



AstraWear 450F

A 450 BHN Wear Resistant Steel

Chemical Composition* – % Weight

C	Mn	P	S	Si	Ni	Cr	Mo	B
.23	1.55	.025	.010	.40	1.0	1.0	.50	.003

Physical Properties – Typical Values at 68°F

BHN Hardness	Tensile Strength	Yield Strength	Elongation in 2"	Charpy Test Toughness Index
430 – 480	205 ksi	175 ksi	12%	20 ft. lbs. Longitudinal @ -40°F

C Equivalent

$$C_{eq} = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

Thickness Range - in.	C.Eq
3/16 – 1.00	≤ .53
>1.00 – 2.00	≤ .64

AstraWear 450F is a water tempered martensitic steel, with typical hardness of 450 BHN, which offers a real response to wear from abrasion. Its resistance, high hardness, and yield strength make it highly resistant to plastic deformation and wear from scraping and impact.

AstraWear 450F shows resistance to wear typically equal to 4 times and any yield strength 3 times greater than those of a A572-50 (S355) steel. Using AstraWear 450F represents a major improvement in terms of service life and lightening of equipment by reducing thickness. AstraWear 450F is easy to process, has good welding capacity and good bendability, considering its outstanding mechanical properties.

This steel is especially suited for applications in quarries, construction, mines, cement plants, and the iron and steel industry, among others.

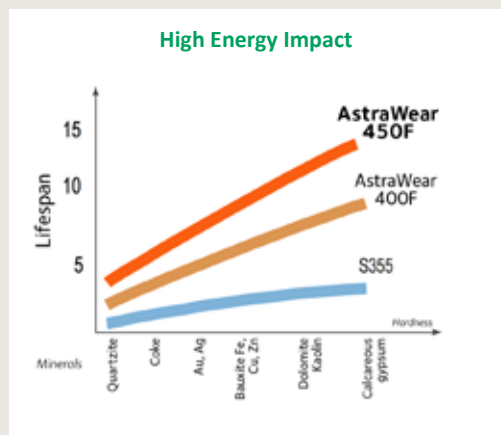
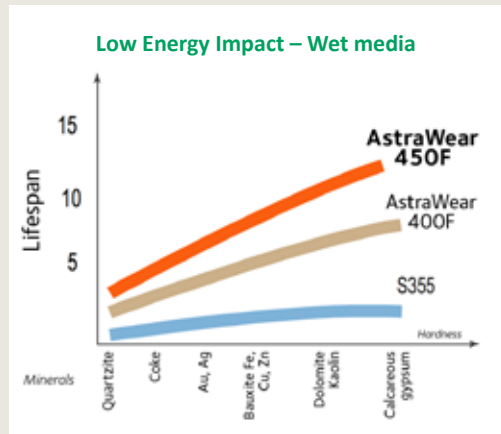
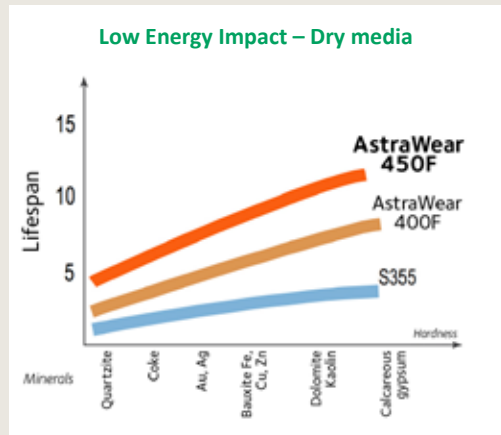
AstraWear 450F is a grade especially suited for manufacturing truck bodies.

Note: The data contained in this document is accurate at time of printing, and intended for use as a general guide.
* Typical maximum values. Mill certifications are available upon request.



AstraWear 450F

Wear Resistant Properties



Wear test data

CUTTING

AstraWear 450F can be cut using classic thermal processes (oxygen, plasma, and laser).

Plates 0.1875 to 2 in. thick do not require preheating, as long as they are processed at temperatures above 60°F (plate temperature). If the temperature of the steel is below 60°F, preheating is necessary to prevent fissures. Plates over 3 in. thick should be preheated prior to cutting to prevent fissures.

Cutting with water spray or shearing can also be used.

Cutting Temperature	Thickness	
	0.1875" – 2"	> 2.0"
≥ 60°F	w/o preheating	Preheating 212° – 302°F
< 60°F	Preheating 212° – 302°F	Preheating 212° – 302°F

MACHINING

Drilling and grinding can be performed with super carburized steel with HSSCO high-speed cobalt bits, using an oil lubricant whenever possible. However, classic high-speed steels may be used. Typical cutting parameters are:

DRILLING	$\phi = 0.40"$	$\phi = 0.40"$	$\phi = 0.80"$	$\phi = 1.18"$
Cutting speed	ft/min	20 – 26	20 – 26	20 – 26
Rotation	rev/min	380 – 500	190 – 250	90 – 250
Feed	in/rev	0.0028	0.00394	0.00789

