PHIELDBUG OPEN SOURCE VERSION BUILD MANUAL

The Complete Photo-Guide to Assembling
PhieldBug Open Source Version



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Introduction

PhieldBug Open Source Version is a kit which builds an IVA-accepted teardrop trailer sleeping-pod.

We have gone to great lengths to make PhieldBug Open Source Version the lightest teardrop - by far - available today. The empty weight of a completed trailer is approximately 150kg and the noseweight is typically 15kg. So manoevering PhieldBug on the campsite or festival ground is extremely easy. And virtually any car - including classic cars, low-powered air-cooled campers, and even lightweight kitcars - can pull PhieldBug Open Source Version with very little impact on performance and handling.

Single-Handed Assembly

These instructions, and associated documents, detail every significant part required to build an IVA-ready trailer. All parts and materials are readily available from retail sellers.

We've designed PhieldBug Open Source Version to be assembled single-handed. And we've designed a construction that is so lightweight that almost everyone will find it easy to handle the parts solo.

It can be useful to have an occasional assistant, but not essential.

Build Duration

All parts are CNC-cut, so they fit precisely together.

Assembly is mainly by high-tack adhesive which is quicker and tidier than using thousands of unsightly fasteners.

The precision of fit and the method of construction make for a quick but relaxed build. Much of the 'build' time will be spent simply doing nothing while the adhesive holding a whole panel in place has time to set. Assembly is mostly a repeated sequence of: squirt glue, press parts together, then take a few hours off. Typically, a trailer can be fully assembled from parts in the space of nineteen evenings, averaging a couple of hours per evening.

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Bill of Materials, Parts, and Tools

A separate document lists all the materials and parts which will be required to build a PhieldBug.

Timber and plastic parts require cutting - preferably by CNC. Any CNC service can make these parts, or contact us via our website - phieldbug.co.uk - to enquire about a pack of ready-machined timber parts.

Some plastic parts require 3D-printing. Any 3DP service can make these parts, or contact us to enquire about a pack of ready-printed parts.

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Tools

Tool	Notes
Hand tools	Typical tools found in any DIY workshop: hammers, screwdrivers, hex keys, spanners, drill, etc
Drill bits	2.5mm, 4mm, 6mm, 6.5mm, 9mm, 10mm, 15mm All twist-drills, suitable for aluminium and timber.
Cone-cut with extension **This is an <u>essential</u> item which cannot be substituted**	A cone-cut with a 14mm-16mmn maximum diameter. Other drill types are **not** suitable. Larger cone-cuts are **not** suitable. An extension-piece of at least 65mm is required.
Nibbler aluminium cutter	Widely available as an inexpensive drill attachment. Falcon brand is ideal. Budget brands are available.
Heavy duty adhesive gun	Cox Powerflow (400ml) is ideal.
Paint rollers and trays	Several 4” ‘Velour’ rollers, a short handle for the rollers, and a 4” roller tray. Foam rollers are **not** suitable. Rollers cannot be cleaned for re-use: dispose after each coat. A pack of 10qty is more than enough.
Paint brushes	Several disposable 1” brushes. Brushes can (with care) be cleaned using acetone. Or dispose after each coat.
2” (50mm) G-clamps	At least 6-qty of these. **Must** be G-clamps. **Must** be strong. Silverline VC22 are ideal.
4” or 6” (100/150mm) G-clamps	At least 4-qty of these.
Belt sander **or** Surform	For a small amount of high-volume timber removal.
150-grit **and** 100-grit hand-sanding cloth on roll	e.g. Deerfos emery cloth-backed abrasive. Requires approx 100mm x 1m of each.
Optional: 150-grit orbital sander	For quick sanding of large surfaces. A simple sanding block is a cheap alternative.
Tin snips **or** scissors	For cutting ventilator mesh. A cheap pair of decorator’s ‘wallpaper’ scissors will serve.
Pop-riveter	Any budget type will serve: there are only 6-qty small rivets to be fitted.
Heat gun	To fit heat-shrink tubing.
Stands/props	Axle-stands or strong blocks/crates to support the axle at ~250mm from the ground during construction.
Broom handle **or** similar length of wood or metal tubing.	To clamp into the front-leg clamp, to support the nose of the trailer at various heights up to ~1.2m. May require a short piece of drain-pipe or tubing to sleeve it up to size.

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Using Soudal Fix-All Adhesive

Almost all of PhieldBug’s major parts are jointed using Soudal's superb 'Fix-All'. Here are some tips for getting the most out of this adhesive:

- Use only grey and brown Soudal Fix-All. Never use the clear version.
- Use only the ‘High Tack’ variant of Fix-All.
- Remove any dried adhesive from around the nozzle before each use, to prevent lumps in the adhesive which would hold parts apart from each other and prevent proper assembly.
- Most joints do **not** need to be clamped. We state where clamping is necessary.
- Do not spill Soudal Surface Activator onto visible parts: it will stain.
- If adhesive oozes from a joint, **do not** try to clean it immediately. Instead, wait for the adhesive to part-cure (~3-7 hours) then carefully scrape it away. This creates far less mess.
- Uncured Fix-All can be cleaned off of surfaces using a rag soaked in methylated spirits or denatured alcohol.
- Fully cured Fix-All - if tooled-down onto the surface - is extremely difficult to remove.
- Fix-All is viscous and requires a very strong caulking gun to drive it out of the tube.

Cure times of Fix-All, in an unheated southern UK outbuilding in typical Summer/Spring/Autumn conditions are approximately:

- 1 hour: some additional ‘grab’ but still minimal joint strength.
- 3-7 hours: very weak joint, part-cured. This is generally the ideal time to remove ‘oozed’ excess adhesive from outside a joint.
- 12-20 hours: modest joint strength - usually safe to continue with the next step of construction. Still possible to remove oozed adhesive in most cases.
- 40 hours: very good joint strength.
- 100 hours: virtually full cure.

Assume longer cure times in cold weather.

Some parts of the kit are assembled without adhesive. Some other parts are temporary jigs which will be removed at the end of the build - never glue these!

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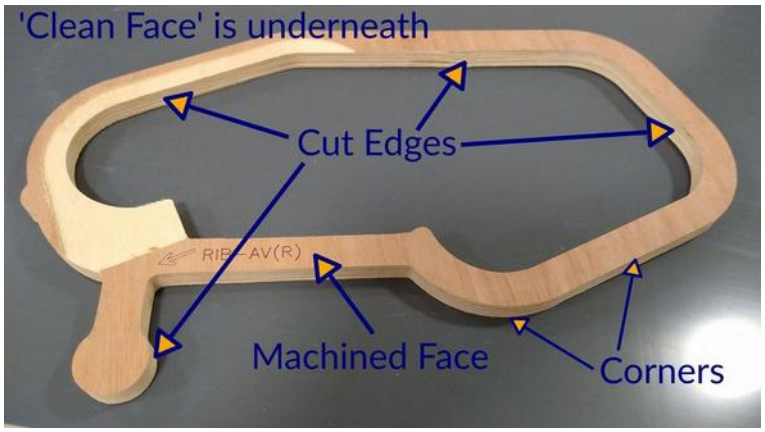
Identifying Parts

Identifying a Part by Name

Most machined parts have their name engraved into them. Those that don't are individually described/pictured.

Identifying a Part's Different Faces

Every machined part has a number of faces. (Image)



In this manual we describe the faces/edges/corners like this:

- The "**machined face"** means the face of the part with machining marks engraved into it. Most parts will have the part name scribed onto this face, as well as other machined features. Each part has exactly one machined face.
- The "**clean face"** means the opposite face of the part. This will have no machining marks (except perhaps drill holes.) Each part has exactly one clean face.
- A "**cut edge"** means any side(s) of the part that were created by the process of cutting the material out of the original sheet of plywood or other material.
- A "**corner"** of a part has a **special meaning** in this document: it means the angle where two edges or faces meet.

The machined face and the clean face will be on opposite sides of the part. They will show a plain woodgrain and will be mostly flat.

The cut edges will be all around the part and - in general - are not flat. Cut edges of timber parts always show the ends of the plies which make up the plywood.

Corners extend all around the part and may be straight, curved, angular, or a combination.

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Orienting a Part

There are three orientation aids on the parts:

- An arrow which - when present - always points towards the front of the trailer.
- The notation ‘(L)’ or ‘(R)’ which indicates that the part is one of a handed pair which fit on the left and right of the trailer.
- Any text on the part: this will be approximately right-way-up when fitted on the trailer.

Identifying Hardware and Fasteners

Fasteners are described by size and head type. See the bill of materials for details.

Identifying Hardware

Hardware can be identified by description and/or by images.

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Storing the Parts

Long-term storage of the timber parts is not recommended. Unfitted and unconstrained, the parts will inevitably move slightly. So the parts should be assembled as soon as possible.

Safety
The mesh has sharp edges. Fasteners are choking hazards. Keep these parts away from children.

For short-term storage (a week or two), the following advice is offered:

Storing Timber Parts

The timber parts must be stored correctly to prevent them warping.

The storage location must be dry and without excessive humidity. Avoid contact with grease or oils, or anything else which would permanently stain timber, such as gloss-painted surfaces.

Large, thin timber parts must be laid flat onto a continuous, smooth, level, flat surface. They must **not** be stored on edge nor stacked against a vertical support or wall. They must **not** be laid on bearers nor on any surface which is not smooth and level.

Bundles of the longer 18mm parts should also be laid flat so that all the parts are supported along their full lengths.

Storing Plastic Parts

The plastic parts must be stored correctly to prevent them warping.

The storage location must be dry and at a temperature lower than 25C. The location must be out of direct sunlight and must be well away from any heating devices such as boilers, radiators, or fan heaters. The location must be well away from oils and solvents.

The large plastic sheets should be stored *unrolled.* They can be laid flat on a clean floor. Or, provided the storage time is less than a month, they can be stored upright by carefully leaning them against a vertical surface or wall. These parts will tend to attract dust by static which is difficult to remove so avoid storing on dusty floors or in a dusty environment. Take care not to scratch them.

The glazing panels should be stored laid flat on a smooth level surface.

Storing Hardware

The electrical parts, light fittings, reflectors, internal fittings and small plastic parts should be stored dry at room temperature.

The fasteners should be stored in the labelled bags/boxes they are supplied in, for ease of identification.

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Chromework and metal parts should be stored carefully to avoid bending, scratching or denting them.

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Build Safety

PhieldBug Open Source Version is designed to be safely built by an able-bodied, competent, adult DIYer. However, there are the usual workshop hazards which must be mitigated by the use of protective equipment and guards and by suitable working practices.

So please build with care and discretion. Follow the safety recommendations that were included with any tools. Heed the warnings and directions which apply to adhesives and coatings.

Appropriate PPE and other safety equipment **will** be required during the build. Details of these are beyond the scope of these instructions. The workshop owner, the builder, and any assistants must ensure that all necessary safety equipment and safety training are provided before starting the build.

There is a significant build hazard which is not obvious for a newcomer to teardrop trailers:

- **Tipping Hazard**: while the pod is being built onto the trailer base, it is finely balanced at the axle of the trailer base. This means that the weight of a person working inside the trailer at the back would tip the trailer backwards. Beside the risk of injury to the person inside the trailer, there is risk of extremely serious injury to any person who is close to the hitch at the front of the trailer. *Always* securely chock up the rear of the trailer floor before reaching inside the trailer. At no stage during the build is it necessary - or safe - to fully enter the incomplete trailer. All work can - and must - be carried out from the workshop floor.

Among the usual and typical workshop risks associated with a significant DIY project, are at least the following hazards. This is not a comprehensive list.

- **Splinter injuries**: Timber naturally produces splinters. There is risk of quite serious injury particularly if hands are rubbed along the grain. When sanding, wear protective gloves in case a large splinter should spall off the timber surface.
- **Sharp edges**: The vent mesh is *extremely* sharp. Keep it away from children and handle with great discretion. Other parts may have sharp edges so handle all parts with caution. Any edges of wood which have been hardened with Bonda-Seal are likely to be especially sharp.
- **Sharp-edged panels:** During the build, aluminium and PVC panels having potentially sharp edges will be temporarily positioned with their hazardous edges and corners exposed at various heights - including at face height. Temporary high-visibility covers for those hazards, together with appropriate PPE, are essential.
- **Fume and dust inhalation**: Adhesives and coatings can give off dangerous fumes. Roller-painting can create fine airborne droplets. Follow the instructions supplied by the manufacturers. Use appropriate PPE when painting and sanding. Provide ventilation.
- **Contact risks**: Adhesives and coatings should not be allowed to contact skin. Follow manufacturer instructions. Use appropriate gloves and protective clothing.
- **Eyes**: Protect against dust, chemical splashes, and impact risks.
- **Crushing and impact**: Some parts of the trailer - and of course the trailer as an assembly - are heavy enough to cause injury. Take care against the risk of parts falling. Make sure the trailer is securely supported and is chocked against movement when working underneath it. Protective footwear may be appropriate when carrying any heavy item.

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- **Fire**: Bonda-Seal, varnish, adhesives, and solvents may produce flammable fumes. Take precautions against build-up and ignition of these.

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Build Stage: Chassis Number

Before installing the chassis, it is convenient to mark the chassis number onto it.

Requirement

It is a legal requirement, for any trailer built new after 2012, that the chassis part of the trailer has a chassis number. The chassis number must be identical to the TIN (Trailer Identication Number). This is the same 17-character TIN used when applying for an IVA (if required).

The TIN should be marked on the side of the chassis, such that it can be read from the right-hand side of the trailer. Typically this means marking it just behind the hitch on the right-hand-side of the drawbar.

The TIN must be permanently and clearly marked into the material of the chassis in such a way that it is difficult to delete. Stamping into the metal, or welding-on a stamped plate, are acceptable methods of marking. Fastening a plate by another means, such as riveting or gluing, is not sufficiently permanent.

If it is judged that the trailer does not require an IVA (for example, if the trailer was built before 2012 and not substantially modified since) then a TIN is not required either, and this step can be omitted.

Marking the TIN

Any suitable method of marking can be employed. The simplest method is to use single number/letter punches to stamp the characters one-by-one. A straight-edge, clamped to the chassis, can assist in keeping the characters level. The characters must be reasonably equally-spaced, such that it would be obvious if, in future, the TIN was modified by an attempt to insert an additional character.

