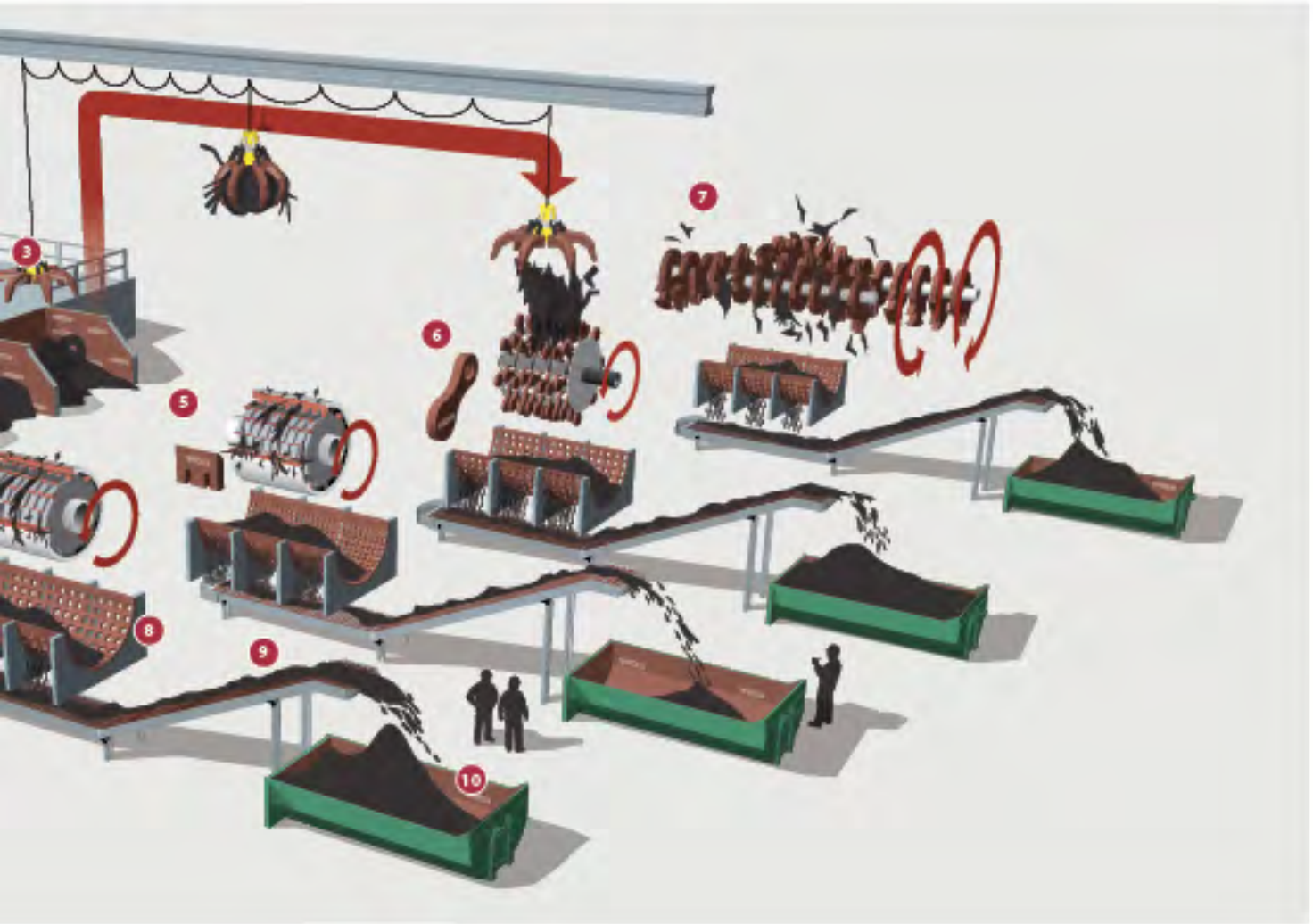
RECYCLING

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


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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.

