STORM POWER COMPONENTS

Design Guide

Understanding Best Practices for Design Drawings

Overview

In custom power distribution busbars, the quality of your drawings directly impacts the quality, cost, and performance of your parts. At Storm Power, we see thousands of drawings every year, and the same patterns show up over and over again: a few simple best practices can make the difference between smooth production and avoidable delays.

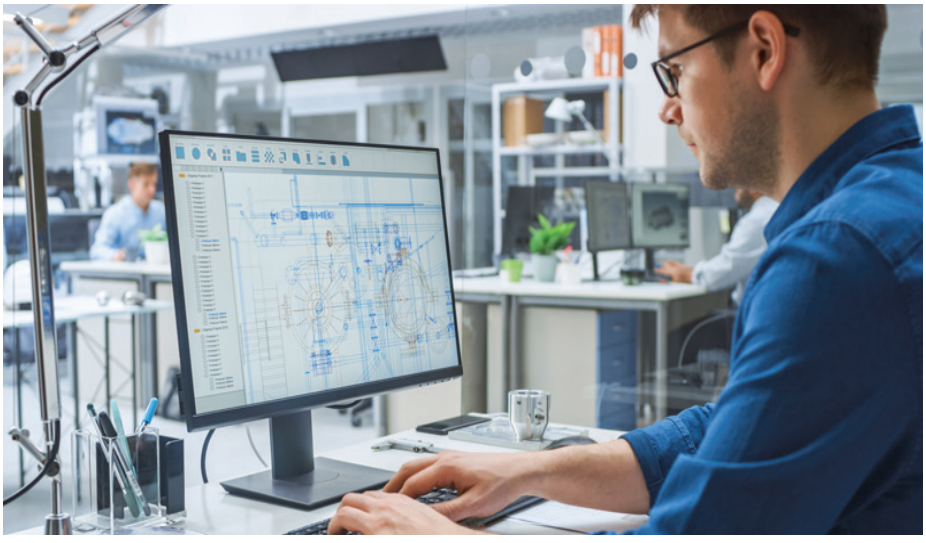
This design guide outlines our recommended practices for better drawings, based on real manufacturing experience with copper and aluminum busbars, coatings, and insulation.

Why Better Drawings Matter

A good drawing is more than a picture of a part—it is a communication tool that must work for everyone in the process, including people who do not have access to CAD.

Clear, fully dimensioned prints reduce ambiguity, which means fewer errors, easier inspection, and fewer interruptions for clarification. That, in turn, saves time on both sides and helps you receive parts that work as intended, without driving unnecessary cost into the job.

Not all manufacturing work centers on a shop floor have CAD available, so we rely on drawings to be inspection-ready. When prints are incomplete or unclear, we may need to create helper prints, which can add time and, in some cases, cost.



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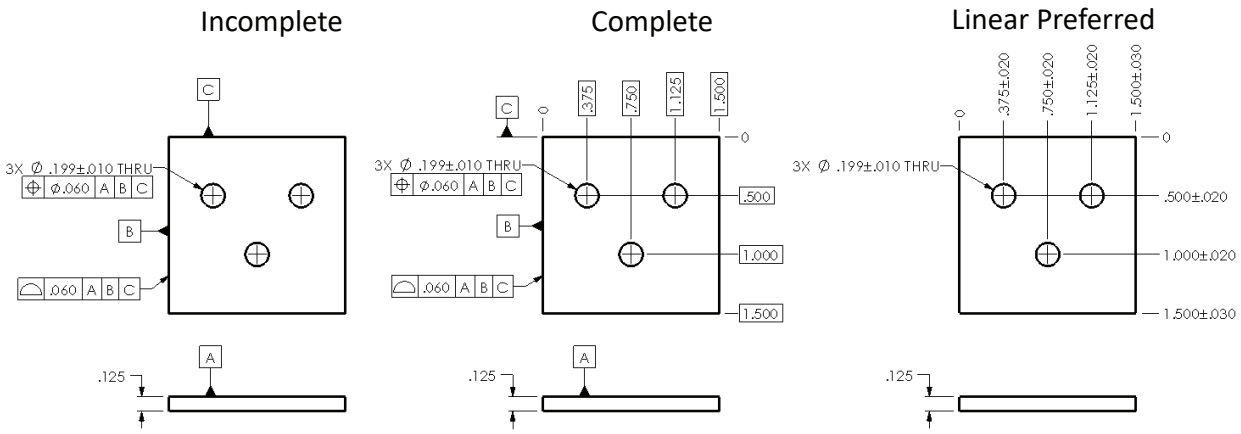
Provide Fully Dimensioned Prints