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Build Stage: Register for IVA

The completed trailer may (or may not*) need an “Individual Vehicle Assessment” if used in the UK. This is a one-off inspection by DVSA which confirms the trailer is built properly for use on the road.

The test is very similar to a MOT, but it only has to be done once. It currently costs £70 (2024) and can be carried out at home, by video-link. The test is not onerous and PhieldBug has been designed to meet all the requirements: dozens of factory-produced and kit-built PhieldBugs have taken the IVA test and all have passed first time.

Waiting-times for IVA appointments can be a few weeks in busy times, so it pays to register immediately, and to book an appointment as soon as the expected completion date is known. Appointment dates can be changed after booking (up to two changes) so there is no need to predict exactly the completion date of the trailer when first registering.

Note: a unique 17-character TIN (aka ‘VIN’) will be needed when registering for IVA. The TIN is decided by the trailer-maker. See notes in the block -VIN-PLATE-ONE in the .DXF drawing file for how to format an acceptable 17-digit TIN. It is *strongly* recommended to stamp the TIN onto the chassis *before* applying for the IVA: if an error is made when stamping onto the chassis then it will not matter - the TIN is essentially random anyway, and that error can then be duplicated on the IVA application.

**Whether a trailer requires an IVA to be legal on UK roads is complex and depends - among other factors - on the age of the chassis, who built it, and the extent of any modifications to it. Any new amateur-built trailer on a new amateur-built chassis will require an IVA. A second-hand trailer which was made before 2012 should require neither a TIN nor an IVA. A second-hand trailer which was built after 2012 should already have a TIN, and it should already have either an IVA or possibly a type-approval which is a professional alternative to IVA.*

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Build Stage: Prepare Insulation

The insulation comes on a 1.2m width roll. When taken directly off the roll, the insulation tends to curl, which makes it difficult to use. So the insulation needs to be flatted-out ready for use.

Use a sharp knife, a cutting-board, and a straight-edge to slice 14-qty lengths each 275mm-280mm wide by 1.2m long.

Lay the slices - stacked together - onto an out-of-the-way area of floor. Weight them to flatten them. By the time they are needed, they will have lost their tendency to curl. (Image.)



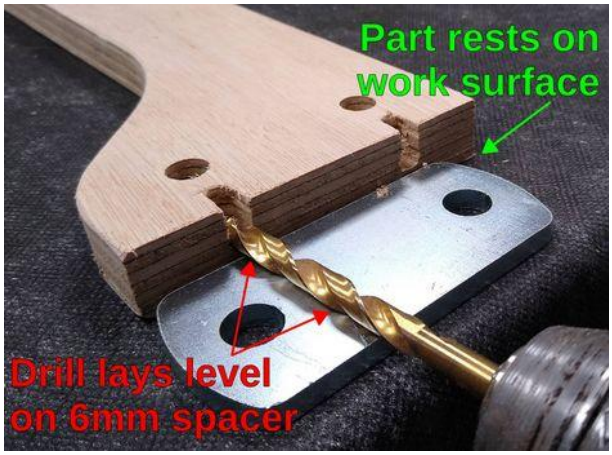
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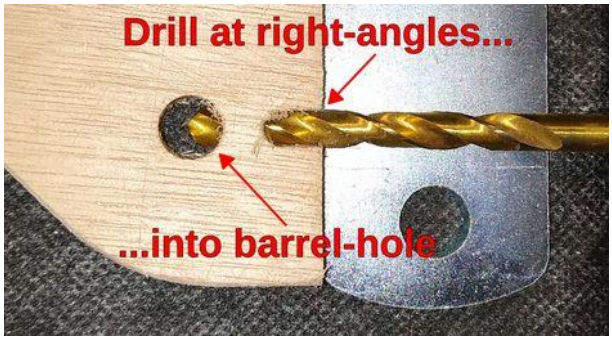
Build Stage: Drilling for Barrels

Stainless M6 machine-screws and M6 barrel-nuts are used to create strong joints between ply parts. The holes which allow the screws to reach the barrel-huts are only part-machined so they require drilling-out.

Drill them with a 6.5mm drill, preferably in a battery-electric hand-drill.

Work on the edge of a flat, hard, horizontal work-bench or similar surface. Use one of the 3qty 6mm plates (to be used later for assembling the chassis to the floor) as a guide:





The guide will scratch slightly. This is not an issue.

The following parts require drilling:

- All five RAFTERs (pictured in the Sanding section below). 4qty holes each.
- Both the SHELF-BEAMs (pictured in the Sanding section below). 4qty holes each.
- Both the SHELF-PURLINs (image below). 8qty holes each.
- The SIMPLE-PURLIN (image below). 2qty holes.
- The FLOOR-JIG (labelled on the part itself). 2qty holes.
- Both the REAR-JIGs (labelled). 1qty hole each.
- Both the WALL-JOINERs (labelled). 16qty holes each.

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Build Stage: Sanding 18mm Ply Parts Prior to Bonda-Sealing

“18mm Ply Parts” means any part which is cut from 18mm-thick plywood.

Note the special meaning of “corner” in this document. See above for explanation.

Tips

The main purpose of the sanding is to safely round-off any exposed sharp corners, inside or outside the trailer. The amount of rounding-off required is usually minimal: a barely-visible radius of a couple of mm is sufficient. Where a corner requires this “rounding-off”, a few firm strokes with 100-grit sanding cloth hand-held at 45-degrees is usually sufficient to achieve a radius.

A much lighter degree of sanding may also be used to clean-up other corners: removing any burrs or ‘hairiness’ left by the machining process. When just “cleaning-up” a corner no significant rounding-off should occur - merely the removal of any burrs or ‘hairs’. So where a corner requires cleaning-up, just one or two quick wipes with the sanding-cloth will usually be enough.

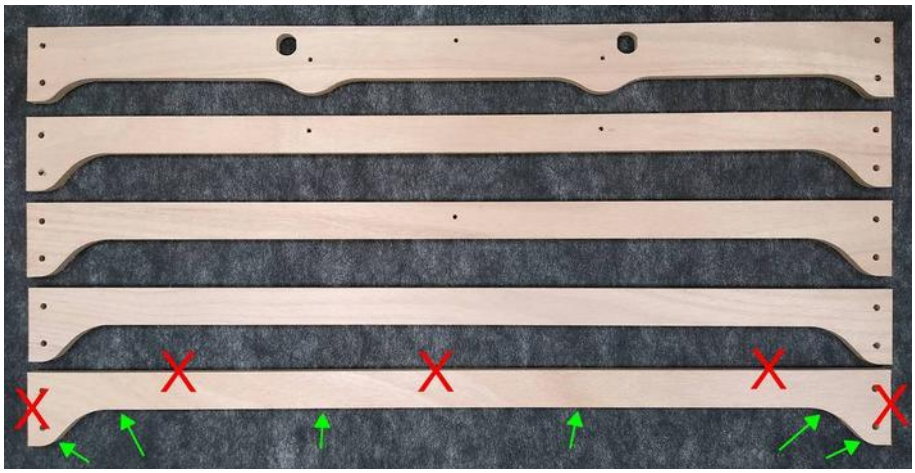
In all cases, take the greatest care **not** to allow the sanding-cloth to rub on the machined face or on the clean face: it would leave indelible scratches. The best results on corners are obtained using the sanding-cloth freehand - without a sanding-block.

For guidance: the RAFTERs (as below) should take less than a minute to sand each.

Do not use filler on the parts at this stage: it would stain the unsealed timber.

Not all parts require sanding, as many are hidden within the structure. Only the following parts require sanding:

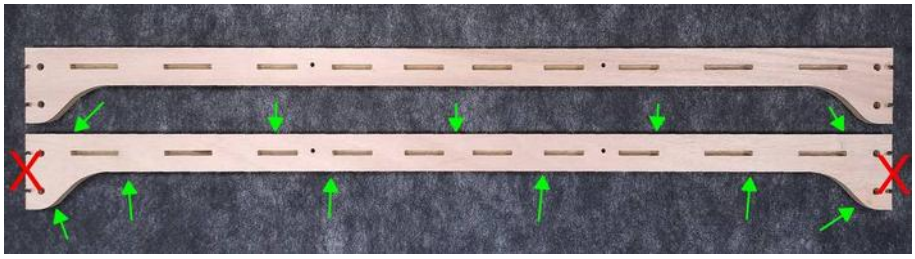
Sanding RAFTERs



Use 100-grit sanding cloth to round-off the corners as shown (green arrows in the image on one example). Do **not** round-off the corners anywhere else (red Xs in the image).

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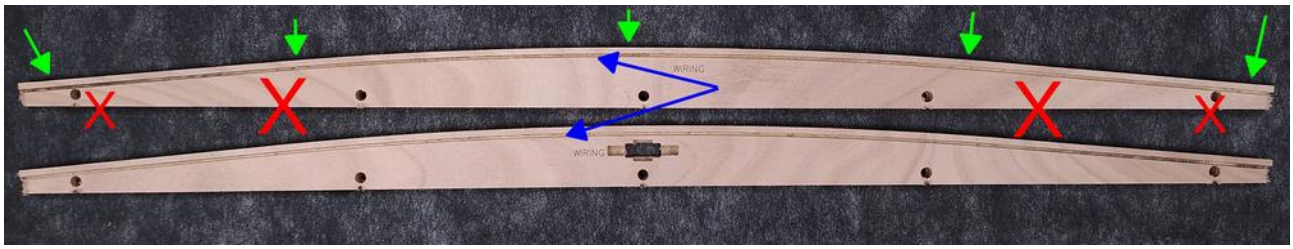
Sanding SHELF-BEAMs



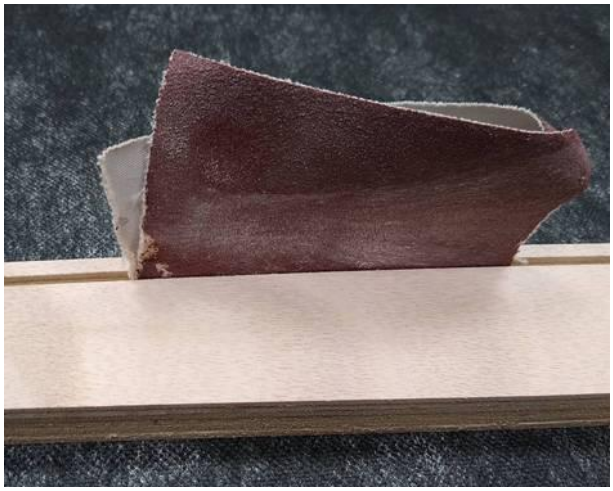
Use 100-grit sanding cloth to round-off the corners as shown (green arrows in the image). Do **not** round-off the corners on the short cut edges (red Xs in the image).

Ensure the 10qty slots in each part are clear of large burrs or hard-packed dust.

Sanding WIRING-A and WIRING-B



Round-off all parts on the curved corners (green arrows). Do **not** round-off the straight corners.

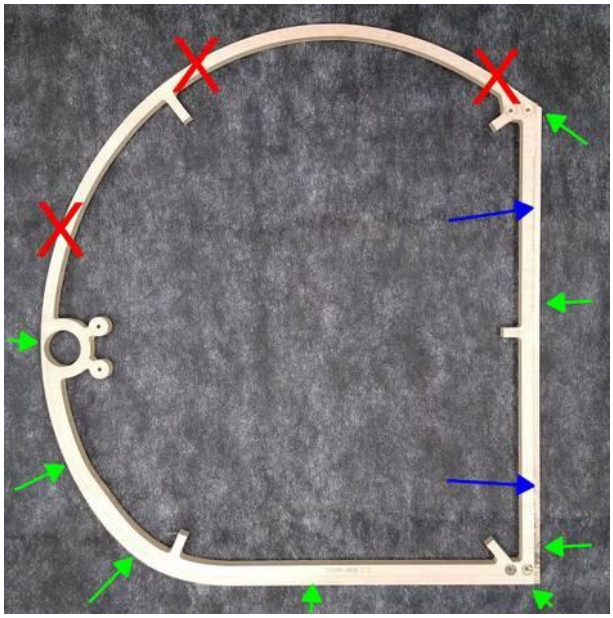


Fold the sanding-cloth double, and use it to clean out any debris or burrs in the slots (blue arrows).

Clean up any severe burrs inside the rectangular fuse-holder slot. But it is not necessary to achieve a perfect finish here.

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Sanding DOOR-WEB-As

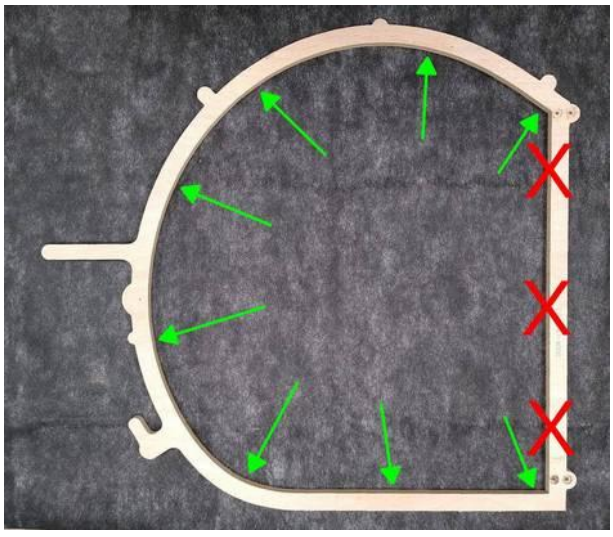


Round-off the corner of **only** the **machined face** and **only** where shown. Clean up any burrs from all the other corners, including any burrs in the round recesses on the machined face, and on the linear recess on the machined face (blue arrows).

Sanding DOOR-WEB-Bs

Clean up any burrs from all the corners. Fold the sanding cloth and clean up any large burrs from the recess on the machined face. No corners need rounding-off on this piece.

