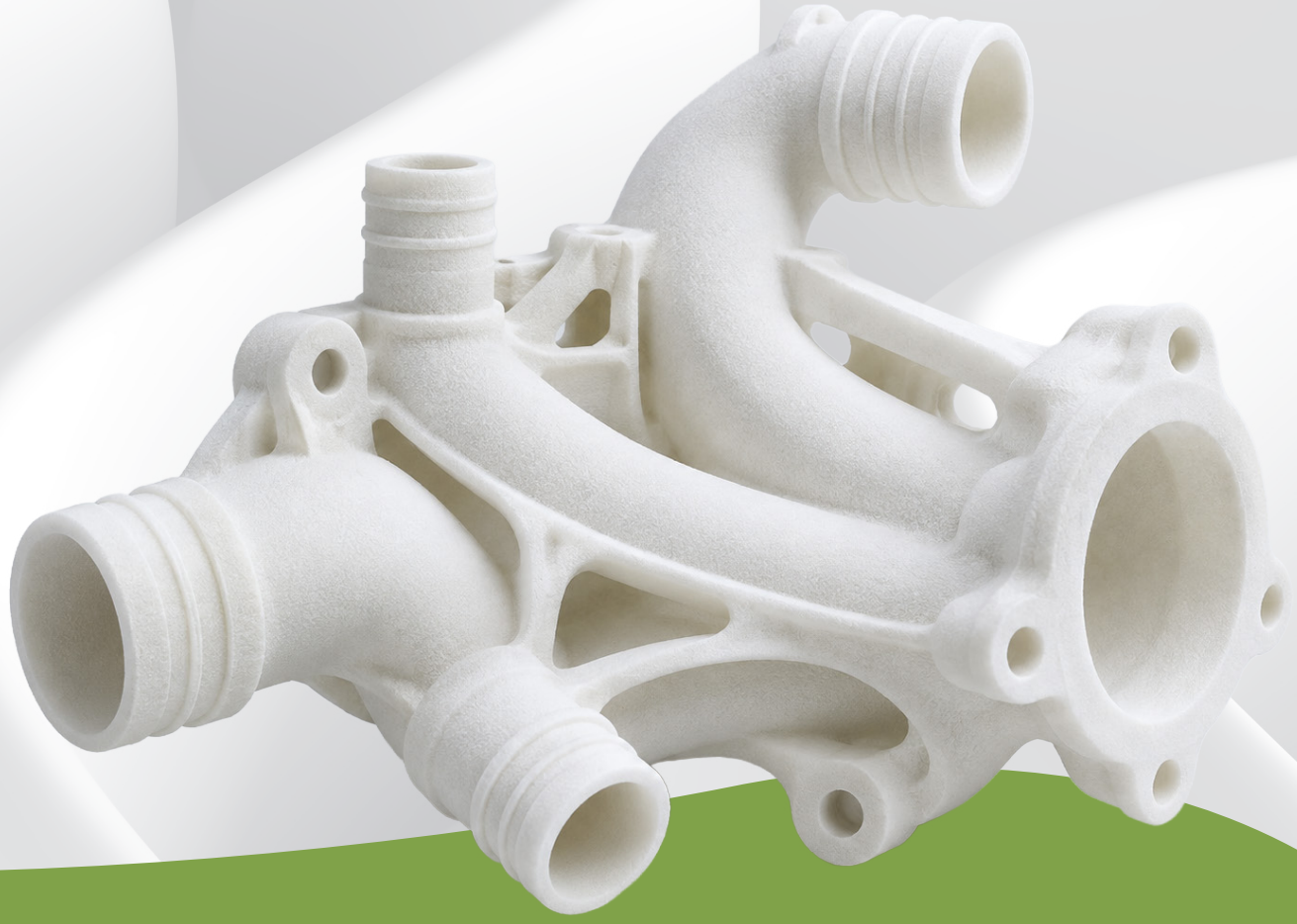
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DESIGN GUIDE

Designing parts for SLA, PSLA, DLP and SLS 3D printing



GOOD DESIGN HELPS YOU GET MORE FROM 3D PRINTING

Choosing suitable wall thicknesses, allowing space between features and planning for cleaning and finishing can all improve the quality and usability of your finished part.

