

WELD WITH COMPLETE CONFIDENCE

NIHONWELD

HARDFACING GUIDEBOOK

VOLUME 1

- ◆ Earth-moving Equipment
- ◆ Dredging Equipment
- ◆ Crushing & Grinding Equipment



Industrial Welding Corporation

Leader in Welding Technology

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR STAINLESS STEEL

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)							Typical All Weld Mechanical Properties		Applications
				C	Si	Mn	Cr	Ni	Mo	Oth-ers	T.S. N/mm ² (Ksi)	Elongation (%)	
LIME TITANIA TYPE	NSS-308	E308-16 (D308-16)	AC DC(+)	0.05	0.66	1.00	20.00	10.50	-	-	590 (86)	40	For welding of 18%Cr-8%Ni steel such as AISI Types 301, 302, 304, 305 and 308
	NSS-316	E316-16 (D316-16)	AC DC(+)	0.06	0.66	1.78	19.33	12.31	2.26	-	590 (86)	44	For welding of 18%Cr-12%Ni-Mo steel (AISI Types 316). Underlaying of the build up welding of 13% Mn steel.
	NSS-309	E309-16 (D309-16)	AC DC(+)	0.03	0.36	1.80	23.83	12.57	-	-	606 (88)	41	For welding of 22%Cr-12%Ni steel, carbon steel or low alloy steel to stainless steel & stainless clad steel.

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR CAST IRON

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)					Typical All Weld Mechanical Properties			Applications
				C	Si	Mn	Fe	Ni	T.S. N/mm ² (ksi)	Elongation (%)	Hardness HV (HRC)	
LOW HYDROGEN	NC-10	Est (DFC Fe)	AC DC(+)	0.43	0.50	0.50	Bal.	-	517 (75)	32	350-390 (35-40)	Nickel-free and non-machinable cast iron electrode for repair of cast iron parts where machining is unnecessary.

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR HARDSURFACING

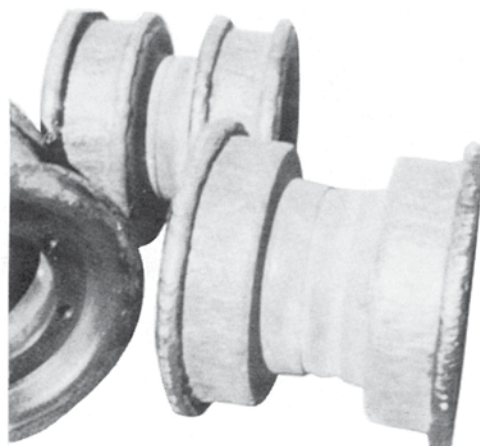
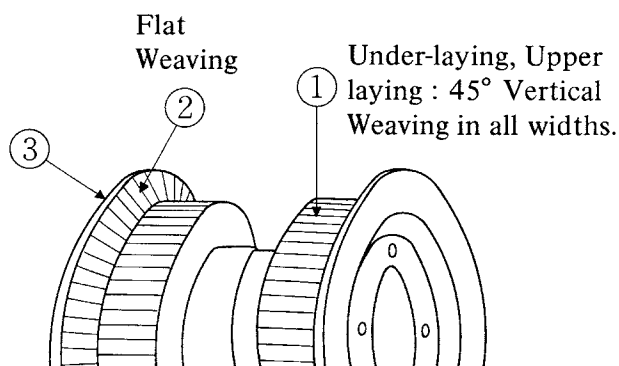
Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)						Typical Hardness of all weld metal HRC (Hv)	Applications
				C	Si	Mn	Cr	Mo	Others		
LOW HYDROGEN TYPE	NHF-300	(DF2A-300B)	AC DC(+)	0.08	0.48	0.80	2.16	0.84	-	23-27 (255-280)	For light intermetallic abrasion. Hardfacing of gears, shafts, wheel and rollers.
	NHF-400	(DF2A-400B)	AC DC(+)	0.26	0.73	1.64	2.35	-	-	35-40 (350-400)	Hardsurfacing of bulldozer links, idlers, rollers and sprockets, etc.
	NHF-450	(DF2A-450B)	AC DC(+)	0.23	1.15	0.60	2.52	0.53	V 0.38	45-49 (450-500)	For intermetallic abrasion. Hardfacing rails, cast steel rollers and parts of bulldozer.
	NHF-500	(DF2A-500B)	AC DC(+)	0.33	1.34	1.17	-	1.20	V 0.34	34-46 (370-460)	For hardsurfacing of idlers and truck links of bulldozers.