Sanding DOOR-LINERs

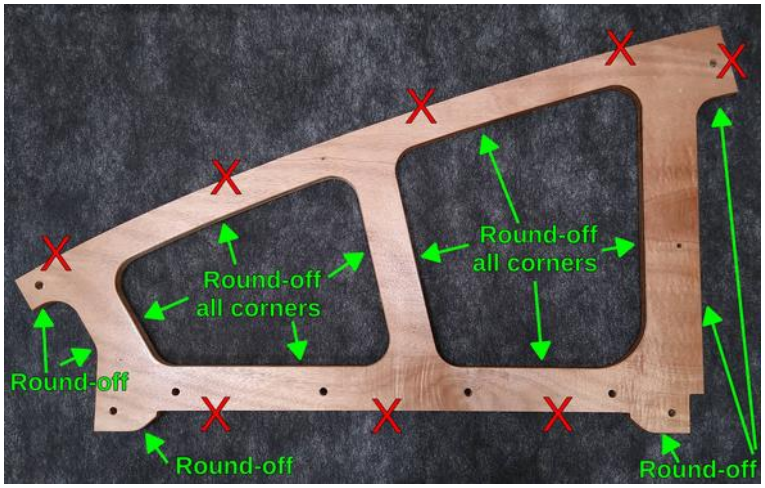


Round-off the corner of **only** the **clean face** and **only** where shown. Clean up any burrs from all other corners, including any burrs in the round recesses on the machined face.

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Sanding SHELF-PURLINs

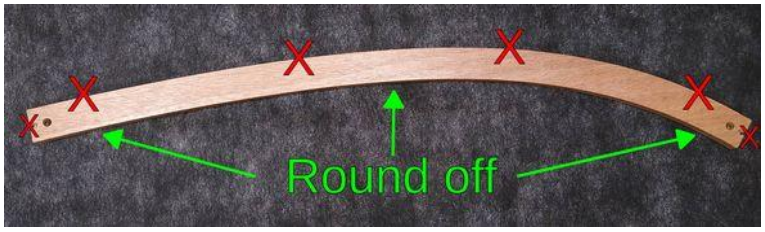
Round-off where shown in the image (green arrows).



Clean off burrs on all other edges (red crosses).

Sanding SIMPLE PURLIN

Round-off where shown in the image (green arrows).



Clean off burrs on all other edges (red crosses).

Sanding RIB-AVs and EDGE-Ds

Clean up any burrs on the corners. Clean any large burrs from the recess.

No rounding-off of any corners is required.

Sanding EYEBROWs

These are fragile items. Handle with care and do not apply excessive pressure to them.

Lightly sand all cut edges.

Round-off the corners all around the **clean** face **only**.

Remove any burrs from the corners all around the **machined** face but do not round-off.

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Sanding SBs

Clean up and remove burrs from all corners of these tiny parts. (Image.)



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Build Stage: Sanding 4mm and 6mm Parts

“4mm Ply Parts” and “6mm Ply Parts” means those parts which are cut from 4mm and 6mm ply. This includes side-skins, door panels, and shutters.

Sanding INNER-SIDE-SKINs

Slightly round-off the corners all around the door-hole on both the clean face and the machined face.

Slightly round-off the corners **only on the clean face** all around the oval ventilator holes.

Clean up any burrs from all the other corners, but do **not** round-off the outsides.

Do not sand the clean face before Bonda-Sealing - the veneer is thin.

Sanding INNER-DOOR-PANELs

Very slightly round-off the corners **only on the clean face** all around the window hole.

Very slightly round-off the corners **only on the clean face** all around the outside.

Clean up any burrs from any other corners.

Do not heavily sand the clean face before Bonda-Sealing: the veneer is thin.

Sanding OUTER-SIDE-SKINs

Slightly round-off the corners **only on the clean face** around the door-hole.

Slightly round-off all corners around the outside, both on the clean face and on the machined face.

Remove any burrs from all other corners.

Sanding OUTER-DOOR-PANELs

Slightly round-off the corners all around the outside, both on the clean face and on the machined face.

Slightly round-off the corners **only on the clean face** around the window opening.

Remove any burrs from all other corners.

Sanding SHUTTERs

Round-off all corners around the outside, both on the clean face and on the machined face.

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Sanding SHUTTER-HANDLEs

These parts are labelled “SH”.

Round-off the corners of the clean face.

Clean up any burrs off the corners of the machined face, but do not round-off.

Sanding Seat-Backs

If supplied by us, these parts will be ready-glued, built from a sandwich of 4mm and 6mm ply cold-moulded and bonded together. Do not sand them until they have been bonded. (Image.)



Sand to round-off all the corners on the back and on the front, including inside the holes.



Smooth out any bumps of cold-moulding adhesive which may have accumulated on the **rear** face. A perfect finish here is not required and any consequent damage to the veneer on the **rear** face is not an issue: this face will be entirely unseen after the seats are installed.

Take great care not to scuff the **front** face of the seat-back when sanding inside the holes: any scratches will be unsightly. Tip: roll a 100mm x 100mm piece of sanding cloth into a tight tube, for access to the corners of the holes.

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Build Stage: Fit the Wiring-Box

Warning. Two **slightly different** lengths of M6 screw are used throughout the build: 30mm and 40mm. Some build stages require a mixture of both lengths. Take great care always to use the correct screw in the correct hole. Fitting the wrong length of screw can immediately destroy a part.

The wiring-box fits at the rear of the trailer, under the floor. It both stiffens the floor and provides a space for electrical services to run.

Begin by laying the floor upside-down (i.e. machined face upwards) onto low trestles or crates. Take care that these supports are well clear of the six big holes in the floor: when later Bonda-Sealing the floor some Bonda-Seal may run through these holes and drip underneath. Such drips are not a problem but the Bonda-Seal is also a strong adhesive, so it must not be allowed to bond the supports onto the floor.

Briefly sand around all the corners of the floor - top and bottom - to remove any large burrs. Vacuum away any dust from the holes and recesses. Vacuum the machined face clean of dust.

Fit 5qty barrels into the holes in timber part WIRING-B. Pass M6 x 30mm screws up through the frontmost row of five matching 6mm dia holes in the rear of the floor. Engage the screws into the barrels. Leave the screws slack. (Image on the left.)





Repeat for WIRING-A. (Image on the right above.)

Press a small W-END part into the recesses at the end of the WIRING-A/B parts. Squeeze WIRING-A and WIRING-B together to clamp W-END in place, then tighten the M6 screws at that end. (Image.) Repeat at the other end of the wiring-box. Finally, tighten all M6 screws very firmly.



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The W-END parts do not need adhesive: they will later be sealed firmly into place by the Bonda-Seal, which acts as sufficient glue for these non-structural parts. Ensure the W-END pieces are pushed tight down against the undersurface of the floor, before Bonda-Sealing.

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Build Stage: First Coat of Bonda-Seal on All Parts

The first coat of Bonda-Seal should be generous. This first coat deeply bonds into the timber. It will harden the surface ready for sanding smooth.

Preparation Before Starting to Bonda-Seal

Prepare locations to hang and to lay out the parts after coating. Prepare a clean workbench.

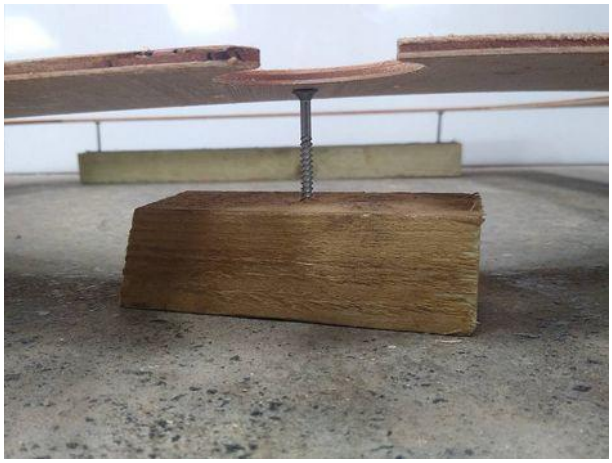
The 18mm plywood parts need to be hung up when drying, with their grain hanging vertically. A few horizontal 8mm steel rods, fixed to a suitable bearer at height, are ideal for this: the parts can be slotted onto the rods with 20-30mm spacing between them and left to dry. (Image.)





All the thin sheet plywood parts should be **laid flat** when drying - **never** stood vertically. Both sides of these parts will be coated simultaneously, so off-the-floor supports will be required for drying. Some 2” woodscrews, partially screwed into scrap timber bearers, make ideal supports. Four supports (three for the smaller pieces) are sufficient for each part (images).





Work Surface

Ideally, a strong flat workbench about 2.4m x 1.2m (8ft x 4ft) is required for applying the Bonda-Seal. The surface **must** be covered in cardboard (e.g. some flattened large boxes). Do not cover with cloth or paper: these would stick to the parts during Bonda-Sealing. Plain brown corrugate cardboard is perfect, as it soaks up any drips.

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Technique

Beware that it will be necessary to handle the wet Bonda-Seal faces. So wear protective gloves.

In general, all parts can be coated using just a 4” roller. A brush is not required except for a few operations (e.g. coating around the crevices on the underside of the floor). This guide mentions whenever a brush will be needed.

The best Bonda-Sealing technique is a seemingly crude one, but it is extremely effective: Bonda-Seal all the **cut** edges first. Then lay the part with **machined face** uppermost and Bonda-Seal that face. Then lay the part the other way up (with the fresh Bonda-Seal in contact with the cardboard on the workbench) and Bonda-Seal the **clean** face. Then quickly move the part to its drying location.

To move the parts from the workbench to their drying locations, simply carry them using gloved hands: the wet Bonda-Seal does not retain fingermarks, provided it has not begun to dry. It may be necessary to lightly re-touch the **clean** faces of the the OUTER-SIDE-SKINs, to remove fingermarks after carrying them, if some areas of these large surfaces have begun to go tacky.

Bonda-Sealing 18mm Ply Parts

All the 18mm ply parts which have been sanded (see above) should be coated all-over*. Use a 4” velour short-pile roller. Each part should be hung up to dry with its grain vertical, and not touching any other part.

Do **not** Bonda-Seal inside any barrel holes, as this will make the barrels difficult to fit. Do **not** Bonda-Seal inside the slots on the SHELF-BEAM parts.

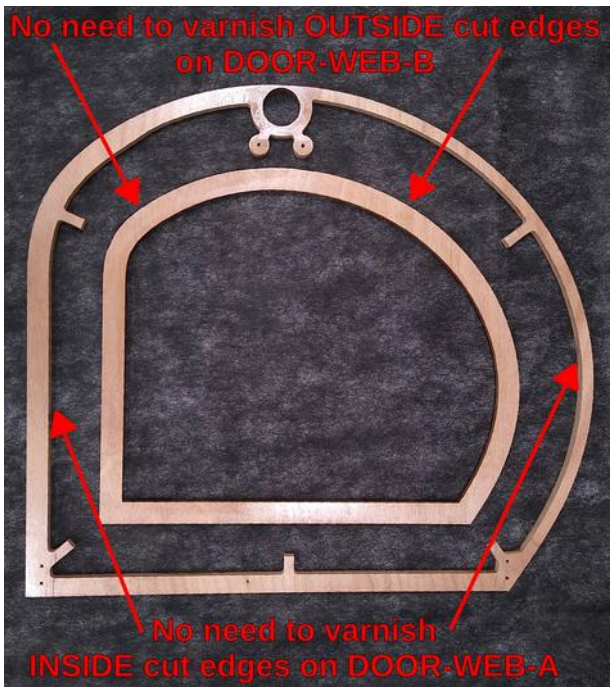
*Some of the **cut edges** of some of these parts can optionally be left un-sealed, saving time and cost, if preferred. This will have no detrimental effect on performance or appearance. The following images explain:

Areas **not** needing Bonda-Seal on RIB-AVs and EDGE-Ds:

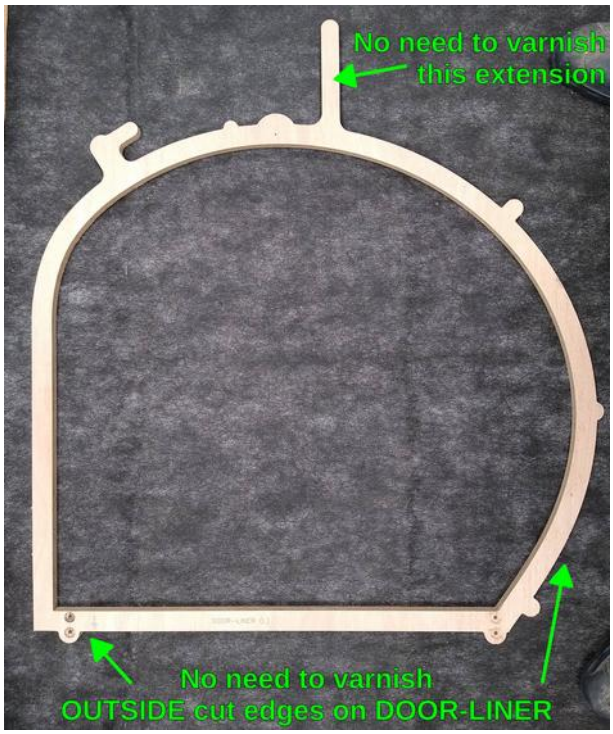


Areas **not** needing Bonda-Seal on DOOR-WEB-As and DOOR-WEB-Bs:

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Areas **not** needing Bonda-Seal on DOOR-LINERs:



Bonda-Sealing EYEBROWs and SBs

These should be Bonda-Sealed all-over. Use a piece of copper wire, inserted in one of the drilled holes, to hang them for drying.

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Bonda-Sealing Seat-Backs

Seat-backs should be Bonda-Sealed all-over using the roller. They should be set flat to dry with their front (concave) faces uppermost. Use supports.

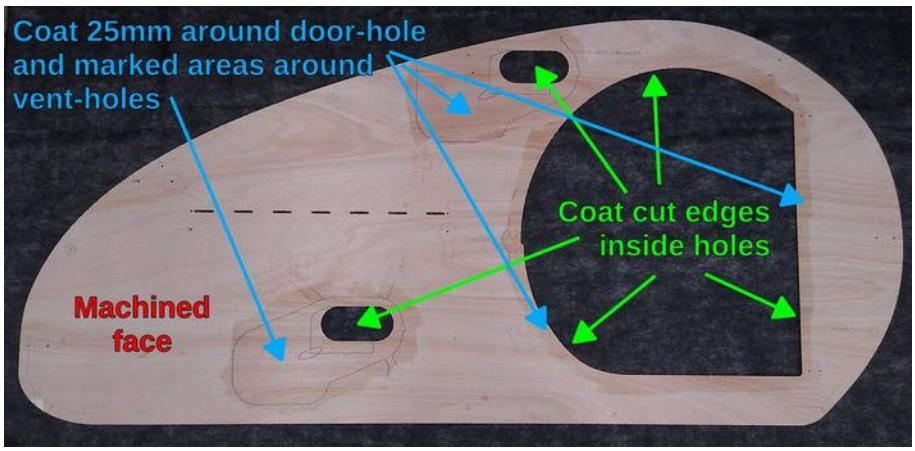
Bonda-Sealing DOOR-INNER-PANELs & DOOR-OUTER-PANELs

All the door panels (inside and outside) should be coated on all edges and all faces using the roller. The parts should be set flat to dry with their clean faces uppermost. Use supports.

