

WESTFIELD ELECTROPLATING CO., INC.
PHOSPHATE COATING PROCEDURE PER MIL-DTL-16232G

1. GENERAL:

- 1.1 SCOPE: THIS PROCEDURE COVERS THE APPLICATION OF ZINC AND MANGANESE PHOSPHATE COATING ON FERROUS ALLOYS EXCEPT CORROSION RESISTANT STEELS, MEETING THE REQUIREMENTS OF MIL-DTL-16232G. THIS PROCEDURE ALSO COVERS THE REQUIREMENTS CALLED OUT BY MIL-STD-171E FINISH NO. 5.3.1.2 FOR MANGANESEPHOSPHATE AND FINISH NO. 5.3.2.2. FOR ZINC PHOSPHATE.
- 1.2 A RECORD WILL BE KEPT OF THE HISTORY OF EACH PROCESSING BATH SHOWING ALL ADDITIONS OF CHEMICALS AND RESULTS OF THE ANALYSIS PERFORMED FOR NO LESS THAN ONE YEAR.
- 1.3 RECORDS OF BATH CONTROLS SHALL BE MAINTAINED AND MADE AVAILABLE TO DCAS OR THE COMMAND UPON REQUEST.
- 1.4 ALL PHASES OF THE CLEANING AND COATING SHALL BE PERFORMED BY WESTFIELD ELECTROPLATING COMPANY UNLESS OTHERWISE SPECIFIED IN THE CONTRACT

2. MATERIALS:

2.1 ALKALINE CLEANER:

Sodium Hydroxide	10-35 g/l	
Unikleen ALK-ADD-S	10-50 ml/L	Mfg: Heathbath
Temperature	140-190 F	

2.2 GRAIN REFINER / PHOSPHATE CONDITIONER:

Fixodine M Ultraphos Accelerate	0.75-15 g/l	Mfg: Henkel
pH	8.5-10.1 pH	
Temperature	60-100F	

2.3 ABRASIVE BLAST MEDIA TYPE:

AL OXIDE,	SIZE 60-200 GRIT,	Mfg.: Mosher Company
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2.4 ZINC PHOSPHATING SOLUTION:

ZINC PHOSPHATE: MI PHOS Z-112,		Mfg.: Hubbard Hall
Free Acid	3.4-6.5 ml	
Total Acid	28.0-35.0 ml	
Iron	5 – 6,000 ppm	
Temperature	140-200F	

2.5 MANGANESE PHOSPHATING SOLUTION:

ULTRAPHOS 1000		Mfg.: Heathbath
Free Acid (by pH)	2.15-2.80 ml (KEEP LOW FOR HARD PARTS)	
Total Acid	9.0-15.0 ml	
Iron	0.01-0.35 ml	
Temperature	150-200F	

2.6 FINAL RINSE:

Chromic Acid	0.30-0.35 g/L-2.0- 4.0 pH	Mfg.: Hubbard Hall
Note:	0.30-0.35 g/L = 300-350 grams / 1000 Liters	
Ratio Total: Free	0.0-7.0 :1	
Temperature	150-200F	

