USES, PROCEDURES, AND CHARACTERISTICS

TYPE: **MILD STEEL - ARC** AWS/ASTM E-6011

NSN: 9GD 3439-00-165-4173 (1/8X 14)
9GD 3439-00-165-4185 (5/32x 14)
9GD 3439-00-262-2655 (3/16X 14)

POSITION: All

POLARITY: AC or DC Straight or Reverse

RECOMMENDED AMPERAGES:
1/8 - 80 to 130
5/32 -130 to 160

USES:
Primary: Joining of mild steel.
Secondary: Good for galvanized steel. Substitute for cutting rod; soak coating and use on straight polarity. On sheet metal, use straight polarity for a forceful spray arc.

PROCEDURES:
Flat: Very short arc. Stay ahead of puddle and use a slight w-hipping motion.
Vertical: Start at the bottom and go to the top using a slight whipping motion. When welding from top to bottom, don't use any motion.
Overhead: Use same technique as the vertical bottom to top. Multipass for buildup.

CHARACTERISTICS :
Deep penetration, light slag, fast freezing deposit.

Tensile Strength: 62,000-72,000 psig

TYPE: **MILD STEEL - ARC** AWS/ASTM E-6012

NSN: 9GD 3439-00-947-5383 (3/32X 14)
9GD 3439-00-165-4176 (1/8X 14)
9GD 3439-00-165-4175 (5/32x 14)

POSITIONS: All

POLARITY: AC or DC Straight

RECOMMENDED AMPERAGES:
3/32 - 40 to 90
1/8 - 80 to 120
5/32 -120 to 190

USES:
Primary: Joining of mild steel. Small-diameter rods for sheet metal, large-diameter rods for fillets and poor fit-up.
Secondary: A fast electrode for overlaying and cladding of worn and undercut surfaces prior to wearfacing.

PROCEDURES:
On flat butt joints, hold the rod at a right angle to the plate. On horizontal fillets, the rod is held 30 to 45 degrees with horizontal and at a right angle to the longitudinal axis. Weld vertical from top down. Use a whipping motion when welding from bottom to top. For overhead work, use a slight whipping motion.

CHARACTERISTICS :
Shallow to medium penetration, medium heavy slag, smooth bead, low spatter loss. Excellent for rusty metal.

Tensile Strength: 67,000-80,000 psig

TYPE: **STEEL - ARC** (low alloy or mild)
AWS/ASTM E-7018

NSN: 9GD 3439-00-165-4186 (1/8X 14)
9GD 3439-00-479-1099 (5/32X 14)
9GD 3439-00-853-2719 (3/16X 14)

POSITION: All

POLARITY: AC or DC Reverse

RECOMMENDED AMPERAGES:
1/8 -100 to 150
5/32 -120 to 200

USES:
Primary: Excellent for joining low-alloy structural steels such as Cor-Ten, Mayari R, Lukens 45 and 50, or Yoloy. Use for welding well casings.
Secondary: Joining all mild steels. Buildup prior to wearfacing.

PROCEDURES: Hold a short arc and use a slight weave.
Flat: Use a high side of current range - weave up to 2 1/2 times diameter of rod.
Vertical: Make root pass with a straight upward progression and a short arc Some welders prefer a V shape motion for root passes. Hesitate at point of the "V" in the root to assure penetration. Each leg of the "V" should be about 1/8 in. No whipping should be done. On subsequent passes, weave across the face of the root, continuously building up a shelf. The weave should pause at the sides of the first pass to clear out trapped slag.
Overhead: Use only stringer beads. Fillets should be made with electrode at a 30 degree angle off the vertical leg.
Horizontal: Use stringer beads for fillets; direct rod into joint at a 45 degree angle. On subsequent passes, use only stringer beads.

CHARACTERISTICS:
Soft arc, low spatter, good bead contour and wetting actions, produces highest quality X-ray deposits. Good impact resistance at normal and sub-zero temperatures. Excellent for high-sulfur (free machining) steels, and cold rolled steels.

Tensile Strength: 70,000-78,000 psig

TYPE: **STEEL - ARC** (low-alloy, high-strength steels) AWS/ASTM E-11018

NSN: 9GD 3439-00-165-4167 (1/8X 14)
9GD 3439-00-165-4165 (5/32X 14)

POSITION: All

POLARITY: AC or DC Reverse

RECOMMENDED AMPERAGES:
1/8 - ll0 to 150
5/32 -120 to 200

USES:
Primary: Joining of low-allow, high-strength steels such as T-1, HY-80, HY-90, HY-100, SSS100 and Jalloy 90 and 100.
Secondary: Substitute for buildup for wearfacing. (NOTE: This rod is prefened over mild steel electrodes for wearfacing buildup.)

PROCEDURES:
Hold a short arc and use a slight weave.
Flat: Use high side of current range; weave up to 2 1/2 times diameter of rod.
Vertical: Make root pass with a straight upward progression - short arc. Some welders prefer a "V" shape motion for root passes. Hesitate at "V" point in the root to assure penetration. Each "V" leg should be about 1/8 inch. Do not use whipping motion. On subsequent passes, weave across the face of the root to continuously build up a shelf. The weave should pause at the sides of the first pass to clear out trapped slag.
Overhead: Use only stringer beads. Fillets should be made with electrode at a 30-degree angle off the vertical leg.
Horizontal: Use stringer beads for fillets; direct rod into joint at a 45-degree angle. On subsequent passes. use only stringer beads.

CHARACTERISTICS:
Fast, efficient metal transfer. Deposits have good X-ray quality and excellent tensile and impact properties.

Tensile Strength: 110,000-114,000 psig

TYPE: **STEEL - GMA** (low-to-medium-carbon) AWS/ASTM E-70, S-3, or S-6

NSN: 9GD 3439-00-593-2241
(.035 X 2 1/2 lb. spool)
9GD 3439-00-903-7832
(.045 x 25 lb. roll)

POSITION: All

POLARITY: DC Reverse

WELDING DATA - ALL POSITIONS

Material Thickness (in.)	Amps	volts	Travel Speed (ipm)
.037	70	17	20-40
.050	85	18	20-50
.062	100	18	25-35
.125	150	20	15-25
.187	150	20	10-20

(NOTE: The above are typical values. Specific welding applications may require changes.)

USES:
Primary: Used for most mild steels.
Secondary: Buildup for wearfacing.

