

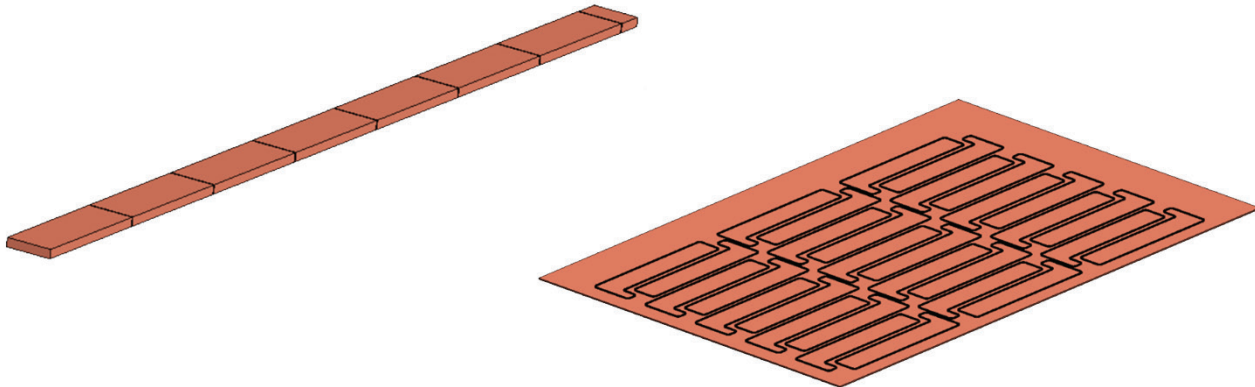
Understanding Best Practices for Busbar Fabrication

Best practices in sheet metal for high current busbars start with designing for both electrical performance and manufacturability from day one.

The guidelines in this document show how Storm Power Components approach copper and aluminum busbars so you can get reliable, repeatable parts at competitive cost.

Start with the right material strategy

Storm fabricates busbars from both sheet and bar stock, and the optimal approach depends on geometry, quantity, and cost targets. Bar stock can minimize scrap, but is limited in size and shape, while sheet metal supports more complex forms at the expense of material utilization.



A key best practice is to allow both sheet and bar, and a range of tempers, on your drawing so Storm can select the most cost effective route without compromising performance.

Typical standard material callout:

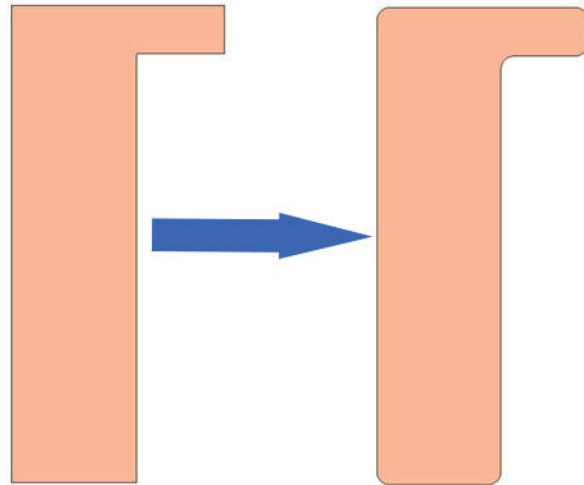
- Copper: C110 ASTM B152 or ASTM B187, H00-H02
- Aluminum: 1100 per ASTM B209 or 6101 per ASTM B317

Typical, unprocessed sheet and bar stock can be expected to hold 0.005" in per inch flatness and 125 μm (3.2 μm) or better surface roughness, which is sufficient surface finish for most busbar applications.

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Design for current flow and smooth geometry

Sheet metal for busbars behaves much like conventional sheet metal, but current density and thermal behavior must drive key design decisions. Current flows more uniformly when sharp corners are avoided, so Storm recommends gentle radii and sweeping curves wherever possible, especially along high current paths.



