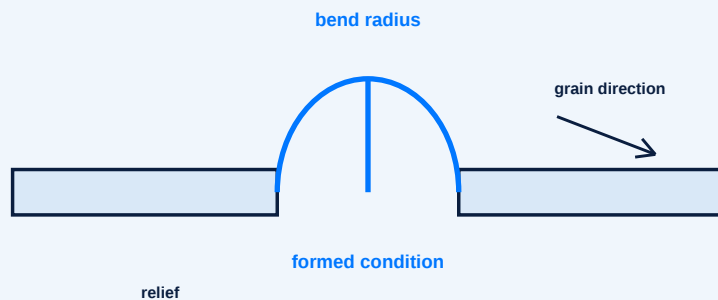


SHEET METAL FABRICATION GUIDE

Design parts for cutting, bending, welding and repeatable assembly



USE THIS GUIDE TO

make the flat pattern and formed part predictable before fabrication.

SHEET METAL FABRICATION DESIGN

Design logic and guide map

ENGINEERING REFERENCE

START WITH FUNCTION

Control material, radius, relief, grain, sequence and free-state inspection as one formed-part system.

FOUR-STEP DESIGN LOGIC

01 Function

What must fit, seal, locate or remain cosmetic?

02 Process

Which process route creates the feature?

03 Setup

Where are datums, tools, supports and gauges?

04 Release

What evidence is required before approval?

GUIDE MAP

Section	Topic	Practical result
01	Material and grain	State alloy, temper, thickness and grain direction.
02	Bend radius	Match radius to material and tooling.
03	Reliefs and corners	Prevent tearing and corner bulges.
04	Holes near bends	Keep holes out of the deformation zone.
05	Bend sequence	Plan formed order and tool access.
06	Welding and distortion	Balance weld heat and fixture restraint.
07	Tolerances	Separate cut, bend and assembly limits.
08	Drawing review	Release flat pattern and formed requirements.

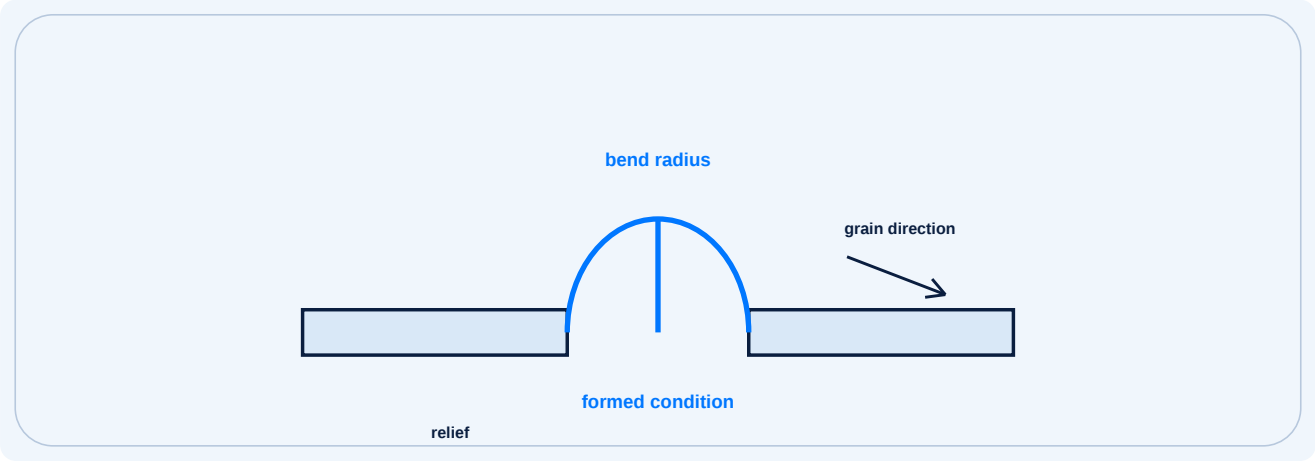
REFERENCE RULE

The drawing, purchase order and approved inspection plan remain the controlling documents.

SHEET METAL FABRICATION DESIGN

Material and grain direction change bend response and appearance.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Alloy / temper	State alloy, temper and thickness.	Unstated condition creates unpredictable springback.
Grain	Call out grain where appearance or crack risk matters.	Grain can change bend uniformity and gloss.
Blank	Confirm flat pattern orientation.	A correct bend on the wrong grain can still fail.

