



Mainstay Manufacturing Solutions, Inc.

## TECHNICAL TERMS AND CONDITIONS FOR FABRICATED COMPONENTS

Code:	QI.01
Version:	A
Created by:	David Colley
Approved by:	David Colley
Date of version:	1/31/2018

## Change history

Date	Version	Created by	Description of change
1/31/2018	A	David Colley	Initial Document Release

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## 1. Purpose, scope and users

This document defines Mainstay Manufacturing Solutions, Inc. general workmanship practices for the fabrication of components. These technical terms and conditions for the delivery of fabricated parts apply in addition to the customer's drawing, electronic CAD file, or supplied component in case of missing, unachievable, or unclear specifications. In this case, these technical terms and conditions are to be considered as an integral part of the contract.

We declare that we do not assume responsibility for any customer requirements going beyond these technical terms, unless these requirements have been specified clearly by the customer and agreed upon by Mainstay Manufacturing Solutions, Inc.

Users of this document are Mainstay Manufacturing Solutions employees and other interested parties.

## 2. Reference documents

ISO 2768-1:1989 – General Tolerances Part 1: Tolerances for linear and angular dimensions without individual tolerance indications.

## 3. Definitions

**Linear Dimensions** – e.g. external dimensions, internal dimensions, step dimensions, diameters, radii, distances, corner rounding and chamfer dimensions of corners.

## 4. Technical Description

### 4.1. Linear Dimensional Tolerances

For linear dimensions without tolerance indications, dimensions that are unclear, or with tolerances that are beyond the general limits of sheet metal fabrication, ISO 2768-1:1989 will be adopted for linear dimensions.

This standard is intended to simplify drawing indications, and it specifies general tolerances for linear dimensions **without individual indications** in four tolerance classes.

This standard applies to the dimensions of parts which have been produced by metal removal or parts which have been formed from sheet metal.

This standard **applies only** to the following dimensions without individual tolerance indications:

- a) Linear dimensions (e.g. external dimensions, internal dimensions, step dimensions, diameters, radii, distances, corner rounding and chamfer dimensions of corners)
- b) Linear and angular dimensions obtained by machining assembled parts.

This standard **does not apply** to the following dimensions:

- a) Reference dimensions indicated in parenthesis or otherwise noted as “reference”.
- b) Theoretical exact dimensions indicated in rectangular frames.

### Mainstay Manufacturing workshop designations by operation

Work Piece Thickness	Operation Designation			
	Laser Cut	CNC Punching	Forming	General Fabrication
>0 ≤.160	m	m	m	c
>.160	m	n/a	c	c

**ISO 2768-1:1989 Table 1 – Linear Dimensions**

Tolerance Class		Division of Dimension (inches)							
Designation	Description	.02 <sup>(1)</sup> up to .118	Over .118 up to .236	Over .236 up to 1.181	Over 1.181 up to 4.724	Over 4.724 up to 15.748	Over 15.748 up to 39.370	Over 37.370 up to 78.740	Over 78.740 up to 157.480
		Permissible Deviation							
f	fine	±.002	±.002	±.004	±.006	±.008	±.012	±.020	-
m	medium	±.002	±.004	±.008	±.012	±.020	±.031	±.047	±.079
c	coarse	±.008	±.012	±.020	±.031	±.047	±.079	±.118	±.157
v	very coarse	-	±.020	±.039	±.059	±.098	±.157	±.236	±.315

Note (1) - For basic dimension below .02 inches, the deviations shall be indicated adjacent to the relevant dimension(s)

#### 4.2. Dimensional Tolerances Not Covered or Adopted Under ISO2768-1:1989

For linear dimensions without tolerance indications, dimensions that are unclear, or with tolerances that are beyond the general limits of sheet metal fabrication, ISO 2768-1:1989 will be adopted for linear dimensions.

##### 4.2.1. Angular Bending Dimensional Tolerances

All angular bending tolerance deviations shall be  $\pm 1^\circ$

##### 4.2.2. Machined Components and Welded Assemblies

Per table below

Work Piece Thickness	Operation Designation	
	Machining	Welding
All	f	c

### 4.3. Edge Condition

Burr Removal - A burr is defined as material existing beyond the intersection of two surfaces. All manufactured parts are to be free from burrs or loose metal chips which might cause hazardous handling. Otherwise, burrs which do not project over .005" on aluminum or .003" on all other metals are deemed acceptable and **no secondary process will be performed.**

Sharp edges – Typically, our thermal cutting operations produce a molten edge that softens/breaks the cut edges enough where a secondary deburring process does not create a hazardous handling scenario. For general print callouts such as “**no sharp edges**”, “**free of burrs**”, “**break sharp edges**”, etc.; we will **not** perform a secondary operation on the edges, **unless** a hazardous handling scenario is produced or **specified at time of initial request for quote submission.**

When burr/sharp edge removal is specified at time of quote request without further qualification, all burrs/edges, including those around holes and cut-outs shall be broken to .030” maximum by way of a mechanical deburr process. The contour of broken edges may vary from a square corner to a chamfer to a true radius.