One of the most common issues we see is under-dimensioned drawings. If a machinist or inspector cannot get every required measurement directly from the print, production slows down and risk goes up. Storm's recommendation is to always provide fully dimensioned prints:

- Include all critical linear dimensions so each feature can be measured.
- Avoid relying on "implied" dimensions that exist only in CAD.
- Favor linear or ordinate dimensions over GD&T when possible, as they are generally easier to interpret on the shop floor.

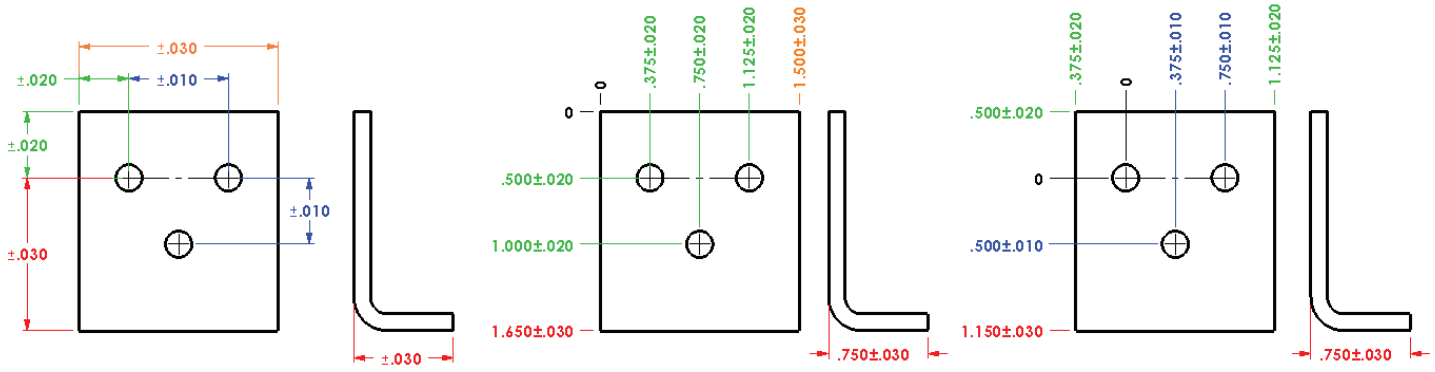
If a print is not fully dimensioned, Storm may need to generate additional internal documentation to clarify the part, and that can add both time and potential additional charges.



Choose Origins Carefully: Hole-Based Datums

Where you choose your dimension origins has a major impact on achievable accuracy. It is often tempting to dimension from edges because they are visually obvious, but edges are not always the most stable reference. In many cases, hole locations can be held tighter than edge locations, particularly in busbar and sheet-based work. Storm recommends:

- When precision is required, start dimensions from holes rather than part edges.
- Use functional datums that reflect how the part will be assembled—often these are key hole patterns or interfaces, not outer profiles.



Note: Tolerances shown in examples are for reference only; exact values depend on material, thickness, geometry, and process. The result is a drawing that aligns with actual manufacturing and inspection practice, improving both capability and consistency.

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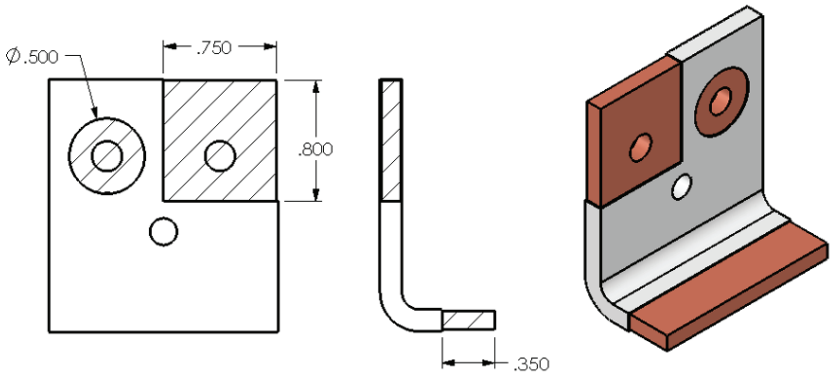
Showing Powder Coat Masking Clearly

Masking is where many drawings fall short. Unclear masking instructions can lead to exposed areas that should be coated, areas that should be bare, or extra rework time.