This guide explains the main design considerations for stereolithography (SLA), projector-based stereolithography (PSLA), digital light processing (DLP) and selective laser sintering (SLS). Use it when preparing your CAD model, checking small details or deciding which process suits your project.

The same design dimensions apply to our SLA, PSLA and DLP services. These are starting points for design: a feature that can be printed may still need to be larger or thicker to withstand assembly, handling or use. Material, part size, build orientation and finishing requirements also affect the result.

All dimensions are in millimetres unless stated otherwise.



UNDERSTANDING SLA, PSLA, DLP AND SLS

SLA, PSLA AND DLP

SLA, DLP and PSLA all use light to cure liquid resin into a solid part, layer by layer. Traditional laser-based SLA traces each layer with a laser, while DLP and PSLA use projected light to expose a complete layer at a time.

PSLA stands for projector-based stereolithography. It combines projected-light curing with a resin-vat process to produce detailed parts with smooth surfaces.

These processes are suitable for parts where fine detail and surface appearance are priorities. Parts may need temporary supports during printing, followed by cleaning and post-curing. Supports are removed afterwards, and their contact points can affect the surface finish. If a particular face must look its best, identify it when submitting your design.

The same design dimensions apply to our SLA, DLP and PSLA services throughout this guide. Material, part geometry, build orientation and finishing requirements can still affect the result.

SLS

SLS uses a laser to fuse polymer powder into a solid part, layer by layer. The surrounding powder supports the part during printing, allowing many features to be produced without separate support structures.

Unfused powder must be removed after printing. This makes access to cavities, holes and internal channels an important part of the design.

CHOOSING A PROCESS

Start with what your part needs to do. Consider its appearance, strength, flexibility, operating conditions and how it will fit with other components.

The printing process alone does not determine performance. Select the material alongside the process, particularly for parts that will carry loads, flex repeatedly or experience heat.

HOW THE PRINTING PROCESSES WORK

Each process builds your part layer by layer. These diagrams show how light, material and the build platform work together, and how the part is supported during printing.

SLA, PSLA AND DLP

SLA, PSLA and DLP use light to turn liquid resin into a solid part. SLA uses a laser, while DLP and PSLA use projected light to cure each layer.

The diagrams show two arrangements: a platform that lowers into the resin, and a platform that lifts the part out. Temporary support structures connect the part to the platform and hold features in place during printing. These supports are removed afterwards, and the part is cleaned and post-cured.

SLS

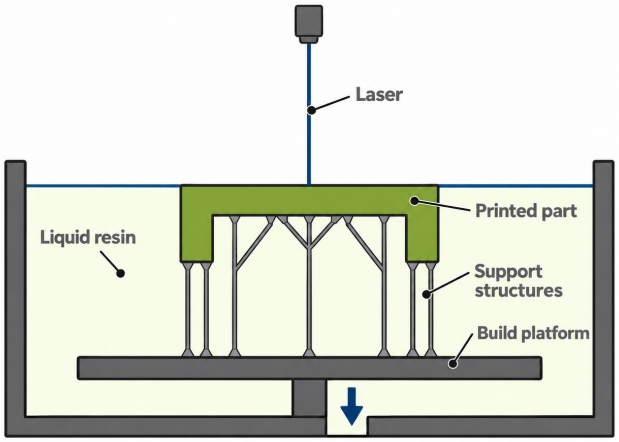
SLS uses a laser to fuse polymer powder into a solid part. The build platform lowers as fresh layers of powder are added.

The surrounding powder supports the part during printing, so separate support structures are generally unnecessary. After cooling, the part is removed from the powder bed and cleaned to remove loose powder.

WHAT THIS MEANS FOR YOUR DESIGN

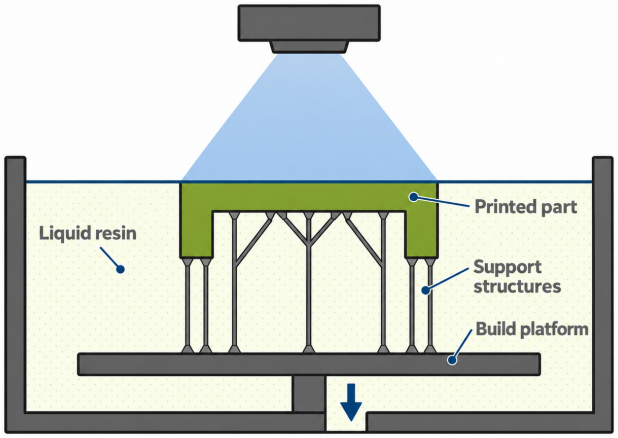
For resin processes, consider where supports will attach and how resin can drain from hollow areas. For SLS, allow access to remove powder from cavities and channels. In every process, build orientation can affect the result.

