



SI PROTECH

— KNOWLEDGE PORTAL

Part Design Guidelines

Designing plastic parts for injection moulding

Eleven considerations to keep in mind when designing a
part for injection moulding.

01

DESIGN FOR
MANUFACTURE

02

WALL THICKNESS

05

DRAFT ANGLES

06

GATE LOCATION

09

MATERIAL
SELECTION

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PROTOTYPING &
TESTING

PART DESIGN

Eleven considerations for a part that moulds well

Good part design starts with the injection moulding process in mind. These guidelines cover the decisions that most affect manufacturability, quality and cost, from wall thickness and draft to gate location, tolerances and prototyping.

01  Design for Manufacture (DFM)	02  Wall thickness	03  Ribs and gussets	04  Fillets and radii
05  Draft angles	06  Gate location	07  Surface finish	08  Tolerances
09  Material selection	10  Design for assembly	11  Prototyping and testing	 Talk to our engineers about your part

01



Design for Manufacture (DFM)

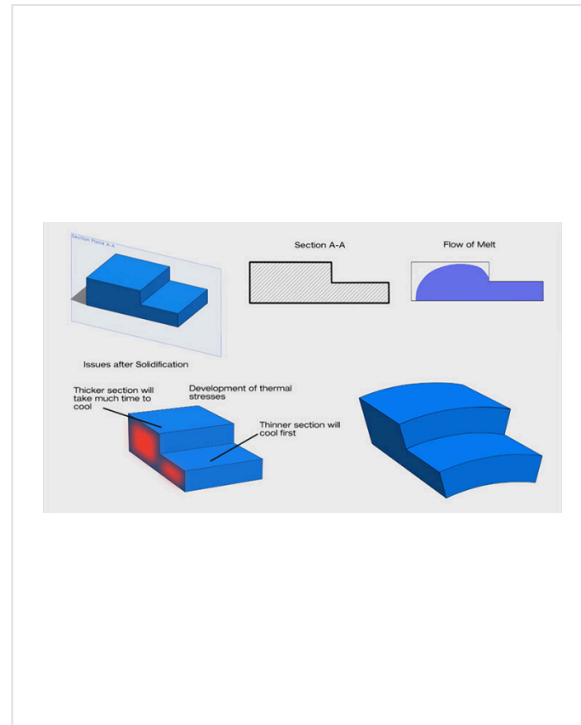
Keep in mind the capabilities and limitations of the injection moulding process during the design phase. Consider factors such as draft angles, wall thickness, parting lines, undercuts, and material flow to ensure the part can be easily manufactured.

02



Wall thickness

Maintain a consistent and appropriate wall thickness throughout the part. Non-uniform wall thickness can lead to issues like sink marks, warping, and uneven cooling. Generally, thicker walls take longer to cool and increase the risk of defects.



WALL SECTION, MELT FLOW AND COOLING

MATERIAL	RECOMMENDED WALL THICKNESS
ABS	0.045 in. - 0.140 in.
Acetal	0.030 in. - 0.120 in.
Acrylic	0.025 in. - 0.500 in.
Liquid crystal polymer	0.030 in. - 0.120 in.
Long-fiber reinforced plastics	0.075 in. - 1.000 in.
Nylon	0.030 in. - 0.115 in.
Polycarbonate	0.040 in. - 0.150 in.
Polyester	0.025 in. - 0.125 in.
Polyethylene	0.030 in. - 0.200 in.
Polyphenylene sulfide	0.020 in. - 0.180 in.
Polypropylene	0.025 in. - 0.150 in.
Polystyrene	0.035 in. - 0.150 in.
Polyurethane	0.080 in. - 0.750 in.

