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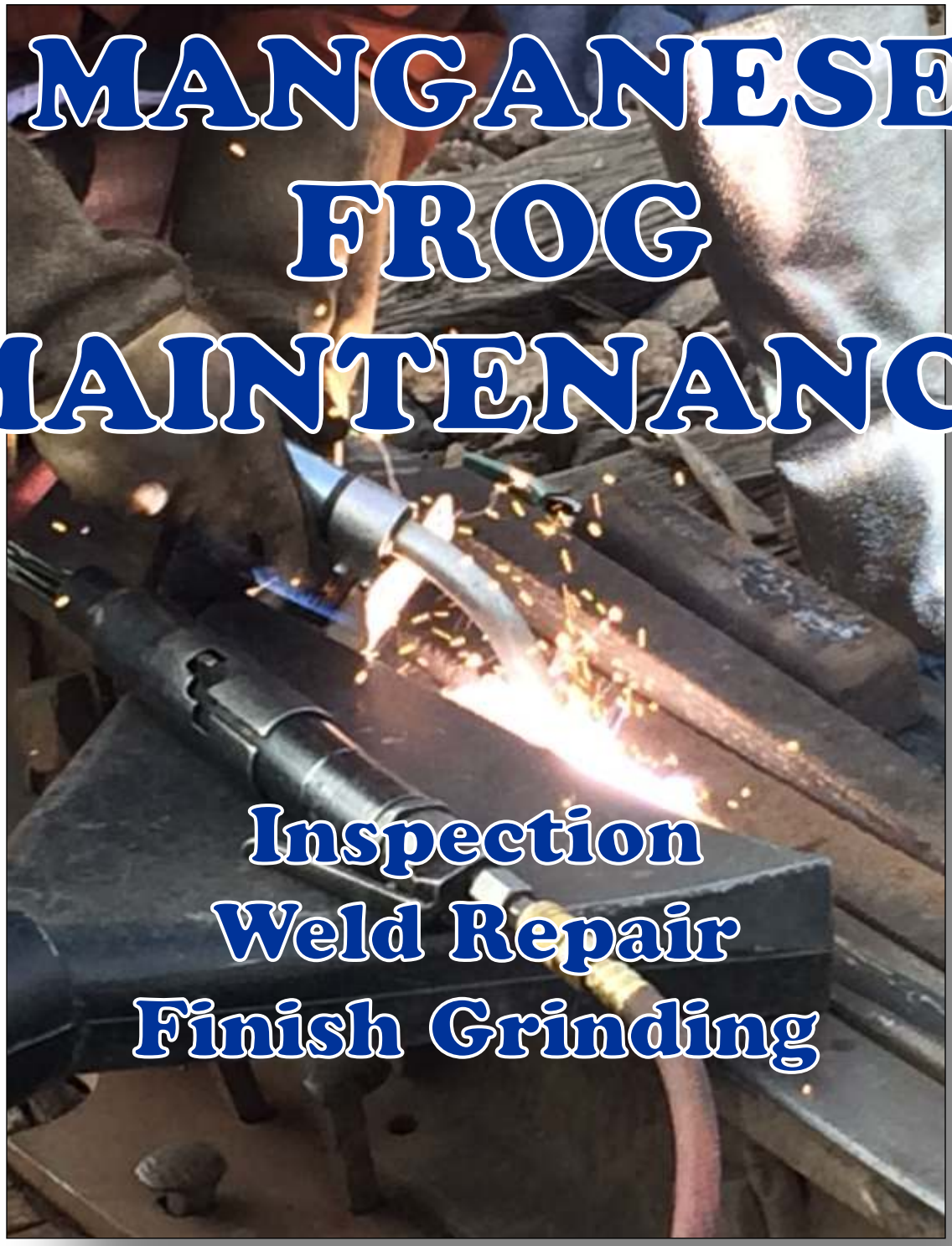
MANGANESE FROG MAINTENANCE



Inspection
Weld Repair
Finish Grinding

HARDFACE TECHNOLOGIES
BY
POSTLE INDUSTRIES
5500 WEST 164TH ST.
CLEVELAND, OH 44142

Frog Maintenance
Inspection, Weld Repair, Finish Grinding

Postle Industries, Inc. • Cleveland, OH 44142 USA • Phone: (216) 265-9000 • Fax: (216) 265-9030 • E-mail: sparky@postle.com