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR HARDSURFACING

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)						Typical Hardness of all weld metal HRC (Hv)	Applications
				C	Si	Mn	Cr	Mo	Others		
LOW HYDROGEN TYPE	NHF-600	(DF2B-600B)	AC DC(+)	0.76	0.87	0.40	7.45	0.52	V 0.57	54-57 (580-630)	Hardfacing of bulldozer blades, tractor parts, scraper blades, shovel, bucket lips and dipper teeth.
	NHF-650	(DF5A-700B)	AC DC(+)	1.02	0.97	1.35	4.12	7.70	V 1.19 W 2.2	55-64 (600-800)	Hardfacing of high speed steel rolls, milling cutters, reamer bits, twists, drills and taps.
	NHF-700	(DF3C-600B)	AC DC(+)	0.66	1.26	0.81	5.53	0.51	-	55-61 (600-720)	For scratching abrasion. Hardfacing of mixers, cutter knives, and dredgers.
	BUFFER-WELD No. 1		AC DC(+)	0.08	0.48	0.80	2.16	0.84	-	23-27 (255-280)	For buffering, cushioning or underlaying base alloy for final hardfacing overlaying or deposit on low, medium and high carbon, low alloy and high tensile strength steel.
SPECIAL COATING	NHF-800	(DF3C-700B)	AC DC(+)	0.91	1.88	1.32	3.87	-	W 2.54 B 0.52	62-64 (740-800)	Hardfacing of pumps casing and cutter knives.
	NHF-950	(DFWA-700S)	AC DC(+)	2.78	0.29	3.22	0.10	0.12	W 47.3	60-69 (700-950)	For severe abrasion with light impact such as concrete cutter, pump impeller, water drilling dull bits.
SPECIAL COATING AUSTENITIC MANGANESE STEEL	NHF-HMn	EFeMn-B	AC DC(+)	0.60	0.17	14.20	0.53	0.53	-	As welded 87-100 HRB (180-220) work hardened 45-51 (450530)	Hardfacing of various crusher jaws, high manganese steel rails and high manganese cast steels with work hardening properties.
SPECIAL COATING CHROMIUM CARBIDE ELECTRODE	NIDURIT 61	EFeCr-Al DIN 8555 E10-UM-60-GRZ	AC DC(+)	3.50	1.00	0.14	35.00	-	Fe Bal.	58-61 (660-720)	Hardfacing electrodes to resist strong grinding abrasion combined with medium impact such as conveyor screws, scraper blades, etc.
RUTILE TYPE	NHF-160MC		AC DC(+)	0.65	0.57	18.10	14.70	0.19	P 0.04 S 0.007	As welded 87-95 HRB (180-220) work hardened 43-49 (420500)	Joining and surfacing of 14% Mn steels and most all hard-to-weld steels when high impact resistance and cavitation resistance is required. Buffer layer before depositing.
	NHF-7CR	(DF3C-600B)	AC DC(+)	0.70	1.03	1.28	7.31	1.23		53-55 (560-600)	For hardsurfacing of structures applied in abrasion accompanied by light impact such as ripper teeth, impeller, and breakers.

APPLICABLE ELECTRODES FOR WELDING OBJECTS I. ITEMS RELATING TO BULLDOZERS

1. TRACK ROLLER

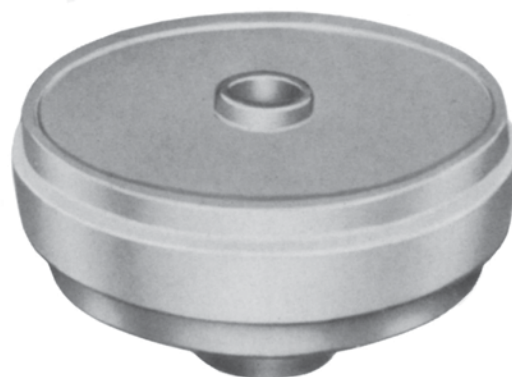
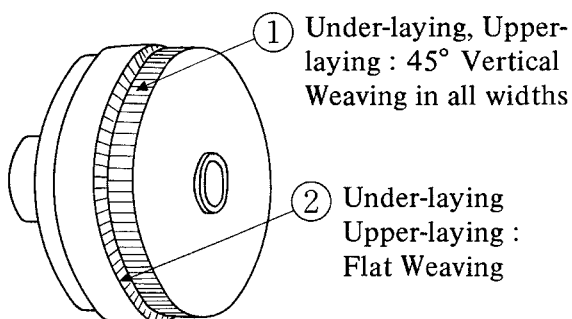


BASE METAL
APPLICABLE
ELECTRODES

Low Alloy Steel, Medium Carbon Steel

- ① Under-laying : NHF-BUFFERWELD No.1
- Upper-laying : NHF-600, NHF-500, NHF-400, NHF-450
- ⚡ Upper-laying (only) : NHF-600, NHF-500, NHF-400, NHF-450
- ⚡ Upper-laying (only) : NHF-400, NHF-450