PROCEDURES:
During welding, wire stickout (tip to work distance) should be approximately 5/16 in. Poor fit up will require lower amps and slower speed. At 17 volts or less, Argon-$C0_2$ mixtures may offer better arc characteristics than $C0_2$. Use only welding grade $C0_2$ gas at a flow of 15-20 cubic feet per hour. Mixed gas should be 75-percent argon to 25-percent $C0_2$. Use wind shield and increase flow rate in windy conditions. This wire can be used with the GMA Spool-On Gun.

CHARACTERISTICS:
Remember! You do not have a flux to purge the deposited molten metal; only a shielding gas prevents the atmosphere from coming in contact with the arc stream. Any moisture, dirt, or oil on the base material, welding wire, or feed rolls will cause a defective weld.

Tensile Strength: 78,000 psig

TYPE: **STEEL - TORCH or GTA**
(low- and medium-carbon)

NSN: 9GD 3439-00-018-1625 (1/16X 36)
9GD 3439-00-165-4198 (3/32X 36)

(NOTE: This triple deoxidized rod should be used if gas welding with MAPP Gas. It can also be used with acetylene gas.)

USES:
Gas welding or GTA welding of low- and medium-carbon steel where properties similar to those of the base metal are required or when the welded joint is subjected to heat. Small parts can be fabricated faster and with less distortion by using a brazing rod (NSN 9GD 3439-00- 165-4199). If joint strength is important, use NSN 9GD 3439-00-027-0953.

MISCELLANEOUS USES:
For faster buildup with arc, feed this rod into arc stream of the electrode. If you have a wearfacing rod that is too hard for impact, feed this rod into arc stream. If you wish to cut stainless or cast iron with the torch, feed this rod into the kerf.

Tensile Strength: 62,000 psig

TYPE: **BRAZING - TORCH**
(flux-coated rod for general brazing)

NSN: 9GD 3439-00-165-4199 (1/8X 18)
9GD 3439-00-165-4197 (3/16X 18)
9GD 3439-00-252-8357 (1/4X 18)

USES:
Joining of steel and cast iron and most copper-based metals, such as brass and bronze. Can be used on some nickel alloys.

(NOTE: Keep base metal of nickel alloys at lowest possible temperature.)

Ideal for dissimilar metal combinations. Can be used to build up frictional wear-resistant surfaces that requir hardness of approximately 80 Brinell or 47 Rockwell B.

PROCEDURES:
Clean joint and bevel heavy sections. On cast iron, use an excess oxygen flame to sear the weld area to a blue heat. Preheat heavy sections to 800°F. Apply flux to weld area and continue heating until flux melts. Melt off a drop of the rod and flow it out - continue to add more alloy drop by drop.

CHARACTERISTICS :
A low-fuming bronze rod that does not require fusion of the surface of the base metal. Flux for this rod is NSN 9GD 3439-00-255-4580.

Tensile Strength: 60,000 psig

TYPE: **STEEL**

NSN: 9GD 3439-00-262-2649 (5/32)
9GD 3439-01-155-2376 (1/8)
9GD 3439-00-262-3876 (1/4)

POSITION: All

POLARITY: AC-DC

RECOMMENDED AMPERAGES:
5/32 -80 to 175

USES:
Maintenance or production general welding fabrication. Light and heavy gauge fabrication for tanks, machinery, frames, plates, angles, beams, sheet metal.

PROCEDURES:
Clean weld area, bevel heavy sections. Set amperage and hold close arc. Electrode can be dragged for some applications. Controllability of slag and non-bum through characteristics makes vertical down or up very easy.

CHARACTERISTICS:
Excellent weld appearance. Free of spatter loss. Light blue tip.

Tensile Strength: 80,000 psig

Yield Strength: 68,000 psig

Elongation: 26-28 percent

TYPE: **BRAZING - TORCH** (flux - coated rod for high-strength brazing)

NSN: 9GD 3439-00-027-0953 (1/8X 18)

USES:
Primary: Torch joining of **all** carbon and alloy steels, including tool steel and carbides. Excellent for repairing broken drills and joining extensions to drills and reamers.
Secondary: For joining and repairing nonferrous metals, **except** aluminum, magnesium and die cast zinc.

PROCEDURES:
When using as a thin flowing alloy and extra flux is not available, break off and pulverize some of the flux coating and mix it with a few drops of water to form a paste to paint the joint area.

Clean joint thoroughly - close fit the joint with about 0.003 in. clearance. Heat with neutral flame until preplaced flux liquefies - apply rod - continue heating on each side of joint until alloy penetrates the joint. When using as a bead-forming alloy, bevel heavy pieces into a 60-900 vee and apply as a brazing rod. Do not melt base metal.

CHARACTERISTICS :
A flux-coated brazing alloy of high strength. Bonding temperature -1400- 1600°F. Use NSN 9GD 3439-00-165-4199 for brazing and for jobs not requiring high strength.

Tensile Strength: 100,000 psig.

TYPE: **SILVER BRAZING KITS - TORCH**

NSN: 9GD 3439-01-047-4141 (3/64x 34)
(per Kit plus dry flux)
9GD 3439-01-030-2412 (1/16)

USES:
For **all** silver brazing applications on ferrous and non-ferrous metals (except the white metals). Use specifically for instrumentation, tubing, controls, switches, and similar devices. Excellent for food vessels, laboratory apparatus, and hospital equipment.

PROCEDURES:
Clean thoroughly, heat broadly along the joint line with a carburizing flame. Touch rod into jar of dry flux and flow into joint, then feed rod into joint. Keep flame at least 1 in. from joint. Continue feeding rod until fillet is observed. When paste flux is needed, mix with a few drops of water to form a paste and paint the area where a preplaced flux is desired. Flux can be removed by quenching in water. Joint clearance should be between 0.002 and 0.003 in. for maximum strength. For color match on stainless, coat silver solder deposit with tin-silver solder 96/4 on page 1-40.

CHARACTERISTICS:
Since this alloy does not contain cadmium, it is safe to use on any food or beverage equipment. Use this rod only where the work is small, delicate, or requires joining by use of a torch at low temperatures. This alloy's thin, flowing properties make it ideal for lap, square butt, and "T" joints because capillary action causes it to fill small-clearances and achieve higher strength bonds.

Temperature: 1145- 1205°F

Tensile Strength: 85,000 psig

TYPE: **CAST IRON - TORCH** (flux coated rod)

NSN: 9GD 3439-00-027-0953 (1/8X 18)
9GD 3439-00-254-5038 (1/4X 18)

USES:
Primary: A general-purpose, cast iron alloy for torch joining of gray cast iron. Use this rod when weld deposit must have physical properties (resistance to bending, corrosion, heat resistance) similar to the base metal. A cast iron manifold, built to withstand heat, should be welded with this rod because it deposits a weld that will withstand exhaust heat and expand and contract at the same rate as the manifold.

