Minnesota Metal Finishing, Inc.

909 Winter Street Northeast•Minneapolis, MN•55413•Ph:612-623-0084•Fax:612-623-1164

Quotation is subject to re-evaluation in 90 days

Part Number: Description:
Process:
Quantity:
Comments: Minimum Billing

Thank You
Jack Logan

Minnesota Metal Finishing, Inc.

909 Winter Street Northeast
Minneapolis, MN 55413
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Zero Defects Operation Guide

Reissue Date: March 25, 2016

Zero Defects Guide – Minnesota Metal Finishing, Inc.
2016 Contents

1.0 SCOPE This document defines the function, responsibility and authority of each group within Minnesota Metal Finishing, Inc. (the company) to obtain the goal of compliance to customer requirements.

1.1 INTENDED USE The intended use of this document is an internal guide to production operations for the company. This document is available to customers, upon request, as a written quality policy of the company.

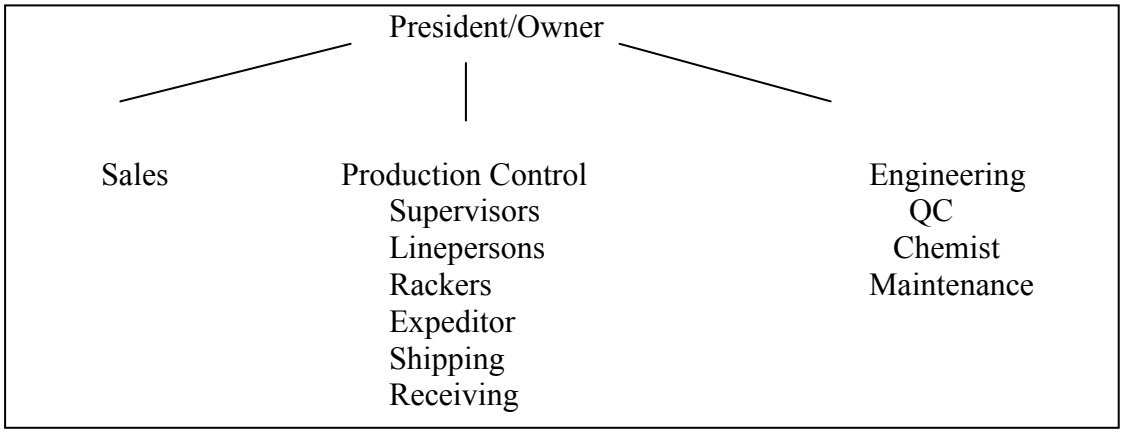
2.0 REFERENCE DOCUMENTS The following documents, of latest issue, form a part of this document to the extent stated herein.

None.

2.1 ORDER OF PRECEDENCE In case of conflict between requirements of this document and others specified, the following order of precedence shall apply:

1. Customer Purchase Order
2. Customer Drawings and Specifications
3. This document

2.2 ORGANIZATION The following reporting structure shall apply at the company:



3.0 PRODUCTION REQUIREMENTS In order to comply with customers' requirements a procedure is set forth to obtain quality production.

3.1 INITIAL JOB QUOTATIONS All price quotation shall be entered into the computer and communicated to the customer either orally or fax transmission. The following information shall be obtained at the time of the quotation:

1. Requested finish type and/or class
2. Material designation
3. Part size
4. Part configuration
5. Part number
6. Quantity
7. Copy of part drawing
8. Packaging requirements
9. Required delivery time
10. Any special requirements

11. Name of contact person

3.1.2 DRAWING AND CHANGES CONTROL All drawings are kept in the respective company's file. However, in the case of a change or drawing update the new drawing is added to the file while the old drawing is sent back to the customer. In the event of a process change to the part, the process is changed in the file as well as in the computer system and job card.

3.2 RECEIVING Incoming parts for processing shall be inspected at random for obvious surface defects or any damage that may have occurred in transit. The customer will be notified immediately if a problem is identified. (See Warranty Section, paragraph 6.0)

3.2.1 COUNT AND WEIGHT Parts shall be counted or weighed by the receiving personnel to ensure that the quantity on the customers P.O. matches the quantity actually delivered. Any variance shall be reported to the customer and noted on the P.O.

