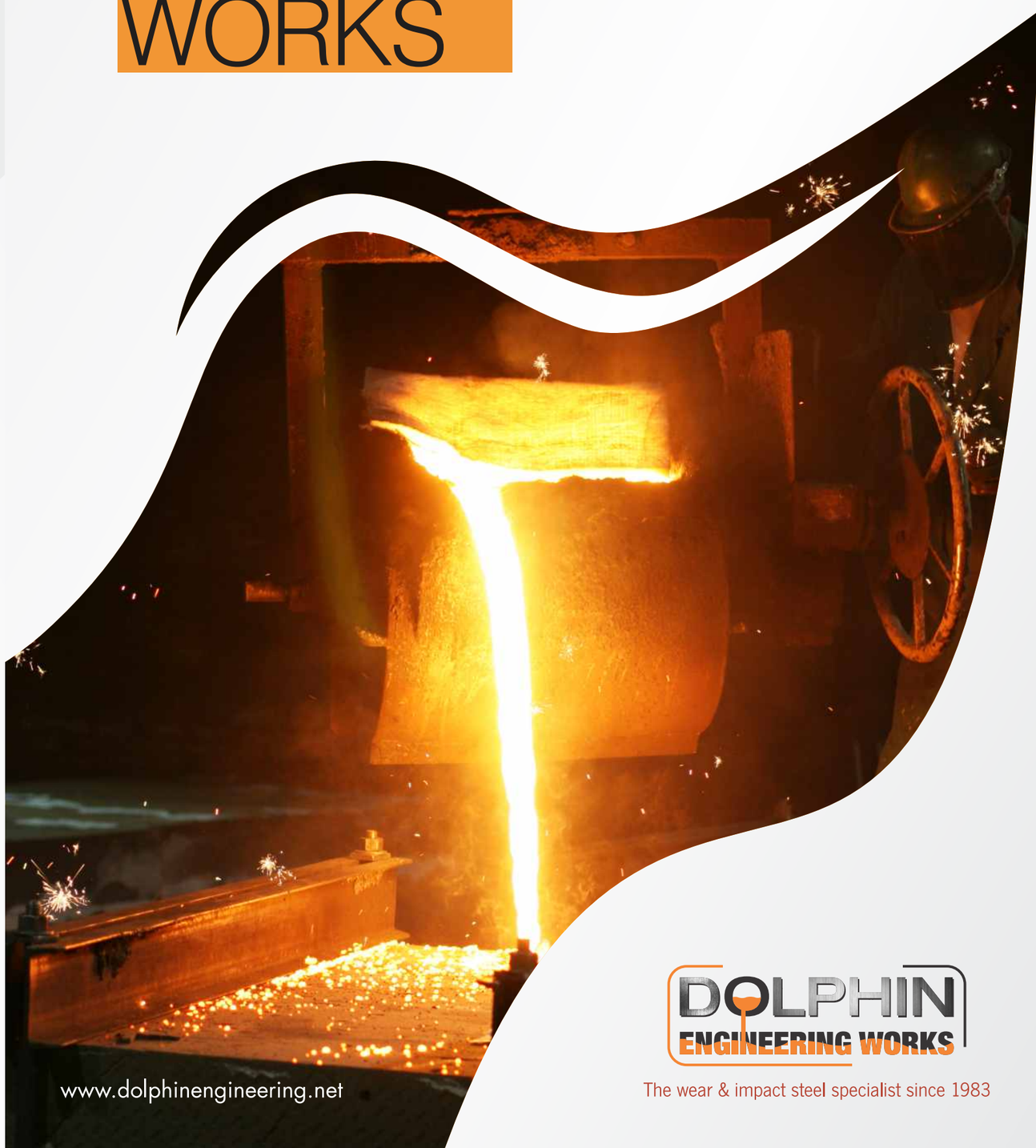
DOLPHIN ENGINEERING WORKS



www.dolphinengineering.net

DOLPHIN ENGINEERING WORKS

The wear & impact steel specialist since 1983

DOLPHIN ENGINEERING WORKS

Dolphin Engineering Works

Office : Maithon More, Post Kumardhubi, Dhanbad, Jharkhand, India - 828203
Phone : +91-6540-272136
Fax : +91-6540-273519
Mobile : +91-9934340894
E-mail : dolphin.engineering.works@gmail.com
abhishek048@gmail.com

CORPORATE
PROFILE

Dolphin Engineering Works has been a pioneer in the field of iron and alloy steel foundry since 1983. The company was initially formed and started by Mr. Suresh Pd. Jaiswal in the year 1983. We are supplying all kinds of alloy steel castings of various shapes and sizes to industries that manufacture/produce/process cement, power, crusher, refractories, mineral ore processing & calcining, ingots, concast mill, mining & machinery, pumps, pulverizer, construction machinery, machine tools, road construction, special industry machinery, valves, fitting and other manufacturers of durable goods. We manufacture single piece casting ranging from 2 kgs. to upto 2500 kgs. in either austenitic manganese steel, high chromium steel or Ni-hard steel castings. Our monthly production is around 140.00 M.T.

The Company's strength lies in the unique combination of its skilled workforce, extensive network of operations, innovative market-driven products and advanced technologies. Furthermore, Dolphin Engineering Works and its employees continually focus on creating innovative and sustainable strategic alliances with its suppliers and customers focusing on top-level quality of the products. The Company's innovation and expansion has shown its ongoing commitment to provide quality products and superior services.

OUR POLICY

We are – "The Wear & Impact Steel Specialists since 1983"

As Dolphin Engineering Works turns 31, it´s harder and tougher than ever. We intend to keep it that way - always ahead of the competition