Secondary: Use on cast iron parts too small and thin to arc weld. When no hard face rod is available, it will make a hard deposit if applied as an arc rod.

PROCEDURES:
Bevel breaks and cracks to forma 75-90° vee. Use neutral flame and preheat uniformly. Keep torch in constant motion. Melt a small amount of flux from the rod and continue heating until the flux liquefies from the heat of the base metal. At this temperature, melt off a drop of the rod and flow it out. Continue depositing alloy drop by drop, using a weaving motion of the torch. Slowly cool by covering with lime.

CHARACTERISTICS:
Deposits are color matching and dense with similar properties of cast iron. The deposit will be machinable if cooled slowly.

Bonding Temperature: 1400- 1600°F

Hardness: 200 Bhn (slow cooled)

Tensile Strength: 40,000 psig

TYPE: **CAST IRON - ARC**
(fully-machinable nickel base)

NSN: 9GD 3439-00-262-2743 (l/8x14)

POSITION: All

POLARITY: AC or DC Straight or Reverse

RECOMMENDED AMPERAGES: 1/8 -55 to 110

USES:
Primary: For welding cast iron in all positions where the weld must have high ductility and machinability in the bonded zone.
Secondary: For joining cast iron to all other metals except the white metals. It can be used for welding nickel, monel, stainless and copper alloys when the proper rods for these metals are not available. Can be used as a cushion for wearfacing.

PROCEDURES:
Bevel breaks and cracks 75-900 vee. Use the gouging rod (NSN 9GD 3439-00-453-5950) to remove unwanted met al. For best machinability, preheat to 400°F to reduce cooling rate. Use a short to medium arc at the lowest amperage possible. Peen lightly to relieve stress. Skip weld to prevent excessive local heat. Cool casting slowly.

CHARACTERISTICS:
Excellent for out-of-position welding. Bare rod may be used for GTA welding of the above metals. This rod is hot short; do not permit casting to overheat. Support properly during welding.

Tensile Strength: 50,000 psig

NOTE: If a nonconductive coating is required in tight fitting areas where arcing through the coating would be undesirable - use Marcoloy #302.

TYPE: **CAST IRON** (fully-machinable)

NSN: 3439-01-135-3913 (1/8)
3439-01-135-3914 (5/32)

POSITION: All

POLARITY: AC-DC Reverse

RECOMMENDED AMPERAGES:
3/32 - 50-90
1/8 - 85-120
5/32 -100-140

USES:
Repair machining errors. Fill sand pockets, holes and defects. Buildup and welding of gear teeth, cracks in housings, blocks and cases.

PROCEDURES:
Clean weld area. Bevel crack. Use stringer beads (short deposits) to avoid overheating area.

CHARACTERISTICS :
Green tip. Nonconductive coating. Excellent purging characteristics.

Tensile Strength: 56,000 psig

NOTE: If a nonconductive coating is required in tight fitting areas where arcing through the coating is undesirable - use Marcoloy #302.

TYPE: **CAST IRON - ARC**
(machinable nickel-iron base)

NSN: 9GD 3439-00-165-4189 (1/8X 14)
9GD 3439-00-165-4188 (5/32X 14)

POSITION: All

POLARITY: AC or DC Reverse

RECOMMENDED AMPERAGES:
1/8 - 80 to 120
5/32 -90 to 140

USES:
Primary: For welding of gray and alloyed cast iron. The deposits give greatest crack resistance and should be used where weld is subject to air, gas, or liquid pressure. Use to repair pump housings, valves, pressure chambers, cast, and malleable fittings. Excellent for crack-sensitive jobs such as joints under restraint, dissimilar thicknesses, and the welding of heavy sections. Can be used to join cast iron to steel.
Secondary: Buildup for hardfacing on cast iron.

PROCEDURES:
Bevel cracks using gouging rod (NSN 9GD 3439-00-453-5950), Keep uniform heat through welded section. On casting of dissimilar thickness, maintain interpass temperature of 5000 F. Peen lightly to relieve stress. Cool casting slowly.

CHARACTERISTICS:
If one section of the casting can move freely during welding, the welding can be continuous so the welding job can be finished quickly. The weld deposit is not hot short like NSN 9GD 3439-00-909-7951.

Tensile Strength: 55,000-60,000 psig

TYPE **BRAZING - ARC**

NSN: 9GJ 3439-00-262-2739 (1/8x14)
9GD 3439-01-131-4934 (5/32X 14)

POSITION: Flat

POLARITY: DC Reverse

RECOMMENDED AMPERAGES:
1/8 - 80 to 160
3/16 -130 to 250

USES:
Primary: For high-strength joints on cast iron, steel, and copper alloys. For joints and dissimilar combinations susceptible to cracking. Excellent for overlaying surfaces subject to frictional wear and corrosive attack by salt water.
Secondary: Can be used for joining stainless, nickel, and nickel alloys.

PROCEDURES:
Bevel crack to 90° angle. Preheat heavy steel and cast iron sections to 200°F. Preheat heavy copper alloy sections 250- 400°F (except silicon, bronze). Use medium arc gap. (NOTE **USE GOOD VENTILATION.** Hold electrode 10-15 degrees off perpendicular.)

CHARACTERISTICS:
Has rapid deposition rate. Deposit is a copper-base alloy.

Hardness: Deposited 130 BHN
Work Hardens to 230 BHN

Tensile Strength: 90,000 psig

TYPE: **ALUMINUM - ARC**
(extruded flux-coated rod) E-4043

NSN: 9GD 3439-00-803-9496 (3/64x14)
9GD 3439-00-165-4177 (1/8X 14)
9GD 3439-01-139-3498 (5/32X 14)
9GD 3439-00-246-0541 (3/16X 14)

POSITION: Flat, horizontal, or vertical

POLARITY: DC Reverse

RECOMMENDED AMPERAGES:
1/8 - 90 to 140
5/32 -125 to 175

USES:
Primary: Arc welding of all weldable grades of aluminum in extruded, plate or sheet, and sand and die castings. Use for welding aluminum landing mats when GMA is not available or dirt, moisture, or wind make GMA impractical.
Secondary: Use with torch for welding aluminum. To make an aluminum paste flux, break flux off rod, pulverize, mix with a few drops of water. Can be used with carbon arc, To use as a TGA rod, remove flux.