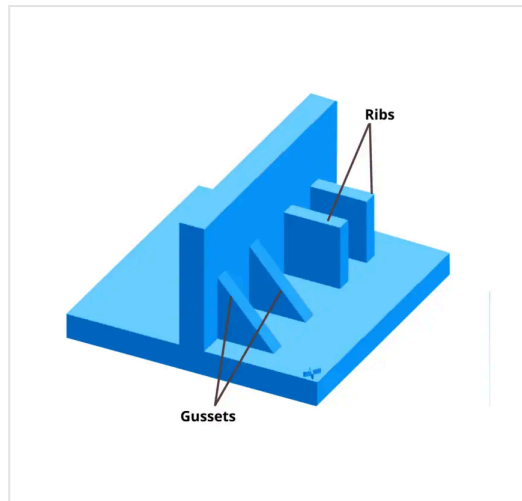
PLASTIC WALL THICKNESS CHART

03

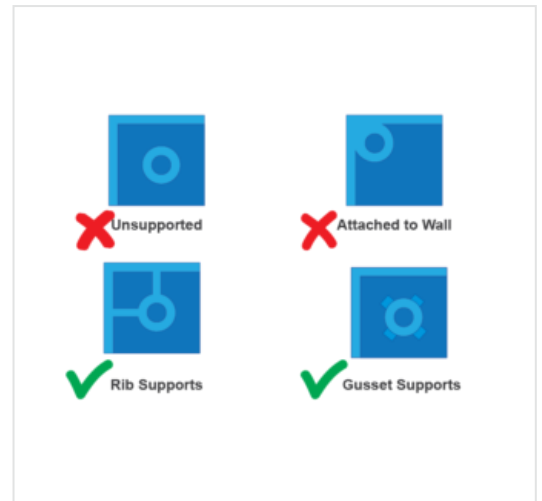


Ribs and gussets

Use ribs or gussets to add structural strength to the part while minimising material usage. These features can help reduce the overall weight and cost of the part.



RIBS AND GUSSETS



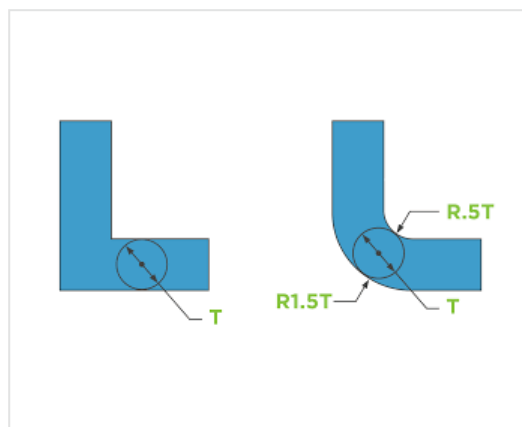
SUPPORTING A BOSS

04

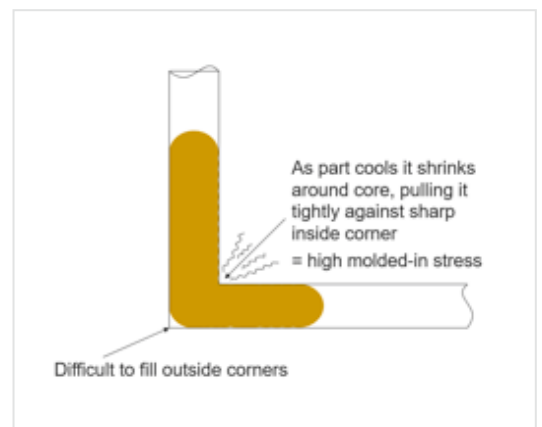


Fillets and radii

Incorporate fillets or radii at the sharp corners of the part. These features help to improve mould flow, minimise stress concentrations, and prevent the formation of sink marks or stress cracks.



SHARP CORNER VERSUS RADIUSED CORNER



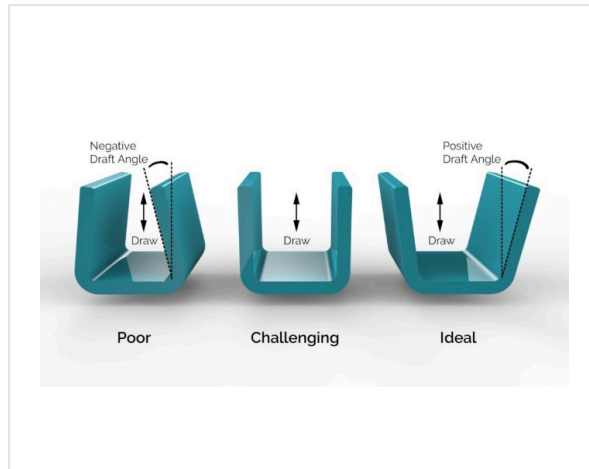
MOULDED-IN STRESS AT SHARP CORNERS

05

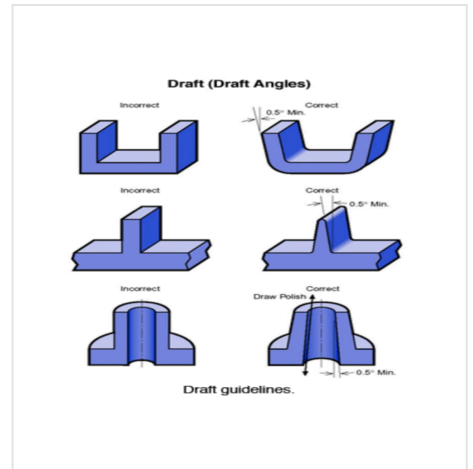


Draft angles

Include draft angles on vertical walls or surfaces of the part to facilitate easy ejection from the mould. Draft angles typically range from 1 to 3 degrees per side, depending on the texture and surface finish requirements.