On Storm drawings, we recommend:

- Explicitly showing masked regions and labeled mask boundaries.
- Calling out whether the dimension applies to the masked (bare) area or the coated surface.
- Keeping notes concise but unambiguous, for example, clearly stating if a hole, pad, or edge must remain free of powder coat.

In most cases, dimensions should not be taken to powder coated edges. Dimensions can be given for the bare part before coating. Masking features should be to copper features that can be measured before and after coating.



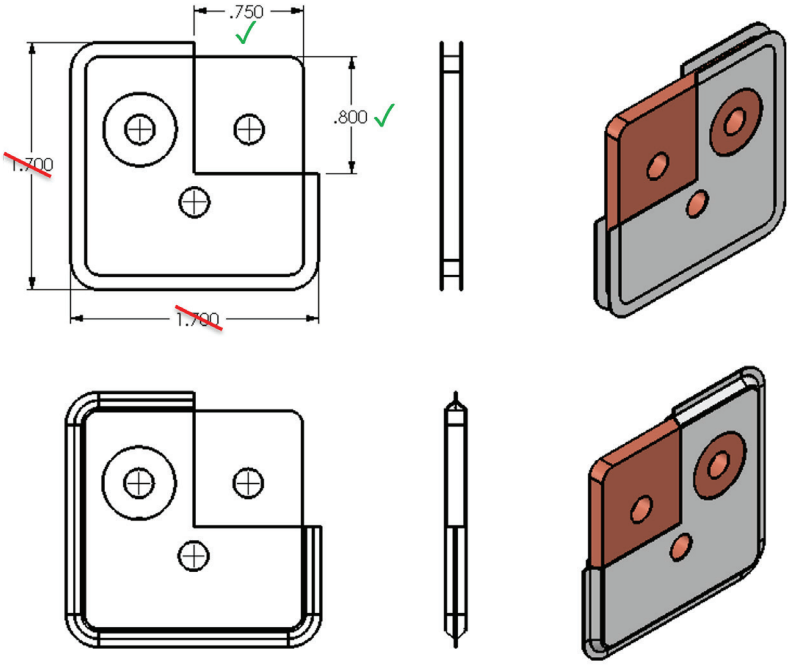
A well-defined masking scheme makes it far easier for our finishing teams to meet your functional and clearance requirements on the first pass.

Dimensioning Parts with Film Insulation

Film insulation is another area where the "perfect" drawing can diverge from real-world behavior. Insulation films are thin and flexible, and they can wrinkle, stretch, or pull back slightly when pinched or formed.

To account for this, Storm recommends:

- Treat insulation edges as approximate rather than exact measurement points when possible.
- Use reference dimensions, MAX dimensions, or generous tolerances for insulation edges.
- Recognize that the idealized, sharp pinch seal shown in drawings often looks different in reality, where the insulation may bulge or recede slightly.



By relaxing expectations on the exact position of film edges—and clearly showing that on the drawing—you improve manufacturability without compromising electrical performance.

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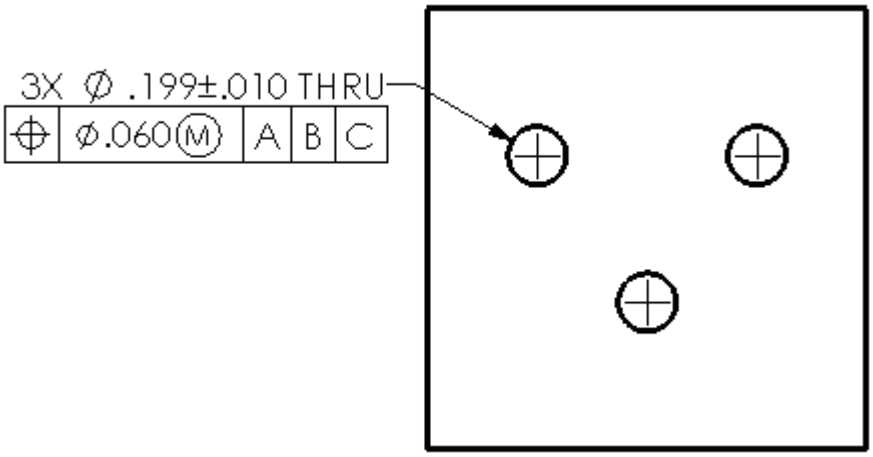
Take Advantage of Maximum Material Condition (MMC)

Geometric Dimensioning and Tolerancing (GD&T) is a powerful way to control functionally important features, but many drawings miss an opportunity by leaving out Maximum Material Condition (MMC) where it would help.