PROCEDURES:
Bevel 1/8 in. or heavier to 750 vee. On heavy sections, preheat to 400°F. Maintain short arc. Hold electrode almost perpendicular to work or slightly in direction of travel. Back whip at crater. Chip slag before quenching. Use Marcoloy #500.

CHARACTERISTICS:
Keep rod dry; flux will absorb moisture from the air easily.

Tensile Strength: 25,500 psig

TYPE: **ALUMINUM - GMA**
(Base Spooled Wire) E-5356

NSN: 9GD 3439-00-803-9498
(3/64 X 1 lb. spool)

POSITION: All

POLARITY: DC Reverse (Argon or helium gas)

RECOMMENDED CURRENT SETTINGS:
(3/16 plate-flat)

volts	Amen (cfh)	Amps
23-25	30-40	160-180

Weld Speed in Min
22-26

(NOTE: There is a different setting for each plate, thickness, type of joint and position. Most of your welding will be in the above ranges.)

USES:
This wire is recommended for welding 5056,5083, 5086,5154, and 5356 aluminum alloys. **USE THIS WIRE FOR WELDING ALUMINUM LANDING MATS.**

PROCEDURES:
Wire and joint to be welded must be clean. Set your machine and gas flow to the above settings and test on a piece of scrap of similar thickness and type of joint in the position you will be welding. Dirt on your work, wire or feeding mechanism, or inadequate gas coverage of your molten weld puddle will result in porosity. Check for leaks into gas flow.

CHARACTERISTICS:
For general maintenance, use flux coated arc aluminum rod on page 1-23. Save this wire for welding aluminum landing mats.

Tensile Strength: 40,500 psig

Yield Strength: 21,000 psig

TYPE: **BRAZING, GAS - ALUMINUM**

NSN: 9GD 3439-01-030-2509 (3/32)
9GD 3439-00-255-4576 (Flux)

POSITION: Flat

USES:
Joining of thin wall tubing, T-joints, lap and flanges, sheets, extrusions, repair of aluminum furniture, automotive trim, radiators, window frames, air conditioning parts, motorcycle parts.

PROCEDURES:
Remove all grease, dirt, oil and oxides. Dip rod into Marcoloy #1500 Flux or mix flux with alcohol or water and brush paste on weld area. Heat uniformly with reducing flame until flux liquifies, add alloy until it flows through joint. Cool slowly, wash flux thoroughly with water.

CHARACTERISTICS:
Yellow tip.

An extremely low melting aluminum alloy that features high strength welds on most aluminums without melting the base metal.

Tensile Strength: 33,000 psi

Bonding Temp: 1070°F

TYPE: **ZINC DIE CAST and ALUMINUM**

NSN: 9GD 3439-01-132-0140

USES:
Repair zinc die cast parts, automotive grills, carburetors, fuel pumps castings and kirksite dies. Aluminum castings and parts, such as sand holes, worn parts and machining errors, can be filled or overlayed, .

PROCEDURES:
Remove all grease, dirt, oil and oxides. Zinc die cast: Apply flux to surface, then heat with soft reducing flame until flux liquifies. Melt off rod and remove heat. Cool slowly. Wash flux off in water.
Aluminum: File or grind surface, use no flux, heat indirectly and keep rubbing alloy on surface until it wets out. Remove heat and allow to cool slowly.
TIG: No flux is required. Use high frequency AC and argon gas.

CHARACTERISTICS:
Brown Tip.

Melting Point: 700°F

Size: 1/8

Tensile Strength: 25,000 psig

TYPE: **STAINLESS - ARC** (all steels - medium, high carbon, alloy, and tool steels)
AWS-ASTM E 312-16

NSN: 9GD 3439-00-902-4209 (3/32X 14)
9GD 3439-00-165-4169 (1/8X 14)
9GD 3439-00-165-4166 (5/32X 14)
9GD 3439-00-165-4168 (3/16X 14)

POSITION: All

POLARITY: AC or DC Reverse

RECOMMENDED AMPERAGES:
3/32 - 50 to 90
1/8 - 90 to 120
5/32 -120 to 160
3/16 - 150 to 190

USES:
Primary: Use this rod when you need a high strength weld deposit or when highly stressed joints, vibration or shock continually cause weld failure. Use on all steels and where destructive combinations of wear, impact, corrosion, or heat are present.

Secondary: Can be used for welding stainless (no acid) and salt-water pipe lines. Can be applied as a buildup on manganese steel or any wear problem involving frictional wear and impact.

PROCEDURES:
Bevel 90°. Preheat alloy steels to 400°F. Hold a short arc. Use stringer beads. Run intermittent welds, especially on high alloy steel. Peen lightly to relieve stresses.

CHARACTERISTICS:
Bare rod can be applied with gas or GTA torch. Since many other rods are capable of doing jobs that this rod can do, conserve supplies and use it only for jobs requiring its high tensile strength properties.

Tensile Strength: 120,000 psig

TYPE: **BUILDUP - ARC** (tungsten, high speed)

NSN: 3439-00-105-9948 (1/4X 14)
3439-01-032-5978 (1/16 x 14)
3439-00-902-4210 (3/16 x 14)
3439-00-105-9945 (3/32 x 14)
3439-01-012-1002 (3/64 x 14)

POSITION: All

POLARITY: AC/DC, Straight/Reverse

RECOMMENDED AMPERAGES:
1/8 -100 to 160
1/4 -200 to 280
5/32 -140 to 180
3/16 -180 to 240

USES:
Primary: To repair or rebuild high speed tools without having to reharden the tool.
Secondary: Form tools, milling cutters, lathe bits, boring bars and other tools usually made entirely of high speed steel can be made compositely with only the cutting surfaces made of high speed steel.

PROCEDURES:
For composite fabrication of cutting tools: machine or grind surface, allow for approximately 3/16 in. of finished weld metal. Preheat to approximately 400ºF. Apply one pass of Marcoloy #200 to eliminate pickup of impurities from base metal to ensure sound, homogeneous deposit of high speed steel on the second pass.

CHARACTERISTICS:
This rod deposits a tungsten-moly high speed steel that can be used for compositely fabricating tools for a wide range of cutting conditions. Its “as-welded” deposit is exceptionally tough and maybe used for rough, deep cuts. It has good impact-resistant characteristics. Tempered, this weld is ideal for finishing cuts at higher speeds. Will hold its temper and cutting qualities up to 1050°F.