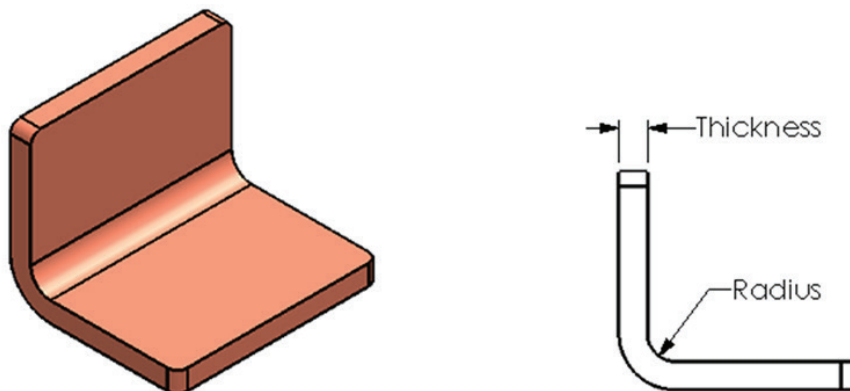
Sharp internal corners can create electrical hot spots, while sharp external corners can cut insulation or wiring harnesses and make parts unpleasant to handle. Best practice is to allow radii on all internal and external corners unless a sharp feature is absolutely required for fit.

Bend radii for copper and aluminum busbars

For 90 degree bends, Storm uses straightforward rules of thumb that balance formability, fatigue life, and tooling availability.

- Copper Typical Radius = Thickness
- Aluminum Typical Radius = 1.5 * Thickness

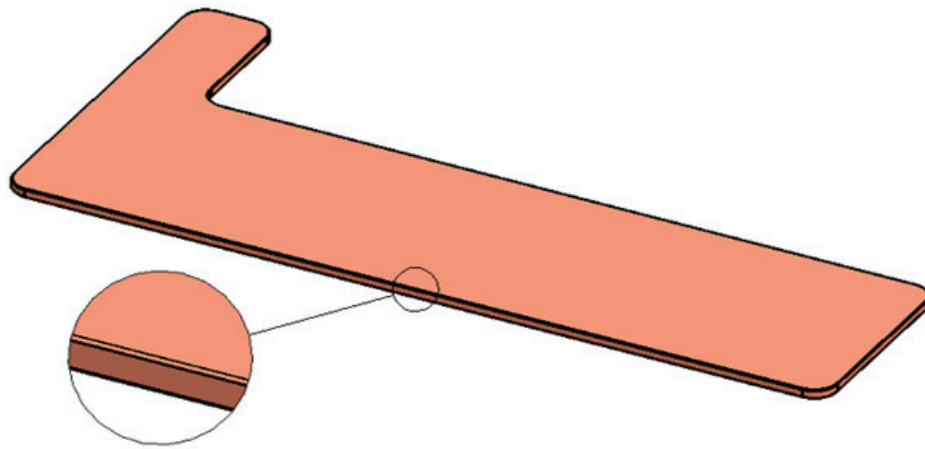
Specifying bend radii as reference dimensions or with generous tolerances allows Storm to use standard tooling.



Manage edge conditions for safety and insulation

Storm deburrs all parts by default unless a customer explicitly instructs otherwise; this practice does not normally need to be called out on drawings and is often difficult to measure directly. Sharp edges can slice through insulation, damage cables, and pose handling risks on the production floor.

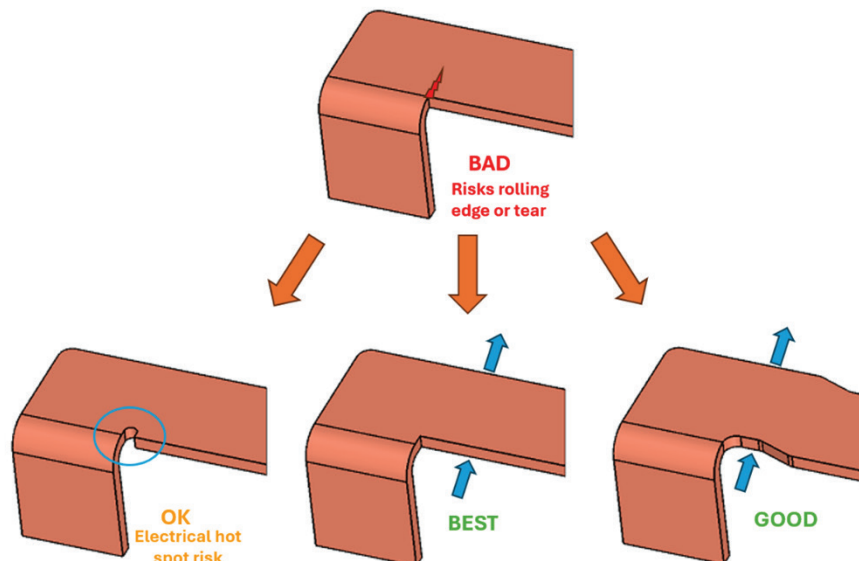
- Typical minimum edge radius for uninsulated parts = R.005"
- Typical minimum edge radius for insulated parts = R.020"



