

QUALITY CONTROL TEMPLATE FOR HOLLOW METAL DOORS AND FRAMES MANUFACTURERS

This document was developed by representative members of the Hollow Metal Manufacturers Association Division (HMMA) of the National Association of Architectural Metal Manufacturers (NAAMM) to provide information and guidance on the development of a quality control program for hollow metal door and frame manufacturers. This document contains advisory information only and is published as an in-house document for the HMMA Division.

NAAMM AND ITS HMMA DIVISION DISCLAIM ALL LIABILITY OF ANY KIND FOR THE USE, APPLICATION OR ADAPTATION OF MATERIAL PUBLISHED IN THIS DOCUMENT.

NAAMM Standards are available by visiting our website at www.hollowmetal.org.

National Association of Architectural Metal Manufacturers

800 Roosevelt Rd.
Bldg. C, Suite 312
Glen Ellyn, IL 60137
Phone: (630) 942-6591 Fax: (630) 790-3095
www.naamm.org

Copyright 2012
National Association of Architectural Metal Manufacturers
All Rights Reserved

FOREWORD

This document is intended as a guide for hollow metal manufacturers to develop or enhance their quality control program. The basics of a quality control program are outlined and these will need modification based on individual company's production flow.

The responsibility for quality control (QC) lies not only within a specific department (in larger organizations) but is the ultimate responsibility of each employee at each work station to include quality assurance as part of their task. Each company should have a minimum of one (1) person assigned to formulate inspection criteria, monitor, periodically review the QC program in addition to training employees on the importance of a quality control program and how to perform the quality checks.

Although this document has been developed around quality procedures on the production floor, the same quality control of check and balances should be inherent in the entire organization.

UL and their Follow-Up Service inspection program require that manufacturers provide a quality control system, which at a minimum the quality system must address the following elements to the extent necessary to maintain compliance with UL Requirements. Re: UL's document titled "UL Mark Surveillance Requirements."

1. *Product Assurance*
2. *Inspection and Testing*
3. *Documentation*
4. *Calibration*
5. *Material control such as procurement, verification and handling.*
6. *Nonconformance resolution and corrective action*
7. *Control of the UL Mark*
8. *Records*
9. *Other process necessary to assure compliance with UL requirements.*

The goal is to provide defect free products to the end user including:

1. Engineering and fabrication to customer specifications.
2. Proper labeling and packaging of products.
3. Correct quantities.
4. On-time shipments.
5. Delivery of product in an undamaged condition.

SCOPE

The basis of developing quality control is by checks and balances. Each operator needs to inspect the work of the station prior to and after performing their job assignment which includes inspecting their own work during and after completion. To accomplish these checks will require:

1. Proper training and involvement of all manufacturing employees.
2. Insure that all employees provide highest quality workmanship and perform inspections to ensure a quality product.
3. Employees should not knowingly produce or pass on to the next station defective product.

INSPECTION OF MATERIAL

The following list of manufacturing processes and inspection procedures are shown as a guideline. Not all manufacturers will follow the same production flow. Each individual company will need to develop documentation of such, and evaluate their individual manufacturing processes for their own Company specific processes and procedures. The intent is that each station is required to:

1. Inspect work performed by the station before them.
2. Perform their required task.
3. Inspect their own work.

MANUFACTURING TOLERANCES

The tolerance of manufactured products shall be in accordance with *ANSI/NAAMM HMMA 841, "Tolerances and Clearances for Commercial Hollow Metal Doors and Frames"*, included as Appendix "C" of this document. Manufacturing tolerances are also listed at individual sections within this document.

MEASURING EQUIPMENT, INSPECTION AND DOCUMENTATION

All measuring equipment such as; tape rulers and calipers (verniers and micrometers) used in the fabrication of hollow metal products must be inspected to ensure accuracy. In addition to the listed inspections below, all equipment must to be visually inspected each time they are used.

1. Appendix "A" - Tape Ruler Verification. Weekly or upon evidence of improper performance.
2. Appendix "B" - Verification / Calibration of measuring devices; Calipers, (verniers and micrometers).

Note: Underwriters Laboratory Inc. now requires companies with Follow-Up Services to maintain their own equipment. Please refer to UL Calibration Requirements: Equipment used for UL/C-UL/ULC Mark Follow-Up Services, which states calibration of measuring and test equipment must be conducted by an accredited calibration service provider annually.

MANUFACTURING PROCESSES

Shearing

All material shall be cut in accordance with work sheets. Door face sheets shall have all four (4) sides trimmed. Frame steel shall be squared at one side and the bottom prior to cutting any pieces.

Inspection of cut pieces for accuracy:

Small quantities – Inspect every piece.

Large quantities [six (6) or more], inspect 1st piece and spot check thereafter.

Acceptable Tolerance:

A. All parts; $\pm 1/32$ in., 0.031 in, (0.79 mm).

Punch Press

Material shall be punched in accordance with work sheets.

Inspection of punched pieces for accuracy:

Small quantities – Inspect every piece.

Large quantities [six (6) or more], inspect 1st piece and spot check thereafter.

Acceptable Tolerance:

A. Hardware cut out; Template dimension $+ 1/64$ in., 0.015 in., (0.4 mm), - 0

B. Hardware location; $\pm 1/32$ in., 0.031 in., (0.8 mm)

C. Between hinge centerlines; $\pm 1/64$ in., 0.015 in., (0.4 mm)

Forming

Material shall be formed in accordance with work sheet.