2. FRONT IDLER

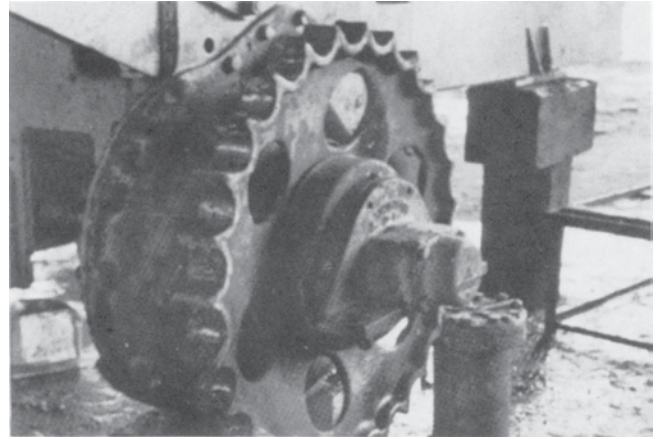
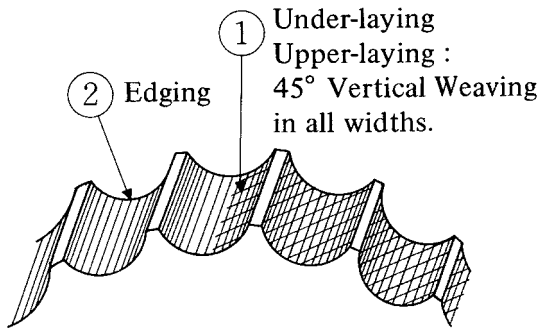


BASE METAL
APPLICABLE
ELECTRODES

Medium Carbon Steel

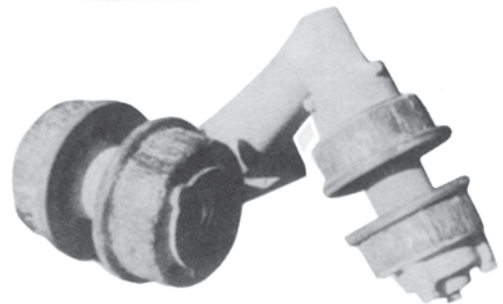
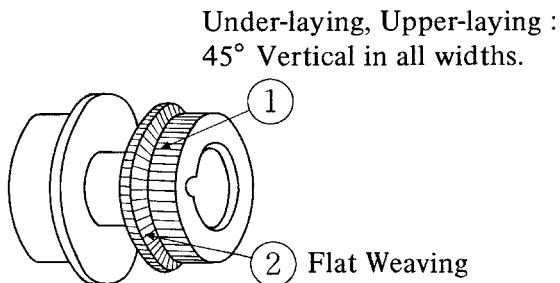
- ① Under-laying : NHF-BUFFERWELD No.1
- Upper-laying : NHF-500, NHF-400, NHF-450
- ⚡ Under-laying : NHF-BUFFERWELD No.1
- Upper-laying : NHF-500, NHF-400, NHF-450

3. DRIVE SPROCKET



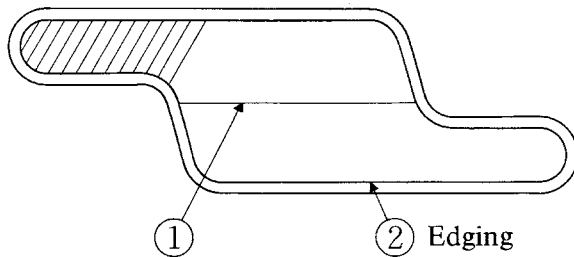
BASE METAL	Medium Carbon Steel
APPLICABLE ELECTRODES	① Under-laying : NHF-BUFFERWELD No.1
	⚡ Upper-laying : NHF-500, NHF-400, NHF-450

4. CARRIER ROLLER



BASE METAL	Low Alloy Steel, Medium Carbon Steel, Chilled Iron
APPLICABLE ELECTRODES	(i) The case of Low Alloy Steel and Medium Carbon Steel
	① Under-laying : NHF-BUFFERWELD No.1
	Upper-laying : NHF-500, NHF-400, NHF-450
	⚡ NHF-400
	(ii) The case of Chilled Iron (Preheating over 200°C)
	① , ⚡ Under-laying : NHF-BUFFERWELD No.1
	Upper-laying : NHF-300

5. TRACK LINK



BASE METAL
APPLICABLE
ELECTRODES

Low Alloy Steel, Austenitic Manganese Steel

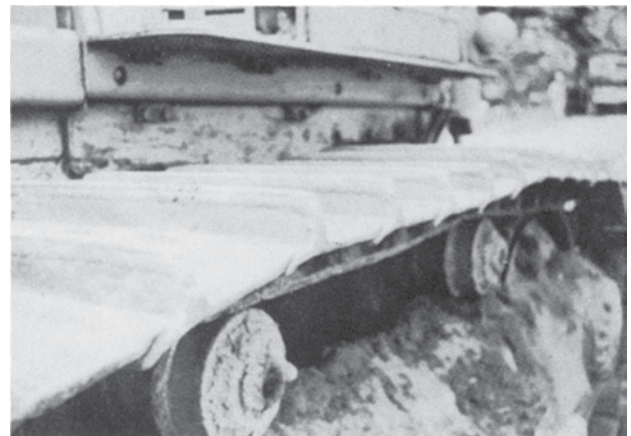
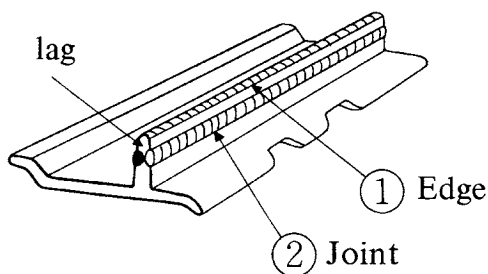
(i) The case of Low Alloy Steel