3.2.2 PROCESSING INSTRUCTIONS A job card shall be printed to specify process requirements of each different part. A copy of the card shall stay with the parts at all times. After each process cycle is complete, the job card shall be initialed by the operator before moving to the next station.

3.2.3 SPECIFICATIONS A master file of government, industry, customer, and company material and process specifications shall be maintained for reference purposes.

3.3 PROCESSING Movement of parts through each process step shall be noted on the job card. All personnel shall be responsible for handling parts in a manner that will not cause rejects, rework, or damage of any kind. Carelessness with customer parts is cause for immediate dismissal.

3.3.1 RACKING Parts shall be racked while adhering to the following requirements: good drainage, no entrapment of air, uniform current distribution, no loss of electrical contact, and the customer's requirements for rack mark location. Shift supervisors will be responsible for ensuring good racking practices.

3.3.2 LINE PROCEDURES Standard line operation procedure will be made available to line operators to help ensure repeatability of finish results. Deviations from standard procedure are allowed to meet customer requirements. (See Warranty Section, paragraph 6.0). Deviations will be noted on the daily run log. The line person also has the authority to modify line procedures as needed to meet end requirements. These changes shall be documented.

3.3.2.1 Zinc plating procedure (QQ-Z-325 or ASTM B633) – All classes: Clear, Yellow and Black Chromate types. The following outline includes the steps required to zinc plate steel parts:

1. Soak clean for 5 – 10 minutes depending on degree of oil on parts.
2. Electro-clean in the reverse current alkaline cleaner for 30 seconds to 2 minutes. A "break free" surface must be obtained.
3. Rinse, dwell time shall be 10 – 20 seconds.
4. Rinse as in step 3, air agitation shall be on.

5. Remove oxides in HCL pickle, dwell time shall be 15 seconds to 20 minutes depending on type of steel and degree of oxidation.
6. Rinse, as in step 3.
7. Rinse in 10% Caustic per-dip for 10 – 20 seconds.
8. Plate, current density shall be 35 ASF at 4 – 7 volts. Amps per part shall be determined and specified on the job card. Plating time shall be 15 minutes for 0.2 ml average thickness.
9. Rinse, as in step 3.
10. Rinse, as in step 3.
11. Rinse, as in step 4.
12. Neutralize in nitric acid dip, dwell time shall be 10 seconds at 0.5%v/v.
13. Rinse, as in step 4.
14. Apply chromate specified on job card:
    a. Clear chromate, dwell time shall be 25 seconds
    b. Yellow chromate, dwell time shall be 30 seconds
    c. Black chromate, dwell time shall be 90 seconds
15. Rinse, as in step 3.
16. Rinse, as in step 4.
17. Hot DI rinse with air agitation for clear chromate parts only. Black chromate parts shall be blown dry after rinse in step 16.
18. Put parts in the fan forced hot air drier box. Accelerated drying with compressed air. Blow off the remaining water if necessary.

3.3.2.2 Passivation of Stainless Steel (Fed. Spec. QQ – P – 35) 300 series only. The following is intended to be an outline of the steps required to passivate stainless steel parts at MMF.

1. Clean, dwell 5 – 10 minutes.
2. Electro-clean, dwell 2 – 8 minutes.
3. Rinse, dwell 10 – 15 seconds with air agitation.
4. Rinse, as in step 3.
5. Nitric, dwell 30 minutes – 1 hour (as job card dictates).
6. Rinse, as in step 3.
7. Yellow chromate, dwell 1 minute.
8. Rinse, as in step 3.
9. Hot DI rinse, dwell 10 –15 seconds.
10. Place parts in the fan forced hot air drier box or accelerate drying with compressed air blow off.

3.3.2.3 Anodizing Procedure (Mil – A – 8625) Type II anodize, Type III hardcoat and variations of the both. The following is intended to be an outline of the steps required to anodize various alloys.

A. TYPE II ANODIZE – Clear and Color
    1. Clean, dwell time is 5 – 15 minutes.
    2. Rinse, dwell for 10 – 20 seconds with air.
    3. Etch, dwell time is:
        a. 1 minute – light etch.
        b. 5 minutes – medium etch.
        c. 10 minutes – heavy etch.
    4. Rinse, as in step 2.

