



**METAL WORKS**  
OF HIGH POINT



**A Complete Guide to  
Fabricating Custom  
Components**



# Introduction

Metal fabrication refers to any process that converts metal into a usable finished product or part. Whether cutting, shaping, or molding the material, metal fabrication creates components for a broad spectrum of industries from raw or semi-finished metal materials.

A few of the most common techniques include laser cutting, forming, drilling, machining, and welding, but there are dozens of metal fabrication processes, each uniquely suited for industrial applications.

# Design Considerations for Custom Components

As with any manufacturing project, the most important way to craft an efficient process is a firm knowledge of the part's purpose. Specifically, search for any problematic features or use cases that could require particular machining techniques, tolerances, or material choices.

As a general rule, try to maximize the use of universal tooling to avoid driving up costs with specialty tooling. When it is impossible to create the whole component using universal tools, consider fabricating the item in several parts and joining them together through welding or other means of assembly.



*Additional considerations for designing custom components include:*



## Material thickness

This thickness must be selected and optimized ahead of production, but you must also ensure that it remains uniform throughout the metal fabrication process.

Be aware of processes that may alter the uniformity of your materials through warping or other distortion.





## Tolerances

Many metal fabrication techniques have the strict tolerances found in processes like CNC machining. However, still consider how the manufacturing process will impact your ability to achieve the proper tolerances, and how those tolerances may impact the efficacy of your design.



## Holes and slots

Make sure the diameter of your holes and slots are greater than the thickness of your material. Otherwise, you risk longer burnish and higher punch loading.



## K-factor

A material's K-factor refers to the ratio of the neutral axis to the thickness of the material. Physical material properties and thickness will change the K-factor of your workpiece.

# Common Materials for Metal Fabrication



Every metal has unique properties that may work well for certain processes and poorly for others. To select the right fabrication process or processes, it is essential to carefully consider your chosen material and how properties such as thickness and melting points will interact with the various process options. The most commonly selected materials include:

## Steel

Steel is an alloy of iron and carbon. It is one of the most common materials used in metal fabrication due to its wide range of use cases, from construction and appliances to equipment and machinery.

## Stainless Steel

Renowned for its glossy mirror coating, stainless steel is a highly corrosion-resistant steel alloy that contains elements like aluminum, chromium, and carbon steel.

## Aluminum

This versatile metal is common in many applications due to its electrical conductivity and high thermal capacity. It is non-corrosive and lightweight with a high strength-to-weight ratio. Aluminum is a great selection for designs that need high electrical or heat conductivity, flexibility, or strength on a budget.

## Brass

A fusion of copper and zinc, brass is a highly formable and corrosion-resistant metal used in many small mechanical parts, including nuts and bolts, clocks, doorknobs, and more.

## Copper

Ideal for demanding applications such as marine and industrial settings, copper is a tough, ductile, conductive, and malleable metal that also boasts high corrosion resistance and durability.

# Types of Fabrication Methods

Once you consider your part's specifications and find a material with properties that match your needs, it is time to choose the appropriate fabrication methods. The proper metal fabrication method balances efficiency, tolerances, and cost, providing the most feasible means of producing your parts and components. Some common metal manufacturing processes include:



## Laser Cutting

Laser cutters use a concentrated beam of light to disintegrate metal, slicing precisely through the material. Many fabricators employ laser cutting to cut holes in material, since the process offers a high degree of precision and can cut through a broad range of thicknesses and materials. Laser cutting produces little waste, making it a popular choice for many industrial applications.

*Other advantages include:*

- Clean edges that often do not require secondary finishing
- Low environment impact
- Little material waste
- Extremely versatile
- Quick turnaround and throughput times

# CNC Forming

Combining the various forming methods with computer numerical control (CNC) technologies offers increased accuracy, precision, efficiency, and speed. Forming refers to any process that involves shaping metal into a particular form. Numerous hot forming and cold forming options exist, depending on the requirements of the material and design.