- ① Under-laying : NHF-BUFFERWELD No.1
- Upper-laying : NHF-600, NHF-500, NHF-450
- ⚡ NHF-BUFFERWELD No.1, NHF-300

(ii) The case of Austenitic Manganese Steel (Overheating must be avoided)

- ① Under-laying : NHF-160MC, NSS-309
- Upper-laying : NHF-600, NHF-HMn
- ⚡ NHF-160MC, NSS-309

6. SHOE



BASE METAL
APPLICABLE
ELECTRODES

Low Alloy Steel, Austenitic Manganese Steel

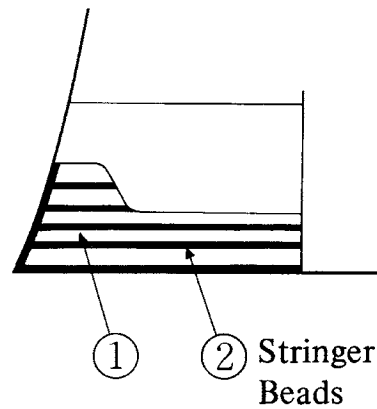
(i) The case of Low Alloy Steel

- ① NHF-800, NHF-700, NHF-650, NHF-7CR
- ⚡ NHF-BUFFERWELD No.1

(ii) The case of Austenitic Manganese Steel (Overheating must be avoided)

- ① NHF-800, NHF-700, NHF-650, NHF-7CR
- ⚡ NHF-160MC, NSS-316

7. END BIT

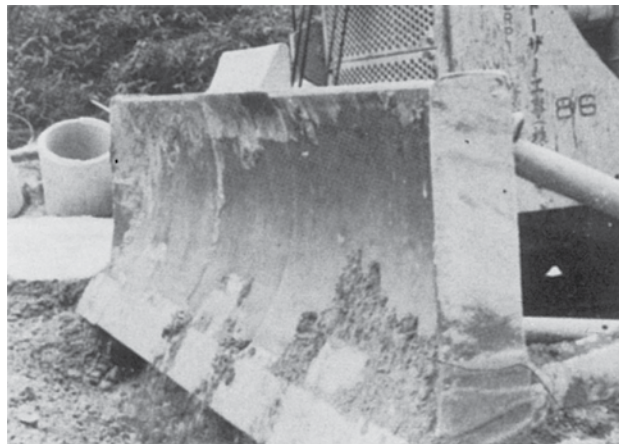
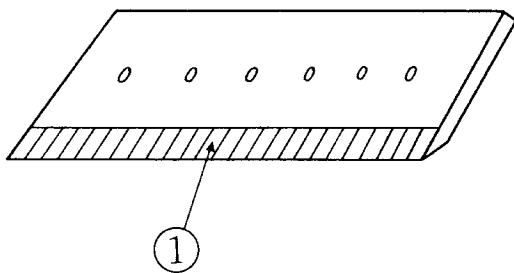


BASE METAL
APPLICABLE
ELECTRODES

High Carbon Steel

- | | |
|----------------------------------|-----------------------------|
| ① Under-laying | : NHF-BUFFERWELD No.1 |
| Upper-laying | : NHF-800, NHF-700, NHF-650 |
| Stringer Beads or Lattice-laying | : NHF-1000, NHF-950 |

8. CUTTING EDGE

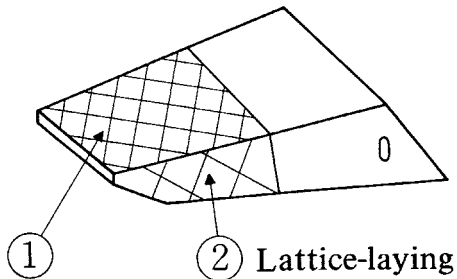


BASE METAL
APPLICABLE
ELECTRODES

Medium Carbon Steel

- | | |
|----------------|-----------------------|
| ① Under-laying | : NHF-BUFFERWELD No.1 |
| Upper-laying | : NHF-700, NHF-600 |

9. RIPPER TOOTH



BASE METAL
APPLICABLE
ELECTRODES

Low Alloy Steel, Austenitic Manganese Steel

(i) The case of Low Alloy Steel

① Under-laying

: NHF-BUFFERWELD No.1

Upper-laying

: NHF-600

⚙ Lattice-laying

: NHF-1000, NHF-950

(ii) The case of Austenitic Manganese Steel (Overheating must be avoided)