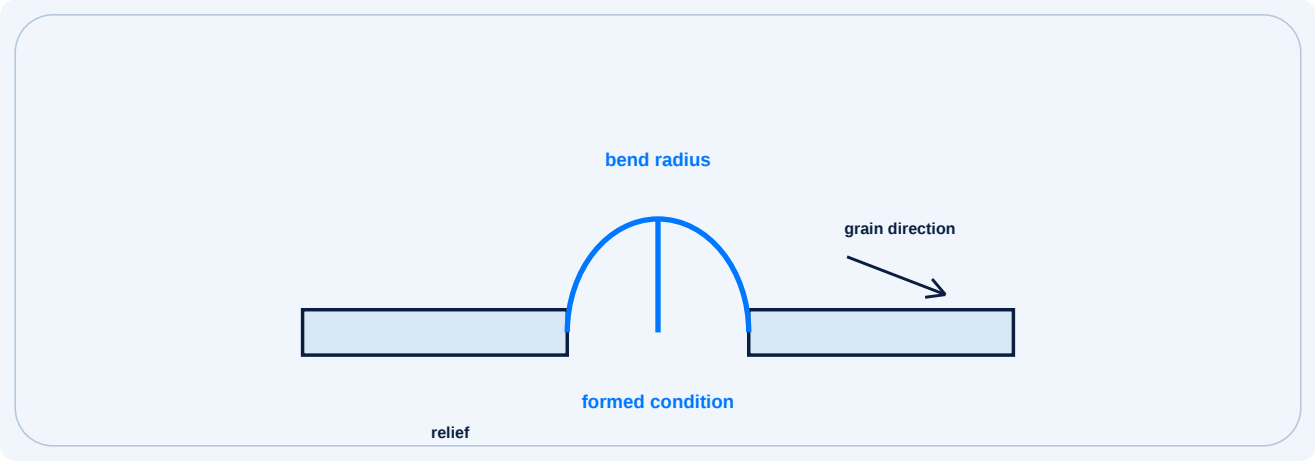
USE WHEN	AVOID
State alloy, temper and thickness.	Unstated condition creates unpredictable springback.

PROCESS CONTROL	Do not release a formed part until material, thickness and grain assumptions are controlled.
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SHEET METAL FABRICATION DESIGN

Radius is a functional and appearance requirement.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Inside radius	Match radius to alloy, temper, thickness and tooling.	Small radii can crack or mark the bend.
Bend-to-edge	Leave straight length beyond the bend zone.	Short flanges can distort or slip in the tool.
Springback	Define expected angle control and correction.	Unplanned springback shifts assembly interfaces.

USE WHEN

Match radius to alloy, temper, thickness and tooling.

AVOID

Small radii can crack or mark the bend.

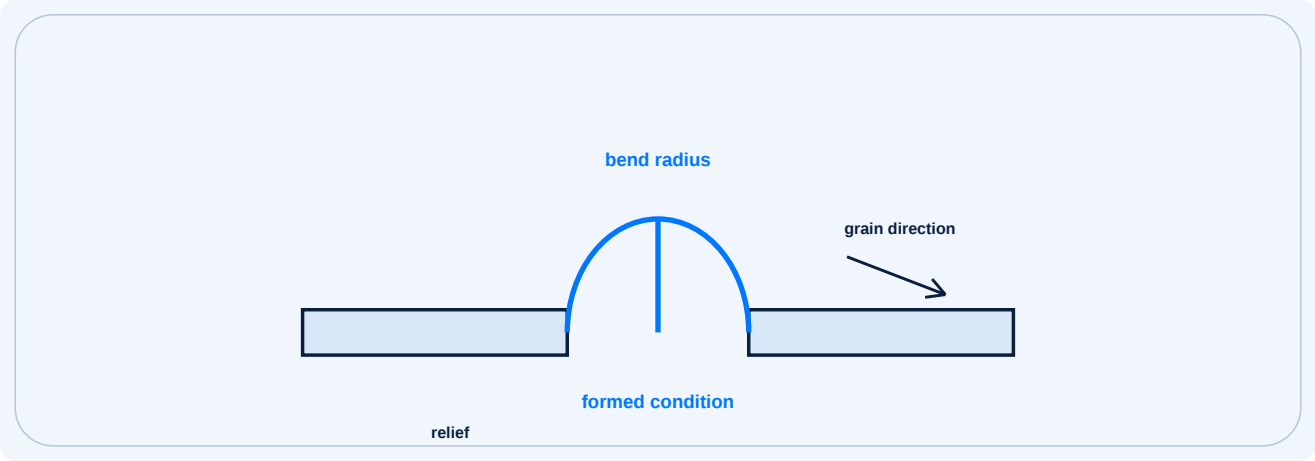
PROCESS CONTROL

Confirm radius, tooling and angle capability before tightening flange dimensions.