Dolphin Engineering Works Policy–Quality

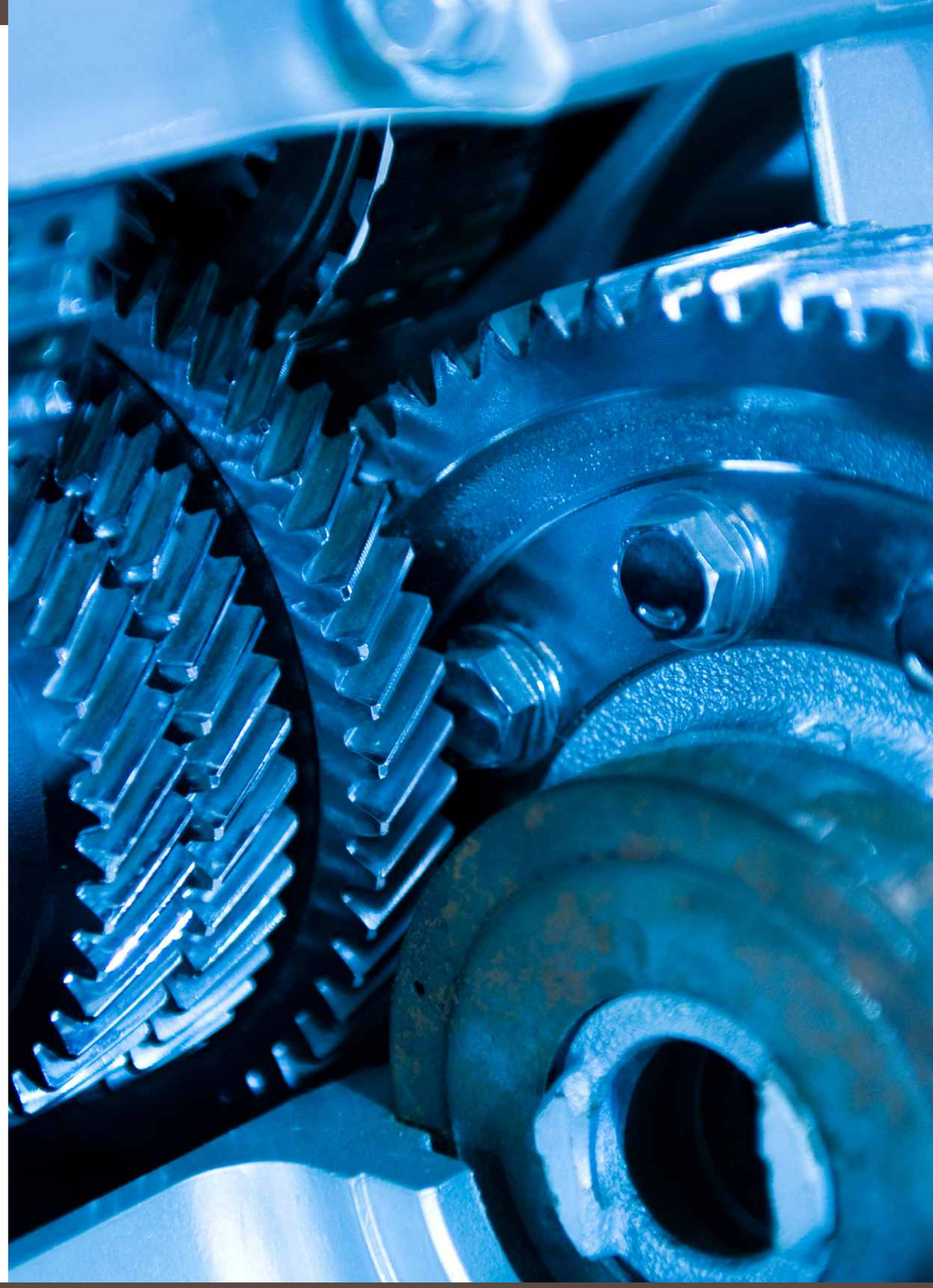
Satisfy customers by continuously improving Safety, Quality, Delivery, and Productivity

MISSION

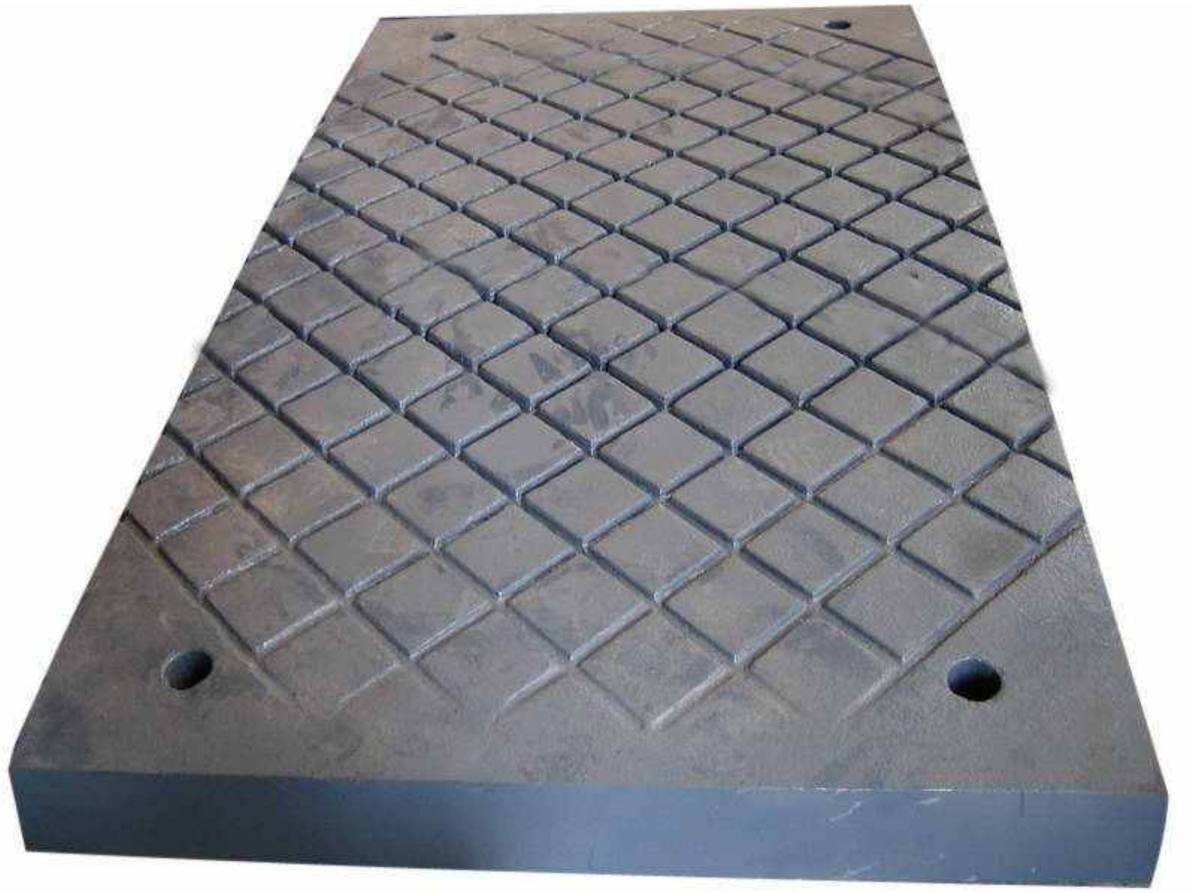
- To understand, creatively interact & meet customer needs.
- To offer all round services to customers, which represent the best value for money, so as to earn complete customer loyalty and facilitate access to expanding market.
- To do product development so as to keep pace with emerging market needs and to develop processes to deliver products of consistent quality and reliability.
- To create a transparent, principles & systems based organization that empowers employees at all levels to take initiative, innovative, learn and grow, while working with enthusiasm and commitment.
- To have a debt free company that offers excellent quality materials, while at the same time amply rewarding employee performance and paying all fair dues to Government & Society.