Bends near edges: avoid tearing and hot spots

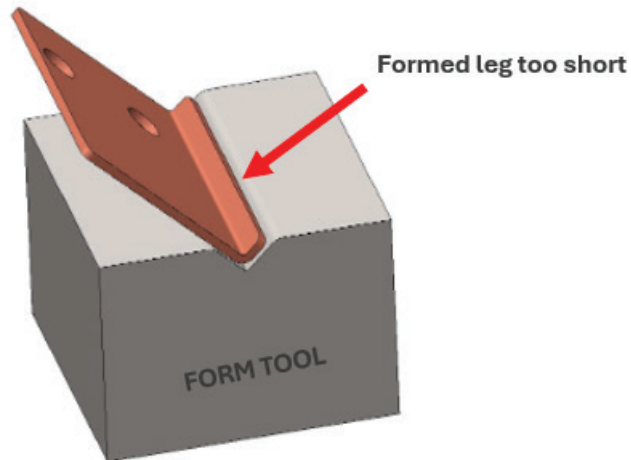
When bends approach a free edge, both mechanical and electrical considerations come into play. If the bend is too close to the edge, the material may “roll” or tear during forming, and the resulting geometry can concentrate current density along a narrow cross section.

Storm recommends placing bends far enough from edges to maintain the full cross section through the bend region and avoid reduced cross sections that can run hotter.



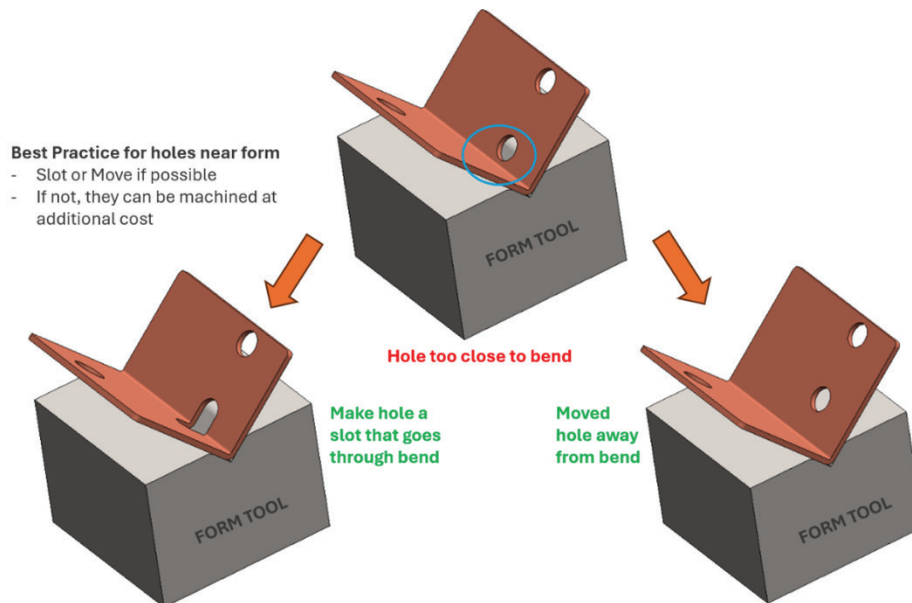
Short Form

Avoiding short legs is ideal; however, if a short leg is required it can be made long and machined after bending at an added cost, or in some cases special tooling can be made.



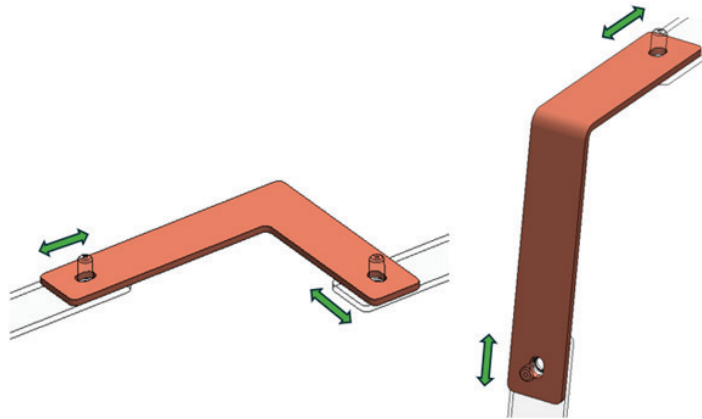
Features near bends: move, slot, or machine

Holes and other cut features close to bends can distort during forming and may require secondary machining. Best practice is to either move the feature away from the bend or convert circular holes into slots that continue through the formed region, which reduces deformation.