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- 2.7 SUPPLEMENTAL COATING MATERIAL:
TECTYL 802A (MIL-PRF-3150) Mfg.: Daubert Chemical
- 2.8 SUPPLEMENTAL COATING MATERIAL : (WHEN SPECIFIED ONLY)
TECTYL 894 (MIL-PRF-16173E CL 1 GR 3) Mfg: Daubert Chemical
- 2.9 CLASS 4 SEALING MATERIAL: (WHEN SPECIFIED ONLY)
Endurion B43-2 60-70 g/l Mfg: Jacksonela
Temperature 160-212F
- 2.10 EQUIPMENT CONSISTS OF ELEVEN STAINLESS STEEL TANKS, 72" X 48" X 48" EACH,
ASSEMBLED IN A STRAIGHT HOISTED PROCESSING LINE.
3. **PROCESSING:**
- 3.1 **INSPECTION AND PREPROCESSING:**
- 3.1.1 INSPECT INCOMING PARTS FOR HARDNESS (Rc) AND ALLOY TYPE IN ADDITION TO
INSPECTION FOR DEFECTS AND DAMAGE. DIMENSIONS AND SURFACE FINISH APPLY
BEFORE PHOSPHATING UNLESS OTHERWISE SPECIFIED. PHOSPHATING WILL BE APPLIED
AFTER ALL MACHINING, WELDING, FORMING, HEAT TREATMENT, ETC. HAVE BEEN
COMPLETED.
- 3.1.2 UNLESS OTHERWISE SPECIFIED, PARTS HAVING A MINIMUM HARDNESS OF Rc 39 OR HAVE
BEEN COLD STRAIGHTENED, COLD WORKED OR GROUND AFTER TEMPERING THEY
SHALL BE STRESS RELIEVED IN ACCORDANCE WITH PARAGRAPH 3.3, i.e. 1 HOUR AT 350-
400F FOR EVERY INCH OF THICKNESS, BUT NOT LESS THEN 1/2 HOUR FOR ANY MATERIAL
THICKNESS LESS THAN ONE 1/2 INCH. CARBURIZED PARTS SHALL BE STRESS RELIEVED
AT 225-275o F FOR 8 HOURS IN LIEU OF THE HIGHER TEMPERATURE
- 3.2 **CLEANING:**
- 3.2.1 **ABRASIVE BLASTING:**
- 3.2.1.1 DEGREASE USING THE ALKALINE CLEANER IDENTIFIED IN SECTION 2 TO REMOVE ALL
TRACES OF OIL BEFORE BLASTING. IMMERSE PARTS FOR 5-15 MINUTES FOLLOWED BY A
THOROUGH RINSING THEN DRY.
- 3.2.1.2 MASK OR PLUG APPROPRIATE AREAS IF REQUIRED.
- 3.2.1.3 UNLESS OTHER WISE SPECIFIED ABRASIVE BLAST USING MATERIAL IDENTIFIED IN
SECTION 2. REMOVE ABRASIVE RESIDUES WITH A BLAST OF CLEAN, DRY AIR. INSPECT
FOR UNIFORMITY OF THE BLAST. IF THE BLAST IS NOT UNIFORM RE-BLAST THE PART TO
OBTAIN A UNIFORM FINISH. PARTS WILL BE PHOSPHATE COATED AFTER BLASTING
WITHOUT ANY INTERVENING PROCESSES.
- 3.2.2 **CLEANING OF PARTS WHEN ABRASIVE BLASTING SHALL NOT BE USED BY THE
REQUIREMENTS SPECIFIED ON THE DRAWING OR IN THE CONTRACT. THIS
CLEANING IS IN ACCORDANCE WITH TT-C-490 METHOD III:**
- 3.2.2.1 DEGREASE USING THE ALKALINE CLEANER IDENTIFIED IN SECTION 2 TO REMOVE ALL
TRACES OF OIL BEFORE MASKING IF REQUIRED. IMMERSE PARTS FOR 5-15 MINUTES
FOLLOWED BY A THOROUGH RINSING THEN DRY.
- 3.2.2.2 MASK OR PLUG APPROPRIATE AREAS IF REQUIRED.

