

STULZ-SICKLES STEEL COMPANY

SINCE 1916

*Providing Years of Wear Resistant Service to the
Foundry and Shot Blast Industries*

Shot Blast



Foundry

BURLINGTON, NEW JERSEY ♦ COLTON, CALIFORNIA
800-351-1776 800-572-5809
www.stulzsicklessteel.com www.manganal.com

STULZ SICKLES STEEL CO.

MANGANAL

HIGH MANGANESE HIGH CARBON STEEL

PHYSICAL PROPERTIES

Yield Strength 60,000/85,000 psi
Tensile Strength 120,000/130,000 psi
% Elongation in 2" 35%/50%
Hardness as Rolled 230 bhn
Work Hardens-up to 550 bhn

CHEMICAL ANALYSIS

Mn-12.0/14.0	Si-0.60 Max.
C-1.1/1.4	P-0.05 Max.
	S-0.04 Max.

CHARACTERISTICS

- RESISTS ALL IMPACT AND ABRASION
- WORK HARDENS RAPIDLY UP TO 550 BRINELL DUE TO HIGH CARBON CONTENT
- REMAINS DUCTILE THROUGHOUT, NEVER BRITTLE
- WORK HARDENED SURFACE BECOMES ALMOST FRICTION-LESS WHICH ALLOWS THE MATERIALS TO SLIDE EASILY
- HAS NON-MAGNETIC PROPERTY
- CAN BE CUT BY OXY-ACETYLENE TORCH, PLASMA, WATER JET, OR LASER

**WELD WITH STULZ MANGANESE-XL
OR STULZ 1616**

HADFIELD GRADE
FULLY HEAT TREATED
FULLY AUSTENITIC
ASTM A128

MANGANAL IS USED HERE FOR MAINTENANCE AND REPAIR WITHIN THE FOUNDRY AND SHOT BLAST INDUSTRIES . . .

- BARREL HEAD LINERS
- CAB. WALL LINERS
- HANGING LINERS
- ROTARY SCREEN SEPARATORS
- FLOOR LINERS
- TABLE LINERS
- TABLE RINGS
- WHEEL HOUSINGS
- FLIGHTS
- BLASTING TREES
- FLOOR GRATINGS
- CHAINS
- HOOKS
- SHAFTS

. . . and any other places where heavy impact, abrasion or metal-to-metal wear is a problem.

FREQUENTLY ASKED QUESTIONS

WHAT IS UNUSUAL ABOUT MANGANAL?

Manganal thrives on severe wear conditions. The more impact and hammering it receives, the harder the surface becomes. This characteristic, known as work-hardening, plus the fact that it remains ductile underneath, makes it a most effective steel in combating impact and abrasion.

HOW HARD CAN THE SURFACE GET BY WORK-HARDENING?

Depending on deformation of the surface crystalline structure, it can work-harden up to more than 550 Brinell. When originally put into service it is about 230 Brinell.

HOW DOES MANGANAL BEHAVE UNDER IMPACT WITH NO ABRASION?

One example of surface work-hardening under almost pure impact is the liners of shot blast cabinets. Manganal work-hardens rapidly, takes a smooth polish due to its low friction property, yet retains its great toughness under the hardened surface. Generally, the heat-treated alloy and tool steels, although of high hardness, tend to erode comparatively fast, and break down on the surface.

HOW IMPORTANT IS THE CARBON CONTENT IN MANGANAL?

The carbon content is very important because when a Manganal plate is impacted, the carbon binds with the manganese and allows the surface to work harden. The result is less wear on the thickness of the plate prior to complete work-hardening. For manganese steel to be considered Hadfield grade, the carbon content must be 1.0% or higher.

HOW ABOUT MACHINING MANGANAL?

Manganal is machined within limits, using special methods and tooling. When a drill or cutting tool is applied to Manganal, it quickly work-hardens the area to the extent that machining becomes very difficult. Therefore Manganal does not lend itself to machining by usual machine shop methods.