Bonda-Sealing SHUTTERs

The SHUTTERs should be coated on all edges and all faces using the roller. The parts should be set flat to dry with their clean faces uppermost. Use supports.

Bonda-Sealing INNER-SIDE-SKINs:



Bonda-Seal some of the **cut edges** and parts of the **machined face** as shown (image). Then flip over and Bonda-Seal the whole of the **clean face**.

Note that the **outside** cut edges do **not** require Bonda-Sealing.

The parts should be set flat to dry with their clean faces uppermost. Use supports.

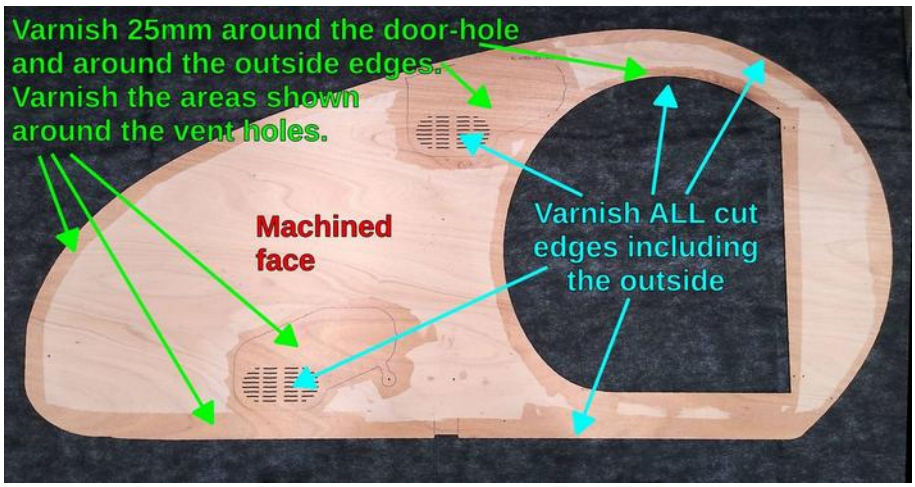
Bonda-Sealing the SHELF

The shelf should be lightly bonda-sealed on both sides. Cut edges do not require sealing.

Bonda-Sealing OUTER-SIDE-SKINs:

Begin by using a brush to work copious amounts of Bonda-Seal into the cut edges of the vent slots. Tip: place a piece of rigid plastic under the vent to catch excess Bonda-Seal. This will create ‘puddles’ of Bonda-Seal inside the slots, from where it will soak deep into the wood.

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Bonda-Seal all cut edges. Bonda-Seal parts of the **machined face** as shown (image) using the roller. Then flip over and Bonda-Seal the whole of the **clean face**.

Note that the **outside** cut edges **do** require Bonda-Sealing.

The parts should be set flat to dry with their clean faces uppermost. Use supports.

Bonda-Sealing the Floor

Bonda-Seal only the parts of the floor that are accessible, with the floor still laid upside down on supports. So do not attempt to Bonda-Seal the clean face of the floor, at this stage.

A 1” brush should be used to work **copious amounts of Bonda-Seal** into the following places:

- The wiring-box, paying especial attention to all the slots and holes in the wiring-box-assembly.
- The holes and slots in the **machined face** of the floor.
- The joints between the wiring-box and the floor.
- The joints between the wiring-box and the W-END pieces.

A roller should then be used to generously coat the **cut edges** and the **machined face** of the floor.

Clean-Up

Dispose of the roller: it cannot be successfully cleaned, although it can be stored for a few hours if it is first heavily soaked in Bonda-Seal before sealing into a plastic bag.

The brush can be cleaned either with thinners (see Bonda-Seal container for instructions) or with acetone. At least three changes of solvent will be required.

Do **not** return any part-used Bonda-Seal from the roller tray back into the Bonda-Seal tin. Store it in a separate container: it *may* remain useable if it has not absorbed excessive moisture from the air.

The Bonda-Seal bonds metal quite effectively. So thoroughly wipe clean the neck and the lid of the Bonda-Seal tin. Lightly grease the threads using ordinary grease or vaseline. Refit the lid and tighten only loosely. This will ensure the lid can be removed.

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The roller-tray can simply be propped onto one end to be left to drain for a few hours. A thin layer of remaining Bonda-Seal will set hard in the tray. The tray can then be re-used without cleaning.

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Build Stage: Repeat Sanding and Repeat Bonda-Sealing

Allow the first coat of Bonda-Seal to go completely hard. Overnight is likely to be sufficient time, even in cold weather. As a test, sand a small area: the Bonda-Seal should come away as a fine white dust without clogging the sandpaper and without balling-up.

Repeat Sanding

Use 150-grit sanding-cloth and/or 150-grit orbital sander to smooth down the raised grain on all faces, edges, and corners that have been Bonda-Sealed. All surfaces should feel quite smooth, after sanding. If hand-sanding then move the sanding cloth only **along** the visible grain, never across.

Fill Any Defects

If desired, use ready-mixed self-coloured Polyfilla to fill any defects in any of the sanded/coated parts. Particularly any voids where internal plies may be missing at cut edges. Sand away any excess filler. The filler will not stain the timber, which is now protected by Bonda-Seal.

Repeat Bonda-Sealing

Recoat all parts, following the instructions on the Bonda-Seal tin, to achieve the following number of coats of Bonda-Seal in total (including the first coat):

- A total of at least **four** coats of Bonda-Seal on:
    - Both OUTER-SIDE-SKINs.
    - Both OUTER-DOOR-PANELs.
    - Both DOOR-WEB-As.
    - Both DOOR-WEB-Bs.
    - Both DOOR-LINERs
    - Both RIB-AVs.
    - Both LONG-Ds.
    - Both EYEBROWs.
    - All SBs.
    - The edges and machined side of the floor and the wiring-box-assembly.

- A total of **two** coats of Bonda-Seal on:
    - Both INNER-SIDE-SKINs.
    - Both INNER-DOOR-PANELs.
    - Both SHUTTERs.
    - Both SHUTTER HANDLEs (‘SH’s).
    - All 5qty RAFTERs (see image in ‘Sanding’ section).
    - Both SHELF-BEAMs (see ‘Sanding’).
    - Both SHELF-PURLINs (see ‘Sanding’).

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- The SIMPLE PURLIN (see ‘Sanding’).
- The SHELF.
- The seat-backs.

Bonda-Seal dries extremely quickly allowing several coats to be applied in one day, so Bonda-Sealing is not a long process.

Best Finish

On the OUTER-SIDE-SKINs and OUTER-DOOR-PANELs and EYEBROWs we like to allow the last-but-one coat to go fully hard overnight, then lightly orbital-sand to obtain a fine finish before applying the final coat.

Extra coats on these exterior parts can improve the ultimate finish, especially if sanded between coats with fine sandpaper. This is left to the builder’s preference. In any case, follow the instructions on the Bonda-Seal tin to ensure proper bonding between coats.

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Build Stage: Fit Chassis to Floor

Before flipping the floor right-side-up, the chassis and suspension must be fitted.

This stage assumes that a T-form chassis, made from 50mm x 50mm box section as shown in the .DXF, is to be used.

If using some other trailer base (for example a repurposed dinghy trailer) then adapt these instructions as necessary to achieve a similar result. We would recommend that the wheels be positioned as shown in the .DXF drawings for best balance of the finished trailer. For most rubber-insert suspension units (which have trailing arms) this will mean locating the axle to the marks which are provided on the underside of the floor.

Preparation

Check the metal of the chassis for any sharp edges or protrusions created by the galvanising process. Use a rasp or coarse abrasive to remove them.

Use a 10mm drill to clean-out excess zinc from the 3-qty bolt-holes which are drilled in the main chassis tubes. Similarly clean-out the 12-qty 10mm dia holes in the plates at the ends of the axle-tube.

Fitting the Chassis

Invert the chassis, and place it on top of the (still inverted) Bonda-Sealed floor. The drawbar goes at the opposite end of the floor to the wiring-box.

Align the chassis with the marks drawn on the machined face of the floor. Centre the chassis on the floor, side-to-side. It is critical that the overhang of the chassis axle-bar, each side of the floor, should be **exactly** equal. The drawbar of the chassis should be exactly between the marks at the **front edge** of the floor. The three pairs of holes in the floor should all remain accessible to 10mm bolts. (Images.)



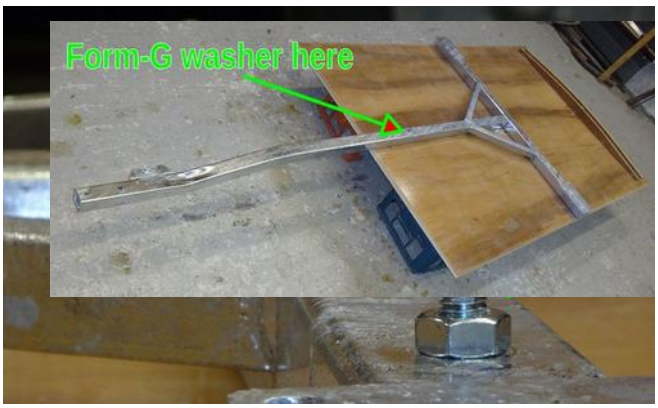


Use three G-clamps to temporarily hold the floor in place. Take care not to bruise the clean face of the floor with the clamps. (Image.)

Match-drill through the three 10mm holes in the axle and the drawbar, drilling clear through the floor (image).

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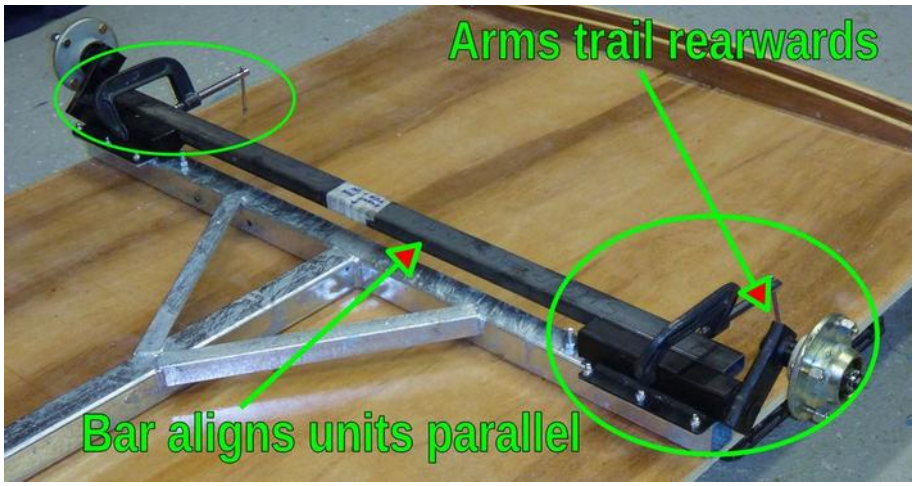


Pass a 10mm coach-bolt **up** through each hole. Fasten in place temporarily with a M10 **plain** nut. For the bolt through the drawbar, place the M10 form-G washer under the nut. Tighten the nuts **only** enough to pull the parts together and to draw the square of the coach-bolt into the timber.

Fitting the Suspension

Loosely fasten both suspension units in place using 12-qty M8 x 20mm hex-head bolts with M8 nyloc nuts. Washers are not required. The bolts should pass **up** through the plates on the chassis, so that the nuts are against the suspension units. The suspension units should be positioned with the trailing-arms rearwards.

Slide the suspension-units so that their outer edges are in-line with the tips of the axle-tube.



Temporarily place a straight metal or timber bar across the chassis and clamp the flats of the suspension units against it. This aligns the suspension-units parallel to each other. This is important as it prevents tyre-scrub and improves stability of the trailer at speed. (Image.)

Slide the suspension-units fore-and-aft until the straight bar is parallel to the axle-bar of the chassis.

Firmly tighten all M8 bolts which are reachable, so that the units are held securely in position.

Remove the straight bar. Firmly tighten the remaining bolts. Tighten the bolts sufficiently to draw the edges of the plates tightly together - do not leave a gap between them even if that means the plates bend slightly as the bolts are tightened.

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Flipping the Floor/Chassis-Assembly

The floor-chassis-assembly can now be turned over.

This is an easy process for two people. But if working alone then it is possible - with care - to lift the rear of the floor so that the nose of the chassis takes the weight, allowing the assembly to be rotated right-way-up. **The assembly is heavy. Do not lift more than you can safely handle.**

The assembly should now be positioned in the workspace so that there is sufficient room to work at both sides, and in front, and behind. At least a metre space behind the floor will be required.

A secure prop, 240mm-260mm high, should be placed under the square body of each suspension unit. The props should be shaped so that the whole chassis-floor-assembly can be tilted forwards and rearwards without risk of the chassis falling off. (Image.) Small axle-stands or strong milk-crates work well.



A 1.2m-long metal tube (or length of wood) should be clamped into the adjustable clamp at the front of the chassis. This creates the temporary front leg. It will then be possible, by adjusting the clamp and the temporary front leg, to tilt the chassis forwards so that the nose touches the ground and to tilt the chassis backwards so that the rear of the floor touches the ground. (In our example image, the temporary front leg is a strong broom handle with a plastic sleeve.)

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Build Stage: Bonda-Seal the Interior Floor

Bonda-Sealing the clean face (the interior side) of the floor is a repeat of earlier Bonda-Sealing processes.

Carefully sand away any lumps created by runs that may have come through from earlier Bonda-Sealing, taking care not to damage any veneer beyond the areas which the chassis-plates will later hide (see next Build Stage).

With the floor propped level, apply one coat to the clean face with a roller. Simply paint over any fasteners - the Bonda-Seal will adhere strongly to metal.

Allow the first coat to dry completely hard. Lightly sand the timber to create a smooth surface. Apply a second coat and allow to dry.

Only two coats are required in total.