HARDFACE TECHNOLOGIES by POSTLE INDUSTRIES

Recommended Postle Products

Electrodes for Manganese Frogs and Crossings

Postalloy® FrogTuff		
Deposits quickly become tougher and harder under load, and will not spall or mushroom.		
AC or DC Reverse Polarity 10 lb. Box	Tensile Strength Yield Strength Hardness as Deposited Work-hardens to Deposit Thickness	125,000 psi 80,000 psi 15-22 Rc 55 Rc As Required
POSTALLOY® 301		
High strength, ductile, crack resistant stainless alloy designed for crack repair.		
AC or DC Reverse Polarity 10 lb. Box	Tensile Strength	Up to 120,000 psi

Self-Shielded Flux Cored Wire for Manganese Frogs and Crossings

Postalloy® FrogTuff-FCO		
High alloy austenitic manganese steel welding wire that produces high-strengh, crack resistant deposits that are tough, ductile and work-harden rapidly.		
DC Reverse Polarity 25 lb. Spool	Tensile Strength Yield Strength Hardness as Deposited Work-hardens to Deposit Thickness	135,000 psi 90,000 psi 20 Rc 50-55 Rc As Required

Electrodes for Carbon Steel Rail Ends

Postalloy® RailTuff		
A build-up electrode that provides wear resistance far superior to low, medium, and low alloy carbon steels. Deposits are extremely tough and have a high resistance to impact and deformation. Not subject to spalling or roll-over. In addition, deposits are dense, crack-free and porosity-free.		
AC or DC Reverse Polarity 10 lb. Box	Hardness Deposit Thickness	32-38 Rc As Required

Self-Shielded Flux Cored Wire for Carbon Steel Rail Ends

Postalloy® RailTuff-FCO		
Strong, tough, low alloy build-up wire. It can be applied to carbon and low alloy steels. Weld deposits are exceptionally sound and dense, and heavy build-ups are possible without danger of cracking.		
DC Reverse Polarity 25 lb. Spool	Hardness Deposit Thickness	30-35 Rc As Required

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Postle Industries.
Manganese Steel Track Castings

General Information & Tips

The purpose of this data is to supply accurate information about materials and procedures for reclamation (by welding) of manganese steel track castings. This data has aided many railroads in reducing maintenance and operating costs. Keep in mind that each frog or crossing should be considered an individual job with its own peculiar characteristics and problems. However, the general comments and instructions provided apply to all manganese steel track castings.

Sound Manganese steel reclamation factors include:

1. Adherence to proper grinding practice.
2. Preparation of the castings for welding.
3. Proper use of flangeway gauges.
4. Use of Tempilstiks® or pyrometer for heat control.
5. Skip-welding methods used in manganese steel welding.
6. Welding techniques and finish grinding.

Areas of most wear on frog castings are:

1. The nose or point.
2. The wings adjacent to the point.
3. The ends of the frog at rail joint.
4. The guard on solid self-guarded frogs.

Areas of most wear on crossing castings are:

1. Points.
2. Rail joints at ends of casting.

Note: Lack of preventive grinding results in 50% wasted time and effort.

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HARDFACE TECHNOLOGIES by POSTLE INDUSTRIES

Inspection and preparation of manganese steel track castings.

1. Lightly grind, clean and inspect castings for cracks and defects. *"If uncertain or questionable " use dye penetrant to locate cracks*.
2. Arc gouge or grind to remove detected cracks and problem areas. **(Do not use a cutting torch. This can cause overheating and embrittlement of the track).**
3. Arc gouge or grind all damaged or work hardened areas to be welded. This requires between 3/16" (5mm) and 1/4" (6mm) of surface thickness to be removed.
4. Grind and remove all battered surfaces, roll over and sharp corners.
5. Use a flangeway gauge to check flange way openings.
6. Grind and round off the edges along the wing rails. (Sharp edges can cause cracking).
7. Never preheat manganese steel unless below 32°F (0°C). Only heat enough to take the chill out of the casting.
8. For removal of defects and cracks, use Arc Air Gouging whenever possible. It will put less heat into the casting than the use of gouging electrodes.
9. **Be sure its Manganese!!** Non-work hardened Manganese steel is nonmagnetic. NOTE: Manganese Frogs that have been exposed to explosive hardening at the mill will most likely be magnetic. Anywhere plastic deformation or cold flow takes place some magnetism will result.
10. If non-work hardened manganese steel exhibits any magnetic properties, the metal has become brittle. Possibly from improper heat treatment at the steel mill or from temperatures higher than 500°F (260°C) during welding repairs.
11. Make sure no excess heat builds up in the metal while grinding. Allow the grinding wheel to cut without applying excess pressure that can produce unwanted heat.
12. If welding frogs in a weld shop use a heavy duty weld jig to minimize warpage.
13. Weld only when necessary. In some cases grinding of the metal flow along the flangeway of the manganese steel frogs and crossings may be all that's required to bring them back to gauge.
14. Heat transfer/conductivity of Manganese is low (25% of carbon steel) – This is the rate that temperature travels.