SHEET METAL FABRICATION DESIGN

Reliefs control tearing and corner bulges where bends meet.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Bend relief	Add relief at intersecting flanges.	Without relief, corners tear or over-bend.
Corner gap	Set a functional gap and cosmetic limit.	An uncontrolled gap can trap debris or fail appearance.
Edge break	Define deburr and edge-break after forming.	Sharp edges create handling and assembly risk.

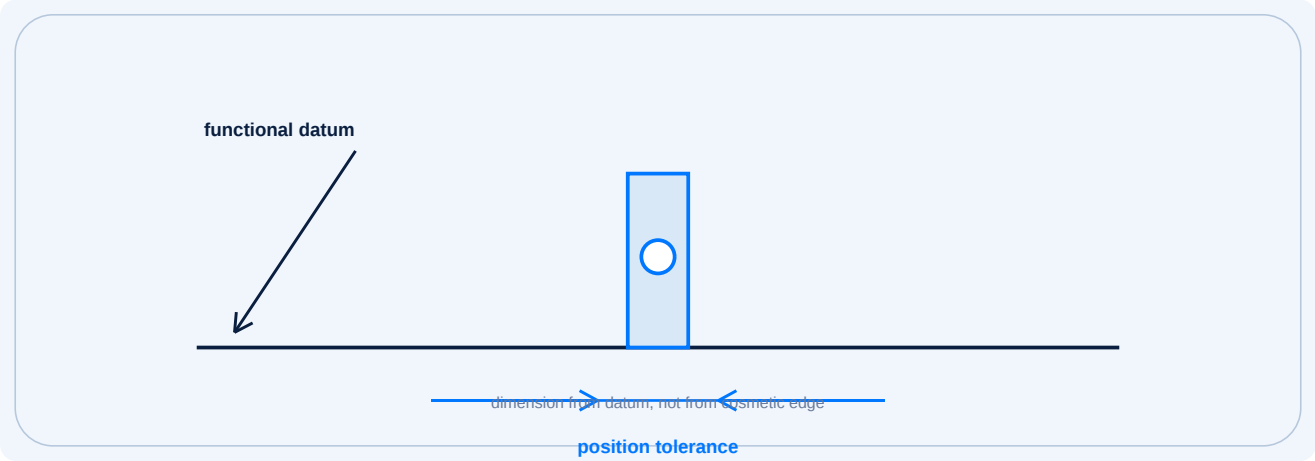
USE WHEN	AVOID
Add relief at intersecting flanges.	Without relief, corners tear or over-bend.

PROCESS CONTROL	Show relief geometry and corner acceptance on the flat and formed views.
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SHEET METAL FABRICATION DESIGN

Holes can ovalize or move when the flange forms.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Hole offset	Keep holes outside the bend deformation zone.	A hole near a bend can lose position and roundness.
Pilot	Use a controlled first operation if the hole must be close.	Forming can shift an earlier un-supported hole.
Gauge	Measure the hole in the formed condition.	Flat-pattern inspection may miss the final position.

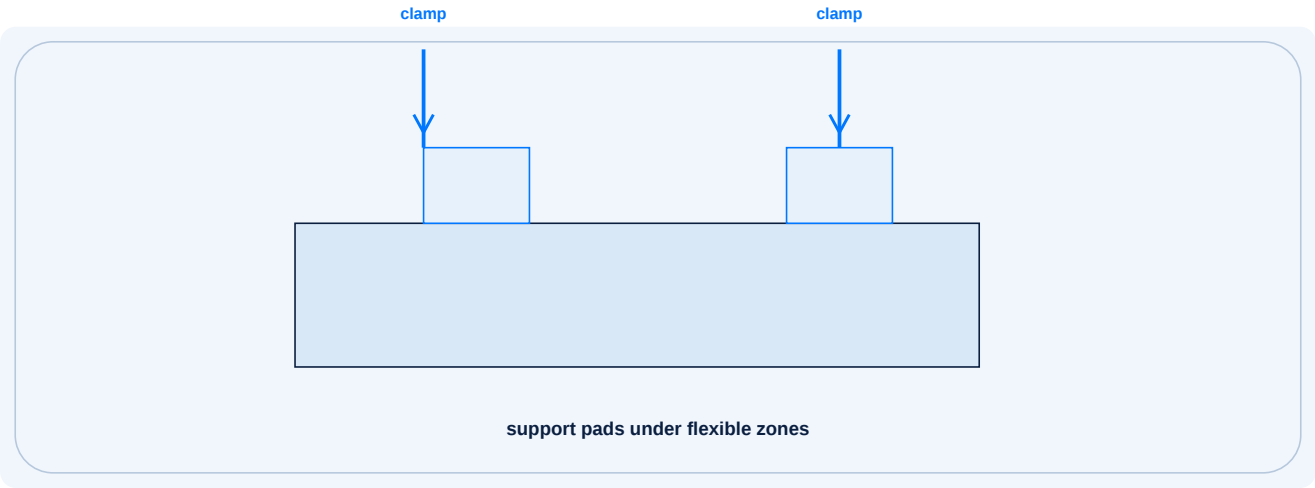
USE WHEN	AVOID
Keep holes outside the bend deformation zone.	A hole near a bend can lose position and roundness.