5. Rinse, as in step 2.
6. Deox, dwell time with air agitation is 1 – 3 minutes.
7. Rinse, as in step 2.
8. Anodize for 39 minutes at 15 ASF.
9. Rinse, as in step 2.
10. Nitric, dwell 5 – 10 minutes.
11. Rinse, as in step 2.
12. Dyes, dwell time is 7 – 20 minutes.
13. Rinse, as in step 2.
14. Rinse, as in step 3.
15. Seal, dwell 5 – 10 minutes per mil thickness.
16. Rinse, as in step 2.
17. Post – Seal rinse in hot DI water, dwell 10 – 20 minutes.

B. TYPE III (Hardcoat) Natural and Color
1. Clean, dwell time 5 – 15 minutes.
2. Rinse, dwell 10 –20 seconds with air agitation.
3. Etch, dwell 30 seconds.
4. Rinse, as in step 2.
5. Rinse, as in step 2.
6. Deox, dwell time with air agitation for 30 seconds – 3 minutes.
7. Rinse, as in step 2.
8. Hardcoat for 50 minutes at 17 ASF
9. Rinse, as in step 2.
10. Rinse, as in step 2.
11. Nitric
    a. Dwell 5 minutes for natural hardcoat.
    b. Dwell 10 – 15 minutes for colors besides black.
    c. Dwell 15 – 20 minute for black hardcoat.
12. Unless noted on job card, do not seal.
13. Hot DI rinse, dwell time 10 – 15 seconds.

C. ALUMINUM CASTINGS TYPE II CLEAR AND COLOR ANODIZE
1. Clean, dwell 5 – 15 minutes.
2. Rinse, dwell 10 – 20 seconds with air agitation.
3. Anodize for 25 minutes at 15 ASF.
4. Rinse, as in step 2.
5. Rinse, as in step 2.
6. Hot DI seal, dwell 2 – 5 minutes.

D. ALUMINUM CASTINGS TYPE III (HARDCOAT) CLEAR AND COLOR.
1. Clean, dwell 15 minutes.
2. Rinse, dwell 10 – 20 seconds with air agitation.
3. Rinse, as in step 2.
4. Hardcoat for 35 minutes at 17 ASF.
5. Rinse, as in step 2.
6. Rinse, as in step 2.
7. Nitric, dwell 5 – 10 minutes.
8. Rinse, as in step 2.
9. Hot DI seal, dwell 10 – 20 seconds.

E. TYPE II ANODIZE CLEAR WITH DICHROMATE SEAL

1. Clean, dwell 5 –15 minutes.
2. Rinse, dwell 10 – 20 seconds with air agitation.
3. Etch
   a. Light etch, dwell 1 minutes.
   b. Medium etch, dwell 5 minutes.
   c. Heavy etch, dwell 10 minutes.
4. Rinse, as in step 2.
5. Rinse, as in step 2.
6. Deox, dwell time with air agitation for 30 seconds – 3 minutes.
7. Rinse, as in step 2.
8. Anodize for 39 minutes at 15 ASF.
9. Rinse, as in step 2.
10. Rinse, as in step 2.
11. Rinse, as in step 2.
12. Dichromate seal, dwell for 15 – 20 minutes.
13. Rinse, as in step 2.
14. Hot DI seal, dwell 10 – 20 seconds.

3.3.2.4 Iriditing Procedure – Chromate conversion Coat (MIL – C – 5541) Two classes: Clear and Yellow. The following is intended to be an outline of the required steps to chromate aluminum parts at MMF.

A. IRIDITE 1744 CLEAR AND YELLOW

1. Clean, dwell 5 –15 minutes.
2. Rinse, dwell 10 – 15 seconds with air agitation.
3. Etch, dwell 30 seconds.
4. Rinse, as in step 2.
5. Rinse, as in step 2.
6. Deox, dwell time with air agitation for 30 seconds – 3 minutes.
7. Rinse, as in step 2.
8. Iridite 1744, dwell 5 seconds – 5 minutes depending on specifications.
9. Rinse, as in step 2.

B. ALUMINUM CASTINGS IRIDITE 1744

1. Clean, dwell 15 minutes.
2. Rinse, dwell 10 – 20 seconds with air agitation.
3. Iridite 1744, dwell 5 seconds to 5 minutes according to specifications.
4. Rinse, as in step 2.
5. Rinse, as in step 2.