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- 3.2.2.3 ALKALINE CLEAN FOR 5-15 MINUTES IN THE ALKALINE CLEANER SPECIFIED IN SECTION 2.
- 3.2.2.4 COLD WATER RINSE AS REQUIRED.
- 3.2.2.5 IMMERSER IN THE GRAIN REFINER IDENTIFIED IN SECTION 2, PRIOR TO MANGANESE PHOSPHATING, FOR 30-90 SECONDS.
- 3.3 **PHOSPHATING:**
- 3.3.2 PHOSPHATE COAT IN THE SOLUTION IDENTIFIED IN SECTION 2 WITH AN IMMERSION TIME AS FOLLOWS:
- 3.3.2.1 ZINC PHOSPHATE:
IMMERSION TIME 10-30 MINUTES
- 3.3.2.2 MANGANESE PHOSPHATE
IMMERSION TIME 20-30 MINUTES
- 3.3.3 EQUIPMENT SHALL BE CONSTRUCTED OF MATERIALS RESISTANT TO THE ACTION OF THE PHOSPHATING SOLUTION AND SHALL BE FREE OF COPPER ALLOY FITTINGS AND BRAZING MATERIALS. FOG SPRAYS ARE PROVIDED AND USED AS NECESSARY TO PREVENT THE PHOSPHATING SOLUTION FROM DRYING ON PARTS PRIOR TO WATER RINSING.
- 3.3.4 RINSE IN CLEAR COLD RUNNING WATER FOR ONE TO FIVE MINUTE. WATER FLOW WILL BE REGULATED TO PREVENT CONTAMINATION, i.e., 3.0 ML OF 0.1 N NaOH PER 100 ML SAMPLE OF RINSE WATER.
- 3.3.5 A CHROMIC ACID RINSE WILL BE APPLIED AT 150-200F ON ALL PARTS EXCEPT WHEN CLASS IV COATINGS ARE SPECIFIED. THE PARTS WILL REMAIN IN THE RINSE FOR A MINIMUM OF ONE MINUTE THEN REMOVED. A BLAST OF DRY AIR MAY BE USED TO FACILITATE DRYING.
- 3.4 **POST PROCESSING:**
- 3.4.1 PARTS Rc 39 OR HARDER SHALL BE STORED AT ROOM TEMPERATURE FOR 120 HOURS AFTER SUPPLEMENTARY TREATMENT OR BAKED AT 210-225F FOR EIGHT HOURS PRIOR TO SUPPLEMENTARY TREATMENT WHEN SPECIFIED BY THE PURCHASER.
- 3.4.2 PARTS OR SECTIONS OF PARTS REQUIRED FOR TESTING OR EXAMINATION WILL BE REMOVED AT THIS TIME. SEE APPLICABLE TESTING PROCEDURES.
4. **TESTING:**
- 4.1 WORKMANSHIP PER PARAGRAPH 3.10 OF MIL-DTL-16232 ON ALL PRODUCTION.