VISION

- To be a reputed global provider of reliable, ready to use high integrity castings, especially manganese steel castings.
- To offer customer delight and employee growth.
- These to be achieved, through being a participative, continuously learning organization with focus on innovation and creativity.



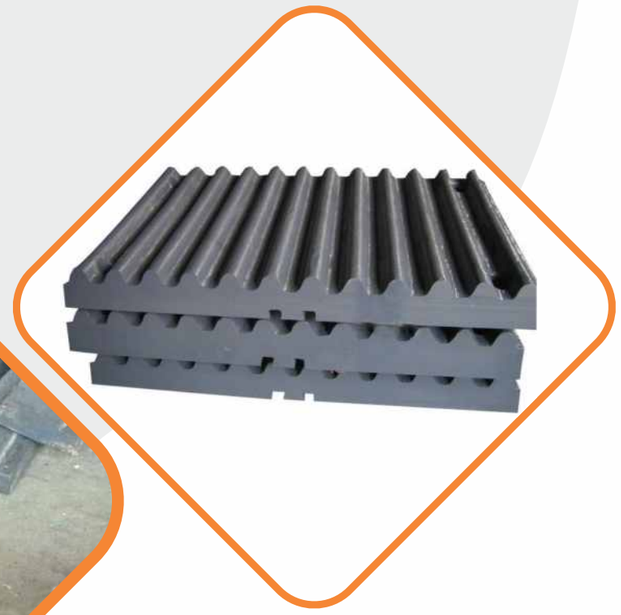
AUSTENITIC
MANGANESE STEEL



The first austenitic manganese steel was developed in 1882 by Robert Abbott Hadfield. Hadfield had done a series of test with adding ferro-manganese containing 80 % manganese and 7 % carbon to decarbonised iron. Increasing manganese and carbon contents led to increasing brittleness up to 7.5 % manganese. At manganese contents above 10 % however, the steel became remarkably tough. The toughness increased by heating the steel to 1000 deg C followed by water quenching, a treatment that would render carbon steel very brittle. The alloy introduced commercially contained 1.2 % carbon (C) and 12 % manganese (Mn) in a ratio of 1:10. This composition is used even today, and the austenitic manganese steel is still known as Hadfield steel. The steel was unique since it exhibited high toughness, high ductility, high work hardening ability and excellent wear resistance. Because of these properties Hadfield's austenitic manganese steel (AMS) gained rapid acceptance as a useful engineering material.

Austenitic manganese steels have a proven high resistance to abrasive wear including blows and metal-to-metal wear, even though they have a low initial hardness. These steels are supposed to work harden under use and thus give a hard wear resistant surface, but it has been reported that these steels have a good wear resistance in components even without heavy mechanical deformation.

Hadfieldȧs austenitic manganese steel is still used extensively, with minor modifications in composition and heat treatment, primarily in the fields of earthmoving, mining, quarrying, oil well drilling, steelmaking, railroading, dredging, lumbering, and in the manufacture of cement and clay products. Austenitic manganese steel is used in equipment for handling and processing earthen materials (such as rock crushers, grinding mills, dredge buckets, power shovel buckets and teeth, and pumps for handling gravel and rocks). Other applications include fragmentizer hammers and grates for automobile recycling and military applications such as tank track pads etc.



PRODUCT SPECIFICATION

GRADE 1 : Mn = 11 - 14%, C = 1.05 - 1.35%, Si = 1.0% max., P = 0.07% max.

- Solution treated castings
- Water quenched at 1050 ^{0}C
- Agitation facility created for maintaining water temperature at 80^{0}C while quenching
- Bend-tested specimen test bar provided on customer's insistence
- Hardness assurance

Uses : In crusher hammers, liner plates, tooth points, etc.

GRADE 2 : Same as above but with Mn = 11.5 - 14%

GRADE 3 : Same as GRADE 2 with Chromium as alloy addition (Cr = 1.5 - 2.5%) which imparts property of improved hardness & toughness.

Uses : Specifically used for machinery with high working temperature applications like shell liners of cement industries, hammers in crushing equipment, etc.

GRADE 4 : Same as GRADE 2 with Nickel as alloy addition (Ni = 3-5%) which imparts impacto toughness.

Uses : For continuous heavy duty crushing parts like grate plate liners.

GRADE 5 : Same as GRADE 2 with Molybdenum as alloy addition (Mo = 1.8 - 2.1%) which induces better yield strength and increases overall life

Uses : In wear & abrasion resistant parts of earth moving equipment e.g. tooth points in pay loaders, excavators, etc.