3.3.2.5 Straight-lining, Buffing, Polishing – of any metal following instructions per customer request.

4.0 QUALITY CONTROL All employees of the company are responsible for performing their jobs to produces “quality” parts. “Quality” is a conformance to customer requirements. Quality Control shall be a central distribution point of all requirements.

4.0.1 SPECIFICATIONS Quality control (QC) shall maintain the master file of specifications (see paragraph 3.2.3)

4.0.2 SUPPLIER RATING Quality Control (QC) and the chemist will maintain a supplier performance record. This record will contain performance ratings and the final report of batch/lot concentrations. Each month the supplier will have a performance rating that will be sent out on the fifth of each month. A response for failure to perform at 95 % or above is required to be returned by the 15th of each month. If a failure to perform above 95 % over three months occurs, a review of the suppliers will be filed in their respective file.

4.0.3 EQUIPMENT AND CALIBRATION Gages and measuring devices shall be calibrated to N.I.S.T. standards on a periodic basis commensurate with the type of equipment and specifications under which it is used. QC has the authority to have any piece of equipment checked should its results become suspect. Responsibility of calibration belongs to QC.

4.0.4 SOLUTION ANALYSIS The chemist shall analyze process tank solutions following the manufacturer's suggested frequency. Company policy is a minimum of one analysis per week. Frequency of tank analysis shall be specified per tank solution. pH probes shall be calibrated bimonthly.

4.0.5 RECORDS QC shall keep a detailed record of all calibrations and analyses done.

4.1 INSPECTION Personnel at each process station shall ensure that the parts meet all requirements of that station before sending them to the next station. To prevent rejects, QC shall work with each supervisor to determine the best procedure at each station.

4.1.1 DEGREE OF INSPECTION The degree of inspection will be dictated by the type and quantity of work being processed. For some jobs, a visual inspection by trained personnel can determine acceptable work. Other jobs will require inspection with the proper test equipment to determine compliance. It shall be left to the discretion of QC personnel as to the degree of inspection and at what point in the process it will be used to determine if compliance has been satisfied.

4.1.2 FINAL INSPECTION Inspection requirements will follow the order of precedence in paragraph 2.1. Upon completion of all processing, and prior to packaging, a final functional inspection of the parts by QC will be done. All parts will be inspected for visual defects during packaging.

4.1.3 NON-CONFORMING WORK Parts rejected for non-compliance will be returned to the appropriated production station for re-operation. QC shall determine why and where the cause of rejection happened and take all necessary steps to ensure that it will not re-occur. Corrective action will be taken and noted on the correct form.

4.1.4 MATERIAL HOLD All non-conforming work will be held in the area designated as such. No work can be removed from this area unless a complete inspection determines area of non-conformance. Parts will remain here until a new process sheet is made available. The customer will also be contacted and provided with the new process schedule.

4.2 QUALITY REVIEW Management will review Quality Control policies and

procedures on an annual basis to ensure all aspects of compliance to customer requirements are being met. This review will also be used to identify and resolve any re-occurring problems.

5.0 PACKAGING Parts shall be packaged in the customer's original shipping container. If the customer requires individual parts wrapped, the company will do so in plain wrapping paper. If special packaging material is specified the customer shall supply it.

5.1 SHIPPING shall be returned to the shipping office and a packing slip is printed. If certifications are required authorized personnel will do so at this time.

6.0 WARRANTY AND DISCLAIMER The company warrants that finished parts shall meet the customer's specifications supplied in writing with the order and that such parts shall be free from defect in workmanship. The company reserves the right to reject work, or, at our option, make an evaluation against warranty for attempting to finish any base metal below our required standard. No responsibility will be assumed, nor warranty given, for defective finishing on parts previously done by others. Such defective parts will be returned to the customer or, at either the customers or our option, refinished in our plant without any warranty. When the customer specifies methods and procedures which differs from ours, we shall comply, but do not guarantee the result or apply a warranty.