Punch or nibbling marks are the normal result of punching with a punch and die and are not considered burrs, unless they present a hazardous handling concern.

The point at which the laser or plasma pierces and “leads-in” to the cut/”leads-out” of the cut face of the part will result in a small protrusion on the cut face of the part due to the change in direction of the beam. This tab will be more pronounced at greater material thicknesses. This is a normal result of our thermal cutting operations and is not considered a burr. **No secondary process to remove this tab will be performed** unless **specified at time of initial request for quote submission.**

### 4.4. Corner Condition

Corners shown sharp, both internal and external, on the print/model will be produced with a radius per table below for thermal cut shapes. Any variance from these values **must be specified at time of initial request for quote submission.**

Carbon Steel	
Material Thickness (in)	Corner Radii (in)
0 - .249	0.020
.250 - .500	0.039
.501 – 1.000	0.118

Stainless Steel	
Material Thickness (in)	Corner Radii (in)
0 - .120	0.020
.121 - .250	0.039
.251 - .500	0.059
.501 - 1.000	0.079

Aluminum	
Material Thickness (in)	Corner Radii (in)
.030 - .120	0.020
.121 - .625	0.039
.626 - 1.000	0.079

Brass	
Material Thickness (in)	Corner Radii (in)
0 - .120	.020
.121 - .250	.039
.251 - .375	.059

Copper	
Material Thickness (in)	Corner Radii (in)
0 - .249	.020
.250 - .375	.039

#### 4.5. Surface Condition

Nicks, scratches, and press brake die marks as a result of normal handling and fabrication processes will be permissible, as long as they are not detectable by tactile inspection. Typical tactile inspection is done by dragging a toothpick or fingernail over the surface of the material. If the toothpick or fingernail does not catch on the blemish, they will be deemed permissible.

Nicks and scratches which do not pass tactile inspection, dents, pits, or other forms of displaced metal as a result of normal handling and fabrication processes will be remediated at our discretion through linear or orbital sanding up to the point of a passable tactile inspection, as long as they do not exceed the applicable tolerances on the drawing.

Any **faces/features that are cosmetic** and must remain free of major imperfections and near free of slight imperfections or remediation methods **must be identified at time of initial request for quote submission**.

#### 4.6. Technical Drawing Requirements

A technical drawing or print is the visual representation of how your component is to be constructed. It's our instructions from you that should communicate all the required specifications. The drawing or print that is supplied should be **complete and clearly define the requirements** for the part.

If drawings we receive are incomplete, inaccurate, or contain features beyond the general limits of sheet metal components; delays, additional charges, and the product not functioning as intended may result. Any delays related to lack of completeness resulting in a shortened production time may incur an additional expedite fee.

Some basic technical drawing requirements are listed below.

Customer	Fully dimensioned	Protective sheet coating (if required)
Part number	Tolerances	Critical surface finish side/requirements
Revision level	Weld symbols	Material brush direction (brushed material)
Material type and thickness		

- Any feature not dimensioned will be manufactured with no restrictions on positioning and size.
- If no tolerance is identified, the default tolerance shown in Table 1 for that operation will be utilized.
- If tolerances specified are beyond the limits of sheet metal fabrication, the default tolerance shown in Table 1 for that operation may be substituted in-place of drawing tolerances.
- If tolerances required exceed the values (tighter than) indicated in Table 1, additional processing and inspection may be possible and can be discussed with your sales representative on feasibility and cost differentials.

#### 4.7. Over/Under Shipment Clause

While we always attempt to produce and ship the ordered number of items, a planned overage will sometimes be used to compensate for production variances that can affect the total output of a production run. **Orders will be shipped at  $\pm 3\%$  of the order quantity**. Orders that are under shipped up to 3% will be considered fulfilled and remaining parts will not be manufactured. **Minimum delivery quantities must be specified at time of initial request for quote submission** and will be manufactured to an over shipment quantity of **up to 6% over the order quantity**.

#### **4.8. Documentation for Quality Control and Inspection**

If no quality control or inspection information is requested either on the drawing or in any other applicable document, parts will only be inspected dimensionally, using random samples during production and before shipping. No quality reports will be generated and/or available.

- Any quality control documentation requests must be specified at the time of initial request for quote submission.
- Inspection certificate requests for raw material must be specified at the time of order placement.