When using GD&T, not applying MMC on applicable features is like leaving free tolerance on the table. Storm's guidance:

- Always include MMC for holes (except threaded holes) when appropriate.
- Use MMC to relax manufacturing tolerances while still protecting functional fit, which helps reduce part cost.



This approach lets us maximize tolerances where allowed, improving yield and lowering cost without sacrificing performance.

Be Thoughtful With Size Dependent Tolerance Systems

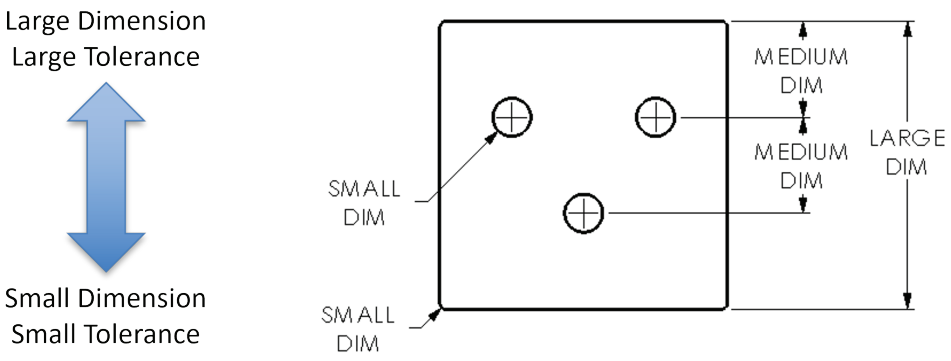
Many standards use tolerance systems where allowed deviation grows with feature size, such as ISO. While this is often reasonable, it does not always align with which features are truly critical in a busbar design.

For example, such systems may give large features large tolerances and small features small tolerances. However, radii are frequently less critical than certain hole patterns or interface dimensions, yet this style can end up assigning radii the tightest tolerances.

To avoid this mismatch:

- Assign tight tolerances to functionally critical dimensions, regardless of size.
- Relax tolerances on non-critical features like cosmetic radii wherever the design allows.

Aligning tolerances with function, not just size, improves manufacturability and keeps your inspection focus where it matters most.



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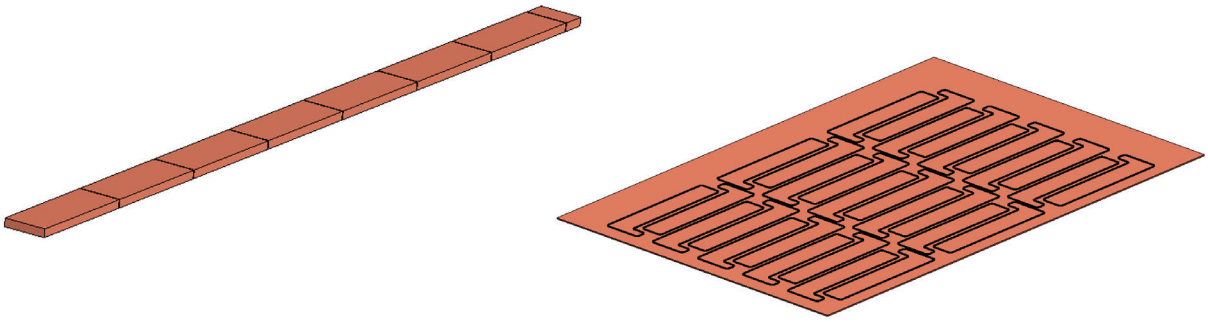
Material Callouts That Enable Cost-Effective Sourcing

Storm manufactures copper and aluminum busbars from both bar stock and sheet metal, and each option has tradeoffs in scrap, available size, and geometry. Drawings that lock in a single form or temper can inadvertently drive up material cost or lead time.