DRAFT: POOR, CHALLENGING, IDEAL



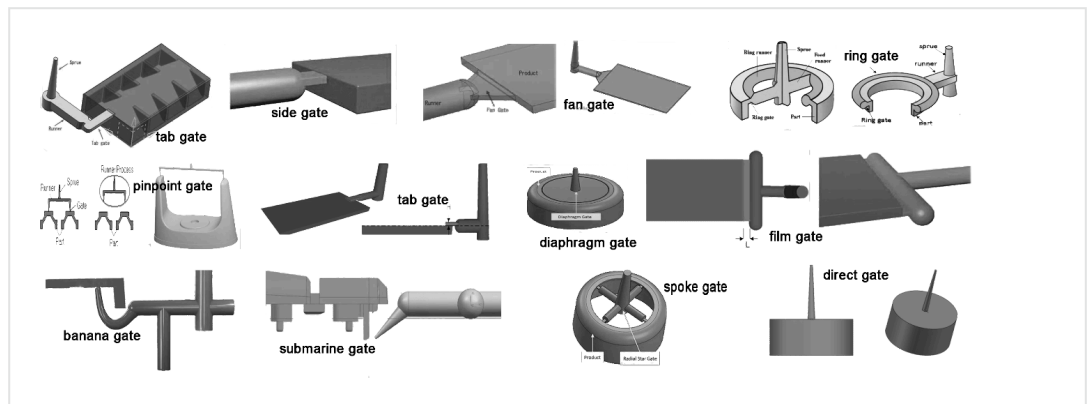
DRAFT GUIDELINES

06



Gate location

Determine the optimal gate location for material injection. Gate placement affects the part's aesthetics, strength, and warpage. Common gate locations include edge, sub-gate, and direct gate options.



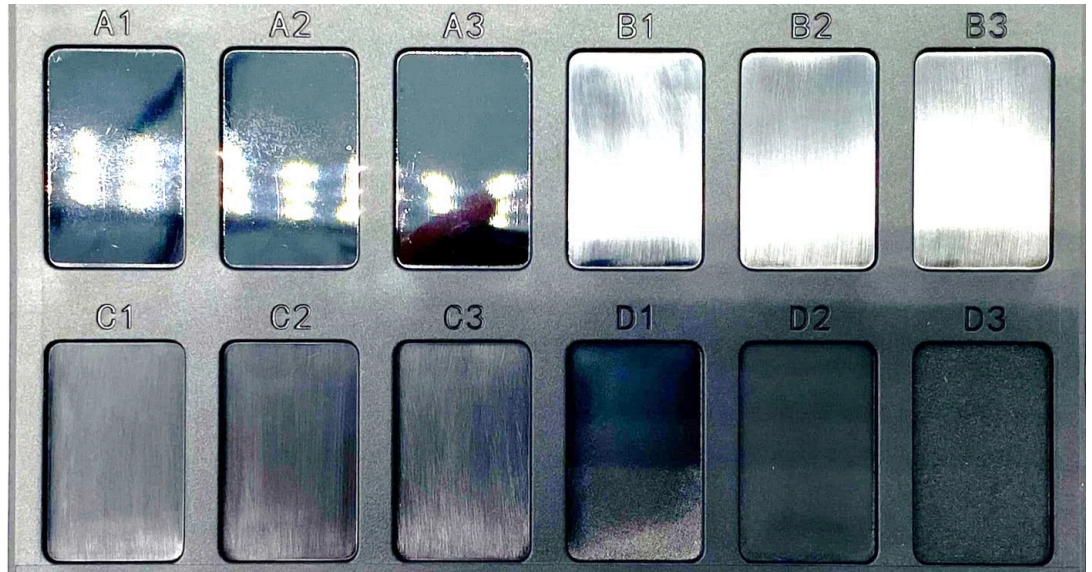
COMMON GATE TYPES

07



Surface finish

Specify the desired surface finish for the part early in the design process. Different areas may require different finishes, such as high gloss, textures, or matte finishes. Consider the impact of textures on part ejection and material flow.