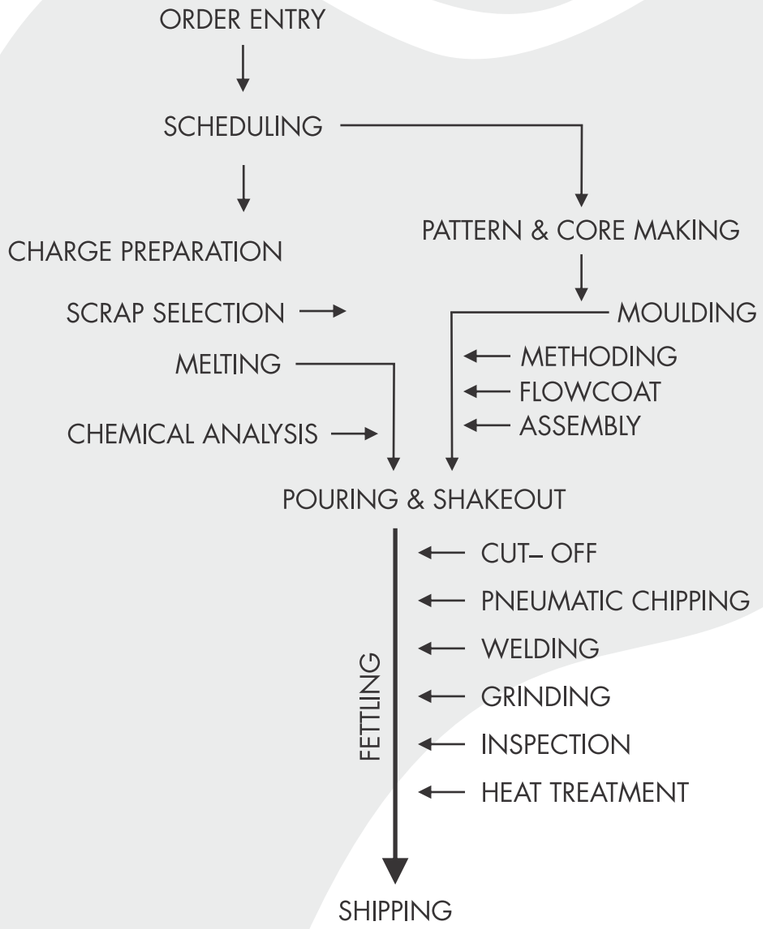
- Casting weight :
  - » Maximum weight = 200 Kgs. (Soon expanding to 350 Kgs.)
- Production capacity :
  - » 75 tons per month (Soon expanding to 150 tons per month)
- Captive power:
  - » 150% of Electric Board Supply
- Finishing Processes :
  - » Gas cutting
  - » DC Arc cutting
  - » Grinding and Fettling
  - » Heat Treatment [1050° C] with temperature control and recorder.
  - » Water Quenching with cooling tower and agitator (temp. control at 50° C max.)
  - » Oil Quenching
  - » Sand Blasting
  - » Shot Blasting
- Quality Control :
  - » Fully equipped Wet lab
  - » Sand Lab
  - » Microscope with polishing equipment
  - » Spectro Analyzer
  - » UTM, BHT, PHT (UTM: Universal Testing Machine, BHT: Brinell Hardness Tester; PHT: Poldi Hardness Tester)
  - » Photometric Analysis
  - » Radiographic Testing (by certified external agencies)

IS: 276 2000 GRADE SPECIFICATION

GRADE	CHEMISTRY							
	%CARBON	%MANGANESE	%SILICON	%CHROMIUM	%MOLYBDENUM	%NICKLE	% SULPHUR	% PHOSPHORUS
1	1.05 – 1.35	11.0 – 14.0	1.0 MAX	------	------	------	0.025	0.08
2	0.90 - 1.05	11.5 – 14.0	1.0 MAX	------	------	------	0.025	0.08
3	1.05 – 1.35	11.5 – 14.0	1.0 MAX	1.5 – 2.5	------	------	0.025	0.08
4	0.70 - 1.30	11.5 – 14.0	1.0 MAX	------	------	3.0 – 5.0	0.025	0.08
5	1.05 – 1.45	11.5 – 14.0	1.0 MAX	------	1.8 – 2.1	------	0.025	0.08
6	1.05 - 1.35	16.0 – 19.0	1.0 MAX	------	------	------	0.025	0.08
7	1.05 - 1.35	16.0 – 19.0	1.0 MAX	1.5 – 2.5	------	------	0.025	0.08