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- 4.2 PHOSPHATE SOLUTION CONTROL SHALL BE CONDUCTED AT THE START OF PRODUCTION AND EVERY FOUR HOURS THEREAFTER TO MAINTAIN THE SOLUTIONS IN THE RANGES SPECIFIED IN SECTION 2. THE TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH MANUFACTURES SUGGESTED PRACTICES AND OUR LABORATORY PROCEDURES MANUAL.
- 4.3 THE CHROMIC ACID RINSE SHALL BE TESTED BEFORE THE START OF PRODUCTION AND EVERY 8 HOURS THEREAFTER FOR pH, TOTAL AND FREE ACID. THE SOLUTION SHALL BE ADJUSTED WITH CHROMIC ACID TO MAINTAIN THE RANGE SPECIFIED IN SECTION 2. WHEN THE TOTAL ACID REACHES 7 TIMES THE LEVEL OF THE FREE ACID THE SOLUTION SHALL BE DISCARDED.
- 4.4 SALT SPRAY TESTS WILL BE PERFORMED PER LOT AT LEAST EVERY 8 HOURS OF PRODUCTION PER ASTM-B117 WITH THE FOLLOWING PARAMETERS.
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|---------------------|--|
| TEMPERATURE: | 33.9-36.7C |
| SALT CONCENTRATION: | 4-6% AT A pH OF 6.5-7.2 |
| COLLECTION RATE: | 1-2 ML/HR/80 SQ. CM. AT 10-25 PSI OF AIR PRESSURE. |
- 4.4.1 PRIOR TO THE APPLICATION OF SUPPLEMENTARY TREATMENTS, PARTS SHALL SHOW NO SIGNS OF CORROSION VISIBLE TO THE UNAIDED EYE AFTER EXPOSURE TIMES OF 1.5 HOURS FOR MANGANESE AND 2.0 HOURS FOR ZINC PHOSPHATE COATINGS.
- 4.5 COATING WEIGHT TESTS WILL BE PERFORMED PER LOT AT LEAST EVERY 8 HOURS OF PRODUCTION PER PARAGRAPH 4.7.3.1 OF MIL-DTL-16232. THE MINIMUM COATING WEIGHT SHALL BE PRIOR TO APPLICATION OF SUPPLEMENTAL TREATMENT:
- | | |
|--------------------------|-----------------------|
| FOR ZINC PHOSPHATE: | 11 GRAMS/SQUARE METER |
| FOR MANGANESE PHOSPHATE: | 16 GRAMS/SQUARE METER |
- 4.6 ADEQUACY OF THE HYDROGEN EMBRITTLEMENT RELIEF TREATMENT FOR PARTS 39 Rc OR ABOVE WILL BE DEMONSTRATED ON THE FIRST LOT COATED IN EACH NEW BATH AND ON A 90 DAY INTERVAL BY TESTING PER PARAGRAPH 4.7.2 OF MIL-DTL-16232 USING NOTCH TENSILE SPECIMENS PER ASTM-F519, TYPE 1A OF 4340 ALLOY STEEL THRU HARDENED TO ROCKWELL C 51-54. FOUR SPECIMENS SHALL BE SUBJECTED TO THE PHOSPHATE COATING PROCEDURE AND GIVEN THE EMBRITTLEMENT RELIEF TREATMENT. THE SPECIMENS SHALL BE SUBJECTED TO A LOAD OF 75 PERCENT OF THE ULTIMATE NOTCHED TENSILE STRENGTH FOR 200 HOURS. LOADING OF THE SPECIMENS SHALL BE ACCOMPLISHED WITHIN ONE HOUR AFTER COMPLETION OF THE EMBRITTLEMENT RELIEF TREATMENT. SPECIMENS SHALL BE FREE OF CRACKS AFTER TESTING WHEN EXAMINED AT LOW MAGNIFICATION AND AN ILLUMINATION OF 1100 LUX. THE TEST FREQUENCY MAY BE SHORTENED TO A PER LOT BASIS IF REQUESTED BY P.O. THE ULTIMATE TENSILE STRENGTH SHALL BE DETERMINED BY PULLING 3 UNCOATED NOTCHED BARS.
- 4.7 PARTS REQUIRING A SPECIFIC SUPPLEMENTARY COATING WEIGHT WILL BE TESTED ACCORDINGLY.

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5. **SUPPLEMENTARY TREATMENT:**
- 5.1 SUPPLEMENTARY OIL WILL BE APPLIED AFTER COMPLETION OF THE PHOSPHATE PROCEDURE. PARTS WILL BE CENTRIFUGED OR PERMITTED TO DRAIN TO REMOVE EXCESS OIL. CLASS 3 COATINGS DO NOT REQUIRE SUPPLEMENTARY OIL TREATMENT.
- 6.0 **DEFINITIONS:**
- 6.1 LOT: MEANS ALL PHOSPHATED ITEMS TREATED DURING ONE SHIFT (8 HOURS)

SUBMITTED BY:

WESTFIELD ELECTROPLATING COMPANY
68 N ELM STREET
WESTFIELD, MA 01085-298

APPROVED BY :



KEVEN W. KUDELKA

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Revision History:

APPROVED FEBRUARY 20, 1992
 AMENDED FEBRUARY 18, 1993
 AMENDED DECEMBER 14, 1993
 AMENDED JUNE 10, 1994
 REVISION "A" MARCH 13, 1995
 REVISION "B" APRIL 24, 1995
 REVISION "C" JUNE 12, 1995
 REVISION "D" OCTOBER 19, 1995
 REVISION "E" DECEMBER 14, 1995
 REVISION "F" FEBRUARY 7, 1996
 REVISION "G" JANUARY 27, 1997
 REVISION "H" FEBRUARY 6, 1997
 REVISION "I" MARCH 31, 1997
 REVISION "J" JULY 27, 1998
 REVISION "K" SEPTEMBER 23, 1999
 REVISION "L" FEBRUARY 7, 2000
 REVISION "M" APRIL 20, 2000
 REVISION "N" MAY 15, 2000
 REVISION "O" JULY 11, 2000
 REVISION "P" OCTOBER 8, 2001
 REVISION "Q" OCTOBER 12, 2001
 REVISION "R" DECEMBER 13, 2001
 REVISION "S" FEBRUARY 5, 2002
 REVISION "T" AUGUST 22, 2002
 REVISION "U" NOVEMBER 18, 2002
 REVISION "V" DECEMBER 3, 2002
 REVISION "W" APRIL 29, 2003
 REVISION "X" NOVEMBER 24, 2003
 REVISION "Y" MARCH 15, 2004
 REVISION "Z" AUGUST 2, 2006
 REVISION "AA" MARCH 5, 2007

Changed temperature in section 2.5 from 150F-190F to 150F-200F.

Reason: Typo in revision Z when solution data was updated.

REVISION "AB" May 23, 2007

Changed: added class 4 sealing chemistry and process instructions to procedure

REVISION "AC" Dec 11, 2008

Added "PRIOR TO APPLICATION OF SUPPLEMENTAL TREATMENT" to 4.5

Added "COATING WEIGHT SAMPLES SHALL BE PARTS OR CUT FROM SCRAP PARTS OR TEST PANELS MADE FROM THE SAME ALLOY, HEAT TREATED IN THE SAME MANNER, SURFACED FINISHED BY THE SAME PROCESS AS THE PARTS THEY REPRESENT AND HAVE A SURFACE AREA OF 10-100 SQUARE CENTIMETERS THAT ARE DISTRIBUTED RANDOMLY AND PROCESSED CONCURRENTLY WITH THE ITEMS THEY REPRESENT AND USED ONCE AND DISCARDED" As 4.5.1

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REVISION "AD" Dec 13, 2008

3.4.1 Was:

PARTS Rc 39 OR HARDER SHALL BE STORED AT ROOM TEMPERATURE FOR 120 HOURS OR BAKED AT 220+/-5F FOR EIGHT HOURS TO RELIEVE ANY EMBRITTLEMENT DUE TO HYDROGEN UPTAKE AND THEN WILL BE GIVEN THE SPECIFIED SUPPLEMENTARY TREATMENT WHEN SPECIFIED BY THE CUSTOMER.

Changed to:

PARTS Rc 39 OR HARDER SHALL BE STORED AT ROOM TEMPERATURE FOR 120 HOURS AFTER SUPPLEMENTARY TREATMENT OR BAKED AT 210-225F FOR EIGHT HOURS PRIOR TO SUPPLEMENTARY TREATMENT WHEN SPECIFIED BY THE PURCHASER

4.3 Was:

THE CHROMIC ACID RINSE SHALL BE TESTED BEFORE THE START OF PRODUCTION AND EVERY 8 HOURS THEREAFTER FOR pH, TOTAL AND FREE ACID. THE SOLUTION SHALL BE ADJUSTED TO MAINTAIN THE RANGE SPECIFIED IN SECTION 2. WHEN THE TOTAL ACID REACHES 7 TIMES THE LEVEL OF THE FREE ACID THE SOLUTION SHALL BE DISCARDED.

Changed to:

THE CHROMIC ACID RINSE SHALL BE TESTED BEFORE THE START OF PRODUCTION AND EVERY 8 HOURS THEREAFTER FOR pH, TOTAL AND FREE ACID. THE SOLUTION SHALL BE ADJUSTED WITH CHROMIC ACID TO MAINTAIN THE RANGE SPECIFIED IN SECTION 2. WHEN THE TOTAL ACID REACHES 7 TIMES THE LEVEL OF THE FREE ACID THE SOLUTION SHALL BE DISCARDED.