PROCESS CONTROL	If a hole must be near a bend, review deformation, gauge access and a secondary operation.
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SHEET METAL FABRICATION DESIGN

Sequence determines access, collision and accumulated variation.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Order	Form features while both sides remain accessible.	A later bend can block the tool or gauge.
Tool access	Check punch, die and flange clearance.	CAD can hide a collision in the press brake.
Datum	Use a stable flange as the next reference.	A changing flange creates cumulative error.

USE WHEN	AVOID
Form features while both sides remain accessible.	A later bend can block the tool or gauge.

PROCESS CONTROL	Include a bend-sequence review for multi-flange parts and tight assembly fits.
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SHEET METAL FABRICATION DESIGN

Weld sequence can move an otherwise accurate formed part.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Joint layout	Minimize weld volume while satisfying structure.	Extra weld metal increases heat and shrinkage.
Fixture	Locate from functional datums and allow predictable movement.	Over-restraint can raise residual stress.
Sequence	Balance sides and use a qualified skip or back-step plan.	Unbalanced heat rotates the frame or flange.

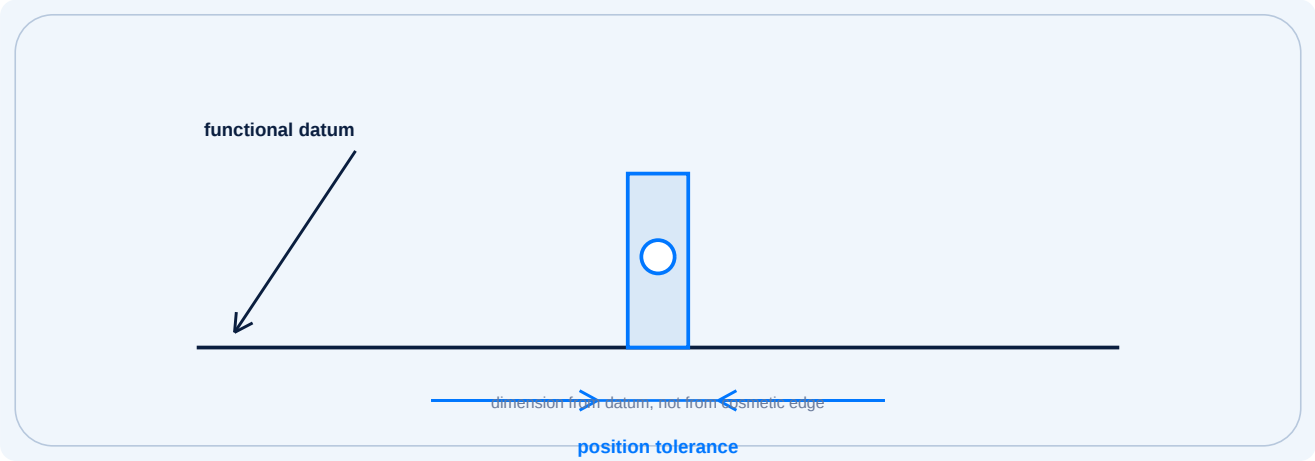
USE WHEN	AVOID
Minimize weld volume while satisfying structure.	Extra weld metal increases heat and shrinkage.

PROCESS CONTROL	Treat heat input, restraint and post-weld inspection as drawing-level design inputs.
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SHEET METAL FABRICATION DESIGN

Each operation contributes a different error pattern.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Flat cut	Use practical laser or punch limits.	Tight blank limits may not improve formed fit.
Angle	State angle limit and free-state condition.	Springback can make a good process look inconsistent.
Assembly	Dimension from functional datums.	Stacking unspecified flange limits creates surprise.