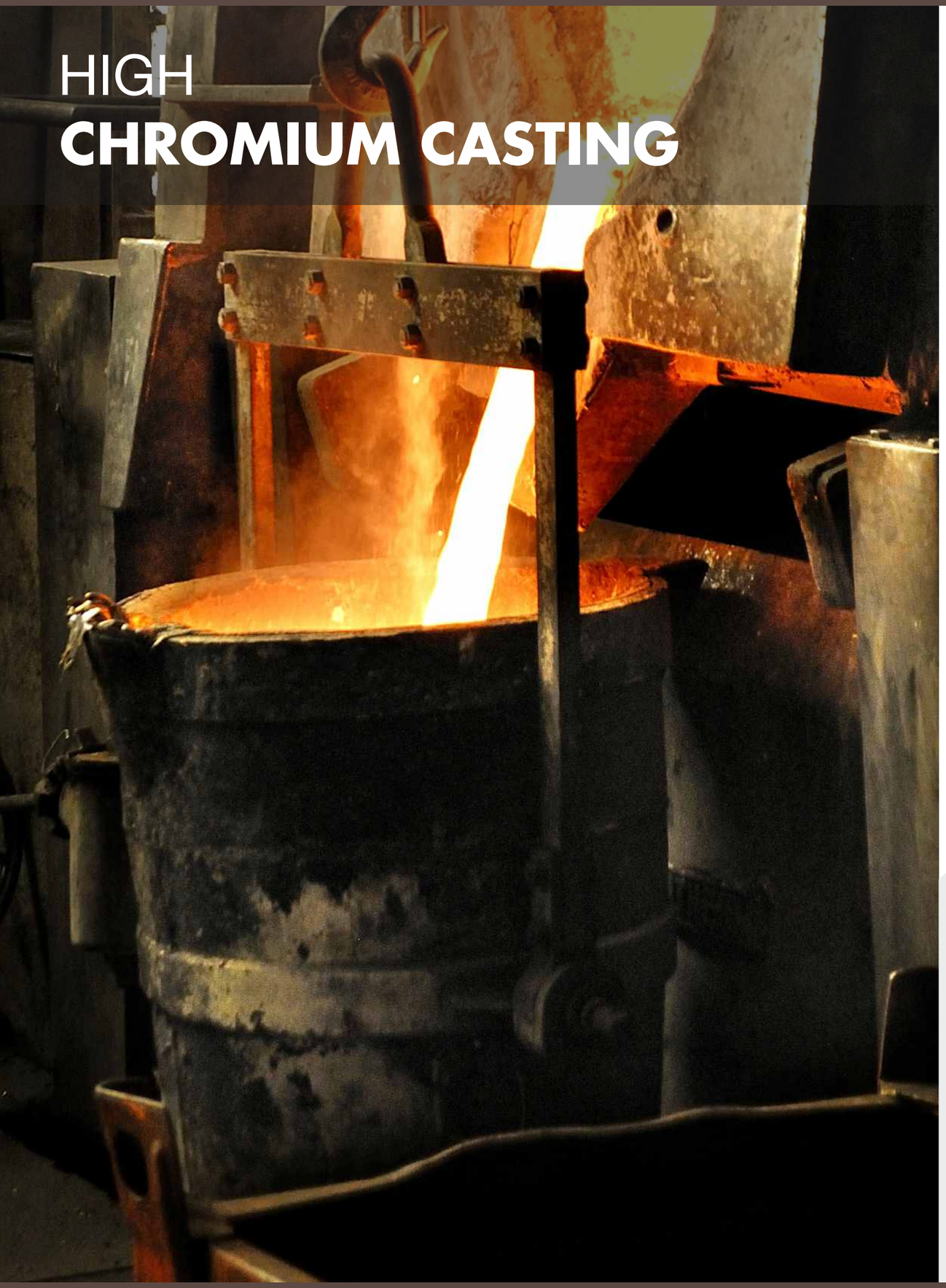
Maximum Hardness for all grades 229 BHN

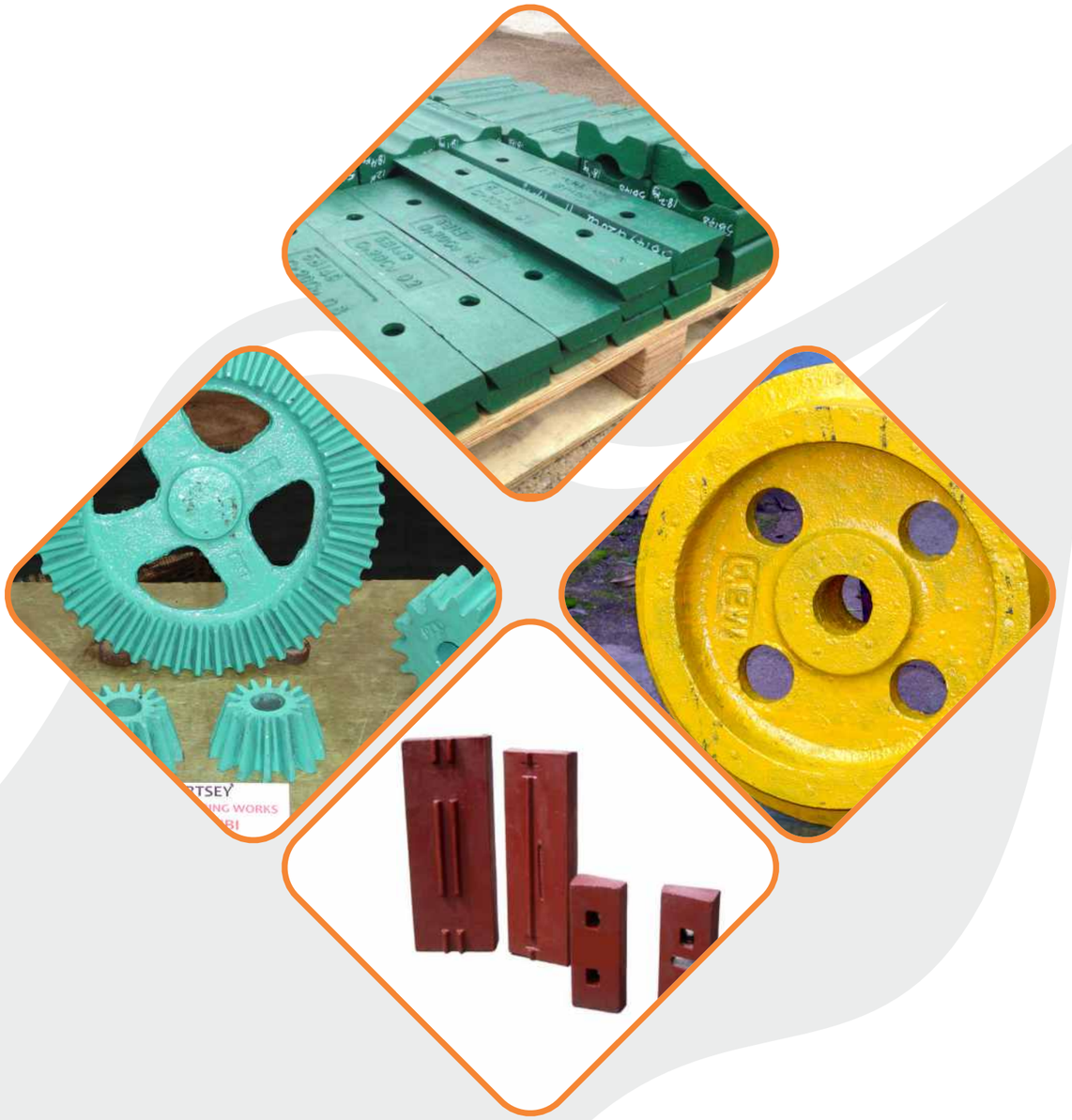
PROCESS FLOW CHART



AUSTENITIC
MANGANESE STEEL

HIGH
CHROMIUM CASTING





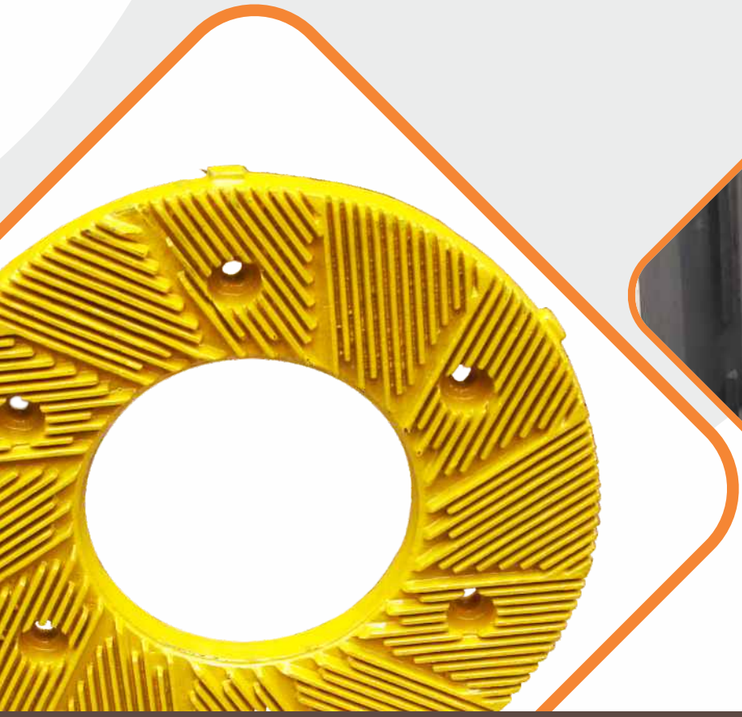
The high-alloy white irons are primarily used for abrasion resistant applications and are readily cast in the shapes needed in machinery used for crushing, grinding, and general handling of abrasive materials. The large volume of eutectic carbides in their microstructures provides the high hardness needed for crushing and grinding other materials. The metallic matrix supporting the carbide phase in these irons can be adjusted by alloy content and heat treatment to develop the proper balance between resistance to abrasion and the toughness needed to withstand repeated impact.

All high-alloy white irons contain chromium to prevent formation of graphite on solidification and to ensure the stability of the carbide phase. Most also contain nickel, molybdenum, copper, or combinations of these alloying elements to prevent the formation of pearlite in the microstructure. While low-alloyed pearlitic white iron castings develop hardness in the range 350 to 550 HB, the high-alloyed white irons range from 450 to 800 HB.