① Under-laying

: NHF-160MC, NSS-308

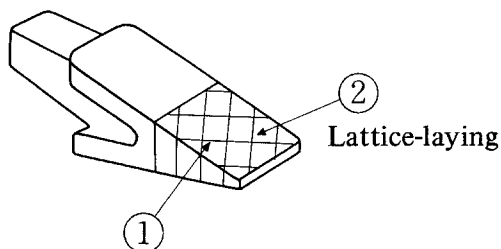
Upper-laying

: NHF-600, NHF-HMn

⚙ Stringer Beads or Lattice-laying

APPLICABLE ELECTRODES FOR WELDING OBJECTS II. ITEMS RELATING TO POWER SHOVEL

1. DIPPER TOOTH



BASE METAL
APPLICABLE
ELECTRODES

Low Alloy Steel, Austenitic Manganese Steel

(i) The case of Low Alloy Steel

① NHF-650, NHF-600, NHF-7CR

⚙ Lattice-laying

: NHF-1000, NHF-950, NHF-800

(ii) The case of Austenitic Manganese Steel (Overheating must be avoided)

① Under-laying

: NHF-160MC, NSS-308

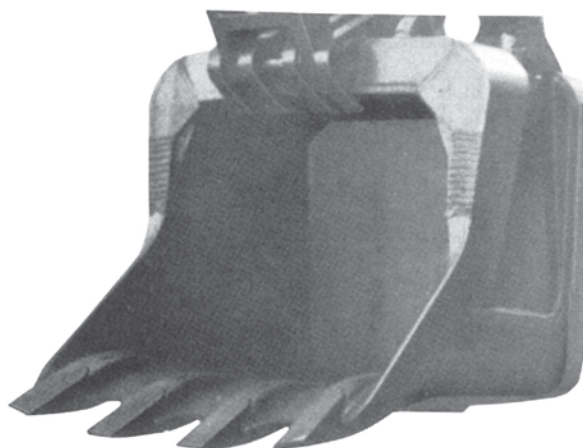
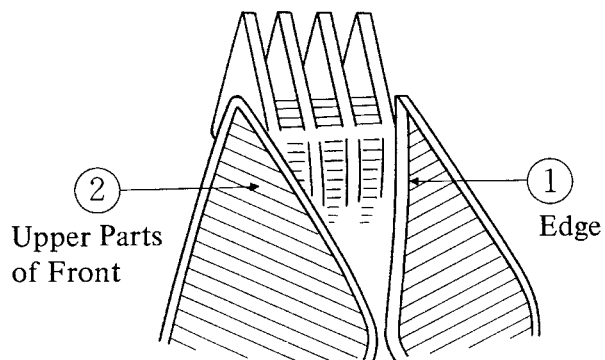
Upper-laying

: NHF-600, NHF-HMn

⚙ Lattice-laying

: NHF-600

2. DIPPER FRONT



BASE METAL
APPLICABLE
ELECTRODES

Austenitic Manganese Steel

1 Under-laying

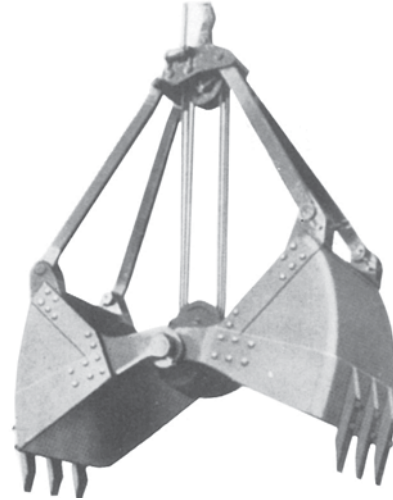
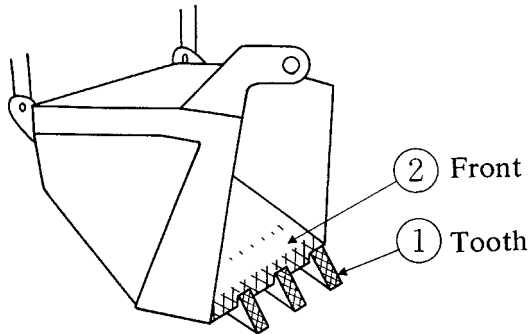
: NHF-160MC, NSS-316

2 Upper-laying

: NHF-600

6. FRONT ATTACHMENT

A. CLAMSHELL BUCKET



1. TOOTH BASE METAL

APPLICABLE ELECTRODES

Austenitic Manganese Steel

Low Alloy Steel

(i) The case of High Mn Steel

NHF-600, NHF-HMn

(ii) The case of Low Alloy Steel

NHF-650, NHF-600

2. FRONT BASE METAL

APPLICABLE ELECTRODES

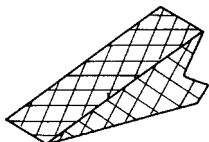
Mild Steel

NHF-500, NHF-600

B. BACK HAW

1. TOOTH BASE METAL

APPLICABLE ELECTRODES



High Manganese Steel

Low Alloy Steel

(i) The case of High Mn Steel

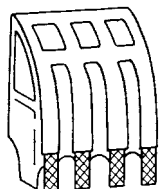
(Overheating must be avoided)