Added:

3.3.7 AFTER ALL PROCESSING AND RINSING THOROUGHLY DRY PRIOR TO EMBRITTLEMENT BAKE OR SUPPLEMENTAL TREATMENT

Deleted from 4.4

TEST SPECIMENS: PARTS OR CUT FROM SCRAP

Added:

4.4.2 SALT SPRAY SAMPLES SHALL BE CUT FROM SCRAP. TEST SPECIMENS TO HAVE EXTERNAL SURFACE AREA BETWEEN 10 TO 100 SQUARE CENTIMETERS. TEST SPECIMENS TO BE DISTRIBUTED RANDOMLY AND PROCESSED CONCURRENTLY WITH ITEMS. TEST SPECIMENS TO BE USED ONCE AND THEN DISCARDED.

4.5.1 Was:

COATING WEIGHT SAMPLES SHALL BE PARTS OR CUT FROM SCRAP PARTS OR TEST PANELS MADE FROM THE SAME ALLOY, HEAT TREATED IN THE SAME MANNER, SURFACED FINISHED BY THE SAME PROCESS AS THE PARTS THEY REPRESENT AND HAVE A SURFACE AREA OF 10-100 SQUARE CENTIMETERS THAT ARE DISTRIBUTED RANDOMLY AND PROCESSED CONCURRENTLY WITH THE ITEMS THEY REPRESENT AND USED ONCE AND DISCARDED.

Added:

6.0 **DEFINITIONS**

Added:

6.1 LOT: MEANS ALL PHOSPHATED ITEMS TREATED DURING ONE SHIFT (8 HOURS)

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Revision "AE" December 16, 2008

2.6 Was:

FINAL RINSE:
Chromic Acid 0.2-0.4 G/L-2.0- 4.0 pH Mfg.: Hubbard Hall
Ratio Total: Free 0.0-7.0 :1
Temperature 150-200F

Changed to:

FINAL RINSE:
Chromic Acid 0.2-0.4 G/L-2.0- 4.0 pH Mfg.: Hubbard Hall
 Note: 0.30-0.35 g/L = 300-350 grams / 1000 Liters
Ratio Total: Free 0.0-7.0 :1
Temperature 150-200F

Added:

1.4 ALL PHASES OF THE CLEANING AND COATING SHALL BE PERFORMED BY WESTFIELD ELECTROPLATING COMPANY UNLESS OTHERWISE SPECIFIED IN THE CONTRACT

Revision "AF" January 30, 2009

2.4 Was:

Iron 0.6 ml max

Changed to:

Iron 5 – 6,000 ppm

2.5 Was:

Chromic Acid 0.2-0.4 g/L-2.0- 4.0 pH Mfg.: Hubbard Hall
 Note: 0.20-0.4 g/L = 200-4000 grams / 1000 Liters

Changed to:

Chromic Acid 0.25-0.35 g/L-2.0- 4.0 pH Mfg.: Hubbard Hall
 Note: 0.25-0.35 g/L = 250 - 350 grams / 1000 Liters

Revision "AG" September 25, 2009

2.6 Was:

Chromic Acid 0.25-0.35 g/L-2.0- 4.0 pH Mfg.: Hubbard Hall
 Note: 0.25-0.35 g/L = 250-350 grams / 1000 Liters
Ratio Total: Free 0.0-7.0 :1
Temperature 150-200F

Changed to:

Chromic Acid 0.30-0.35 g/L-2.0- 4.0 pH Mfg.: Hubbard Hall
 Note: 0.30-0.35 g/L = 300-350 grams / 1000 Liters
Ratio Total: Free 0.0-7.0 :1
Temperature 150-200F

Revision "AH" February 4, 2010

Added:

2.10 EQUIPMENT CONSISTS OF ELEVEN STAINLESS STEEL TANKS, 72" X 48" X 48" EACH, ASSEMBLED IN A STRAIGHT HOISTED PROCESSING LINE.

THIS PROCESS DOES NOT USE ANY CLASS 1 OZONE-DEPLETING SUBSTANCES