SLA
Laser stereolithography



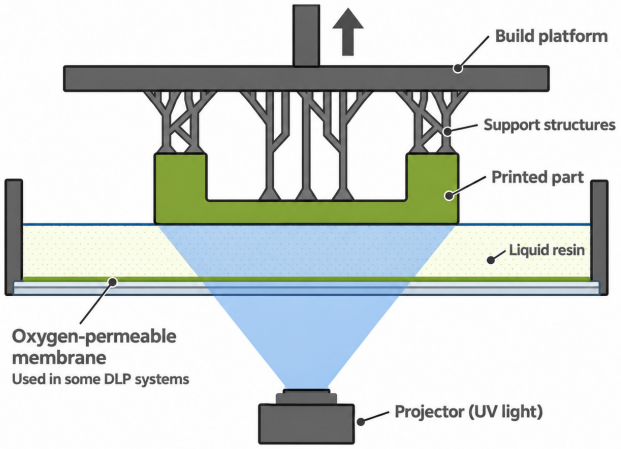
Support structures connect the part to the build platform.
The build platform lowers into the resin as each layer is printed.

PSLA
Projection stereolithography



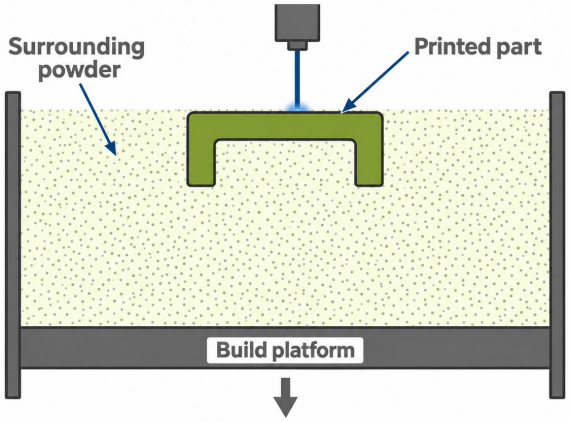
Support structures connect the part to the build platform.
The build platform lowers into the resin as each layer is printed.

DLP
Digital light processing



The part hangs from the platform on support structures.

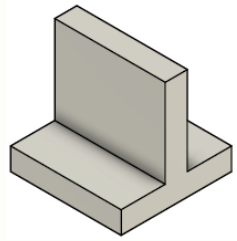
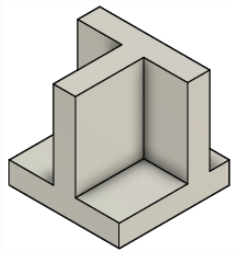
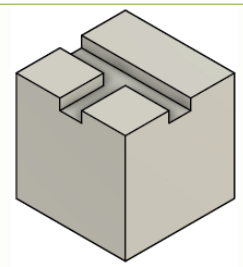
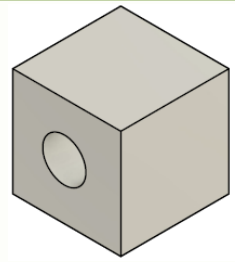
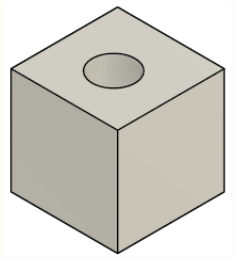
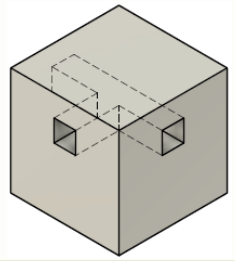
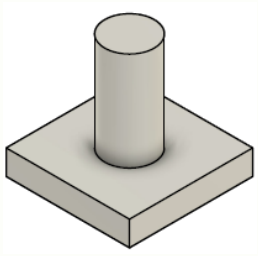
SLS
Selective laser sintering