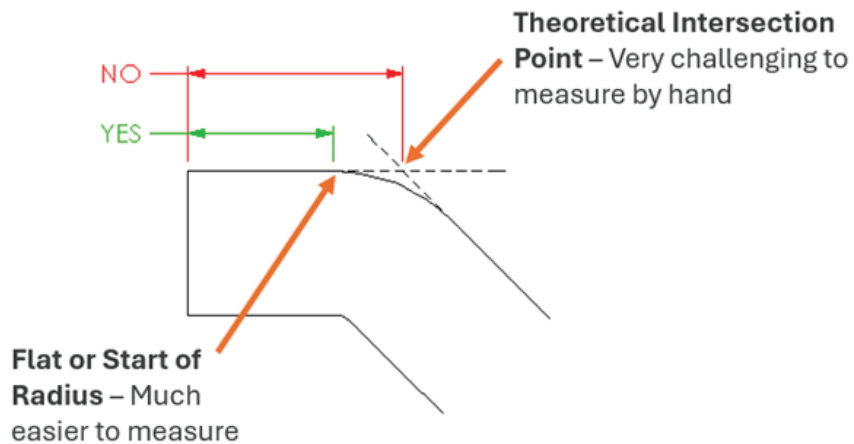
Slot Holes

Slot holes allow for stackup tolerances, reduce cost, and prevent assembly issues.



Dimensioning Drawings for real world measurement

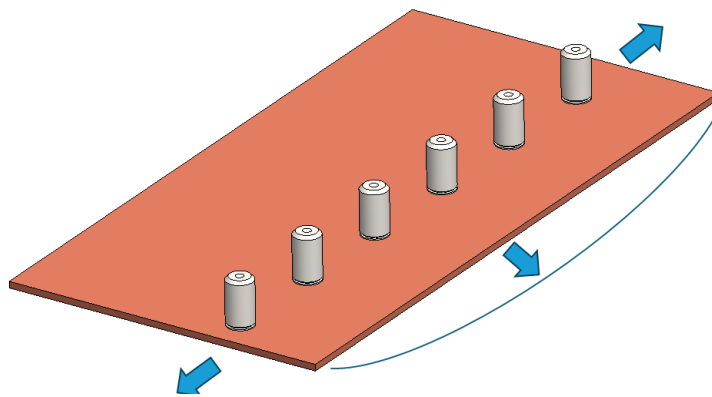
Accurate drawings are not just about geometry; they must support practical inspection on the shop floor. Dimensioning to theoretical intersection (TI) points can look precise on paper, but is extremely challenging to measure by hand.



Using PEMs and other clinch hardware

Storm installs captive clinch hardware—including PEM, Bossard, and similar fasteners—on a daily basis, always following the hardware manufacturer's specifications for hole size, material thickness, edge distance, and installation. Clinch hardware designed for aluminum is typically suitable for use in copper busbars as well, simplifying material choices across product families.

These components are well suited for securing mechanical or electrical terminations, but the current should always pass through mating copper surfaces, not through the fasteners, unless specifically engineered and rated for that purpose. To avoid growth or warping, Storm recommends avoiding long lines of clinch hardware, especially near edges, where accumulated displacement stresses can distort the part.



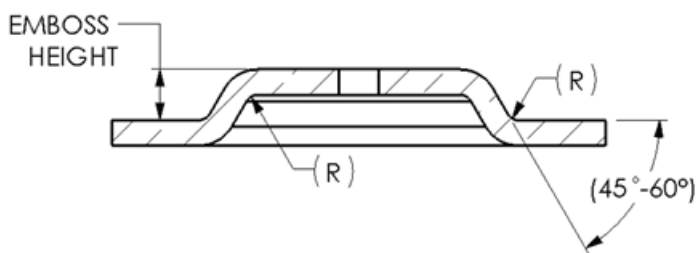
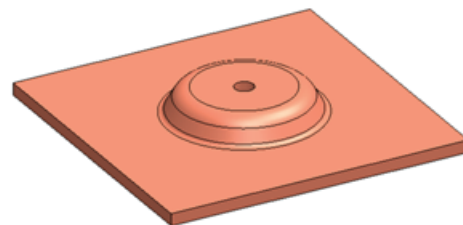
Embosses

Embosses, also known as dimples, are an economical way to avoid adding spacers and bushings. Custom forming tools are required for each unique emboss or dimple. Generous dimensional tolerances may allow Storm to use existing tools if available, avoiding custom tooling charges.