To keep options open, we recommend, where appropriate, specifying material ranges that permit the use of either sheet or bar stock.

- For copper, allowing both C110 ASTM B152 and ASTM B187 in tempers H00–H02.
- For aluminum, allowing either 1100 per ASTM B209 or 6101 per ASTM B317.



Typical unprocessed sheet and bar stock can generally be expected to have flatness around 0.005 inch per inch and a surface roughness of about 125 microinch (3.2 micrometer) or better. Giving us flexibility in material form and temper helps Storm choose the most cost-effective path for your specific design.

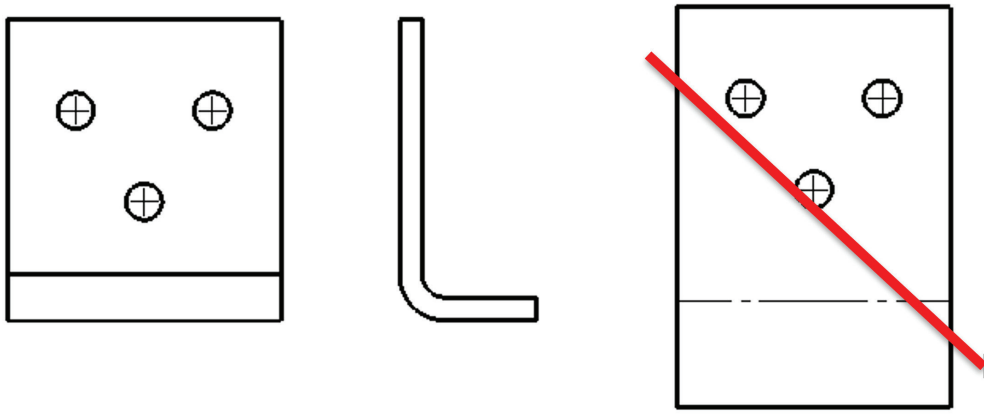
Rethink Flat Blanks: Focus on Formed Views

It is common to see flat blank views dominate a drawing, but for formed busbars, what matters most is that the final formed part fits and functions in your assembly. Different tooling and processes use different bend allowances; the flat pattern that works in one process may not be ideal in another.

Storm recommends:

- Always provide clear formed views of the part, showing how it exists in the final assembly.
- If you include flat blanks, mark them as reference only.
- Allow Storm to develop the flat based on the actual tools and processes we will use.

This keeps the drawing focused on functional intent, while letting the manufacturing process determine the exact flat pattern needed to achieve that result.



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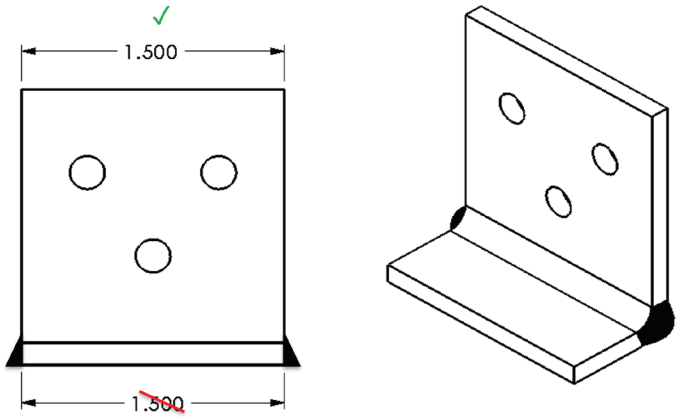
Dimension to Edges, Not Form Bulges

Features formed from bending can create small local bumps or bulges at the form. If dimensions are taken directly to these formed surfaces, measurement becomes less repeatable and part-to-part variation appears larger than it really is.

Wherever possible:

- Dimension to stable edges instead of localized forms or bumps.
- Use formed features for functional fit but reference more stable geometry when defining tolerances.

This small shift in dimensioning practice can significantly improve measurement repeatability and reduce unnecessary rejections.



Putting It All Together

Better drawings are not just about adding more information. Instead, they are about providing the right information, in the right way, for the people who have to build, finish, and inspect your parts.

By fully dimensioning prints, choosing practical origins, treating coatings and insulation realistically, using MMC wisely, aligning tolerances with function, and allowing flexible material options, you help Storm deliver parts that work the first time while controlling cost.