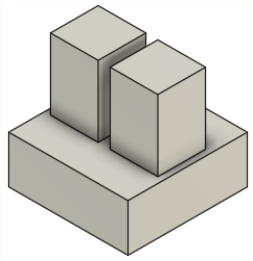
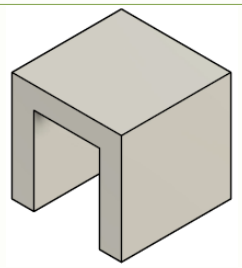
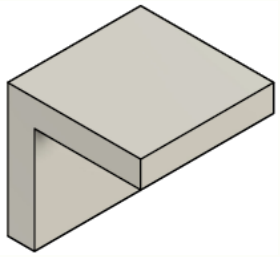
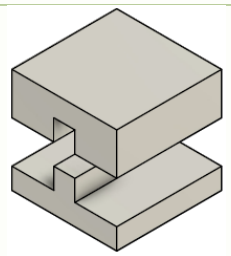
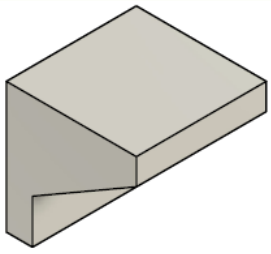
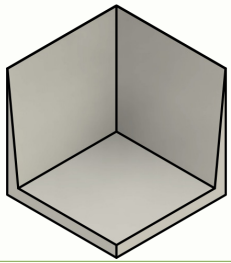
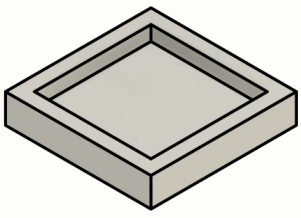


Surrounding powder supports the part. No support structures required.

QUICK DESIGN REFERENCE

Use this table for an initial check, then read the explanations that follow.

	Feature	SLA / PSLA / DLP	SLS
	Unsupported wall thickness	0.7 mm minimum	Discuss thin or tall walls before ordering
	Supported wall thickness	0.5 mm minimum	Discuss thin or tall walls before ordering
	Open channel or gap width	0.5 mm minimum	0.8 mm minimum
	Horizontal hole diameter	0.7 mm minimum	1.0 mm minimum
	Vertical hole diameter	0.5 mm minimum	0.5 mm for depths up to 5 mm; 1.0 mm for greater depths
	Enclosed channel size	1.0 mm minimum, subject to cleaning access	Review individually
	Vertical pin diameter	0.5 mm minimum	1.0 mm minimum

	Feature	SLA / PSLA / DLP	SLS
	Clearance between nearby features	0.5 mm for features up to 5 mm high; 1.0 mm above 5.0 mm	0.7 mm for features up to 5 mm high; 1.0 mm above 5.0 mm
	Unsupported bridge span	5.0 mm minimum	Material is self-supporting, so this is not a concern
	Unsupported overhang length	2.0 mm minimum	Material is self-supporting, so this is not a concern
	Mating clearance	0.1 mm unpainted, 0.2 mm painted	0.1 mm minimum
	Self-supporting angle	40°	Material is self-supporting, so this is not a concern
	Feather edge	Will form up to 0.5 mm	Will form up to 0.5 mm, edge may have a wave/ warping issue
	Large Flat Surfaces	Warpage is generally not an issue, but orientation will be optimised to reduce effect	Parts will distort after print; adding ribs can help but may not overcome twisting

Horizontal and vertical refer to the orientation during printing. Rotating a part for manufacture can change which guidance applies.

DESIGNING WALLS THAT HOLD THEIR SHAPE

Wall thickness affects whether a part prints successfully and how well it survives cleaning, finishing and use.

A **supported wall** is braced by adjoining geometry, such as a wall connected along two or more sides. An **unsupported wall** has fewer connections and is more vulnerable to bending or distortion.

For SLA, PSLA and DLP, use a minimum thickness of **0.5 mm for supported walls** and **0.7 mm for unsupported walls**.

For SLS, discuss thin walls with us, especially where they are tall or form a broad, flat surface. Large flat areas can be susceptible to warping.

PRACTICAL DESIGN TIPES

- Increase thickness where a wall will carry a load or be handled regularly.
- Add ribs or bracing where a large panel needs more stiffness.
- Avoid sudden changes in thickness where possible.
- Review thin sections around holes, slots and cut-outs, as these may become weak points.