NHF-600, NHF-HMn

(ii) The case of Low Alloy Steel

NHF-650, NHF-600

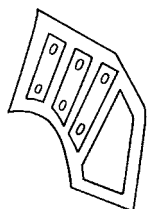
2. FRONT



BASE METAL
APPLICATION
ELECTRODES

Austenitic Manganese Steel
(Overheating must be avoided)
NHF-600, NHF-600

3. SIDE

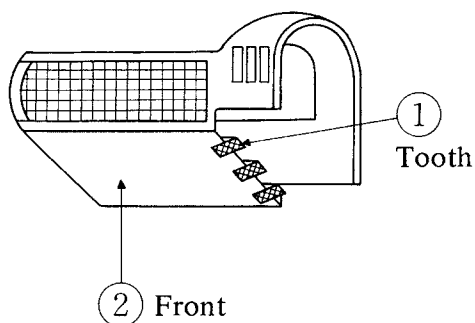


BASE METAL
APPLICABLE
ELECTRODES

Austenitic Manganese Steel
NHF-600, NHF-HMn



C. DRAGLINE BUCKET



1. TOOTH

BASE METAL

Austenitic Manganese Steel
(Overheating must be avoided)
NHF-600, NHF-HMn

2. FRONT

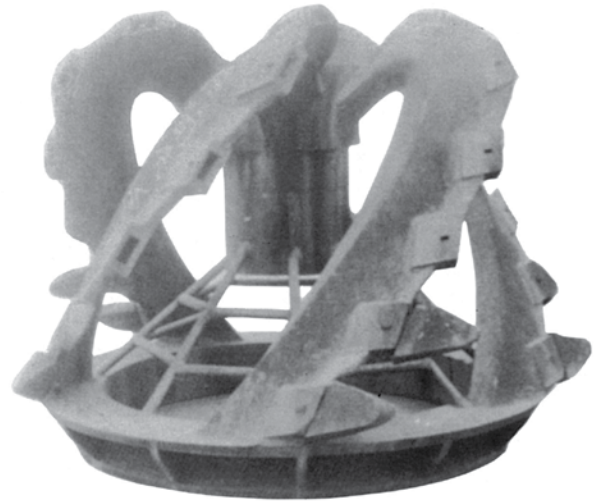
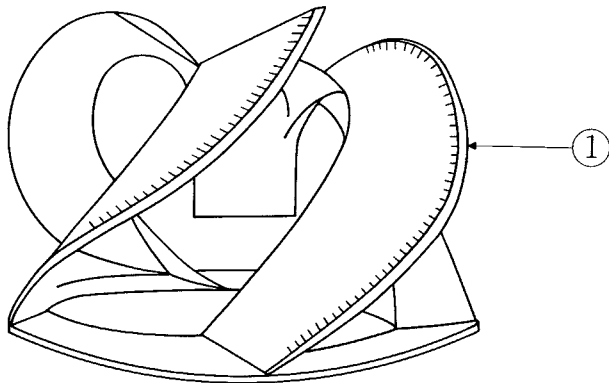
BASE METAL

APPLICABLE ELECTRODES

Austenitic Manganese Steel, Low Alloy Steel
(Overheating must be avoided)
(i) The case of Austenitic Manganese Steel
NHF-600, NHF-HMn
(ii) The case of Low Alloy Steel
NHF-650, NHF-600

APPLICABLE ELECTRODES FOR WELDING OBJECTS III. ITEMS RELATING TO DREDGER

1. DREDGE PUMP CUTTER KNIFE



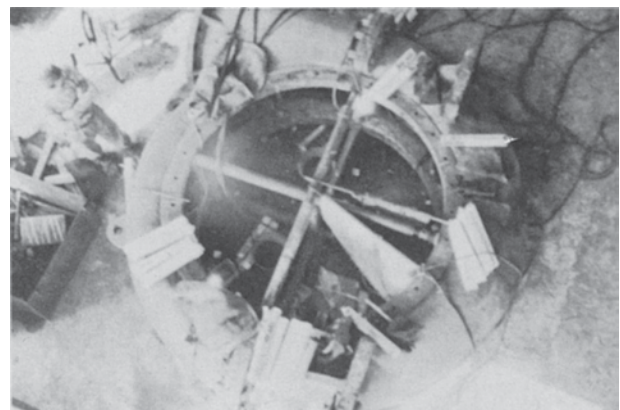
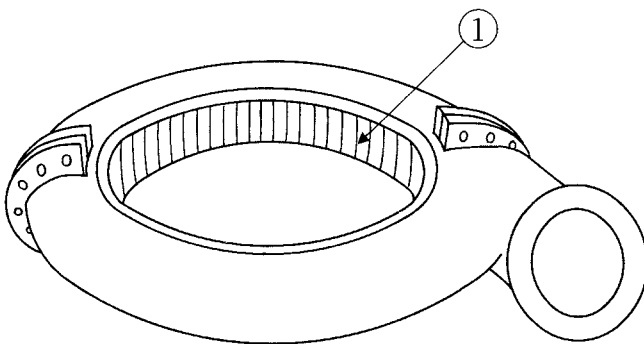
BASE METAL