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Build Stage: Chassis Bolts and Plates

Undo and remove either **one** of the three M10 coach-bolts which hold the axle-bar of the chassis to the floor. **!!Do not yet remove either of the other two temporary chassis bolts!!**

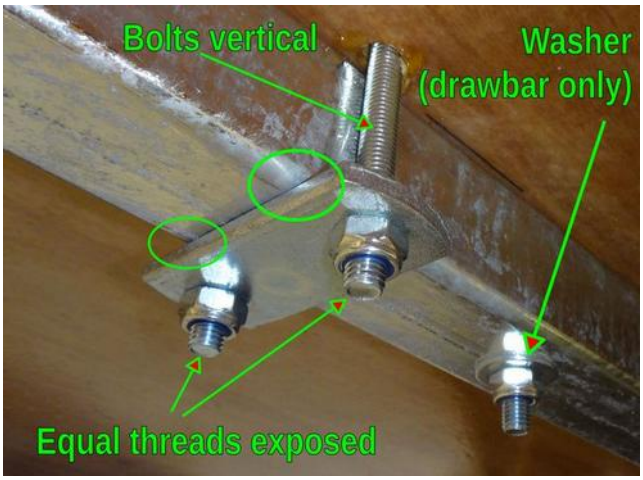
Lay a triangular zinc-plated chassis-plate onto the top of the floor, so that its three square holes align with the coach-bolt's hole and the two nearby 12mm dia holes in the floor.

Drop the coach-bolt back down through the hole that it came from. Fit a new M10 **nyloc** nut. Do not tighten yet.

Drop two more coach-bolts through the chassis-plate and through the matching holes in the floor. Put a 6mm-thick clamp-plate onto the bolts and thread new **nyloc** nuts onto the bolts.

Tighten all the nuts firmly and evenly, but do not deform the chassis bar. Ensure the clamp-plate is flat against the chassis at both ends (image).





Repeat for the other side of the axle.

Repeat for the drawbar. Here, refit the **Form G washer** between the nut and the chassis, as before.

Discard all three M10 plain nuts.

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Build Stage: Assemble Shutters

This simple gluing task helps build familiarity with the Fix-All adhesive.





Identify the plastic shutter handles. Fit one each of these to the Bonda-Sealed faces of the SH parts using #8 x 5/8” pan-head self-tapping screws. (Images.)

Cut the nozzle as shown.



Lay one of the SHUTTERs machined-face-up on a flat, clean workbench.



Apply Fix-All (grey or brown) to the unsealed face of one of the SH parts. Ensure the adhesive is 12mm-15mm away from the edges of the part - even a modest bead can ooze that far. (Image.)

Align the tips of the SH part with the two curved marks on the SHUTTER. Lower the SH part into contact so that the screw-heads drop into the two holes machined in the SHUTTER.

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Slightly adjust the SH part until both the curved marks are completely hidden. (Image.)

Adjust so that the screw-heads are approximately central to the machined holes. (Image.)

Repeat for the other shutter.





Adhesive Cure

Lay the shutter-assembly horizontal and handle-upwards on a smooth, clean, flat surface to cure for 20 hours. No clamping/weighting should be needed, but monitor the joint for the first hour.

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Build Stage: Ventilation Mesh

A fine stainless-steel mesh prevents insects entering the trailer via the ventilators. The mesh must be cut to the correct shape, ready for fitment.

Warnings

WARNING: take *extreme* care when cutting and fitting the mesh: its edges are very sharp indeed.

WARNING: wear eye protection when cutting the mesh: it will spall off particles as it is being cut.

For safety:

- Never allow children to handle the unfitted mesh.
- Wear eye protection and keep people and animals well away from where you are cutting: particles will spall off as you cut.
- Wear tough gloves.
- Do not slide fingers along any edge of the mesh, not even when embedded in adhesive.
- Immediately dispose of waste mesh parts where they cannot cause injury: treat them with the same respect that you would broken glass.
- Do not use unprotected fingers to press the mesh down into the adhesive during fitting.

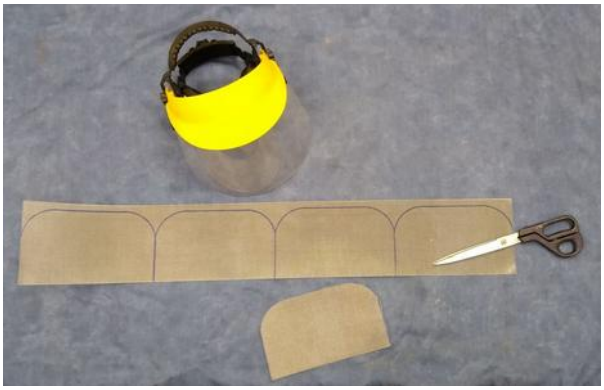
The mesh is strong. However, should it ever sustain damage in the future, do not use the trailer until exposed edges of the mesh have been made safe.

If there is significant risk of future damage to the mesh - such as by hard loaded items falling against it - then permanently protect the mesh by fitting a suitable internal grille of sufficient size not to obstruct the airflow.

Cutting the Mesh

Use the plywood mesh-template and a marker-pen to draw the required outline onto the stainless-steel mesh.

Cut out four identical pieces with tin snips. Or decorators wallpaper scissors will suffice.



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Eye protection is *essential* because tiny dangerous metal particles will ping away from the mesh as it is being cut.

Each cut piece should fit neatly into the shallow recesses machined into a RIB-AV part or an EDGE-D part, with about 2-4mm clear all round. Check and trim as necessary. (Image.)



The mesh is likely to be slightly curled. It is not necessary to completely flatten out the curl.

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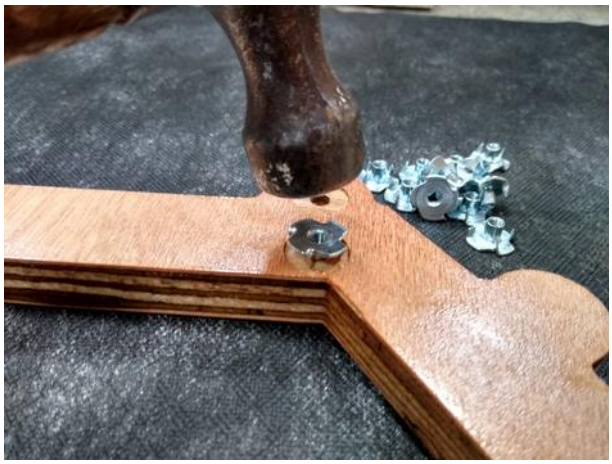
Build Stage: Splined Captive Nuts

Preparation

A clean, well-swept, smooth concrete floor is required to work on. A workbench is unlikely to be sufficiently rigid.

Fitting the Splined Captive Nuts

Lay one of the DOOR-LINERs, machined face uppermost, onto the concrete floor. By hand, push a splined captive nut (M5) into of the 7mm dia holes at the centre of one of the recesses. Use a hammer to tap the splined captive nut home into the recess. (Image).





Repeat for all four recesses on the part. Repeat for the other DOOR-LINER and both DOOR-WEB-A parts. In total, 16-qty captive nuts need to be fitted.

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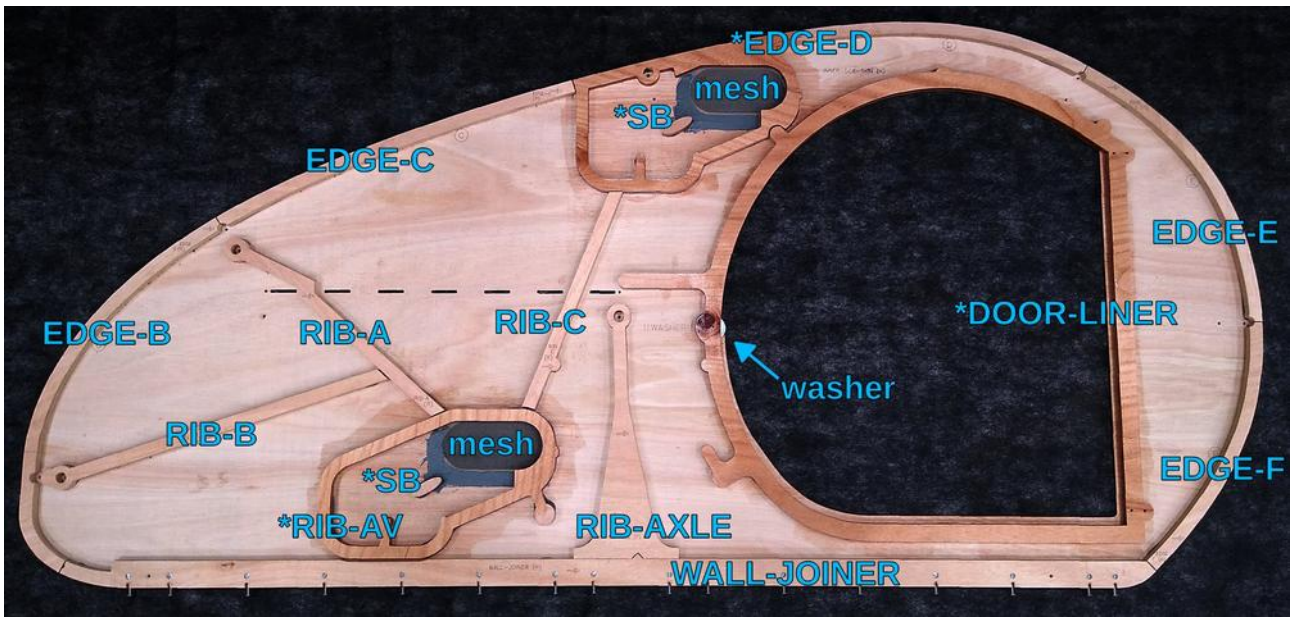
Build Stage: Side-Assemblies

In this step, various spacer parts are bonded to the INNER-SIDE-SKINs.

All parts are in left- and right-handed pairs. Each part must be fitted to the correct corresponding side of the trailer.

Some parts have a complex fitting procedure: trial-fit these dry before gluing, to clarify fitment.

Reference Image



Parts labelled with ***** are the pre-varnished parts. They should be fitted machined-face downwards. All other parts are fitted machined-face upwards so their text labels are visible. All arrows should point forwards - i.e. to the right in this picture.

Preparation

A smooth level concrete floor or a flat workbench is ideal to work on. Vacuum the surface clear of all grit or other debris.

Lay the right INNER-SIDE-SKIN (6mm ply) onto the work surface, positioned with the **machined** face uppermost.

Fit Latch-Plate

Apply a modest amount of adhesive into the recess machined at the rear of the door-hole on the INNER-SIDE-SKIN. Firmly press a 50mm dia washer into the adhesive. (Images.)

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Fit DOOR-LINER

Carefully, using only a hand screwdriver and only very light force, thread 4-qty M5 screws into the holes in the **clean face** of the right DOOR-LINER, so that they engage into the captive nuts. Adjust until the tips are 4mm-5mm proud of the **machined face**. These screws will act as guides. (Image.)



Lay the right DOOR-LINER (without adhesive) onto the right INNER-SIDE-SKIN so that the guide-screws engage into the matching 5mm dia holes. This correctly positions the straight edge of the part. If necessary, clean out the 5mm dia holes in the INNER-SIDE-SKIN using a M5 bolt.

Drop a 2.5mm dia drill down through the 3mm dia hole in the DOOR-LINER, and into the matching 3mm dia hole in the INNER-SIDE-SKIN at the centre of the 50mm washer. (Image.)



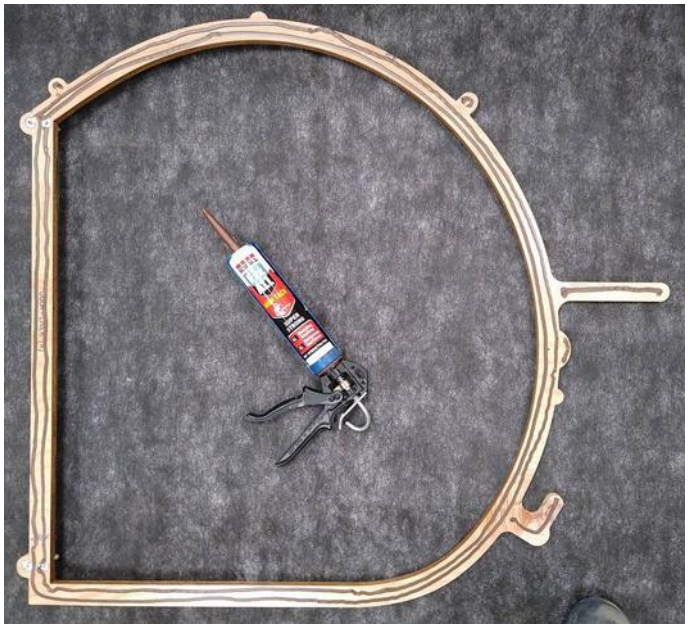


Press the DOOR-LINER down onto the INNER-SIDE-SKIN, checking that it fits correctly. **Immediately** install a safety chock onto the end of the drill, to prevent risk of injury. (Image.)

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Remove the part. Apply **brown** adhesive (image) and permanently refit following the same procedure as above. Weight evenly all over to ensure the assembly cures flat. The screws, the 2.5mm drill, the safety-chock, and the weights must all remain in place until the adhesive has fully cured. Tip: first hold the DOOR-LINER at an angle, so that only the screw-tips can touch the INNER-SIDE-SKIN. Engage the screws in their holes to align the parts, and only then allow the adhesive to come into contact.

If adhesive oozes from the edges, leave it. Do not try to scrape or wipe it away: doing this would tool it down and cause it to firmly adhere to finished visible surfaces. The excess oozed adhesive can instead be easily removed later when it is part-cured (3-7 hours).





Fit Mesh Parts - RIB-AV and EDGE-D

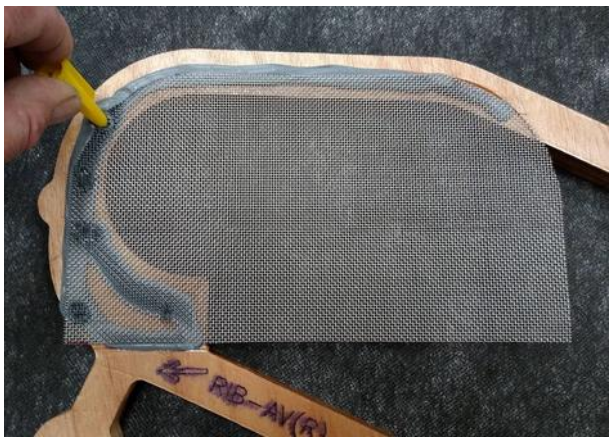
Warning: the mesh is sharp. **Never** press it into the adhesive with fingers. Use tools only.