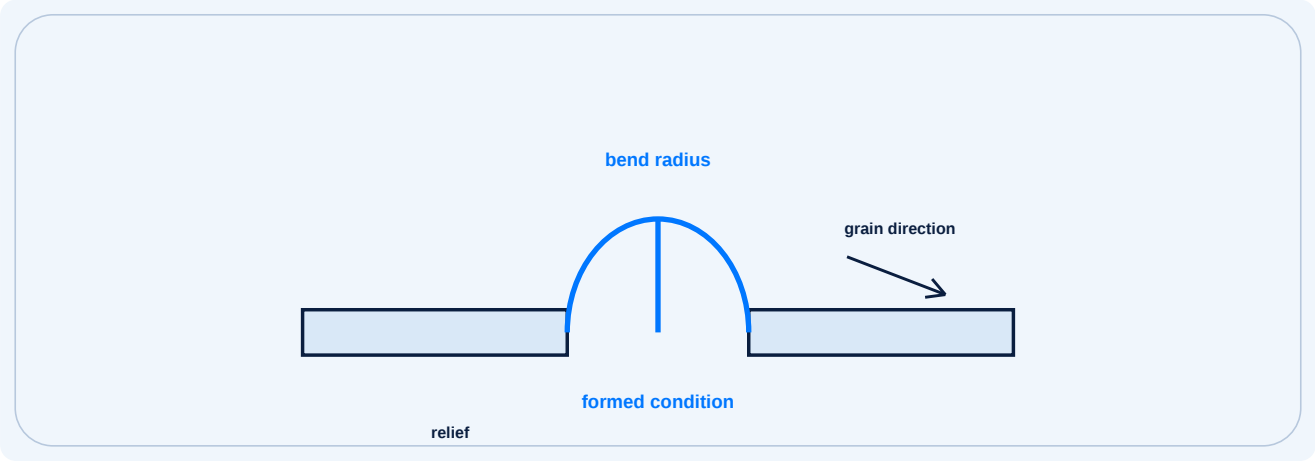
USE WHEN	AVOID
Use practical laser or punch limits.	Tight blank limits may not improve formed fit.

PROCESS CONTROL	Use a datum chain that represents the assembled condition, not just the flat blank.
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SHEET METAL FABRICATION DESIGN

The supplier needs both the blank and the final geometry.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Flat pattern	Show bend lines, grain and reliefs.	Missing flat detail forces supplier assumptions.
Formed view	Show radii, angles and inspection condition.	A blank-only drawing cannot control the final part.
Finish	Define cosmetic faces and protection.	Handling marks can appear after forming or welding.

USE WHEN

Show bend lines, grain and reliefs.

AVOID

Missing flat detail forces supplier assumptions.

PROCESS CONTROL

Send the flat pattern, formed model, quantity and finish requirement for engineering feedback.

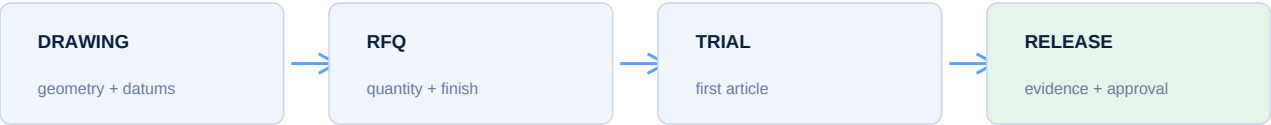
SHEET METAL FABRICATION DESIGN

Drawing review checklist before RFQ or production release

RELEASE CHECKLIST

- ☐ Thickness, alloy, temper and grain direction are stated.
- ☐ Bend radii match material and tooling.
- ☐ Reliefs are shown at corners and intersections.
- ☐ Holes are clear of deformation zones.
- ☐ Flat pattern and formed orientation are unambiguous.
- ☐ Bend angles and springback controls are defined.
- ☐ Weld seams, starts and cosmetic zones are identified.
- ☐ Free-state or restrained inspection is stated.
- ☐ Assembly datums are used across multiple flanges.
- ☐ Deburr and edge-break requirements are listed.

RELEASE PATH



DECISION RECORD

Record the drawing revision, open question, owner, target date and final customer decision in the related checklist workbook.

SHEET METAL FABRICATION DESIGN

RFQ and release worksheet

DRAWING INPUTS

Part number	Revision	Process
Alloy / temper	Quantity	Minimum feature
General tolerance	Critical tolerance	Critical datum
Finish	Inspection condition	Target date

CUSTOMER / SUPPLIER ACTION

Action	Owner	Due date	Decision / evidence

ENGINEERING SUPPORT

Send the 2D drawing, 3D model, quantity and finish requirement for a practical design review.

baosongprecision.com/contact-us/