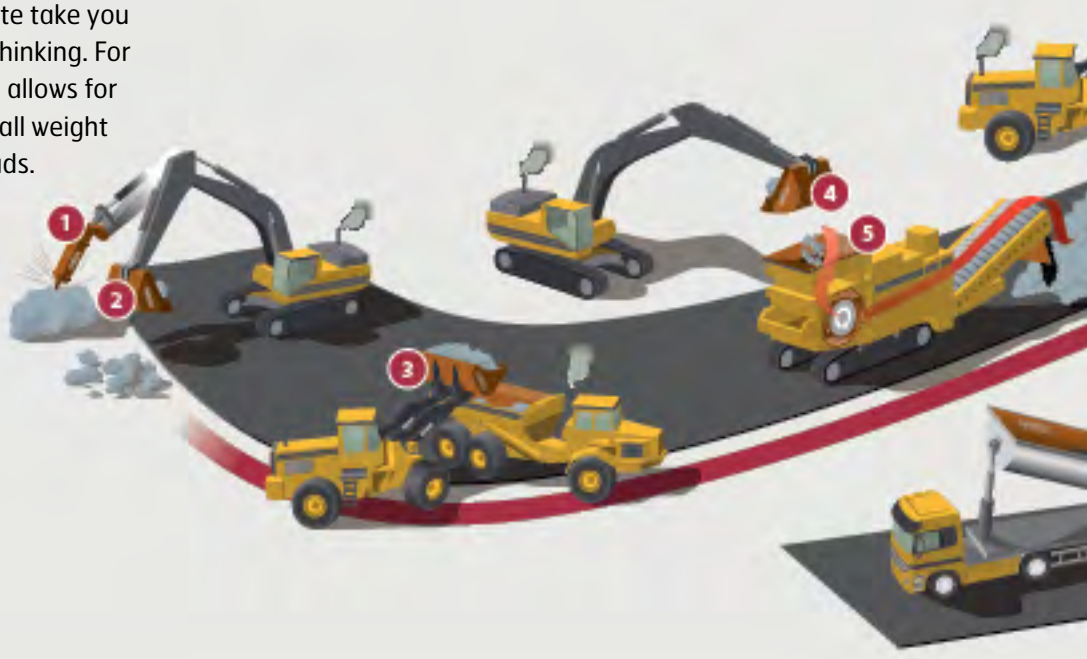
1. Shovel
2. Bulldozer
3. Dump truck
4. Excavator
5. Dump pocket
6. Feeder
7. Screener
8. Jaw crusher
9. Conveyor
10. Transfer chute
11. Hammer crusher
12. Final screening
13. Loader
14. Tipper

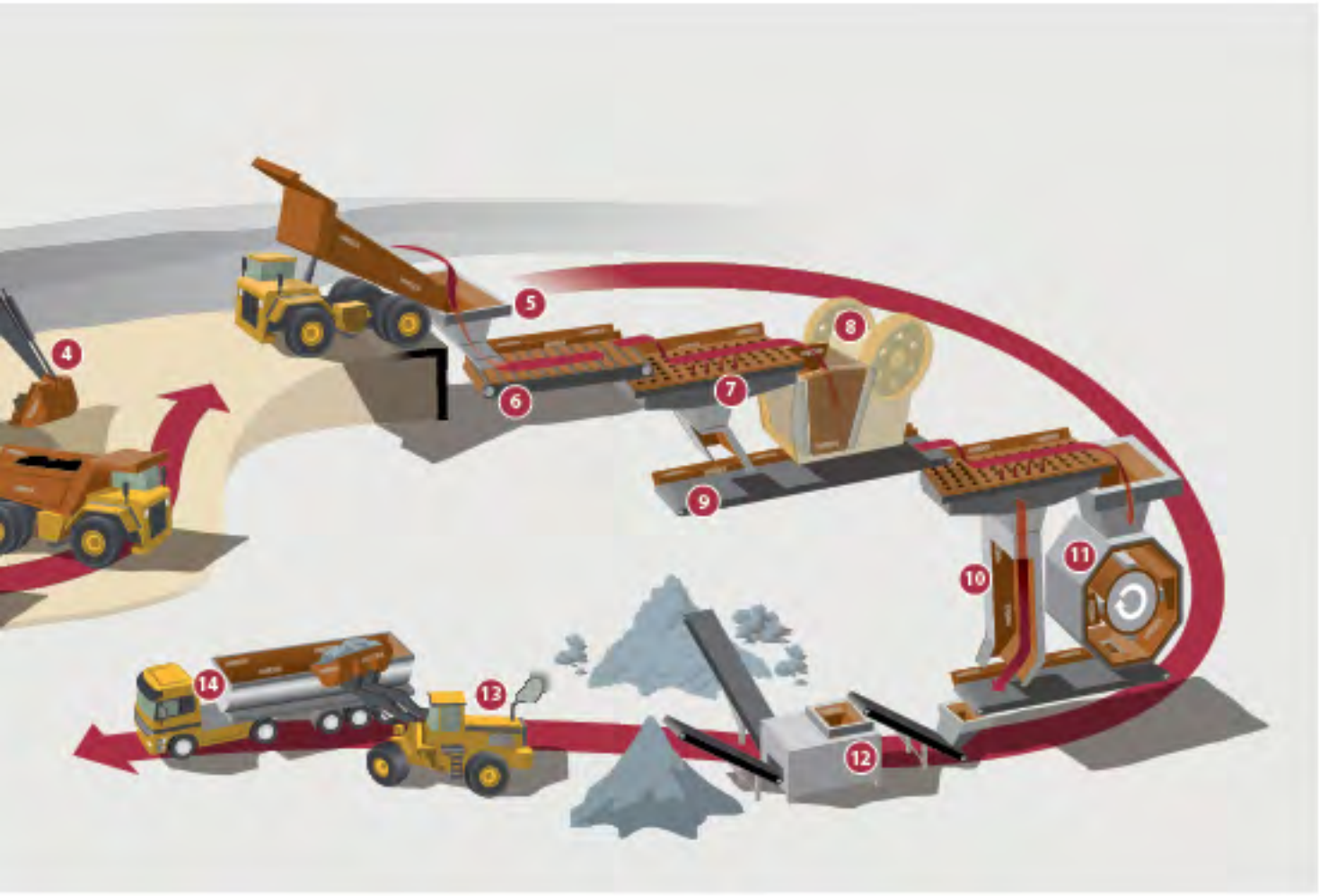


ROAD BUILDING

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




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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