TYPE: **OVERLAY - ARC** (manganese wearfacing)

NSN: 9GJ 3439-00-165-4172 (5/32x 1/4)
9GD 3439-00-165-4187 (3/16X 1/4)

POSITION: All

POLARITY: AC - DC Reverse

RECOMMENDED AMPERAGES:
5/32 -110 to 140
3/16 -150 to 220

USES:
Primary: This electrode is used for buildup and overlay where severe impact and compression will be encountered. This rod is excellent for building up and joining manganese steel, for the restoration of buckets, bucket teeth and lips, and crushers. It can be used for joining steel to manganese, and steel to steel.
Secondary: Can be used for joining cast iron, if cast rod is not available.

PROCEDURES:
Clean and remove remains of previous cracked or brittle hard surfacing deposits. Keep the interpass temperature on manganese steels low (less than 500°F). This can be done by back stepping and skip-welding techniques that prevent localized overheating.

CHARACTERISTICS :
This is a manganese chrome nickel electrode. It can be used to build up worn steel parts, but should be held for manganese steel jobs if the supply is limited.

(NOTE: DO NOT BUILDUP MANGANESE CRUSHER ROLLS OR JAWS WITH A MILD STEEL ROD OR A STEEL BUILDUP ROD UNLESS STAINLESS ROD IS APPLIED FIRST.)

Hardness: As deposited RB 80-90
Work hardened RC 45-50

Tensile Strength: 150,000 psig

TYPE: **BUILDUP - ARC** - Tungsten

NSN: 3439-01-012-1002 (3/64)
3439-00-105-9945 (3/32)
3439-01-032-5978 (1/16)
3439-00-105-9948 (1/4)
3439-01-149-2831 (1/8)

POSITION: All

POLARITY: AC-DC Straight or Reverse

RECOMMENDED AMPERAGES: 135 to 175

USES:
Primary: For repairing or rebuilding high speed tools (without the need to reharden the tools), sprockets, rollers, tractor parts, excavator equipment, etc. Excellent for heavy padding when toughness and resistance to deformation is needed.

(NOTE: DO NOT USE AS A BUILDUP ON MANGANESE STEEL.)

TYPE: **BUILDUP - ARC** (FeMn A-Class 3)

NSN: 9GD 3439-00-752-7818 (3/16X 14)

POSITION: All

POLARITY: AC-DC Straight or Reverse

RECOMMENDED AMPERAGES:
3/16 -135 to 175

USES:
Primary: On ferrous (steel) parts subject to heavy shock loading and pounding. On hammers, sprockets, rollers, tractor parts, excavator equipment, etc. Excellent for heavy padding when high toughness and resistance to deformation is needed.

(NOTE: DO NOT USE AS A BUILDUP ON MANGANESE STEEL.)

Secondary: Can be used to join steel if steel rod is NOT available.

PROCEDURES:
On heavy sections, preheat 200- 300°F. Hold a short to medium arc and use a stringer or weaving technique. Do not allow excessive heat buildup in base metal. On large buildup, deposit succeeding layers across previous layer to minimize peeling.

CHARACTERISTICS: Deposits are machinable.

Hardness: RC30

TYPE: **OVERLAY - ARC** (intermediate wearfacing)

NSN: 9GD 3439-00-165-4182 (5/32X 14)
9GL 3439-00-165-4181 (3/16X 14)

POSITION: Flat, vertical, and horizontal

POLARITY: DC Reverse

RECOMMENDED AMPERAGES:
3/16 -140 to 200

USES:
On hard overlays subject to abrasive wear and medium impact. When overlaying cast iron, first apply two passes of cast iron rod, NSN 9GD 3439-00-165-4188.

PROCEDURES:
Preheat to about 200- 300°F on heavy sections. Use weaving or stringer technique while holding a short to medium arc. Do not allow excessive heat buildup in the base metal.

CHARACTERISTICS:
At least two passes must be used to reduce the effects of dilution.

Hardness: RC50

NOTE: For an electrode with all position characteristics, including overhead position, use MARCOLOY #702.

TYPE: **OVERLAY - ARC** (wearfacing - high abrasion)

NSN: 9GJ 3439-00-165-4178 (1/8X 14)
9GD 3439-00-165-4179 (5/32X 14)
9GD 3439-00-165-4180 (3/16X 14)

POSITION: Flat - horizontal

POLARITY: AC -DC Straight

RECOMMENDED AMPERAGES:
1/8 - 80 to 130
5/32 -100 to 160
3/16 -160 to 240

USES:
For applications that require resistance to high abrasion and erosion. (NOTE: use only where impact is low.)

PROCEDURES:
Use a medium arc with a slight weaving motion. A long arc is recommended when wide, thinner-flowing applications are desired. Do not weld beads longer than 6 inches, and stagger welds to reduce local heat build up. Use 1/8 in. diameter only on grader blades.

CHARACTERISTICS:
Any rate of cooling will give a high hardness.

Hardness: RC60

TYPE: **CHAMFERING or GOUGING- ARC**

NSN: 9GD 3439-00-453-5950 (1/8X 14)

POSITION: All

POLARITY: AC -DC Straight

RECOMMENDED AMPERAGES:
1/8 -250 to 350

USES:
Primary: This electrode can be used for chamfering or gouging all metals. Used for preparing sections prior to welding, gouging out unwanted or defective weld metal.
Secondary: Can be used for cutting or piercing all metals. Use to sear oil-soaked cast iron prior to welding by holding a long arc and rapidly passing over oil-soaked area.

PROCEDURES:
Insert electrode into electrode holder and point electrode, like a lance, in the direction of travel. Hold electrode at an angle not more than 300 with the plane of the work. Strike arc and push chamfering rod along the line of cut, quickly for a shallow groove, more slowly or with a weaving motion, for a deeper groove. If a deeper groove is required, repeat the procedure.

CHARACTERISTICS:
The coating on this rod is heat resistant and the arc's force is concentrated at the point of application.

NOTE: For carbon arc gouging and cutting use Marcolite Aluminum Carbons, 1/4x 12 inches (NSN 3439-01-138-3106, Electrode Carbon Arc Aluminum 1/4 for arc air.

TYPE: **GRAPHITE** (carbon electrodes)

NSN: 9GD 3439-00-262-4228 (3/8X 12)

POLARITY: DC Straight

USES:
Brazing of sheet metal (galvanized). Preheating and post-heating when a torch is not available. Cutting of all metals (when a cutting rod or torch can't be used). Soldering (small work) by shorting carbon electrode next to joint and feeding solder into a prefluxed seam. Use to plug holes prior to welding or brazing or on reverse polarity to deposit carbon to harden base metal.