Treat the minimum printable thickness as a manufacturing limit. It does not establish whether a wall will be strong enough for your application.

OPEN CHANNELS AND GAPS

An open channel is a groove or passage exposed along one side. A gap is the space between neighbouring surfaces.

Use a minimum width of **0.5 mm for SLA**, **PSLA and DLP** and **0.8 mm for SLS**.

Narrow spaces can be difficult to clean and may not remain fully open. Deep grooves and long slots can need more clearance than short, shallow features.

If a channel carries fluid or airflow, explain its purpose when submitting the design. A passage that forms successfully may still need further consideration to meet its intended performance.

HOLES AND INTERNAL PASSAGES

Hole size and depth both matter. A small hole through a thin wall is generally easier to produce and clean than a long passage of the same diameter.

HORIZONTAL HOLES

For holes running horizontally during printing, use a minimum diameter of:

- SLA, PSLA and DLP: 0.7 mm
- SLS: 1.0 mm

VERTICAL HOLES

For holes running vertically during printing, use:

- SLA, PSLA and DLP: 0.5 mm minimum diameter
- SLS: 0.5 mm minimum diameter for depths up to 5 mm, increasing to 1.0 mm for greater depths

These figures describe printable features. They are not dimensional tolerance guarantees. If a hole must locate a pin, accept a bearing or fit a fastener precisely, identify the required finished size and fit.

ENCLOSED CHANNELS

An enclosed channel is surrounded by material along its length. Both ends may be open, but access for cleaning is more restricted than in an open groove.

For SLA, PSLA and DLP, use **1.0 mm as the starting minimum channel size**, with the final design reviewed for drainage and cleaning access.

SLS enclosed channels require individual review. Their length, bends, openings and accessibility affect whether unfused powder can be removed.

Keep internal routes short and direct where possible. Avoid blind passages that can trap material, and provide access openings where needed.

SMALL PINS AND PROJECTING DETAILS

Pins, posts and other narrow projections can be fragile, even when they meet the minimum printable diameter.

For vertical pins, use a minimum diameter of:

- SLA, PSLA and DLP: 0.5 mm
- SLS: 1.0 mm

The taller the pin, the more important its diameter and connection to the surrounding part become. A short locating feature and a long slender post should not be treated as equivalent.

Where possible, strengthen the base with a radius or local reinforcement. Tell us if the pin will carry a load, flex or be pressed into another component.

LEAVING SPACE BETWEEN FEATURES

Nearby features need enough separation to remain distinct and allow cleaning.

For SLA, PSLA and DLP, allow:

- 0.5 mm clearance for features up to 5 mm high
- 1.0 mm clearance for features above 5 mm high

For SLS, allow:

- 0.7 mm clearance for features up to 5 mm high
- 1.0 mm clearance for features above 5 mm high

These values apply to separation between features. The clearance needed for an assembly or moving mechanism should be reviewed separately.

BRIDGES AND OVERHANGS

A **bridge** spans a gap and connects to the part at both ends. An **overhang** projects from the part and is connected at one end.

For SLA, PSLA and DLP, the starting limits without additional support are:

- Unsupported bridge span: 5.0 mm
- Unsupported overhang length: 2.0 mm

Longer features may need temporary supports, a different build orientation or a design change. Support removal also needs to be possible without damaging the part.

SLS powder supports the surrounding geometry during printing, so the same unsupported span limits do not apply. Long, thin or broad features can still distort and should be reviewed.

DESIGNING PARTS THAT FIT TOGETHER

Parts that fit together need a deliberate allowance between their mating surfaces. Matching CAD dimensions alone may not produce the required fit.

The correct allowance depends on the material, geometry, surface finish and type of connection. A sliding fit, a press fit and a glued joint each have different requirements.

When submitting an assembly, tell us:

- Which components fit together.
- Whether the connection should be loose, sliding, tight or permanent.
- Whether parts will be painted or coated.
- Which dimensions are critical to the fit.

Paint and coatings can reduce available clearance. For a critical assembly, consider testing the fit on a sample before producing the full quantity.

Parts intended to move while printed together need a separate review of clearance and cleaning access.