Inspection of formed pieces for accuracy:

Small quantities – Inspect every piece.

Large quantities [six (6) or more], inspect 1st piece and spot check thereafter.

Acceptable Door Tolerance:

A. Width and Height; $\pm 3/64$ in. 0.046 in., (1.2 mm)

B. Thickness: $\pm 1/16$ in., 0.062 in., (1.5 mm)

Acceptable Frame Tolerance, cross sectional profile:

A. Face, Stop, Rabbet; $\pm 1/32$ in. 0.031 in., (0.8 mm)

B. Depth/Width; $\pm 1/16$ in., 0.062 in., (1.5 mm)

C. Throat; $\pm 3/32$ in., 0.093 in., (2.4 mm)

Mitered Joints

Mitered joints; either lazer cut, punched or saw mitered. When lazer cut or punch mitered, inspection shall be conducted prior to and after forming. When saw mitered, inspection will be at time of mitering and at next fabrication process.

Inspect for correct angle of miter, jamb opening height, and correct hinge locations from top of mitered rabbet.

Acceptable Tolerance:

A. Hinge location; $\pm 1/32$ in., 0.031 in., (0.8 mm)

Spot Welders

Hardware reinforcing preparation shall be welded inside of frame or door.

Hinge reinforcements; Projection/Spot Weld in three (3) places at each end.
Lock /Strike reinforcements; Projection/Spot Weld minimum two (2) welds per end.

Inspect for quality of welded marks, mortise depth, and alignment of screw holes.

Acceptable Tolerance:

A. Mortise depth; $\pm 1/64$ in., 0.015 in. , (.04 mm)

Welding of components such as closer reinforcement, floor clips, anchors, door core material and reinforcements for surface hardware shall be in accordance with project specifications.

Anchor spacing shall be to suit specific project requirements and or fire rating requirements.

Apply fire rating label on hinge edge of frame and door(s) prepared for mortised hinges or in header of frame and top of door(s) prepared for continuous hinges.

Inspect for quality of weld marks, correct label, quantity of welds, and location of anchors.

Spot Weld Twist Test

Determines two factors; (1) the size of the weld nugget and (2) the connectivity of the material. Used to verify the settings of a spot welder. Using two pieces of material representative of the material to be spot welded; overlap on one end and provide one weld in specimen. Rotate (twist) the two specimens until separation. Inspect for complete fusion and amount of nugget pull.

Drilling and Tapping

Verify that all material has been properly punched, drilled and tapped for all required mortised hardware with appropriate reinforcements, including silencer holes.

Existing wall anchors; Drill or punch jamb as specified and countersink hole to proper depth. Locate approximately 6 in. from top and bottom of frame and others equally spaced between.

Assembly

Frames shall be welded in accordance with project specifications as stated on work sheets. During assembly, the welder shall inspect for quality and accuracy.

Every representative sample shall be checked for:

- A. Squareness.
- B. Jamb opening size (width & height).
- C. Top hinge Location.
- D. Swing hand.
- E. Mark number.
- F. Label requirements.

Acceptable Tolerance:

- A. Jamb Depth/Width; +/- 1/16 in., 0.062 in., (1.5 mm)
- B. Hinge Locations; +/- 1/32 in., 0.031 in., (0.8 mm)
- C. Between Hinge Centerlines; +/- 1/64 in., 0.015 in., (0.4 mm)

Doors – Doors shall be constructed in accordance with shop sheets. During assembly, the door shall be inspected for quality and accuracy.

Every representative sample shall be checked for:

- A. Width & Height.
- B. Top Hinge Location.
- C. Swing Hand.
- D. Mark Number.
- E. Label Requirement.

At random, inspect for:

- A. Squariness; +/- 1/16 in., 0.062 in., (1.5 mm)
- B. Surface Flatness; +/- 1/8 in., 0.125 in., (3.1 mm)
- C. Perimeter Flatness; +/- 1/16 in., 0.062 in., (1.5 mm)
- D. Twist; +/- 1/16 in., 0.062 in., (1.5 mm)

Removable Glass Stops

Where required, frame and door products shall be provided with removable stops for glazing or infill panels. Inspect for correct quantity of pieces, length, and hole spacing.

Acceptable Tolerance:

- A. Width and Length; +/- 1/32 in., 0.031 in., (0.8 mm)

Finishing

After fabrication, tool marks and surface imperfections shall be filled and sanded as required to make face sheets, vertical edges and weld joints free from irregularities and dressed smooth.

Dressed smooth is defined as having a surface roughness < 1 mil. Respectively, when surface roughness is < = 1 mil., a prime coat of 1.5 mils or greater and a finish coat of paint will hide the grind marks. Finish coat of paint to have a maximum gloss rating of 20% reflectance, measured using a 60 degree gloss meter

Link to testing equipment: www.ktagage.com

Shipping

The employee in charge of loading, known as the shipper, shall check overall quality of product, quantity of material and required labels, including any loose items.

The shipper shall record on the "Bill of Lading", arrival and departure time of all brokerage trucks. After loading, the shipper shall confirm the quantities of material loaded.