For embosses, heights between one half and two times the material thickness are ideal, with 45–60 degree sidewall angles. Embosses should be kept away from edges when possible and should include radii for smooth metal flow.

Embosses

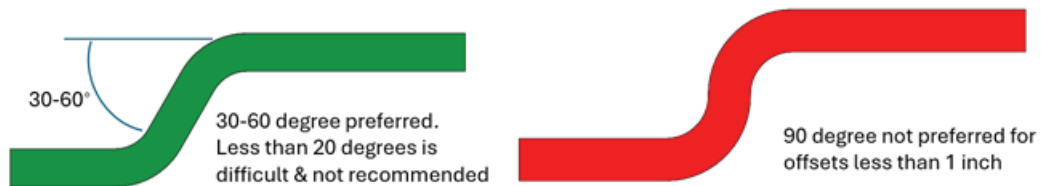
- Emboss height of $\frac{1}{2}$ to 2X material thickness is ideal
- Avoid embosses close to edges when possible
- Allow room for generous radii
- 45-60 degrees is generally ideal



Offset Forms

Custom forming tools are required for each unique form and generous tolerance may allow existing tooling to be used to avoid tooling costs. Storm recommends offset angles between 30 and 60 degrees, which provide predictable forming without excessive thinning or spring-back. Angles below 20 degrees are difficult to produce consistently and are generally not recommended.

For offset heights under 1 inch, 90 degree offsets are not preferred. When you need a unique offset profile, early collaboration with Storm's applications team can help balance geometric needs, tool complexity, and total part cost.

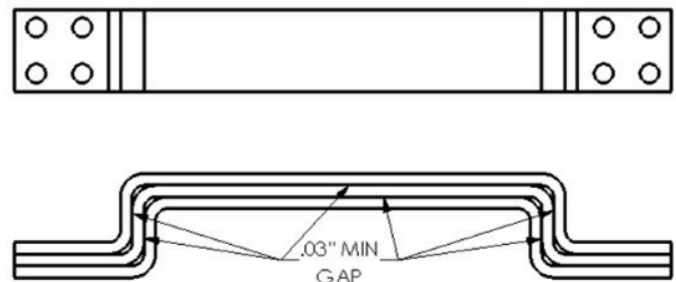
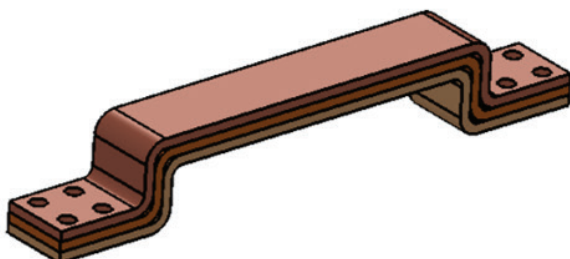


Nested forms and tolerance planning

Complex nested shapes—where one formed busbar must fit inside or around another—are never perfect, even with tight process control.

Storm encourages designers to allow realistic clearance and tolerance in nested regions so parts go together smoothly without forcing, which can introduce stress or deformation and make assembly inconsistent.

Recognizing that “there is no such thing as perfection in manufacturing” drives better stack up analysis, fewer fit up issues in the field, and more robust long term performance in high current systems.



Let Storm develop the flat blank

Different forming tools and processes require different bend allowances, so a single “correct” flat pattern rarely exists across multiple presses and tooling sets. Storm asks that customers provide formed views and treat any flat blank outlines on drawings as reference only, allowing Storm’s manufacturing team to develop the actual flat based on the specific tools and processes used.

Summary

Storm Power Components brings deep, application-driven expertise to copper and aluminum busbars, combining precision sheet and bar stock fabrication with best-practices to design for the electrical needs of you system.

We focus on developing cost-optimized parts by evaluating material options engineering bend radii, offsets, embosses, and edge conditions that balance electrical performance, manufacturability, and safety.