7.0 ANNUAL REVISION Each year starting in January, the Zero Defects Operation Guide for Minnesota Metal Finishing, Inc. will be reviewed and corrections will be made. The deadline for this yearly review is March 1, of that year. This revision will allow QC, the chemist, salespeople, owners and expediters to make corrections and changed that will allow MMF to progress a s a successful company. These revisions will be added to the document as well as noted at the end of the modified Guide. The original copy of this document will always remain in the office while other copies are in various locations around the building.

Shop Capabilities

Anodize (Mil – A – 8625)

TYPE II, SULFURIC
TYPE III, HARDCOAT

Chromate Conversion Coat (Mil – C – 5541)

CLASS 1A – paint base or stand alone
CLASS 3, conductive

Passivation (Federal Spec. QQ – P – 35) 300 series only

TYPE I
TYPE II
TYPE III

Straight-lining

Zinc plating (QQ – Z – 325 or ASTM B633)

All classes – clear, yellow, and black chromate types

Certificate of Compliance

Date ___ / ___ / ___

I hereby certify the performance of all necessary processing steps to be in complete compliance with the following indicated specifications of latest issue in affect:

___ Mil-A-8625 Type ___ Class ___

___ Mil-C-5541 Type ___ Class ___

___ QQ-P-35 Type ___ Class ___

___ ASTM B-633 Type ___ Class ___

___ Other _____

_____

Upon the following parts:

Customer Name _____

P.O. Number _____ Part Number _____

Quantity _____

Description _____

_____

There has been no substitutions for material which has been supplied for this order.

MINNESOTA METAL FINISHING, INC.

_____

Jack Logan

Laboratory Work Request	
Material to be tested	
Tests required	
Reason for tests	
Requested by	Date:
Test data and results:	
Recommendations	
Tested by:	Date:

Minnesota Metal Finishing, Inc.

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Minneapolis, MN 55413
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Monthly Supplier Performance Report

Supplier Name
123 ABC Ave.
City, State ZIP Supplier Number

Listed below is your performance rating for Month and Year

Delivery
Total Receipts
Order on time
Order late
Performance
Percentage

Batch/Lot concentration analysis
Total receipts
Accepted concentration (accepted range of concentration ---- opg/gpl)
Rejected concentration
Performance percentage

Comments

Analysis by: Date:

If you have any questions concerning the above information, please contact me at 612-623-0084.

Sincerely,

QC

Annual changes presented in this revised edition

Additions - none

Deletions – p. 5, 3.3.2.1 – 17, …and yellow

Changes - none

Changes made to numerical order - none

Yearly update change - none

Punctuation and typing errors – p. 4, 3.2.1, P.I.O to P.O.; p. 9, 5.1 returened to returned; p. 9, 5.1 requiredm to returned; p. 10 straightling to straight-lining.

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Effective March 2016

Clear Anodize
Colored Anodize
Clear Hardcoat
Black Hardcoat
Yellow Iridate
Clear Iridate
Polish
Straightline
Yellow and Clear Zinc
Black Zinc
Tri-Chrome Yellow
Tri-Chrome Black
Passivation of 400 Series
Passication of 300 Series
Teflon
Electroless Nickel - Aluminum
Electroless Nickel - Steel
Black Oxide
Tin - Bright
Tin - Matte
Barrel Zinc - Yellow
Barrel Zinc - Clear
Barrel Zinc - Black
Oil
Baking
Wax
Strip
Part Marking
Masking
Certificate of Compliance

Minnesota Metal Finishing, Inc.

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5541

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Corrective Action Request

Source of Issue Requiring action:

P.O.:_____ **Job #:** _____ **Part #:** _____

☐ **Customer Complaint**
☐ **Customer Returned Parts**
☐ **Non Conforming Parts from Vendor**

Customer/Vendor name:

_____

☐ **Internal audit**
☐ **Customer audit**
☐ **Improvement suggestion**

Description of situation requiring action:

_____
_____
_____
_____

Initiator: _____ **Date:** _____

Root cause analysis (employee error):

_____
_____
_____

Investigator: _____ **Date:** _____

Note: For preventive actions, attach cost benefit analysis.

Corrective Action:

_____
_____
_____

Approved by: _____ **Date:** _____

Verified action was effective:
Comments:

_____
_____
_____

Inspector: _____ **Date:** _____

Signature Page

Edited and corrected by: Rochelle Rougier-Maas, QC.

Authorized by: Jack Logan