Bending is one of the most common forming processes. Using a press brake or similar bending equipment, engineers can form a new shape along a linear axis for an existing piece of metal.

Panel benders—also referred to as folding machines—rely on part manipulators and bladed bending units to form a workpiece into the desired shape. The manipulator moves the workpiece on a horizontal plane to the front of the machine, where the blades apply upward or downward force to it to form the desired bends. Compared to press brakes, these machines produce parts with varying radii or intricate geometries (e.g., hems on metal sheets) more efficiently.

Modern metal fabricators typically rely on CNC-controlled forming equipment. Benefits of CNC forming include:



*Precision and accuracy*



*A smaller chance of workpiece damage or quality control issues*



*Faster, more efficient production at higher volumes*



*Compatibility with wide range of materials and part sizes*



## **Welding**

At its most basic, welding fuses metals together with pressure and heat. The bond created between the materials is permanent, and the welded joint is often stronger than parts being connected.

This has made welding one of the most durable, dependable, and popular types of metal fabrication over time. There are several varieties of welding, including robotic welding, MIG welding, TIG welding, and spot welding, among others.

Each method excels in particular use cases. Your manufacturer can help you select the best welding method for your needs.

## **Applications of Metal Components**



While tolerance requirements, complexity, and general standards may vary widely between industries, the presence of metal components is relatively ubiquitous throughout industries.



*A few examples from various industries include:*



## **Aerospace**

frame components, engine parts, seatbelt buckles, aircraft wings



## **Construction**

tools, equipment parts, beams, building components



## **Consumer Appliances**

frames, panels, brackets, hinges, mechanical parts



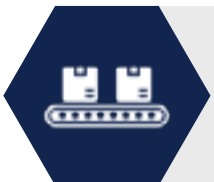
## **Furniture**

fasteners, brackets, frames, hinges



## **Manufacturing**

equipment components, robotics



## **Material Handling**

conveyor belt system components, machinery components, robotics



## **Telecommunications**

brackets, fasteners, antennas, equipment components



## **Transportation**

automotive parts, vehicle frames, seatbelt buckles, fasteners, brackets, welded components

# Choosing the Right Metal Fabricator for You



With so many complex considerations, from workpiece material to processing style, choosing the best metal fabrication technique requires the help of trained professionals and should not be taken lightly. The decision has far-reaching implications that will impact the throughput rate, cost efficiency, environmental sustainability, and quality of the production run for your final product, as well as the functionality and durability of the product itself.

Choosing the appropriate partner for these decisions can be a challenge, but a few key factors can help you identify a custom metal fabrication shop to hire for your next project.

## Experience

Make it a priority to seek out a company with many years of experience and an established name. An added benefit of experience is that you can cross-reference the quality with other past clients.

## Industries Served

Since metal fabrication has such a range of applications, it is important to find a company who has experience working within your industry. If they have worked on a similar project before, they likely have the appropriate equipment, skills, and expertise to meet your industry's standards.

## Production Type

Inquire about the metal fabricator's production capabilities to make sure they can meet your volume, tolerance, and complexity requirements.

## Quality Systems & Equipment

Use a partner with modern, up-to-date equipment to ensure the tightest tolerances, most consistent results, and highest efficiency for your products.



**METAL WORKS**  
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## About Us

Metal Works of High Point takes pride in offering turnkey contract metal fabrication solutions for our clients. Since 1992, we have offered American quality and craftsmanship to our clients on a local, national and international level. In our ISO 9001:2015 facilities, we feature state of the art equipment and software that give us the capability to manufacture and deliver precise, high quality products.

To see how our expertise can benefit your next project, please request a quote today.

**CONTACT US**

**REQUEST A QUOTE**

918 West Martin Luther King Jr. Drive High Point, NC 27262 USA

Phone: 336.886.4612      Email: [sales@metalworksHP.com](mailto:sales@metalworksHP.com)

[www.metalworksHP.com](http://www.metalworksHP.com)