Medium Carbon Steel, Low Alloy Steel

APPLICABLE ELECTRODES

- ① NHF-650, NHF-800, NHF-700
Stringer Beads, Lattice Laying
Nidurit 61, NHF-950

2. DREDGE PUMP CASING



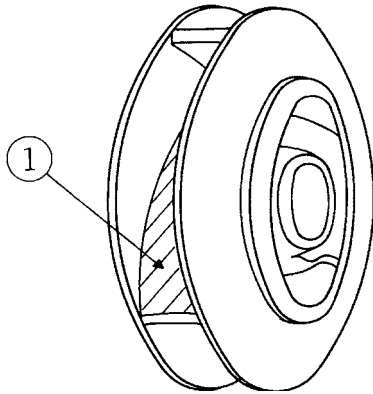
BASE METAL

Medium Carbon Steel, Low Alloy Steel, High Chrome Iron

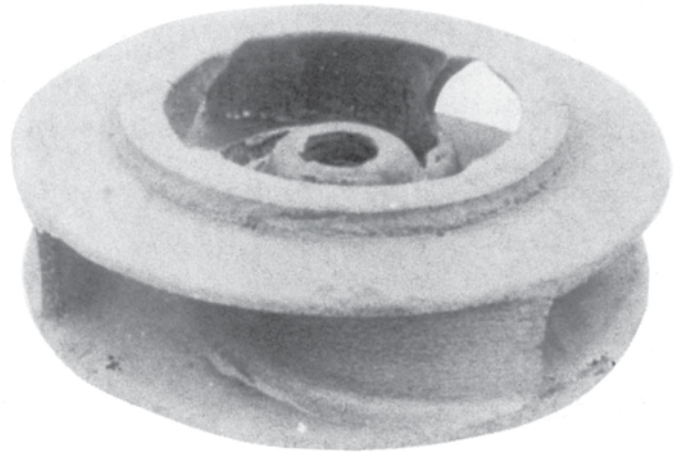
APPLICABLE ELECTRODES

- (i) The case of Medium Carbon and Low Alloy Steels
① NHF-800, NHF-700, Nidurit 61
(ii) The case of High Chrome Iron
Impossible to repair

3. DREDGE PUMP IMPELLER

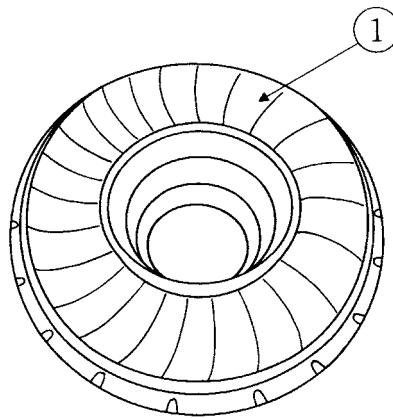


BASE METAL
APPLICABLE ELECTRODES



Medium Carbon Steel, Low Alloy Steel
① Nidurit 61, NHF-800, NHF-700

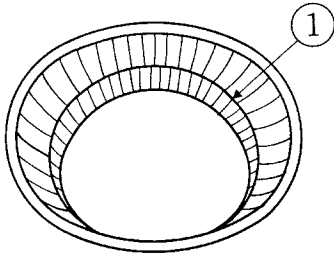
4. DREDGE PUMP DOOR



BASE METAL
APPLICABLE ELECTRODES

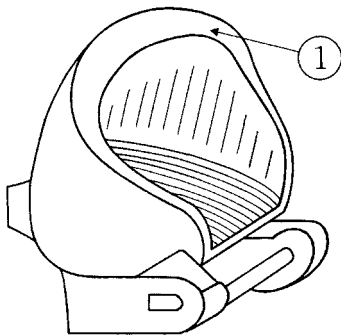
Medium Carbon Steel, Low Alloy Steel, High Chrome Iron
(i) The case of Medium Carbon and Low Alloy Steels
① Nidurit 61, NHF-800, NHF-700
(ii) The case of High Chrome Iron
Impossible to repair

5. DREDGE PUMP MOUTH RING



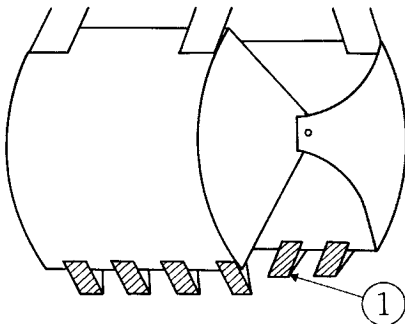
BASE METAL	APPLICABLE ELECTRODES
Medium Carbon Steel Low Alloy Steel High Chrome Iron	(i) The case of Medium Carbon & Low Alloy Steels ① NHF-800, NHF-700, Nidurit 61 (ii) The case of High Chrome Iron Impossible to repair

6. DREDGE BUCKET



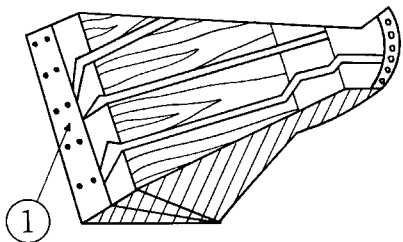
BASE METAL	APPLICABLE ELECTRODES
Austenitic Manganese Steel (Overheating must be avoided)	① NHF-600, NHF-HMn, NHF-7CR