WHAT METHODS ARE EASILY USED TO WORK MANGANAL?

It can be flame cut by oxy-acetylene torch, cut by abrasive cut-off machine and electric welded (minor preheating is recommended). Shearing, bending, and rolling require heavy equipment which has at least twice the capacity that would be needed for the same thickness of mild steel.

MANGANAL

WEAR RESISTANT HIGH MANGANESE STEEL APPLICATOR BARS AND PLATE

STULZ HADFIELD GRADE ♦ 12-14% MANGANESE ♦ 1.1/1.4 CARBON

FLATS						ROUNDS	SQUARES	PLATES
SIZE	SIZE	SIZE	SIZE	SIZE	SIZE	SIZE	SIZE	THICKNESS
3/16" x 2-1/2"	3/8" x 1"	1/2" x 1"	3/4" x 1-1/2"	1" x 1-1/2"	1-1/2" x 2"	3/8" 2-1/4"	3/8"	1/8"* 1-1/8"
1/4" x 1"	1-1/2"	1-1/2"	2"	2"	6"	1/2" 2-1/2"	1/2"	3/16" 1-1/4"
1-1/2"	2"	2"	2-1/2"	3"		5/8" 3-1/8"	5/8"	1/4" 1-3/8"
2"	2-1/2"	2-1/2"	3"	4"	2" x 3"	3/4" 3-1/2"	3/4"	5/16" 1-1/2"
2-1/2"	3"	3"	3-1/2"	5"	4"	7/8" 4-1/8"	1"	3/8" 1-5/8"
3"	4"	3-1/2"	4"	6"	6"	1" 4-1/2"	1-1/4"	1/2" 1-3/4"
4"	4-1/2"	4"	5"	8"		1-1/8" 5-1/8"	1-1/2"	5/8" 2"
5"	5"	5"	6"			1-1/4" 5-1/2"	2"	3/4" 2-1/4"
	6"	6"				1-1/2" 6-1/8"		7/8" 2-1/2"
						1-3/4" 6-3/4"		1" 3"
						2" 7-1/8"		

FABRICATED PARTS TO SPECIFICATION

WELDED, PUNCHED, DRILLED
AND FORMED FABRICATIONS WILL
BE QUOTED ON SUBMISSION OF
SKETCH OR BLUEPRINT SPECIFICATIONS.

ANGLES
2" X 2" X 1/4"

**PINS &
BUSHINGS**

**SHOT-BLAST
GRATING**

STOCK PLATE SIZES

48" X 96"

48" X 144"

60" X 120"

72" X 144"

84" X 120"

96" X 240"

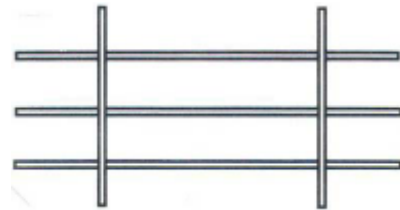
& Lengths up to 24 ft.

* 1/8" x 40" x 99"

CUSTOM MANGANAL PRODUCTS

MANGANAL BAR GRATING

- CUSTOM PRODUCED IN 10 FOOT LENGTHS
- 1/4" X 1" BEARING BARS (OPTIONAL)
- 1/4" X 1-1/2" BEARING BARS (STANDARD)
- 3/8" DIA. CROSS BARS



MANGANAL WIRE SCREEN

- CUSTOM PRODUCED
- VARIOUS WIRE DIAMETERS
- STANDARD SQUARE OPENINGS
- STANDARD WEAVES



MANGANAL PINS, BUSHINGS & CAST TUBING

- CUSTOM PRODUCED



TUFFWEAR

400 AND 500 BRINELL PLATE AND 400 BRINELL HOT ROLLED ALLOY WEAR BARS

Heat Treated for High Hardness, High Tensile Strength
to Resist Severe Abuse and Abrasion