RIB-AV and EDGE-D form the sides of the ventilator channels, inside the double-skin structure.

Run a heavy bead of grey adhesive around the recess in the right RIB-AV part, keeping the adhesive spaced **well away from** the vent-hole itself. (Image.)

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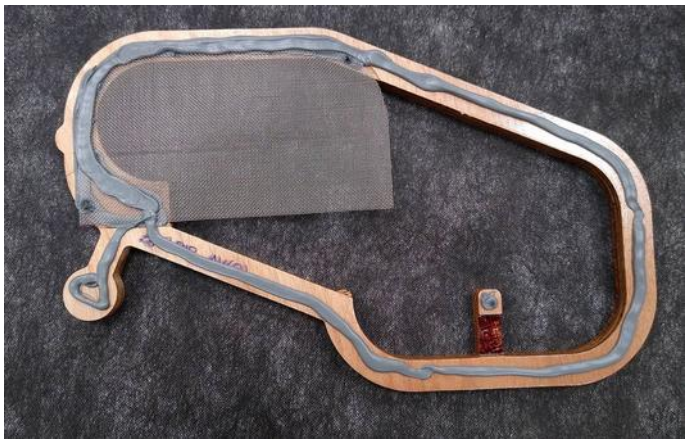




Lay the mesh onto the adhesive, matching the curves to the cut-outs in the recess. If the mesh is slightly curled, lay it into the recess with concave-side-up (i.e. like a bowl, *not* like a roof). Dab the mesh down with the tip of the glue nozzle cap to secure it into the adhesive. Do not get adhesive onto the central part of the mesh. Do not touch with fingers. (Image.)

Run another generous bead of grey adhesive **on top of** the previous bead, so that the mesh is sandwiched by adhesive. Ensure that the bead is deep enough that it will make contact with the INNER-SIDE-SKIN once the part is fitted. Run a continuous bead of adhesive around the other mating faces of the part. Set the part aside for a moment. (Image.)

Run several generous beads of adhesive around the marked area on the INNER-SIDE-SKIN, ready to accept the mesh. Again, keep the adhesive well away from the vent-hole itself. (Image.)





Lay the RIB-AV part onto the INNER-SIDE-SKIN, aligning it to its marks. Press the wood part down firmly. Use the edge of a spatula* to press the mesh down into through the adhesive so that it is in contact with the wood beneath. Adhesive will ooze up through the mesh holes. Spread out this oozed adhesive evenly on top of the mesh, adding a little additional adhesive if necessary to create a smooth surface. (Image.)

*These spatulas are included in the .DXF drawing. They will be cut automatically with roof parts.

Apply a generous bead of adhesive to the machined side of a small oval ‘SB’ part and press down onto its marked position, so that the corner of the mesh is trapped in its recess. (Image.)

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Apply weights evenly over the whole RIB-AV part, to hold the assembly flat while curing.

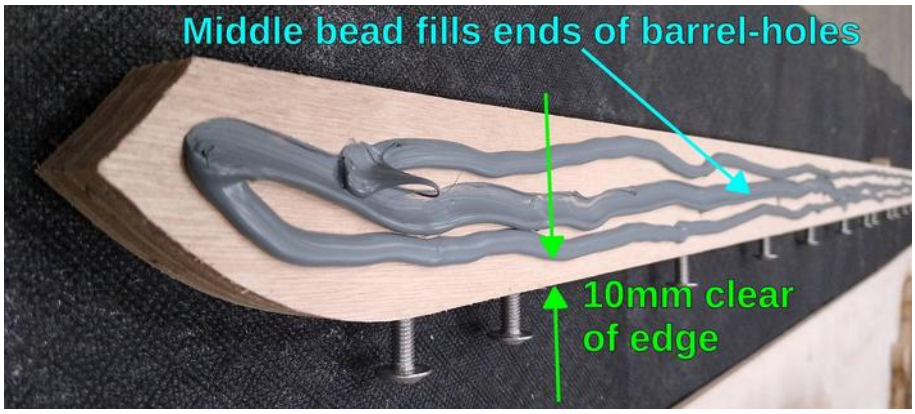
Repeat the same process, for the EDGE-D part and its mesh. When fitting EDGE-D, ensure that its cut edge is flush with the cut-edge of the INNER-SIDE-SKIN along its whole length.

Fit WALL-JOINER

Fit barrel-nuts and M6 x 40mm screws into the machined holes on the right WALL-JOINER part. (Image.) Tighten the screws finger-tight only.



Apply three generous beads of adhesive along the **clean face** of the part, the lowest bead approx 10mm clear of the cut edge. All barrels must be touched by the adhesive. (Image.)



Align the WALL-JOINER to its marks on the INNER-SIDE-SKIN. Pay particular attention to aligning the triangular guide located at the centre of the part. Press firmly down.

Adjust so that, at the bottom of the INNER-SIDE-SKIN, the two parts are exactly even or if anything with the WALL-JOINER is slightly (0.5mm - 1mm) proud of the INNER-SIDE SKIN - **never** vice-versa. (Image.)

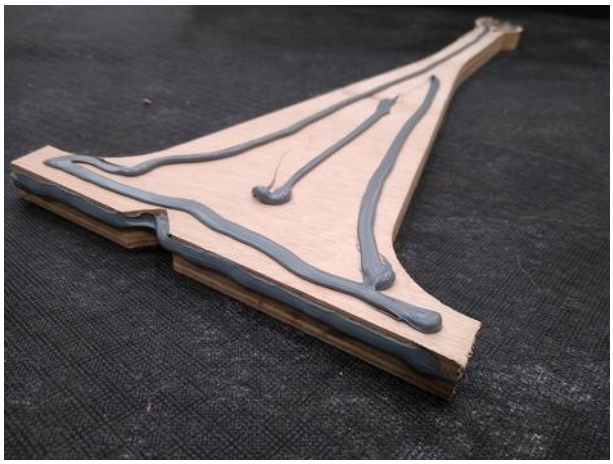
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Weight evenly all over, to ensure the assembly cures completely flat.

Fit RIB-D

Apply adhesive to the **clean face** of the right RIB-D part. In the image, note the bead of adhesive along the bottom **cut edge** which will bond it to the WALL-JOINER. Fit RIB-D in place on its marks, near the centre of the INNER-SIDE-SKIN. Weight the part in place. (Image.)



Note: RIB-D is the **only** part of the side-assembly which requires adhesive on its cut edge.

Fit All Other Parts of the Side-Assembly

Similarly, fit RIB-A, RIB-B, RIB-C, EDGE-B, EDGE-C, EDGE-E, EDGE-F on their marks. These parts do **not** need adhesive on their cut edges. All EDGE-x parts must be fitted so that they are flush with the edge of the INNER-SIDE-SKIN.

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Weight all parts in place.

Final Checks Before Leaving the Adhesive to Cure

There should be a 50mm washer in the correct place.

There should be two mesh panels.

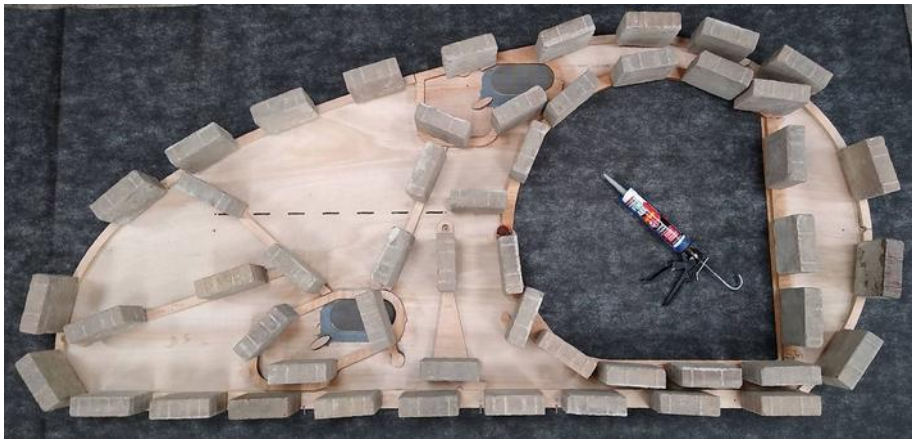
All parts should be on their marks.

Parts around the edges should be fitted flush.

All gaps between the 18mm parts and the 6mm INNER-SIDE-SKIN should be closed tight by weights, and the whole assembly should be flat overall.

Adhesive Cure

Leave the side-assembly to cure for at least 20 hours before removing the weights.



Repeat

Repeat for the left INNER-SIDE-SKIN.

Clean-Up

Allow the adhesive to cure at least 20 hours.

Once cured, remove all weights, remove the M5 screws, remove the 2.5mm drill.

Oozed adhesive inside the door-hole can be removed with the side of a blunt scraper. This is best carried out after approx 3-7 hours, if it can be done without disturbing the part. But even full-cured oozed adhesive can be easily removed *provided it was not tooled-down after oozing.*

Oozed adhesive all around the outside of the side-assembly can be removed with a scraper, sharp chisel, or even - with care - a thumbnail.

Oozed adhesive elsewhere on the assembly will be hidden after completion. It does not need to be

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removed.

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Build Stage: Partial Door-Assemblies

In this step, various spacer parts are bonded to INNER-DOOR-PANELs.

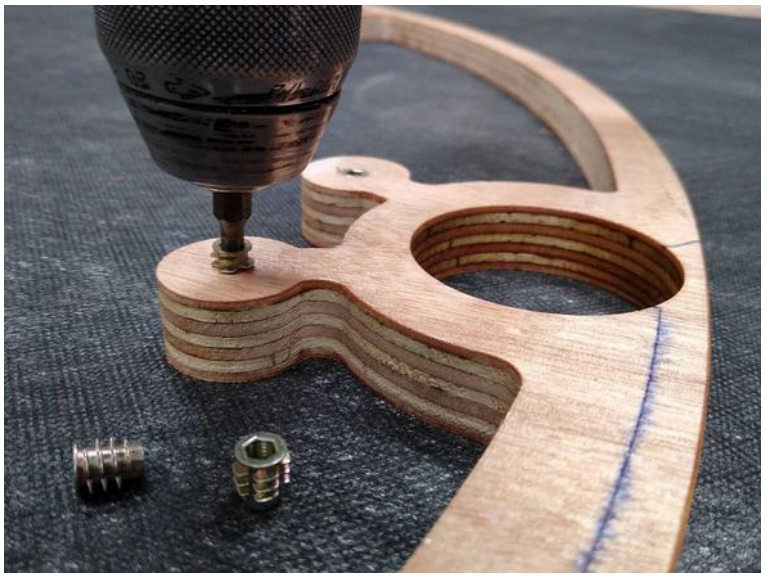
All parts are in left- and right-handed pairs. Each part must be fitted to the correct corresponding side of the trailer.

Preparation

A smooth flat workbench is ideal to work on. Vacuum the work surface clear of all grit or other debris.

Fit Threaded Captive Nuts

Lay the right DOOR-WEB-A part **machined-face** upwards on a flat surface. Use a 4mm hex-bit in an electric screwdriver to drive 2-qty threaded captive nuts (M4) into the 6mm dia holes near the latch-hole. (Image.)



Fit Guide Screws

Working on the **clean face** of DOOR-WEB-A, thread 4-qty M5 screws through the relevant holes to engage with the splined captive nuts. Thread 2-qty M4 screws through the relevant holes to engage with the threaded captive nuts. Screw all six screws down so that 4mm-5mm of thread is exposed on the machined face of the part. (Images.)

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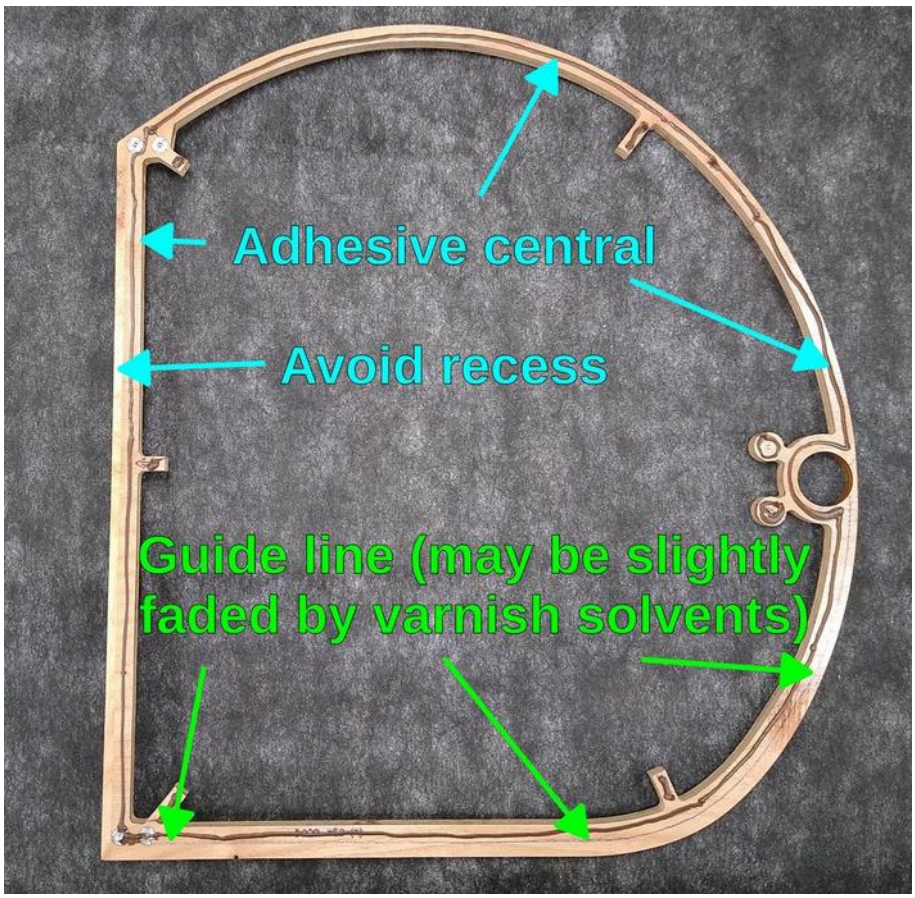
Fit DOOR-WEB-A

Check the fit of DOOR-WEB-A onto the INNER-DOOR-PANEL. All 6-qty screw-tips should drop into the matching holes on the INNER-DOOR-PANEL. Clean out the 5mm dia holes on the panel (using a spare M5 screw as a ‘file’) if necessary.
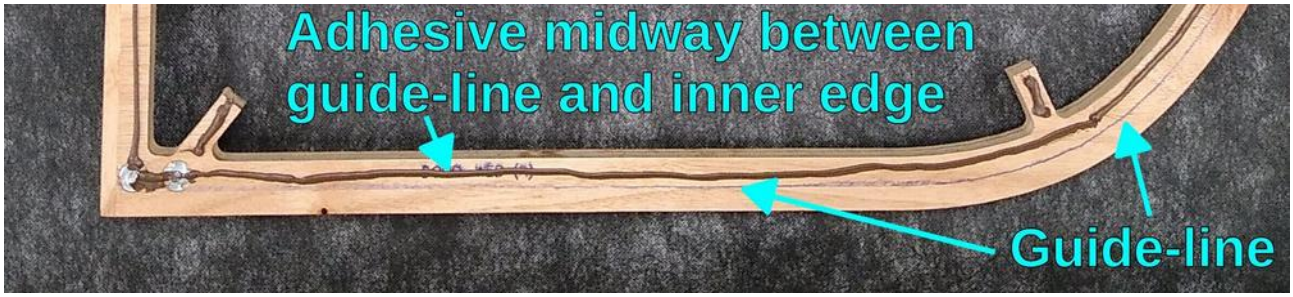
Apply adhesive to the machined face of the DOOR-WEB-A part. There is a guide-line around the bottom half of the part: ensure that the adhesive is well within that line, and is well within the outside edges of the part everywhere else. (Image.)