THREADING	$\phi = 0.40"$	$\phi = 0.80"$	$\phi = 1.18"$
Cutting speed	ft/min	3.3 – 10	3.3 – 10
Rotation	rev/min	30 – 95	15 – 45

GRINDING	Depth (in.)	Cutting speed (ft/min)	Feed (mm/tooth)
HSSCO	0.04	3.9 – 4.7	0.00314
AR 12.0.5.5 (T15)	0.16	3.1 – 4.3	0.00472
F40M	0.04" – 0.20"	2.7" – 7.9"	0.0059 – 0.0138

AstraWear 450F

BENDING

Thanks to its high level of refinement (low sulfur and phosphorus content), AstraWear 450F is easy to bend; provided the following conditions are observed:

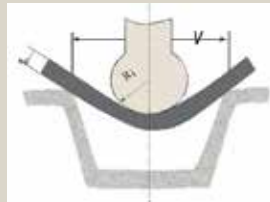
- * Cutting (or abrasion) of edges caused by gas cutting to limit hardened areas
- * Sufficiently powerful equipment
- * The minimum forming radius is respected
- * The minimum plate temperature is 60°F

For plates under 2 in. thick, forming conditions are summarized in the following table:

th = thickness	Perpendicular to grain direction	Parallel to grain direction
Inner bend radius R _i (min)	4 x th	5 x th
V die aperture (min)	12 x th	12 x th

Please call regarding plates over 2 in.

Within these permissible bending parameters, the force required to shape a plate is a function of the length bent, metal thickness, die aperture, die shape (V or U), and punch shape.



The following table shows the bending forces, for minimum die aperture (V=10 th), required to bend plates in V for a 3.28 ft. bend.

Thickness (in)	Bending force required per foot of band * (tons/ft)
0.20	27.44
0.40	53.35
	* ± 10%



AstraWear 450F steel is unsuitable for thermo-forming at temperatures above 392°F.

WELDING

Thanks to a chemical analysis with low carbon content, AstraWear 450F offers outstanding welding characteristics. It can be welded under simple conditions with total safety.

Welding consumable[s]

All products compliant with the following standards are acceptable:

Stick electrodes	MIG-MAG	Gas protected flux cored wire	Submerged arc welding wire flux
AFNOR NF A81-340 EY50 1NiMo Bxxx1xTBH			NF A 81-322 FP/x xx/xx xB xSA31 47 05 04
ASW A5-5-81 E 70xx	A5-28 ER 70 S-x	A5-29 E 7xT5-x	A5-23 F7P4-Exxx-A2
DIN DIN 1913 E51 55 BX			

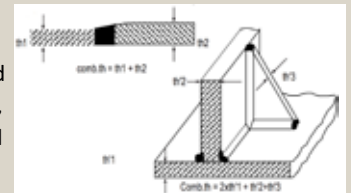
The following standards are met by the following products on the market:

	Stick Electrode	MIG-MAG	FCAW	Wire SAW	Flux SAW
BÖHLER	Fox Ev 50	EM K7		AM S3	
COMMERCY	CY2051	SG 6		CY 10	SP 1000
ESAB	OK 48.04	OK 12.51	OK 15.00	OK 12.32	OK 10.62
KLÖCKNER	FIRMA 5520 R	VDG 15/60	EWB1-MF	VDG-S3	
LINCOLN	CONARC 49C	LNМ 27	MC 710 H	L60	880M
MESSER	GRICON 515S			UP S2 Ni	LW 330
METRODE	MET-MILD MP51	ER 70-S6			
OERLIKON	TENACITO 38R		FLUXOFIL 31	SOUNDOR SD3	OP 121TT
SAF	SAFDRY NF58	NIC 70S	SAFDUAL 200	AS 36	AS 589
THYSSEN	B120	K52		S2	UV 421TT
UTP	613 KB				

For truck chassis, this list is valid for classic welded structures without any special applied tension. However, it is advisable to check with each provider of welding consumables.

Conditions prior to heating - Combined thicknesses

- * In the thickness range of 0.15" to 0.39", provided the welding sequences are optimized to avoid introducing high welding voltage, preheating should not be applied for AstraWear 450F.



- * Case of combined thickness: AstraWear 450F can be welded without risk of fissures and without preheating up to a combined plate thickness of 2".

For greater thicknesses, the following conditions are recommended:

		1.18"	1.57"	1.96"	2.36"	2.75"	3.14"	3.54"	3.93"	4.33"
GMAW	5.9 kJ/in									
	11.8 kJ/in									
SMAW	3.9 kJ/in									
	7.9 kJ/in									
SAW	7.9 kJ/in									
	11.8 kJ/in									

Without preheating
T*Plate >40°F

With light preheating
79.44°F

With pre-post heating
≥129.44°F



Astrawear 450F

THICKNESS

Astrawear 450F is available in thicknesses ranging from 3/16" – 3".
Additional thicknesses are available upon request.

APPLICATIONS

- * Truck chassis
- * Quarries, construction, earth moving
Separators, crushers, screens, bulldozers
- * Cement plants
Pails, crushers
- * Mines, coal mines
Backhoe, winding and unloading machines, conveyor belts
- * Iron and steel industry
Various decks, guide plates, and elevators



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