CHARACTERISTICS:
Slow oxidation of the carbon electrode generates carbon monoxide and carbon dioxide; these gases offer some weld metal protection.

TYPE: **SOLDER** (tin - antimony 95/5)

NSN: 9GD 3439-00-088-8768 (1/8X 1 lb. spool)

USES:
Where moderately elevated temperature is a factor. This solder has a plastic range of 12 degrees; it melts at 452°F and flows at 464°F. It has a higher electrical conductivity than tin-lead solders and can be used where lead is objectionable. Do not use on aluminum, zinc, or zinc-coated metals such as galvanized iron. When stocks are depleted, use the tin-silver solder 96/4 on page 1-40.

PROCEDURES:
Clean and roughen surface as this solder makes a stronger joint on a rough surface than on a polished one. Joint clearances can be from 0.003 in. to a maximum of 0.010 in. An improper fit requires more solder and leaves the joint weaker. The flux to use is NSN 9GD 3439-00-255-4566. Remove flux residue after soldering joint.

TYPE: **SOLDER** (tin - lead 50/50) ASTM 50A

NSN: 9GK 3439-00-163-4347 (BAR)
9GD 3439-00-273-1637 (1/8X 5 lb. spool)

USES:
A general purpose solder recommended when a combination of a relatively narrow pasty range, good wetting properties, strength, and economy are desired. Can be used as a wiping and sweating solder and on radiator cores, electrical connections, heating units and roofing seams.

PROCEDURES:
Clean and roughen surface as this solder makes a stronger joint on rough surfaces than on polished ones. Joint clearances can be from 0.003 in, to a maximum of 0.010 in. An improper fit requires more solder and leaves the joint weaker. The flux to use is NSN 9GD 3439-00-255-4566. Remove flux residue after soldering joint.

Melting Temperature: 361°F

Flow Temperature: 421 ‘F

TYPE: **SOLDER** (tin - lead 40/60) ASTM 40A

NSN: 9GD 3439-00-188-6986 (3/8X 5 lb. spool)

USES:
This acid core, general purpose solder can be used extensively on sheetmetal work. It is cheaper than 50/50 solder and can be used in similar applications. No flux is needed on small work because of its acid core. (NOTE: SEAL END OF WIRE AFTER USING.)

PROCEDURES:
Clean and roughen surface as this solder makes a stronger joint on a rough surface than on a polished one. Joint clearances can be from 0.003 in. to a maximum of 0.010 in. An improper fit requires more solder and leaves the joint weaker. If more flux is needed, use NSN 9GD 3439-00-255-4566. Remove flux residue after soldering.

Melting Temperature: 361°F

Flow Temperature: 455°F

TYPE: **SOLDER** (tin - lead 60/40 rosin core)

NSN: 9GD 3439-00-184-8953 (3/32X 1 lb. spool)

USES:
For soldering instruments, where a “free” solder is needed and temperature requirements are critical. For soldering wiring because it has a narrow pasty range and solidifies quickly. Use this solder on electrical wiring because its core of rosin flux has a relatively low corrosive nature.

PROCEDURES:
Clean and roughen surface because solder makes a stronger joint on a rough surface than on a polished one. Joint clearances can be from 0.003 in. to a maximum of 0.010 in. An improper fit requires more solder and leaves the joint weaker. In electrical work, a closer tolerance gives better conductivity.

Melting Temperature: 361°F

Flow Temperature: 374ºF

Use flux for cleaning (NSN 3439-00-255-9935)

TYPE: **SOLDER** (tin - silver 96/4)

NSN: 9GD 3439-00-968-3370 (1/8X 5 lb. spool)

USES:
For food and beverage containers requiring a cadmium-free and lead-free solder. It retains a bright finish, is a good color match for stainless steel, and is excellent for joining dissimilar metals.. It is stronger and has better electrical conductivity than tin-lead solders and may be used for refrigeration work if tin-antimony 95/5 solder is unavailable.

PROCEDURES:
Clean and roughen surface because solder makes a stronger joint on a rough surface than on a polished one. Joint clearances can be from 0.003 in. to a maximum of 0.010 in. An improper fit requires more solder and leaves the joint weaker. Use flux NSN 9GD 3439-00-018-1655. Remove flux residue after soldering joint.

TYPE: **SOLDER** (tin - lead 60/40 rosin core)

NSN: 9GD 3439-00-184-8953 (3/32X 1 lb. spool)

USES:
For soldering instruments, where a “free” solder is needed and temperature requirements are critical. For soldering wiring because it has a narrow pasty range and solidifies quickly. Use this solder on electrical wiring because its core of rosin flux has a relatively low corrosive nature,

PROCEDURES:
Clean and roughen surface because solder makes a stronger joint on a rough surface than on a polished one. Joint clearances can be from 0.003 in. to a maximum of 0.010 in. An improper fit requires more solder and leaves the joint weaker. In electrical work, a closer tolerance gives better conductivity.

Melting Temperature: 361ºF

Flow Temperature: 374°F

Use flux for cleaning (NSN 3439-00-255-9935)

TYPE: **SOLDER** (tin - silver 96/4)

NSN: 9GD 3439-00-968-3370 (1/8X 5 lb. spool)

USES:
For food and beverage containers requiring a cadmium-free and lead-free solder. It retains a bright finish, is a good color match for stainless steel, and is excellent for joining dissimilar metals.. It is stronger and has better electrical conductivity than tin-lead solders and may be used for refrigeration work if tin-antimony 95/5 solder is unavailable.

PROCEDURES:
Clean and roughen surface because solder makes a stronger joint on a rough surface than on a polished one. Joint clearances can be from 0.003 in. to a maximum of 0.010 in. An improper fit requires more solder and leaves the joint weaker. Use flux NSN 9GD 3439-00-018-1655. Remove flux residue tier soldering joint.

CHARACTERISTICS:
This solder is lead-, antimony-, and cadmium-free and has good corrosion resistance.

Flow Temperature: 430°F

Tensile Strength: 15,000 psig

Shear Strength: 11,200 psig

Electrical Conductivity: 11.05 x 10-6 ohms/cm

NOTE: Soldering Kit, Lead-Free (NSN 9GD 3439-01 -297-3284) consists of 1 pound of corrosion resistant solder, 1/16 in.; a 2 oz. plastic bottle of white paste flux, melting point of 390°F; soft solder for stainless, copper, brass, nickel and bronze alloys; to be used with torch, solder iron or furnace applications.