It is OK to have adhesive on the guide screws - it will not prevent them being removed.

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Detail. (Image.)



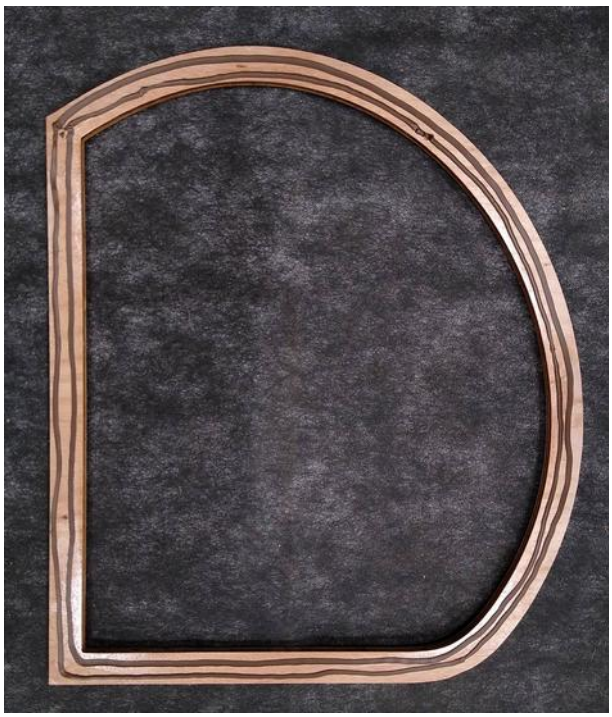
Hold DOOR-WEB-A above the INNER-DOOR-PANEL. Align carefully then lower into contact so that the screw-tips engage. Press the parts firmly together.

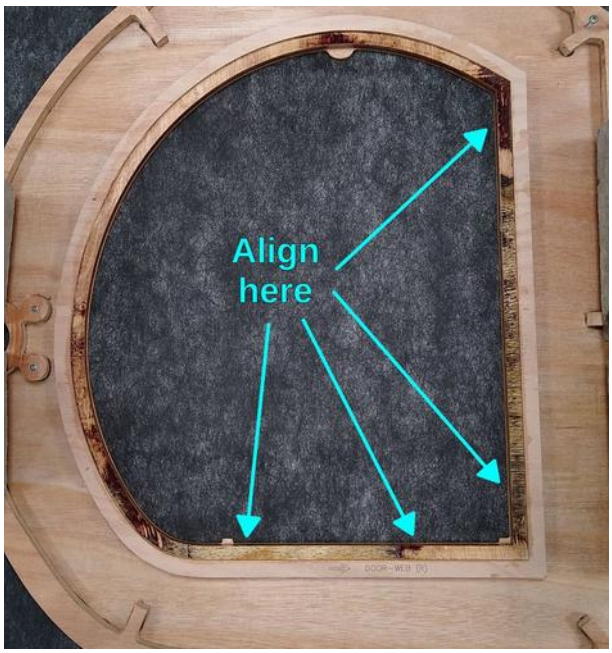
Fit DOOR-WEB-B

Lay the right DOOR-WEB-B **clean face** upwards on the workbench. Apply two modest beads of adhesive around the face. (Image.)

Lay DOOR-WEB-B onto the INNER-DOOR-PANEL, so that the inner edges of the door-hole of both parts are aligned. Adjust carefully so that the two **straight** edges are exactly aligned and flush-fitted. Perfect alignment of the curved edges is not vital. (Image.)

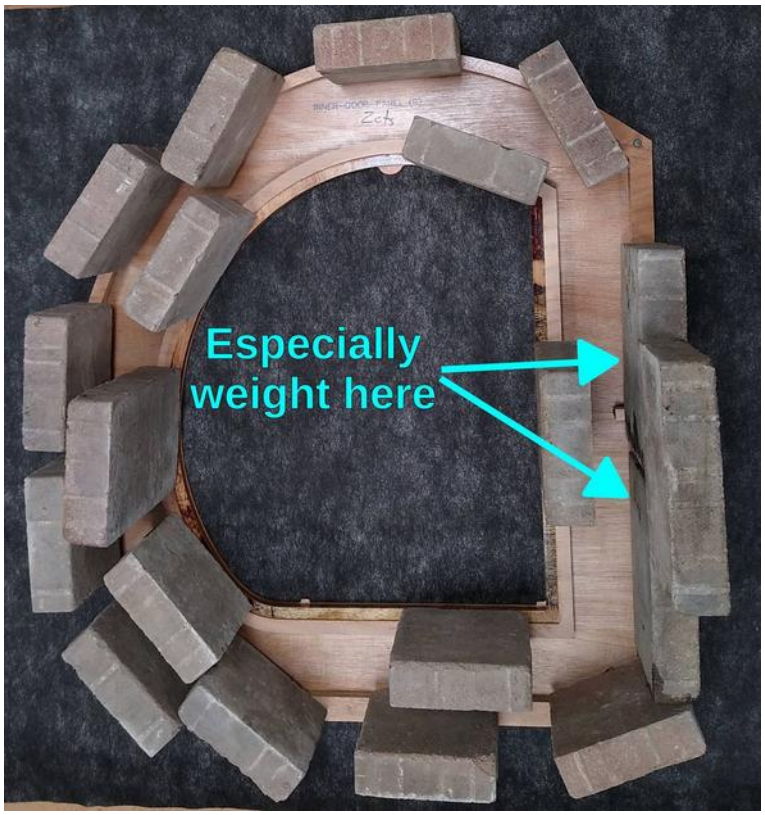
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Adhesive Cure

Heavily weight all the parts, particularly along the vertical straight edges of the DOOR-WEBs, so that the assembly will cure perfectly flat. (Image.)



Keep the parts weighted until the adhesive has fully cured.

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Clean Up

Allow to cure at least 48 hours.

Keep the parts flat and weighted-down until ready to fit the OUTER-DOOR-PANELs to complete the doors (see next build stage). Only then remove the weights and remove all the screws.

Cut away any dried oozed adhesive around the outside of the part, or within the door hole, using a blunt scraper. Do not damage the Bonda-Sealed surfaces.

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Build Stage: Complete the Doors

This stage is documented here, directly after 'Partial Door-Assemblies', for ease of reference. However, this stage should be delayed until the partial door-assemblies have cured at least 48 hours.

Other stages (below) can be carried out in the meantime. Return to this stage when convenient.

Care of the Glazing Panels

The glazing panels are UV-protected polycarbonate. They have both faces hard-coated to protect against scratching. The panels are extremely tough and impact-resistant.

The glazing is proof against ethanol which can be used if necessary to clean off adhesive spills.

The glazing material **would be immediately destroyed** by other solvents, especially acetone. Do **not** allow acetone, paint thinners, surface-activator, or similar solvents to come into contact with the glazing panel.

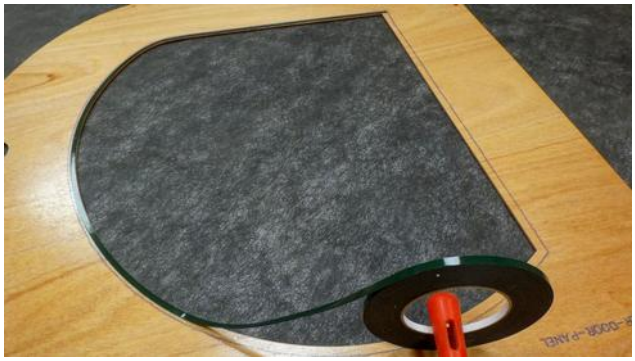
Preparation

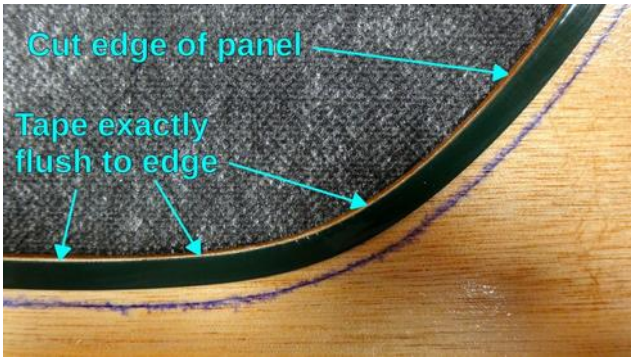
A smooth flat workbench is ideal to work on. Vacuum the work surface clear of all grit or other debris.

Glazing

Lay the right OUTER-DOOR-PANEL onto the work surface, machined face upwards.

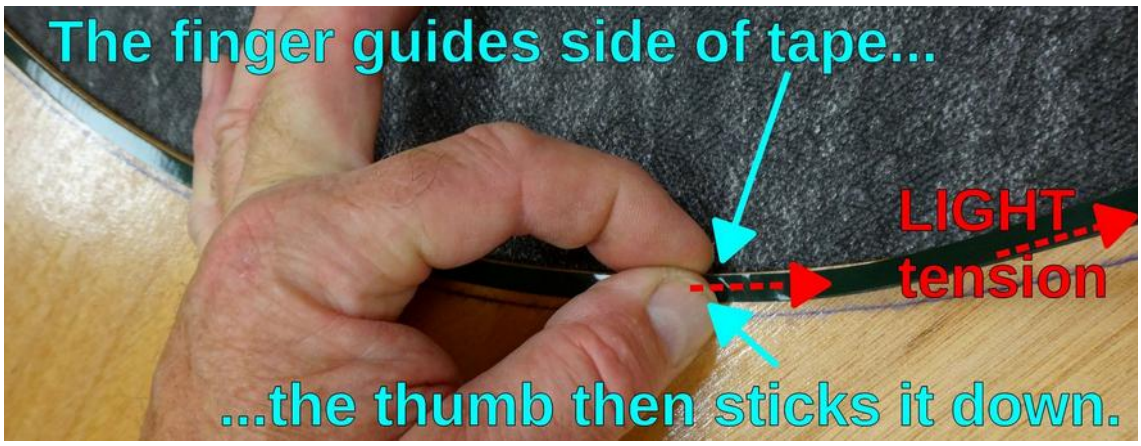
Apply Hodgson Flexistrip tape around the door-hole. (Images.) The tape **must** be exactly flush against the inner edge of the door hole. Two lengths will be required per door: one around the curved part, another along the straight front edge. Use a sharp blade to butt-join each joint, leaving no gap. **Do not** overlap. *(Images show black tape. White is recommended.)*





Tip: apply the tape from-left-to-right. Rub the left forefinger along the cut edge of the panel to guide the tape exactly into position. Simultaneously use the left thumb to gently stick it down. The right hand guides and unreels the roll of tape. Or reverse these directions left/right, if more comfortable guiding the tape right-handed. (Image.)

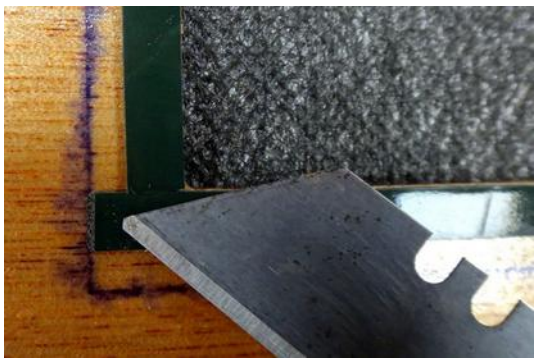
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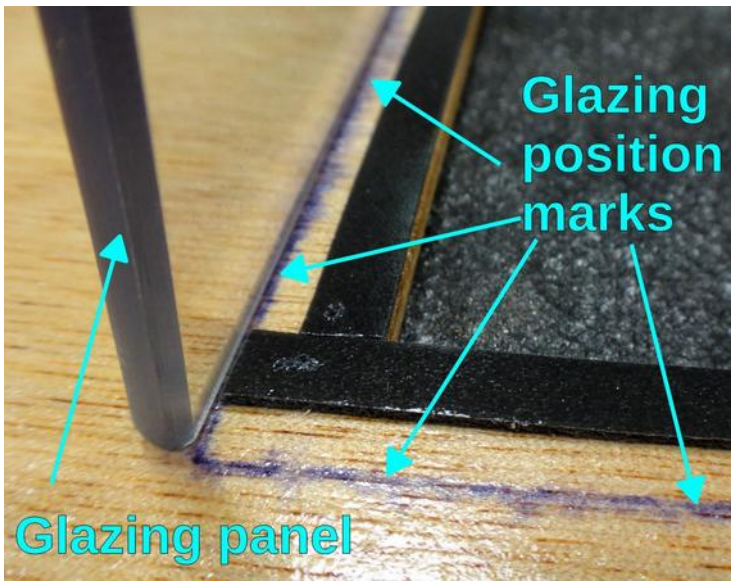


The clear glazing panels are handed: the approval engravings are marked on opposite faces. Select the glazing panel which will have its engraved approval markings on the **inside** of the trailer once installed. I.e. the engraved side will be upwards during this fitting stage.