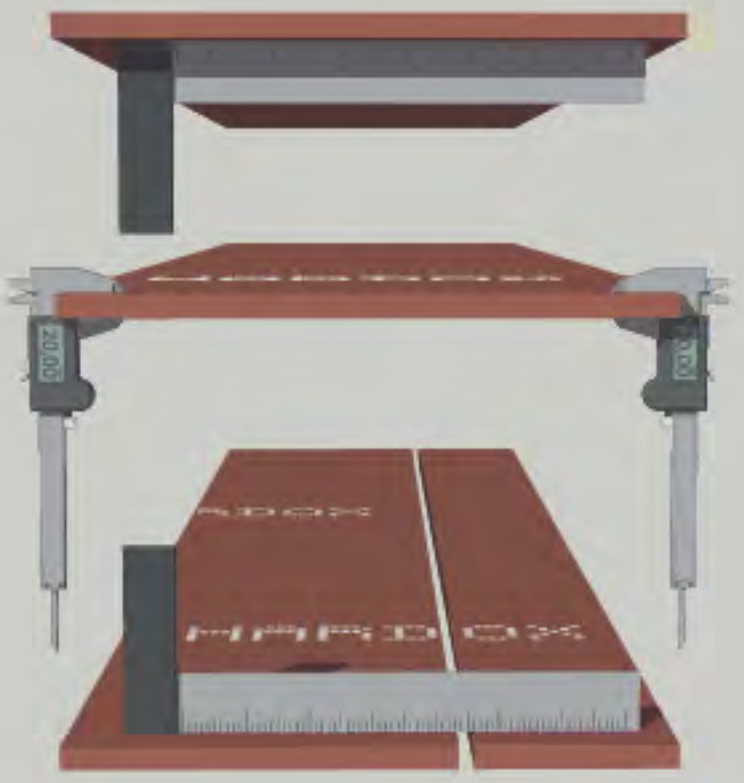
SSAB customers have quick access to hands-on support and recommendations from local engineers, usually providing assistance in your own language. Our technical support team is backed up by SSAB's worldwide network of sales offices and representatives.

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.

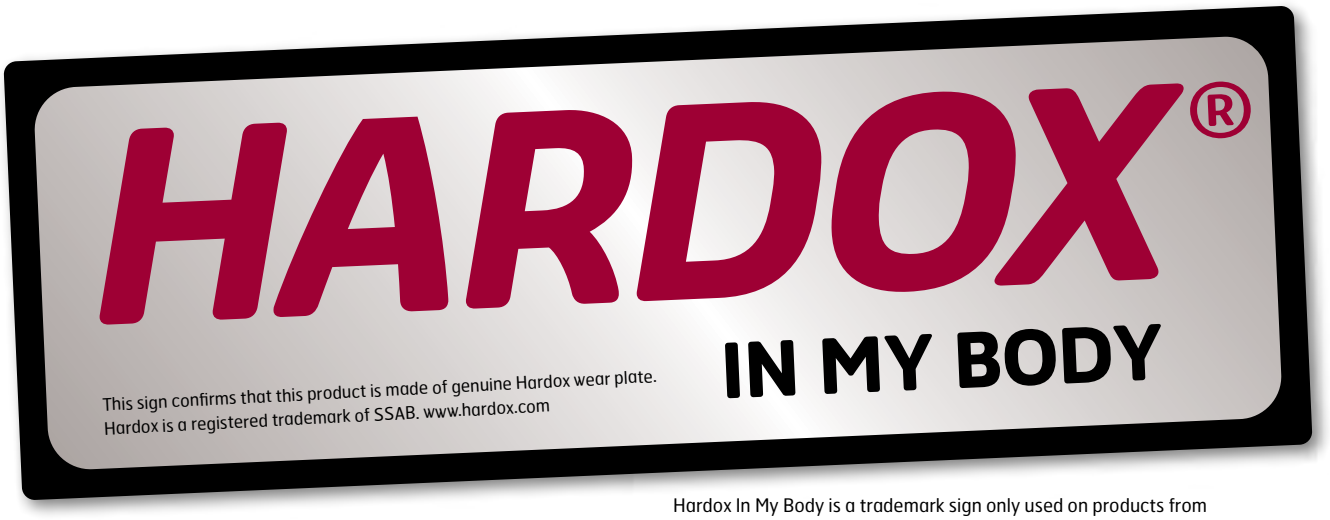
THE NAKED TRUTH ABOUT HARDOX IN MY BODY



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 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

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