**TUFFWEAR IS USED HERE FOR MAINTENANCE AND REPAIR WITHIN THE FOUNDRY
AND SHOT BLAST INDUSTRIES . . .**

- SHAKER TABLES
- VIBRATORY FEEDER PANS
- PERFORATED PLATE
- STAGING AREA BINS
- DUCTS FOR DUST COLLECTION

WELDABLE

Use Stulz Special Alloy
Welding Electrodes

FORMABLE

Double Grained Plate
Allows For Forming in
Either Direction

UNIFORM HARDNESS

Through Hardened
Quench and Tempered

PHYSICAL PROPERTIES

TUFFWEAR 400

Hardness 390/400 Brinell
Tensile Strength 180,000 Min. PSI

TUFFWEAR 500

Hardness 490/500 Brinell
Tensile Strength 230,000 Min. PSI

TUFFWEAR PLATE

TUFFWEAR 400 390/400 BRINELL HARDNESS

SIZE	WGT. PER SQ. FOOT (lbs.)
3/16"	7.7
1/4"	10.2
3/8"	15.3
1/2"	20.4
5/8"	25.5
3/4"	30.6
1"	40.8
1-1/4"	51.0
1-1/2"	61.2
2"	81.6

Other sizes on request

TUFFWEAR 500 490/500 BRINELL HARDNESS

SIZE	WGT. PER SQ. FOOT (lbs.)
1/4"	10.2
3/8"	15.3
1/2"	20.4
3/4"	30.6
1"	40.8

Other sizes on request

STULZ ALLOY-WEAR BARS 390/400 BRINELL Q.T.

SIZE	WGT. PER FOOT (lbs.)	STANDARD LENGTH (ft.)
1/4" x 1"	.85	20
1-1/2"	1.28	20
2"	1.70	20
3"	2.55	20
4"	3.40	20
6"	5.10	20
3/8" x 1"	1.28	20
2"	2.55	20
2-1/2"	3.19	20
3"	3.83	20
4"	5.10	20
5"	6.40	20
6"	7.65	20
8"	10.20	20
1/2" x 1"	1.70	20
1-1/2"	2.55	20
2"	3.40	20
2-1/2"	4.25	20
3"	5.10	20
3-1/2"	5.95	20
4"	6.80	20
5"	8.50	20
6"	10.20	20
8"	13.60	20
3/4" x 2"	5.10	20
2-1/2"	6.38	20
3"	7.65	20
4"	10.20	20
5"	12.75	20
6"	15.30	20
8"	20.40	20
1" x 2"	6.80	20
2-1/2"	8.50	20
3"	10.20	20
4"	13.60	20
5"	17.00	20
6"	20.40	20
8"	27.20	20

STULZ FABRICATIONS TO ORDER



MANGAL VENTED CHUTE



1/2" MANGAL FIXTURE HOLDS PARTS IN PLACE FOR ACCURATE BLAST CLEANING



TWO VIEWS OF A MANGAL WELDMENT. MANGAL PLATE AND PIPE ARE WELDED TO MAKE WEAR RESISTANT BINS AND CHUTES



MANGAL DECK RIDER BAR

3/8" MANGAL FIXTURE FOR HOLDING MULTIPLE PARTS IN PLACE FOR COMPLETE BLAST CLEANING



1/2" MANGAL PLATE ROLLED TO MATCH THE CAROUSEL TABLE INSIDE OF A SHOT BLAST CABINET. THE HOLES ARE COUNTERSUNK TO ALLOW THE ATTACHMENT HARDWARE TO BE FLUSH WITH SURFACE OF THE WEAR PLATE