TYPE: **HOLDING AND HEAT-RESISTING COMPOUND**

NSN: 9GS 3439-01 -2664557(5 lb. can)

USES:
Excellent for holding irregular shapes or parts during welding, brazing, or soldering. Protects threads and flammable materials from flame, arc heat and spatter. For easy removal after soldering wire, first cover the wiring with a sheet of asbestos or aluminum foil. If this compound is unavailable, use a high temperature insulation, fire clay, or carbon paste instead.

PROCEDURES:
Place a small amount under each section and press parts into the holding compound until properly aligned.

CHARACTERISTICS:
Can be used many times over by mixing with a small amount of water. It is easily removed from holes or threads and will not melt, bum, crack, expand, or contract to disturb alignment.

TYPE: **SURFACE-HARDENING (CASE) COMPOUND**

NSN: 9GD 6850-00-139-5936 (10 lb. can)

USES:
For rapid surface-hardening of all types of mild- and low-alloy steel. Will not increase the dimensions of the part. It can surface-harden cams, small tools, shafts, gears and collars, as well as bolt and nut threads to help prevent stripping.

PROCEDURES:
Method No.1: After removing all scale, etc., heat the part to a uniform bright red (1650 -1700°F). Roll, dip, or sprinkle the compound powder onto the part or section to be surface-hardened. The powder will melt and adhere to the surface. Reheat again to 1650- 1700°F and hold at this temperature for a few minutes before quenching in cold, clean water. The part will now have a case hardness of uniform depth.
Method No. 2: When a deeper case hardness for a part is required, place it on a can lid, or a similar tray (bum off tin before using), and cover it completely with surface-hardening compound. Heat it to a bright red color (1650°F) for 5 to 30 minutes, riding on the depth of hardness required. Remove the part with dry tongs and quench it in clean, cold water.

PENETRATION RATES:
After heating apart to 16500F using Method No. 2:

Case Depth	Time in Minutes	Case Depth	Time in Minutes
.005	15	.015	40
.010	30	.020	50-55

Method No. 3: Heat the part to be hardened to a dull red color (1400 - 1600ºF) before covering it with surface-hardening compound. Cover flat sections by applying compound with a knife or spatula. Round sections can be dipped or rolled in compound. Allow the part to seal, let it air for 30 seconds and then reheat it to a dull red color. Keep it at heat for one minute, then immediately quench it in water.

For deeper penetration, apply fresh compound at one minute intervals for several minutes while the part is at red heat, then immediately quench it after the last

TYPE: **SURFACE-HARDENING (CASE) COMPOUND** (Continued)

heating cycle. Hot water will easily remove any residue.

CHARACTERISTICS:
This material is free of poisonous compounds, such as cyanide, but take precautions to avoid breathing its fumes. Do not add fresh powder when it weakens; instead, simply discard and use a new can.

APPLICATION GUIDES AND COMPARATIVE INDEX

This section includes Quick Reference Guides for Welders (Tables 1-1 through 1-5). These application guides reference pages in this manual and cover primary and alternate electrodes to be used when welding the different metals listed. This section also includes a comparative index (Table 1-6) to further aid the welder in identifying comparable welding products. Two or more products in this index maybe listed as being comparable under a National Stock Number (NSN) whereas, in reality, they differ. Remember, specifications merely state minimum requirements. Although two products meet the same specifications, they may have different performance characteristics. Table 1-6 is provided to help the deployed welder identify the right electrode, or the next best one from available welding products, and should not necessarily be construed to mean the products are the same or that they all meet the requirements for a particular National Stock Number (NSN). Space limitations required abbreviation of some product designations - For example: nickel manganese has been listed as Ni Mang.

TABLE 1-1. Cast Iron Application Guide

Application	Primary Electrodes		Alternate Electrodes	
	Arc	Torch	Arc	Torch
General Use	1-20	1-15	1-17	1-1o
Heavy Castings	1-20		1-17	1-1o
Thin Castings	1-17	1-15	1-20	1-1o
Alloy Cast Iron	1-20		1-17	1-1o
Cracks	1-17	1-15	1-20	1-1o
Gears	1-17		1-20	
Cutting, Grooving	1-32			
GTA	1-17		1-20	
Joining to Other Metals	1-22	1-1o	1-17	1-12
Motor Blocks	1-17		1-20	1-15

TABLE 1-1. Cast Iron Application Guide (Continued)

Application	Primary Electrodes		Alternate Electrodes	
	Arc	Torch	Arc	Torch
Overlay-Machinable	I-22	1-1o	1-20	1-12
Pipes	1-20	1-15	1-17	1-1o
Pulleys	1-17	1-15	1-20	1-1o
Valve Seats	1-20	1-15	1-17	
Malleable Iron	1-20	1-1o	1-17	
Ductile Iron	1-20	1-1o	1-17	1-12

TABLE 1-2. Copper, Brass, and Bronze Application Guide

Application	Primary Electrodes		Alternate Electrodes	
	Arc	Torch	Arc	Torch
General Use	1-22	1-16	1-17	1-12
Light Gauge		1-13		
Very Thin Gauge		1-39		1-37
Aluminum Bronze	1-23	1-25		
Bus Bar		1-13		
Beryllium Copper	1-22	1-13		
Casting (Heavy)	1-22	1-1o		1-12
Castings (Light)		1-13		
Cutting, Grooving	1-34		1-35	
Gears	1-22	1-10	1-17	1-12

TABLE 1-2. Copper, Brass, and Bronze Application Guide (Continued)

Application	Primary Electrodes		Alternate Electrodes	
	Arc	Torch	Arc	Torch
Manganese Bronze	1-22	1-10	1-17	1-12
Naval Bronze	1-22	1-10	1-17	1-12
Overlay-Machinable	1-22	1-10		1-12
Phosphor Bronze	1-22	1-10	1-17	1-12
Piping, Flanging	1-22	1-13	1-17	
Plumbing, Heating		1-13		
Sealing		1-39		1-37
Sheet, Brass, Bronze		1-13		1-37
Tubing		1-13		1-37

TABLE 1-3. Aluminum Application Guide

Application	Primary Electrodes			Alternate Electrodes		
	Arc	GMA	Torch	Arc	GMA	Torch
General Use	1-23		1-23		1-24	
Brazing			1-23			
Castings	1-23				1-24	
Castings to Sheet or plate	1-23		1-23		1-24	
Crankcase	1-23		1-23			
Cutting, Grooving	1-34					
Thin Parts			1-23			
Tubing			1-23			
Landing Mats		1-24				