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HARDFACE TECHNOLOGIES by POSTLE INDUSTRIES

Welding Repairs
Manganese Steel Track Castings.

1. Use recommended Postalloy Welding Parameters for the Frogtuff FCO wire and Frogtuff electrode as listed on the data sheet or packaging.
2. Strike a weld bead on a scrap piece of metal to adjust parameters.
3. Convex bead shapes are acceptable. Flat and concave beads are unacceptable.
4. With proper parameters you should see a convex bead shape with easy slag removal and very low spatter.
5. Prior to welding, clean the work area by grinding to remove all scale, grease and foreign matter.
6. **Electrodes.** (CC). 2x Diameter of electrode 5/8" (16mm). Maximum bead width – 6" (152mm) to 9" (229mm) bead length - remove slag, wire brush and peen before bead cools. Overlap beads 30-40%. Electrode angle 10° to 30° degree.
7. **Wire Feed.** CV (Recommended) 5/8" (16mm) Maximum Bead Width. 10° – 15° degree torch angle. 1" (25mm) to 1-1/4" (32mm) stick out. 12" (305mm) maximum bead length.
8. N ever make a weld bead wider than 5/8" (16mm) wide or approximately two times the diameter of the rod. (Wider beads require slower travel speed causing higher heat input into the casting). Always use as fast a travel speed as possible.
9. Prevent overheating by making frequent tests with a 500°F (260°C) Tempilstik® or a pyrometer. Test 1" (25mm) from your last bead. Welding can continue in another area that has cooled down.
10. Reverse the direction of the weld beads to reduce and minimize stresses.
11. Skip-weld whenever possible.
12. Weld beads should never be started or stopped at the edge of castings. (This can cause a n undercut creating a stress area). Start near the center and away from the rounded edges. At the end of the weld be sure to back fill the crater before stopping.
13. **Peen all weld beads,** it is essential that weld deposits be peened in severely stressed areas such as cross cracks and areas where deep defects have been removed. Strike 3-4 blows per inch (25mm), with a 32 oz. Ball-peen hammer.
14. Carefully grind to contour and gauge after welding.
15. Slot grind and make final Inspection.

Follow up grinding!!

Depending on traffic patterns you will need to remove all metal flow from areas of repair welding within 7 – 10 days. In heavy traffic areas you may need to grind frogs much sooner.

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Repairing Cracks.

1. **Vertical Crack**: U groove out until crack disappears or to a maximum depth of 1/2" (13mm) below flangeway. Cracks shall be removed as completely as practical by grinding or Arc Air Gouging. Gouging is preferred. **NOTE:** U type grooves reduce the tensile stresses created during the weld repair process
2. Implement good welding practice by removing all potential contaminants from the U groove and area before welding. Remove work hardened area at least 1/4" (6mm), oil, grease, oxides, etc.
3. Groove should be tapered and just wide enough to permit electrode manipulation during welding.
4. If the cracks are shallow and completely removed Postalloy Frogtuff can be used alone to repair the U groove.

5. Use Postalloy 301 to seal cracks that cannot be removed. (Use no more than three passes over crack.) After applying the root pass check for soundness; if crack free, continue to completion using Postalloy Frogtuff.
6. While welding the groove with Postalloy Frogtuff peening is very beneficial in minimizing the possibility of cracking caused by stresses during the cool down period. Peening should take place immediately while the weld metal is still red. Peening after the weld metal cools does little to reduce the tensile stresses. Use a 32 oz. ball-peen hammer with the rounded peen end and a 6" (152mm) to 8" (203mm) drop for each strike. Use 3 to 4 strikes per inch.
7. After each bead, remove slag, peen, wire brush and thoroughly inspect welds and casting for new cracks.

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