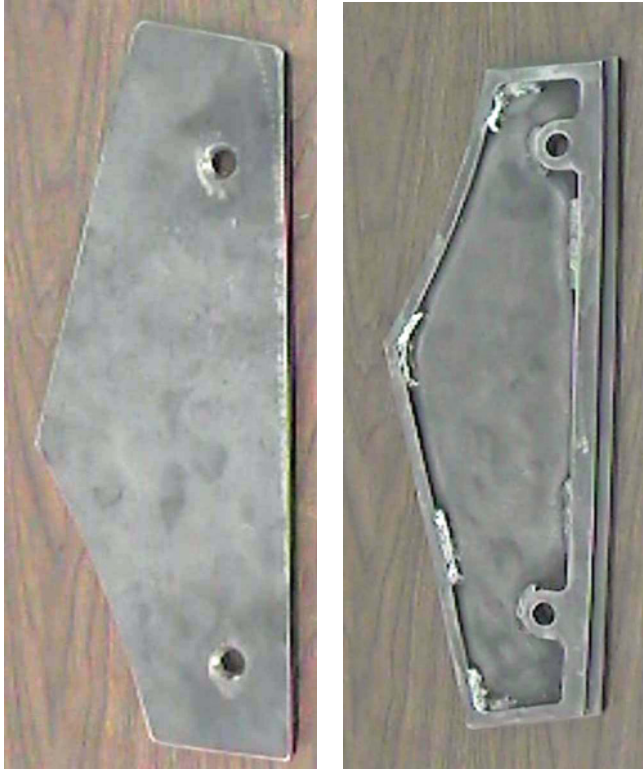
STULZ FABRICATIONS TO ORDER



1" THICK MANGANAL PLATE HELD IN PLACE BY COUNTER SUNK SCREWS. THE MANGANAL PLATE HAS BEEN MILLED TO ALLOW THE HEAD OF THE SCREW TO BE FLUSH WITH SURFACE OF THE WEAR PLATE



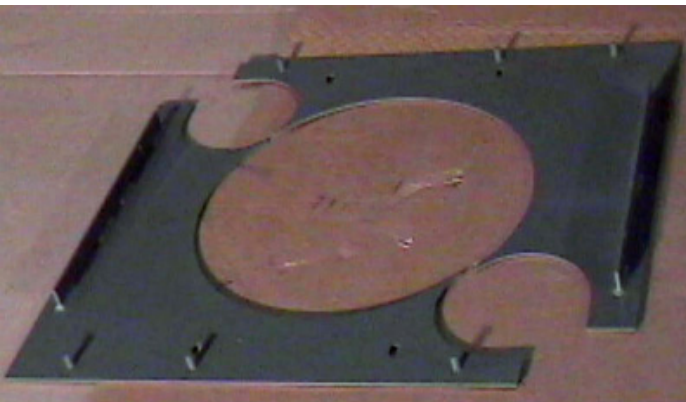
MANGANAL SIDE RAIL FOR A CONVEYOR. 1" DIAMETER MANGANAL ROUND BAR CHAMFERED AND WELDED TO A 1/2" THICK MANGANAL PLATE. THE SLOTTED HOLES ALLOW FOR VERTICAL ADJUSTMENT



MANGANAL CABINET SIDE AND UNDERSIDE OF A FABRICATED WEAR PLATE



1/4" MANGANAL SEAL RINGS



MANGANAL WEAR PLATES FOR THE ENDS OF SHOT BLAST CABINET

STULZ FABRICATIONS TO ORDER



SHOT BLAST MACHINES SHOWING MANGANAL TABLE LINER, TABLE RING, HANGING LINERS, AND BLAST WHEEL HOUSING



SHOT BLAST MACHINE SHOWING MANGANAL TABLE LINER, TABLE RING, AND WALL LINERS

MANGANAL PLATE DOOR LINERS



MANGANAL SHOT BLAST TREES



WELDING ELECTRODES FOR HEAVY INDUSTRY

SEMI-AUTOMATIC OPEN ARC WELDING WIRES

STULZ MANGANESE-XL

A high manganese-nickel chrome electrode for joining manganese and building-up parts of manganese, carbon and alloy steels that are subject to extreme shock, impact and abrasion. No peening is required. May be applied multiple pass. Tensile strength 125,000 PSI. Six 10 lb. waterproof containers per carton. Standard length 14".