TABLE 1-4. Stainless Steel Application Guide

Application	Primary Electrodes		Alternate Electrodes	
	Arc	Torch	Arc	Torch
General Use	1-28	1-12	1-17	
Brazing, Silver Alloys		1-13		
Piping, Flanging	1-27	1-13	1-17	
Soldering		1-40		1-39
Stainless to Monel	1-17	1-13	1-22	1-12

TABLE 1-5. Steel Application Guide

Application	Primary Electrodes			Alternate Electrodes		
	Arc	GMA	Torch	Arc	GMA	Torch
General Use	1-1	1-7	1-9	1-2		1-12
Alloy Steels, low	1-3	1-7		1-12	1-27	1-10
T-1 Steels	1-5			1-12	1-27	
Well Casings	1-3		1-12	1-5		1-10
Pipe	1-1	1-7	1-9	1-2		1-12
Shafts	1-3		1-12	1-1		1-10
Brazing Applications	1-22		1-12			1-10
Spring Steel	1-27		1-12			1-13
Carbon Steel, (High)	1-27		1-12			
Tool Steel	1-27		1-12			1-13

TABLE 1-5. Steel Application Guide (Continued)

Application	Primary Electrodes			Alternate Electrodes		
	Arc	GMA	Torch	Arc	GMA	Torch
Carbon Steel (Low)	1-1	1-7	1-9	1-2		1-10
Chrome, Moly	1-30-C		1-12			1-10
Cutting, Grooving	1-34					
Gears	1-27		1-12	1-3		1-10
Stainless Cladding	1-27					
Tool Tipping			1-13			
Tungsten	1-30 (a)(b)					
Instrumentation			1-13			
Manganese Steel	1-29			1-27		

TABLE 1-5. Steel Application Guide (Concluded)

Application	Primary Electrodes					
	Arc	GMA	Torch	Arc	GMA	Torch
Overlays:						
Abrasion	1-33			1-32		
Bronze	1-22	1-10		1-17		1-12
Corrosion Resistance	1-27	1-12		1-22		1-10
Machinable	1-31			1-3		
Heat Resistance	1-27			1-20		
Impact Resistance	1-29			1-27		

TYPE: **UNDERWATER CUTTING** (Electrode - Underwater cutting)

NSN: 9GD 3439-01-256-3361 (1/8X 14)

MIL SPEC: MILE- 17764

POSITION: All

POLARITY: AC/DC

RECOMMENDED AMPERAGE: 450

USES:
To cut ferrous or non-ferrous metals, concrete, rock, even the space shuttle's heat shield!

CHARACTERISTICS:
Readily ignited when submerged, this rod will continue to burn - **even without power** - until its oxygen supply is cut off. This advanced cutting rod works in conjunction with any cutting torch or welding machine, but reaches maximum efficiency when used with an oxy-arc cutting torch.

PROCEDURE:
Rod can be bent 900 for hard-to-reach cuts or for cutting around blind corners without restricting the oxygen flow or decreasing its cutting efficiency.

Table 1-6. Welding Rod Comparison Chart

Type of Weld/Cut	AWS/ASTM Class	Welding Process	Alloy Rods	Marco	Hobart	Lincoln	McKay	TechAlloy	Unibraze	Eutectic	Page NO.
Aluminum	ER 5356	GMA	N/A	501.M	5356	N/A	N/A	N/A	N/A	N/A	1-17
	ER 4043	SMAW1	N/A	500	4043	Alumin/weld	N/A	N/A	N/A	N/A	1-16
		OAW/GTA	N/A	1570	N/A	N/A	N/A	N/A	N/A	N/A	1-19
	ER CuAL-A2	SMAW	N/A	400	N/A	N/A	N/A	N/A	N/A	N/A	1-15
		OAW	4lFC	1300FC	N/A	N/A	N/A	N/A	410FC	N/A	1-7
	RBCuZn-D	OAW	11FC	1200	N/A	N/A	N/A	N/A	110FC	N/A	1-9
		OAW	N/A	1900	N/A	N/A	N/A	N/A	N/A	Silver Weld Kit	1-10
Cast Iron	ENi CL-A	SMAW	Nickel Arc 99	301	N/A	Softweld 99 Ni	N/A	N/A	N/A	N/A	1-12
		SMAW	N/A	302	N/A	N/A	N/A	N/A	N/A	N/A	1-13
	EFiFE-C1	SMAW	N/A	300/303	Cast-Tex 55	Softweld 55	N/A	Tech-Rod 55	Harris 55	Xyron-23	1-14
	RCI	OAW	N/A	1301/327	N/A	N/A	N/A	N/A	N/A		1-11
Steel		OAW	N/A	1300FC	N/A	N/A	N/A	MMSO.062	N/A	N/A	1-7
	E–6012	SMAW	SW612	202	12	FW-7	N/A	RACO6012	N/A	N/A	1-2
	E-6011	SMAW	SW14	203/211	335A/335C	FW-35	6011	RACO6011	N/A	N/A	1-1
	E-701B	SMAW	Atom Arc 70 8	201	718/718MC	Jet Weld LH-70	7018-M	RACO7018	N/A	CEC9708	1-3
	E1101 8	SMAW	Atom Arc	210	Haballoy 11018-M	Jetweld LH110	MR 11018-M	RACO 11018-M	N/A	N/A	1-4
	E70, S-3, S-6	SMAW	Spool-Arc 85	201M	HB-25, HB-33	L-50	S-3	RACO-121	N/A		1-5
	E312-16	SMAW	ARCALDY 312ACDC	200	SOUDOCR-OM312-16	N/A	312AC-DC	RACO 312-16	Harris 312-16	EUTEC3026	1-20
Cutting, Chamfer/ Gouging Arc		SMAW	DH-4	800	W/A	N/A	N/A	N/A	Grovrod	Chamfer Trade	1-27
Build-up	l-A-2b	SMAW	31P	W/A	Tufanhard 250	BU-90	Hardalloy 32	N/A	Matrix	Ferro-Rod 2B	1-24
Wearfacing	EFeMn-B	SNAW	Super–WH	701	160	N/A	Chrome Mang	N/A	HS-44	3205	1-22
Buildup		SMAW	51P	702	375/400 600	Abrasoweld	Hardalloy 58	N/A	N/A	Steel tectic 2	1-25
		SMAW	40	700	580	Faceweld	Hardalloy 55	W/A	U/A	5505 6606	1-26