High Cr cast irons are alloys based on the Fe–Cr–C system, usuallyin the range from 10 to 30% Cr and from 1.8 to 4% C. Commercialalloys contain up to 1% residual Si and additions of Mn, Mo, Ni andCu to increase hardenability. In this range of compositions most ofthe alloys solidify as mixtures of austenite and M7C3 carbides. Though high amounts of carbides and high matrix hardness tendto promote wear resistance, these parameters must be balancedaccording to the applications, because of the brittle behaviour of the carbides.

The high-chromium irons designated for use at elevated temperatures fall into one of three categories, depending
upon the matrix structure:

- The martensitic irons alloyed with 12 to 28% Cr
- The ferriticirons alloyed with 30 to 34% Cr
- The austenitic irons which in addition to containing 15 to 30% Cr also contain 10 to 15%Ni to stabilize the austenitic phase

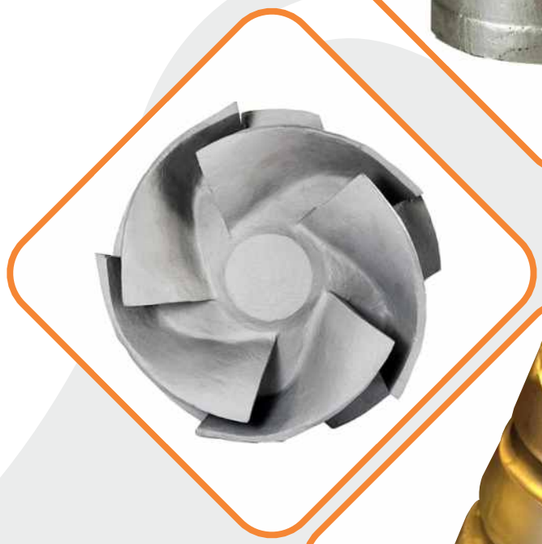


HIGH
CHROMIUM CASTING

Chemical Composition									Hardness HB, Min					
Type of Iron	Grade	C	Si	Mn	Ni	Cr	Mo	Cu % (max)	P % (max)	Section - upto 50mm	Section - Over 50mm	Section - upto 125mm	Section - over 125mm	HB Min
Unalloyed White Iron	1A	2.4 - 3.4	0.5 - 1.5	0.2 - 0.8	–	0.2 max	–	–	0.15	400	350	–	–	–
	1B	2.4 - 3.4	0.5 - 1.5	0.2 - 0.8	–	0.2 max	–	–	0.5	400	350	–	–	–
	1C	2.4 - 3.0	0.5 - 1.5	0.2 - 0.8	–	0.2 max	–	–	0.15	250	200	–	–	–
Ni – Hard	2A	2.7 - 3.2	0.3 - 0.8	0.2 - 0.8	3.0 - 5.5	1.5 - 3.5	0.5 max	–	0.15	–	–	500	450	–
	2B	3.2 - 3.6	0.3 - 0.8	0.2 - 0.8	3.0 - 5.5	1.5 - 3.5	0.5 max	–	0.15	–	–	550	500	–
	2C	2.4 - 2.8	1.5 - 2.2	0.2 - 0.8	4.0 - 6.0	8.0 - 10.0	0.5 max	–	0.1	–	–	500	450	–
	2D	2.8 - 3.2	1.5 - 2.2	0.2 - 0.8	4.0 - 6.0	8.0 - 10.0	0.5 max	–	0.1	–	–	550	500	–
	2E	3.2 - 3.6	1.5 - 2.2	0.2 - 0.8	4.0 - 6.0	8.0 - 10.0	0.5 max	–	0.1	–	–	600	550	–
High Chromium Grades	3A	1.8 - 3.0	1.0 max	0.5 - 1.5	2.0 max	14 - 17	2.5 max	2	0.1	–	–	–	–	600
	3B	3.0 - 3.6	1.0 max	0.5 - 1.5	2.0 max	14 - 17	3.0 max	2	0.1	–	–	–	–	650
	3C	1.8 - 3.0	1.0 max	0.5 to 1.5	2.0 max	14 - 17	3.0 max	2	0.1	–	–	–	–	600
	3D	2.0 - 2.8	1.0 max	0.5 - 1.5	2.0 max	14 - 17	1.5 max	2	0.1	–	–	–	–	600
	3E	2.8 - 3.5	1.0 max	0.5 - 1.5	2.0 max	14 - 17	1.5 max	2	0.1	–	–	–	–	600
	3F	2.0 - 2.7	1.0 max	0.5 - 1.5	2.0 max	14 - 17	2.5 max	2	0.1	–	–	–	–	600
	3G	2.7 - 3.4	1.0 max	0.5 - 1.5	2.0 max	14 - 17	3.0 max	2	0.1	–	–	–	–	650

HIGH CHROMIUM CASTING

Ni HARD
CASTINGS



Ni - Hard is an extremely wear resistant material and in cast form is ideal for use with abrasive products, giving a much more extended life when compared with cast iron or mild steel when incorporated in pneumatic conveying systems.

Nickel content increases with section size or cooling time of the casting to inhibit pearlitic transformation. For castings of 38 to 50 mm thick, 3.4 to 4.2% Ni is sufficient to suppress pearlite formation upon mold cooling. Heavier sections may require nickel levels up to 5.5% to avoid the formation of pearlite. It is important to limit nickel content to the level needed for control of pearlite; excess nickel increases the amount of retained austenite and lowers hardness.

Uses of Ni-Hard in Typical Application

- **Ni Hard types 1 and 2**
  1. Metal-working rolls
  2. Grinding mill liners
  3. Pulveriser rings
  4. Lurry pump parts
  5. Grinding media
- **Ni Hard type 3**
  1. Slurry pump parts
  2. Impact blow bars

CHEMICAL COMPOSITION OF ABRASION-RESISTANT IRON CASTING (PERCENT)