7. GRAB BUCKET



BASE METAL	APPLICABLE ELECTRODES
Low Alloy Steel Austenitic Manganese Steel	(i) The case of Low Alloy Steel ① NHF-650, NHF-600 (ii) The case of Austenitic Manganese Steel (Overheating must be avoided) ① NHF-600, NHF-HMn

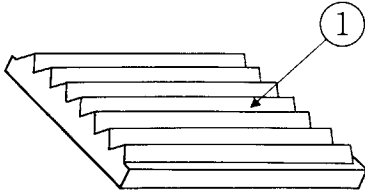
8. DRAG HEAD



BASE METAL	APPLICABLE ELECTRODES
Austenitic Manganese Steel Low Alloy Steel	(i) The case of Austenitic Manganese Steel ① NHF-HMn, NHF-600 (ii) The case of Low Alloy Steel ① NHF-650, NHF-600

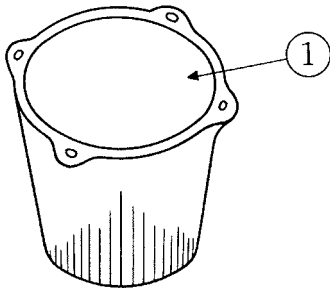
APPLICABLE ELECTRODES FOR WELDING OBJECTS IV. ITEMS RELATING TO CRUSHER

1. CRUSHER JAW



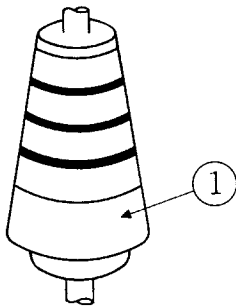
BASE METAL	APPLICABLE ELECTRODES
Austenitic Manganese Steel (Overheating must be avoided)	① Under-laying : NHF-160MC, NSS-309 Upper-laying : NHF-600, NHF-HMn

2. GYRATORY CRUSHER LINER



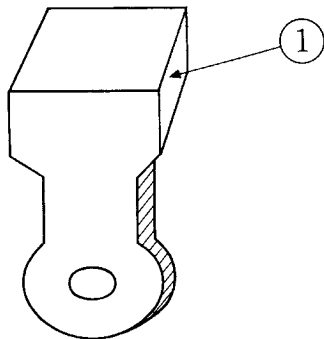
BASE METAL	APPLICABLE ELECTRODES
Austenitic Manganese Steel (Overheating must be avoided)	① Under-laying : NHF-160MC, NSS-309 Upper-laying : NHF-600, NHF-HMn

3. GYRATORY CRUSHER MANTLE



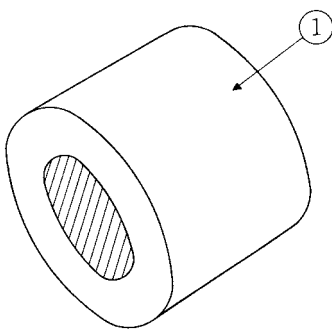
BASE METAL	APPLICABLE ELECTRODES
Austenitic Manganese Steel (Overheating must be avoided)	① Under-laying : NHF-160MC, NSS-309 Upper-laying : NHF-600, NHF-HMn

4. CRUSHER HAMMER



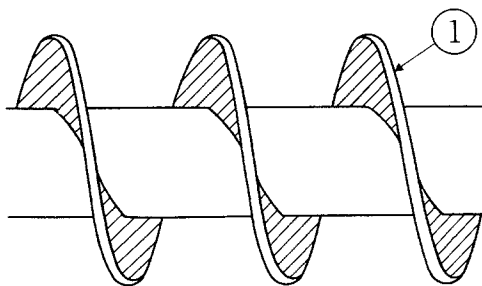
BASE METAL	APPLICABLE ELECTRODES
Austenitic Manganese Steel (Overheating must be avoided)	① Under-laying : NHF-160MC, NSS-309 Upper-laying : NHF-600, NHF-HMn

5. CRUSHER ROLL



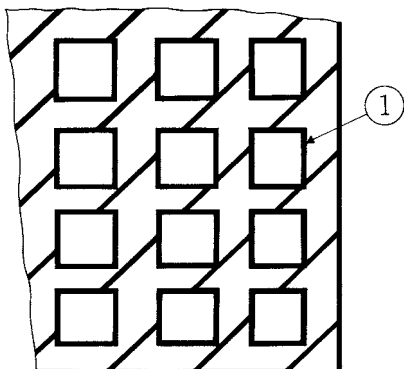
BASE METAL	APPLICABLE ELECTRODES
Austenitic Manganese Steel (Overheating must be avoided)	① Under-laying : NHF-160MC, NSS-309 Upper-laying : NHF-600, NHF-HMn

6. CONVEYOR SCREW



BASE METAL	APPLICABLE ELECTRODES
Medium Carbon Steel	① Stringer Beads : NHF-800, Nidurit 61 Lattice-laying :

7. SIZING SCREEN



BASE METAL	APPLICABLE ELECTRODES
Medium Carbon Steel Mild Steel	① Stringer Beads : NHF-950, NHF-800 Lattice-laying :

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