AC-DC

STULZ 1616 ELECTRODES

All purpose high chromium, high manganese for high strength joining of manganese steel to other alloy steels and for multi-pass build-up for good wear resistance. Cannot be flame cut. Standard length 14". AC-DC

STULZ UNIVERSAL HARDFACE

All purpose hardsurfacing for heavy industry and mining; for combinations of abrasions and impact. Forgeable. Reasonably resistant to corrosion. Hardness to 45RC. Six 10 lb. waterproof containers per carton. Standard length 14".

AC-DC

STULZ ULTRA HARD - 60

Chrome/silicone carbide. Weld hardness 60 RC in just a single pass. Has good resistance to impact and pressure. Limited to two passes. Six 10 lb. waterproof containers per carton. Standard length 14".

AC-DC

STULZ SPECIAL ALLOY ELECTRODES

Low hydrogen, Iron Powder Electrode which combines a deposit of excellent tensile strength and resistance to cracking under impact. A specially-designed welding electrode for use with Stulz Alloy/Wear products and other low to medium carbon steels. All position. Six 10 lb. waterproof containers per carton. Standard length 14".

AC-DC

**WE
ACCEPT**



STULZ MANGANESE XL- S/A

Used for build-up and replacement of worn manganese steel by semi-automatic method.

7/64", 1/16" and .045 Dia.

OPEN ARC

STULZ HARDFACING #12-S/A

For any single and multi-pass hardfacing of manganese, low alloy, and mild steels.

7/64", 1/16" and .045 Dia.

OPEN ARC

STULZ #1616-SA

All purpose high chromium, high manganese for high strength joining of manganese steel to other alloy steels and for multi-pass build-up for good wear resistance. Cannot be flame cut.

7/64", 1/16" and .045 Dia.

OPEN ARC

STULZ MULTI-LAYER 50 S/A

A hardfacing wire with multi-pass capabilities. A one wire answer to jobs requiring major build-up.

- Can be welded on either carbon or manganese steel.
- A chrome-manganese-Moly analysis with deposit hardness of 45 RC (2 layers) to 50 RD (4 or more layers).
- 7/64" diameter (60lb. coils).

OPEN ARC

STULZ SPECIAL ALLOY S/A

A specially-designed welding wire for use with Stulz Alloy/Wear products and other low to medium carbon steels.

- Requires shielding gas CO2 or 75% Argon 25% CO2 mixture preferred.
- Tensile Strength: 83,000 PSU - Yield Strength: 65,000 PSI
- .045" and 1/16" diameters.

STULZ CHROMIUM WEAR STRIPS

INSTANT HARDFACING **Hardness:** 50 RC up to 700F
Dim.: 1/4" x 1 1/2" x 19 to 20" ● **Standard Pkg.:** 36 Pcs.



STULZ WEAR PATCHES INSTANT HARDFACING

3/16" Thick ● Hardness: 60 RC

Slotted for easy, quick attachment by welding.



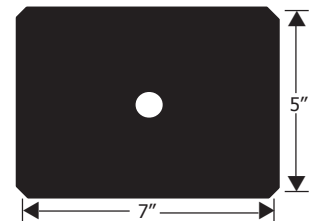
STULZ JUMBO WEAR PATCHES

INSTANT HARDFACING

Hardness: 60 RC

Slotted for easy, quick attachment by welding.

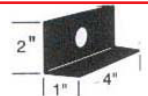
Size	Std. Pkg
1/4" x 3" x 4"	75 pcs
1/4" x 4" x 5"	50 pcs
1/4" x 5" x 7"	25 pcs
3/8" x 4" x 5"	25 pcs
3/8" x 5" x 7"	12 pcs



Other sizes on request

STULZ CORNER WEAR PATCHES

3/16" Thick ● Std. Pkg: 100pcs.



STULZ-SICKLES STEEL COMPANY

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