IS : 4771 - 1985

	Type 1A		Type 1B			Type 2		Type 3	
Constituent	NiL Cr 30/500	NiL Cr 34/550	NiH Cr 27/500	NiH Cr 30/550	NiH Cr 34/600	CrMoHC 34/500	CrMoLC 28/500	HCrNi 27/400	Hcr 27/400
Total Carbon	2.7 to 3.3	3.2 to 3.6	2.5 to 2.9	2.8 to 3.3	3.2 to 3.6	3.1 to 3.6	2.4 to 3.1	2.3 to 3.0	2.3 to 3.0
Silicon	0.3 to 0.6	0.3 to 0.6	1.5 to 2.2	1.5 to 2.2	1.5 to 2.2	0.3 to 0.8	0.3 to 0.8	0.2 to 1.5	0.2 to 1.5
Manganese	0.3 to 0.6	0.3 to 0.6	0.3 to 0.6	0.3 to 0.6	0.3 to 0.6	0.4 to 0.9	0.4 to 0.9	1.5 Max	1.5 Max
Nickel	3.0 to 5.5	3.0 to 5.5	4.0 to 6.0	4.0 to 6.0	4.0 to 6.0	0.5 Max	0.5 Max	1.2 Max	0.5 Max
Chromium	1.5 to 2.5	1.5 to 2.5	8.0 to 10.0	8.0 to 10.0	7.5 to 9.5	14.0 to 18.0	14.0 to 18.0	24.0 to 28.0	24.0 to 28.0
Molybdenum	0.5 Max	0.5 Max	0.5 Max	0.5 Max	0.5 Max	2.5 to 3.5	2.5 to 3.5	0.6 Max	0.6 Max
Sulphur, Max	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Phosphorus, Max	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Remainder	◄---------- Essentially Iron ----------►								

Ni HARD
CASTINGS

The high-alloy white irons are primarily used for abrasion-resistant applications and are readily cast into the parts needed in machinery for crushing, grinding, and handling of abrasive materials. The chromium content of high-alloy white irons also enhances their corrosion-resistant properties.

The high-alloy white cast irons fall into two major groups:

- **Nickel-chromium white irons,** which are low-chromium alloys containing 3 to 5% Ni and 1 to 4% Cr, with one alloy modification that contains 7 to 11% Cr,
- Chromium-molybdenum irons containing 11 to 23% Cr, up to 3% Mo and often additionally alloyed with nickel or copper.

The nickel-chromium irons are also commonly identified as Ni-Hard types 1 to 4.

Ni-Hard Casting or Nickel-Chromium White Irons

The oldest group of high-alloy irons of industrial importance, the nickel-chromium white irons, or Ni-Hard irons, has been produced for more than 50 years and is very cost-effective materials for crushing and grinding.

Ni-Hard is a metal with chrome content of 1.4% to 28%. It is an abrasive iron for low and high stress abrasion in **Mining, Milling**, and **Earth Handling** uses.

It is also used extensively in the **Power Plant Industry, Brick Plant Industry, Asphalt Industry, Cement Industry** and **Rock Crushing Industry.**

The optimum composition of a nickel-chromium white iron alloy depends on the properties required for the service conditions and the dimensions and weight of the casting. Abrasion resistance is generally functioning of the bulk hardness and the volume of carbide in the micro structure.

MINIMUM BRINELL HARDNESS VALUES (BHN) OF ABRASION-RESISTANT IRON CASTINGS

	Type 1A		Type 1B			Type 2		Type 3	
Condition	NiL Cr 30/500	NiL Cr 34/550	NiH Cr 27/500	NiH Cr 30/550	NiH Cr 34/600	CrMoHC 34/500	CrMoLC 28/500	HCrNi 27/400	Hcr 27/400
Sand-Cast	500	550	500	550	600	500	500	400	400
Hardened	—	—	—	—	—	600	550	550	550
Annealed	—	—	—	—	—	380 Max	380 Max	—	380 Max

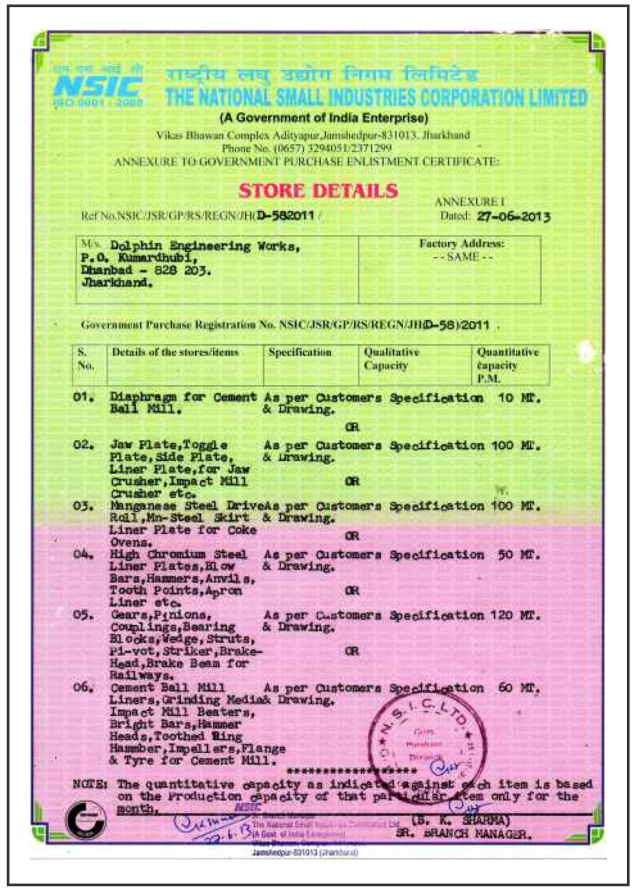
Ni HARD
CASTINGS

QUALITY **CONTROL**

OUR CLIENTS

- schenck process
- सेल SAIL
- JK PAPER LTD. Creating lasting impressions
- SCAN GROUP OF COMPANIES
- PREMIER
- Prakash
- Powertech
- LARSEN & TOUBRO LIMITED Engineering Construction & Contracts Division
- JK LAKSHMI CEMENT Ltd
- Burn Standard
- KANORIA GROUP BAGALKOT CEMENT & INDUSTRIES LTD.
- BESCO LIMITED (WAGON DIVISION)
- TITAGARH WAGONS LIMITED Multi Product. Single Focus
- TORSA 15 Years of Manufacturing Excellence
- Mahakoshal Group ISO 9001:2008 CERTIFIED
- MPL MAITHON POWER LIMITED
- एनटीपीसी NTPC
- HINDUSTAN COPPER LIMITED (A Government of India Enterprise)
- TEXMACO RAIL
- TATA POWER Lighting up Lives!
- Rashi Steel & Power Ltd.
- KOBELCO KOBE STEEL GROUP
- Kirloskar Enriching Lives
- KLEIN STEEL SERVICE STRONGER. FOR YOUR SUCCESS.
- ACC Limited
- Wabtec CORPORATION
- ace calderys
- VNSTEEL
- ALLIED MINERAL PRODUCTS, INC.
- बी एच ई एल BHEL
- Braithwaite & Co Limited (A Government of India Undertaking) Subsidiary of BBUNL
- ADE
- alacero
- HINDUSTAN PULVERISERS
- mbe Mcnally bharat Engineering co.Ltd
- STAVOKLIMA V.O.S.
- Pennsylvania Crusher Since 1905
- AK Steel
- VERTEX STEEL PRIVATE LIMITED