SURFACE FINISH SAMPLES

08



Tolerances

Understand the manufacturing capabilities and limitations when setting tolerances for critical dimensions. Tight tolerances may require more precise tooling and can increase production costs.

09



Material selection

Choose an appropriate plastic material for the intended application and environment. Consider factors such as mechanical properties, temperature resistance, chemical compatibility, and regulatory requirements. See the materials information table located on our website.



Plastic Materials Information

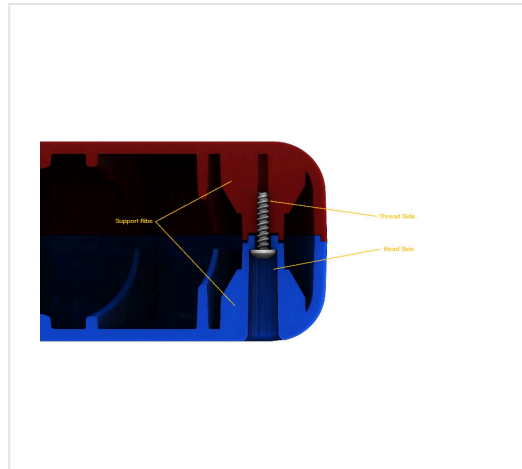
Properties and typical applications for common moulding polymers, available at siprotech.co.uk.

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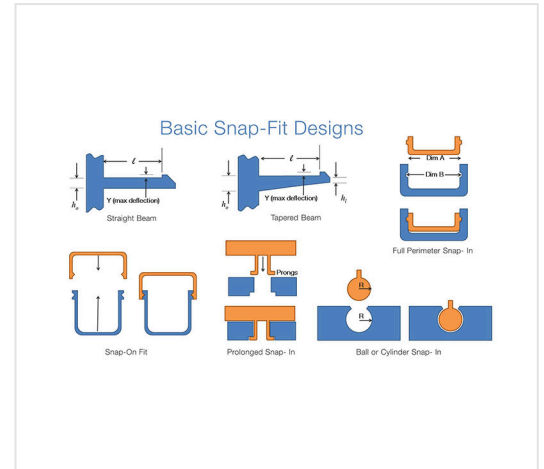


Design for assembly

If the part requires assembly with other components, consider features like snap fits, interlocking tabs, or self-aligning features to simplify the assembly process.



SUPPORT RIBS AND SCREW BOSSES



BASIC SNAP-FIT DESIGNS

11



Prototyping and testing

Before finalising the design, it is advisable to create prototypes and conduct functional testing to identify potential issues and make necessary improvements.

QUICK REFERENCE

Prototyping process comparison

Prototyping methods compared by description, strength, finish and typical materials, alongside production injection moulding.

PROCESS	DESCRIPTION	STRENGTH	FINISH	EXAMPLE MATERIALS
SL Stereolithography	Laser-cured photopolymer	2,500 - 10,000 (psi) 17.2 - 68.9 (MPa)	Additive layers .051 - .152 (mm) typical	Thermoplastic-like photopolymers
SLS Selective Laser Sintering	Laser-sintered powder	5,300 - 11,300 (psi) 36.5 - 77.9 (MPa)	Additive layers .102 (mm) typical	Nylon, metals
DMLS Direct Metal Laser Sintering	Laser-sintered metal powder	37,700 - 190,000 (psi)	Additive layers .020 - .030 (mm) typical	Stainless steel, titanium, chrome, aluminium, Inconel
FDM Fused Deposition Modelling	Fused extrusions	5,200 - 9,800 (psi) 35.9 - 67.6 (MPa)	Additive layers .127 - .330 (mm) typical	ABS, PC, PC/ABS, PPSU
3DP Three Dimensional Printing	Liquid binder inkjet printed onto powder	Low	Additive layers .089 - .203 (mm) typical	Plaster-based powder/liquid binder
PJET Poly-Jet	UV-cured jetted photopolymer	7,200 - 8,750 (psi) 49.6 - 60.3 (MPa)	Additive layers .015 - .030 (mm) typical	Acrylic-based photopolymers, elastomeric photopolymers
CNC Computer Numerically Controlled (Machining)	Machined using CNC mills	3,000 - 20,000 (psi) 20.7 - 137.9 (MPa)	Subtractive machined (smooth)	Most commodity and engineering-grade thermoplastics and metals
IM Injection Moulding	Injection moulded using aluminium tooling	3,100 - 20,000 (psi) 21.4 - 137.9 (MPa)	Moulded smooth (or with selected texture)	Most commodity and engineering-grade thermoplastics, metal and liquid silicone rubber



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