THIN AND TAPERED EDGES

A feather edge tapers towards a very thin section, such as the edge of a blade-like feature.

These edges can be delicate and may not reproduce as a perfectly sharp point. SLS edges may also show waviness or distortion.

Where possible, finish the taper with a small, defined thickness. If the edge performs a specific function, identify that requirement so its suitability can be assessed.

HOLLOW PARTS AND CLEANING ACCESS

Hollowing a part can reduce material use, but it also creates spaces that need to be drained or cleaned.

For SLA, DLP and PSLA, provide openings that allow uncured resin to drain and internal surfaces to be cleaned. The design must also allow appropriate post-curing. Discuss fully enclosed cavities before finalising your model.

For SLS, provide openings that allow unfused powder to be removed. Small openings, tight bends and inaccessible cavities can make this difficult.

Discuss hollow parts before finalising the design. The number, size and position of openings should suit the cavity, material and printing process. Where internal access is restricted, splitting the model into separate components may make cleaning and assembly more practical.

PLANNING FOR SURFACE FINISH

Consider the finished appearance while designing the part.

Identify visible faces, areas that will be painted and surfaces that must fit against another component. Small details and narrow gaps may be affected by sanding, coating or other finishing operations.

If lettering, logos or textured details are important, flag them for review. Their size, depth and position all influence how clearly they reproduce.

PREPARING YOUR DESIGN FOR A QUOTATION

Submit the latest revision of your model and clearly identify the units used.

Alongside the model, include:

- The intended use of the part.
- Your preferred material and process, if known.
- Quantity required.
- A drawing showing critical dimensions and tolerances.
- Assembly and fit requirements.
- Important cosmetic surfaces.
- Painting, coating or finishing requirements.

If you are unsure about the process or material, describe what the part needs to achieve.

FINAL DESIGN CHECKLIST

Before submitting your design, check that:

- Walls are suitable for the part's size and intended use.
- Small pins and projecting details are robust enough for handling.
- Holes, channels and gaps meet the relevant guidance.
- Internal cavities can be drained or cleaned.
- Mating parts have an allowance appropriate to the required fit.
- Finishing requirements have been considered.
- Critical dimensions and visible surfaces are clearly identified.
- Your files show the correct units and revision.

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Use **Matrix** for instant quotes for SLS, SLA and DLP 3D printed parts: **prototypeprojects.com/matrix**

NEED HELP WITH YOUR DESIGN

If your design includes unusually thin walls, small details, enclosed channels or a critical fit, discuss it with us before ordering.

Share the model and explain what the part needs to do. This helps us assess the features that matter most and identify any changes needed before manufacture.

Email us: office@prototypeprojects.com

Call us: 01763 249760

DATA VERIFICATION AND FORMAT

Please note, we will need to verify all CAD data and confirm lead times for every quote request and order.

All data should be supplied in .step/.stp file format.

If you have any questions, please call us on 01763 249760 or **check our website**.

OVERNIGHT 3D PRINTING

The final CAD and order is required by 3.00pm, Monday-Thursday, for our overnight 3D Printing production speed.

We also offer a Fill Up Friday production speed where work is printed over the weekend, ready for dispatch Monday, subject to print times and finishing options. Final CAD and order are required by midday on Friday.

All other production speed orders received after 1.00pm will be scheduled from the next working day.

Visit our website for more information about our **production speeds**.

INSTANT QUOTING

Use our online platform, **Matrix**, for instant quotes and ordering for SLS, SLA, and DLP 3D Printed parts. We'll be adding CNC Machining during 2025, so check our website for updates. For all other quotes, including PSLA, simply **request a quote** on our website.

QUICK LINKS

We have a wealth of information on our website. Here are links to some of the most useful content you may need.

- **Process datasheets**
- **Material datasheets**
- **Policies, forms and certificates**

Our blog is full is useful articles, including how-to, design guides, industry news, and more.

Matrix - instant quotes and ordering

Request a quote

CASE STUDIES

The majority of our work is, understandably, confidential. However, if and when you are able to talk about a project we have worked on together, we would welcome the opportunity to write up a case study. It's great promotion for us both! Please get in touch with our marketing team if you're interested.

Not quite up to a full case study? We also love to be able to share photos and videos of parts we've worked on. Again, as and when the time comes, please **email our marketing team**.



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