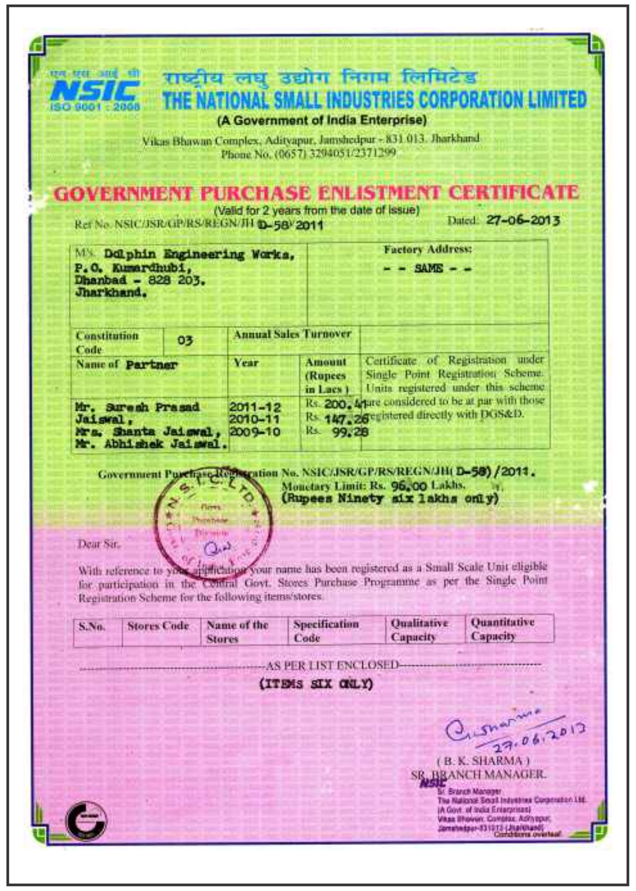
OUR CERTIFICATIONS



NSIC ISO 9001:2008
राष्ट्रीय लघु उद्योग निगम लिमिटेड
THE NATIONAL SMALL INDUSTRIES CORPORATION LIMITED
(A Government of India Enterprise)
ANNEXURE TO GOVERNMENT PURCHASE ENLISTMENT CERTIFICATE
STORE DETAILS
ANNEXURE I
Dated: 27-06-2013
M/s. Dolphin Engineering Works, P.O. Kumardhubi, Dhanbad - 828 203. Jharkhand.
Factory Address: - - SAME - -

S. No.	Details of the stores/items	Specification	Qualitative Capacity	Quantitative Capacity P.M.
01.	Diaphragm for Cement Ball Mill.	As per Customers Specification & Drawing.		10 MT.
02.	Jaw Plate, Toggle Plate, Side Plate, Liner Plate, for Jaw Crusher, Impact Mill Crusher etc.	As per Customers Specification & Drawing.		100 MT.
03.	Manganese Steel Drive Roll, Mn-Steel Skirt Liner Plate for Coke Ovens.	As per Customers Specification & Drawing.		100 MT.
04.	High Chromium Steel Liner Plates, Blow Bars, Hammers, Anvils, Tooth Points, Apron Liner etc.	As per Customers Specification & Drawing.		50 MT.
05.	Gears, Pinions, Couplings, Bearing Blocks, Wedge, Struts, Pivot, Striker, Brake-Head, Brake Beam for Railways.	As per Customers Specification & Drawing.		120 MT.
06.	Cement Ball Mill Liners, Grinding Media, Impact Mill Beaters, Bright Bars, Hammer Heads, Toothed Ring Hammer, Impellers, Flange & Tyre for Cement Mill.	As per Customers Specification & Drawing.		60 MT.

NOTE: The quantitative capacity as indicated against each item is based on the production capacity of that particular item only for the month.
(B. K. SHARMA)
SR. BRANCH MANAGER.



NSIC ISO 9001:2008
राष्ट्रीय लघु उद्योग निगम लिमिटेड
THE NATIONAL SMALL INDUSTRIES CORPORATION LIMITED
(A Government of India Enterprise)
GOVERNMENT PURCHASE ENLISTMENT CERTIFICATE
(Valid for 2 years from the date of issue)
Dated: 27-06-2013
M/s. Dolphin Engineering Works, P.O. Kumardhubi, Dhanbad - 828 203. Jharkhand.
Factory Address: - - SAME - -
Mr. Suresh Prasad Jaiswal, Mrs. Shanta Jaiswal, Mr. Abhishek Jaiswal.
Monetary Limit: Rs. 96.00 Lakhs. (Rupees Ninety six lakhs only)
Dear Sir,
With reference to your application your name has been registered as a Small Scale Unit eligible for participation in the Central Govt. Stores Purchase Programme as per the Single Point Registration Scheme for the following items/stores.
AS PER LIST ENCLOSED
(ITEMS SIX ONLY)
(B. K. SHARMA)
SR. BRANCH MANAGER.

KVQA
Certificate of Registration
(Quality Management System)
KVQA CERTIFICATION SERVICES PVT. LTD.
This is to certify that the Quality Management System of
DOLPHIN ENGINEERING WORKS
Post-Kumardhubi-828203, Dist-Dhanbad, Jharkhand, India
Has been found to be of the Quality Management System Standard
AS/NZS ISO 9001:2008/ISO 9001:2008
This certificate is valid for the following product or service range
Manufacturer Of Sand Castings Namely Austenitic Manganese Steel Castings, White Cast Iron Casting And NI-Hard Castings.
IAF
JAS-ANZ

GOVERNMENT OF INDIA
MINISTRY OF COMMERCE AND INDUSTRY
OFFICE OF JT. DIRECTOR GENERAL OF FOREIGN TRADE
CERTIFICATE OF IMPORTER-EXPORTER CODE (IEC)
DOLPHIN ENGINEERING WORKS
P.O. - KUMARDHUBI, DHANBAD / JHARKHAND 828203
ABHISHEK JAISWAL PARTNER
2111003522
31.01.2012

EEPCINDIA
REGISTRATION-CUM-MEMBERSHIP CERTIFICATE
M/s. DOLPHIN ENGINEERING WORKS
P.O. KUMARDHUBI DHANBAD - 828203 JHARKHAND
Valid / renewed upto: 31. March 2014
Date of Issue: 12. March 2012