Tip: practice positioning the glazing onto the tape **before** removing the protective strip off the tape.

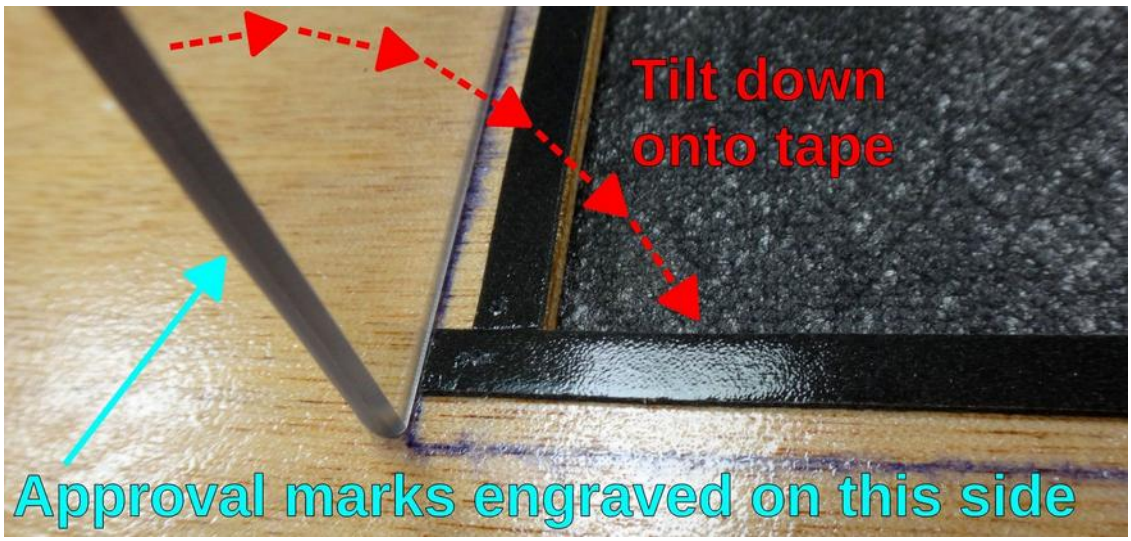
Peel the protective sheets off of **both** sides of the glazing panel. Put them aside sticky-side-up ready for re-use. Lift the protective strip away from all the double-sided tape. (Image.)





Beware that the tape will instantly bond, so the glazing panel has to be installed in the correct place first time, without repositioning. Stand the straight edge of the glazing panel onto the matching markings on the OUTER-DOOR-PANEL then carefully tilt it down into contact with the double-sided tape. (Image.) Tip: the right hand can hold the top edge of the glazing panel to control the tilt, while the left hand's outspread fingers can chock the bottom edge of the panel, to keep it on its marks.

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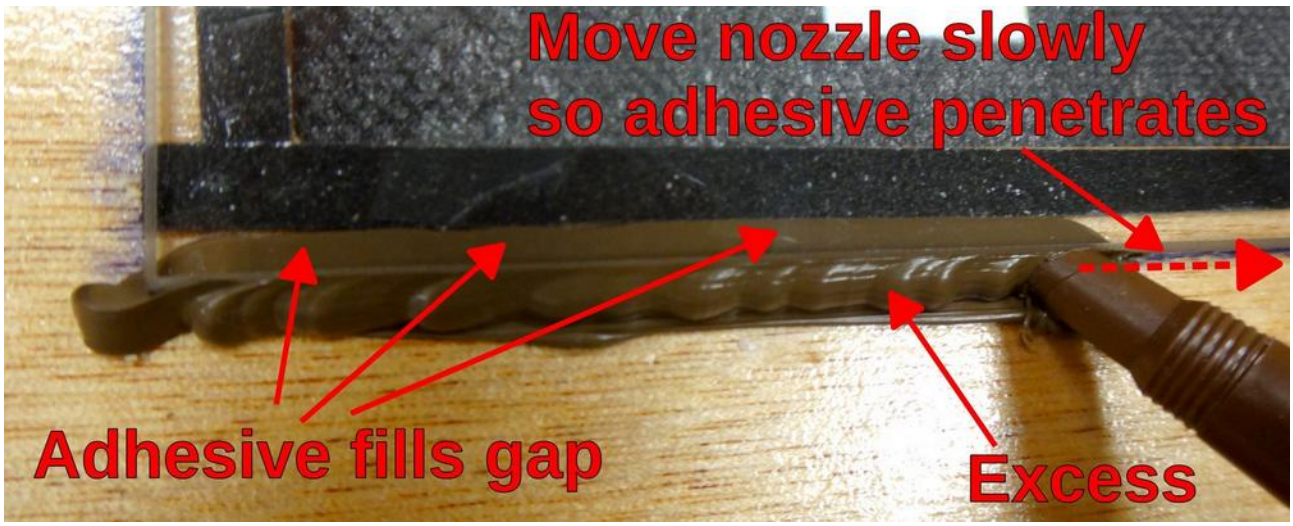
Position check: The design makes allowance for slight mis-placing the panel onto the tape. But before pressing the glazing permanently into the tape's adhesive, place the right partial door-assembly (previously built) onto this new assembly. Check that the M5 holes can be aligned without the glazing fouling on the partial door-assembly. Remove all tape and restart the process, if necessary.

Press the glazing firmly into the tape's adhesive. (Image.)

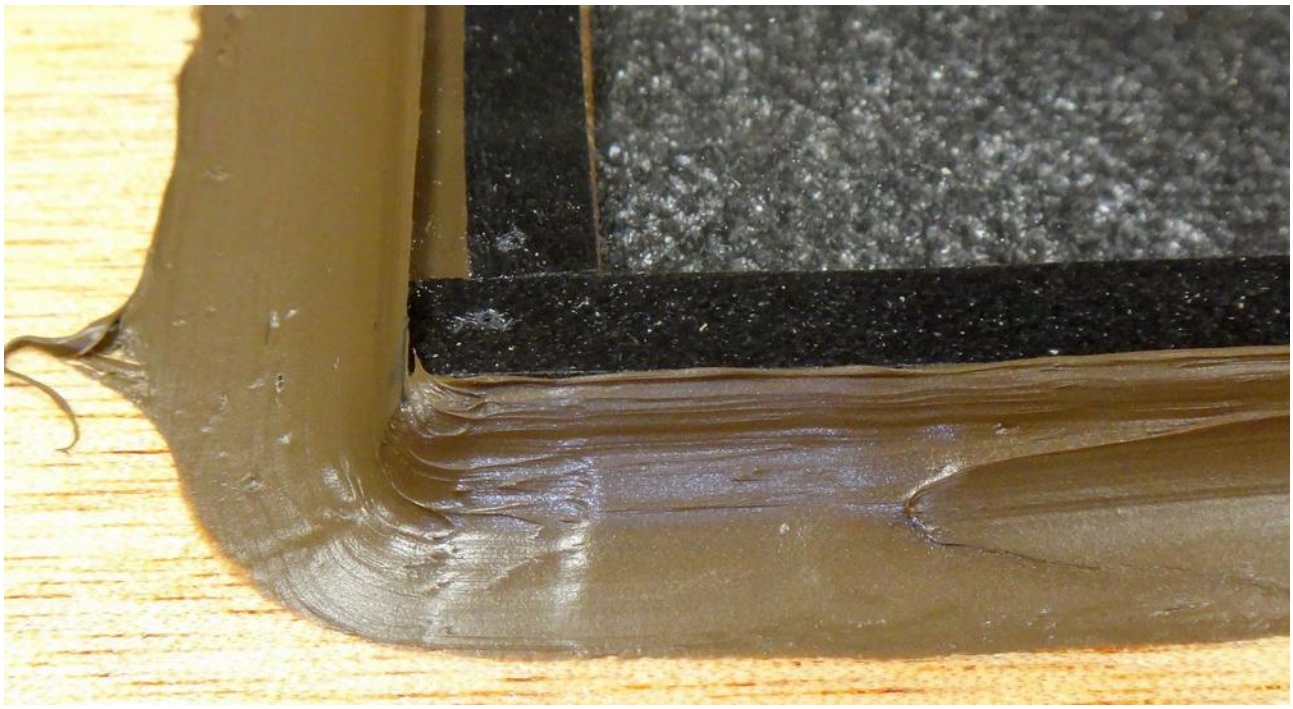


Augment the double-sided tape with **brown** Fix-All adhesive, to ensure a weathertight seal. Force the adhesive into the gap between the glazing panel and the timber all around. Work slowly to completely fill the gap with adhesive. (Image.)

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Tool-down the excess adhesive into **a generous additional fillet** to seal between the timber and the cut edge of the glazing panel. Add adhesive to the fillet if necessary. Take care not to allow adhesive onto the inside face of the glazing panel itself. (Image.)

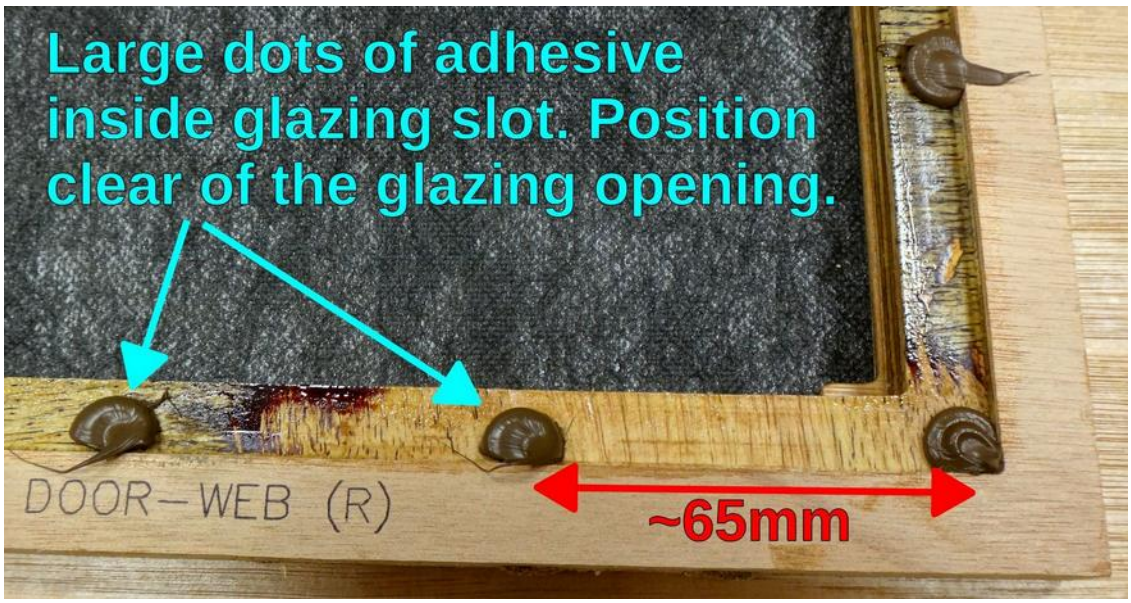


Continue **immediately** to assemble the complete door. Do **not** allow the glazing adhesive to cure.

Assemble the Complete Door

Lay the previously-built partial INNER-DOOR-PANEL door-assembly onto the work surface with its INNER-DOOR-PANEL downwards. Apply heavy dots of brown adhesive into the glazing recess

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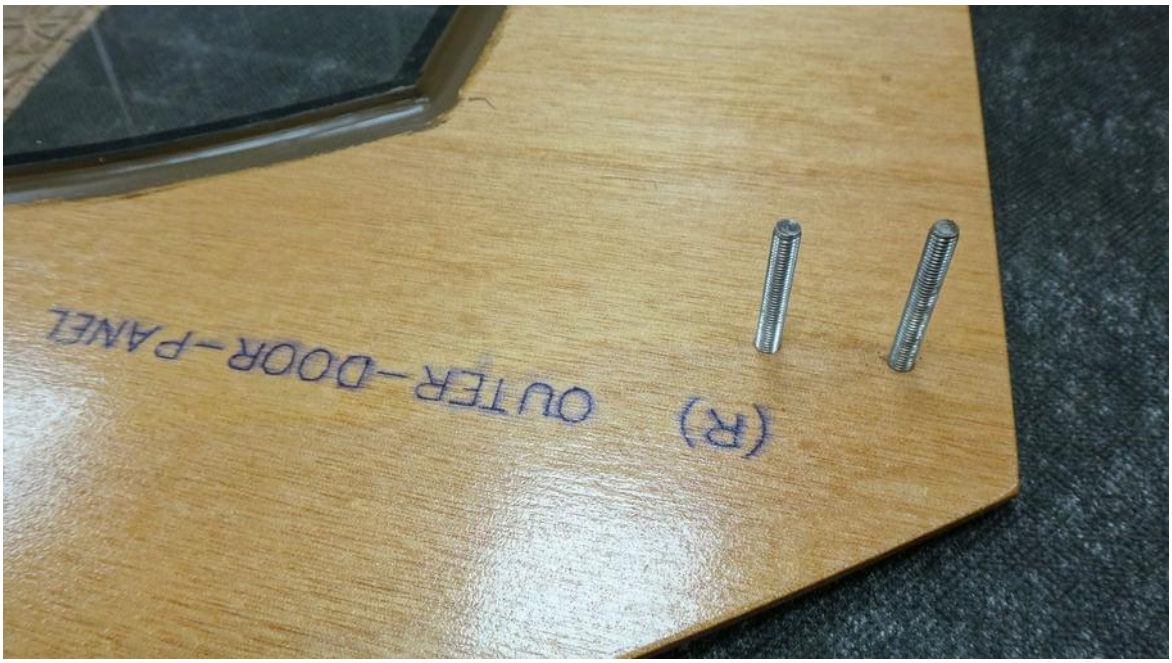
of DOOR-WEB-B to support the back face of the glazing. The adhesive dots must be large enough to guarantee that the glazing will embed into them. Position them about 65mm apart, all around the glazing opening. (Image.)

Apply adhesive along the centre-line of all DOOR-WEB-A and DOOR-WEB-B parts. (Image.)



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Thread M5 screws up through the holes in the OUTER-DOOR-PANEL so that the whole of their threaded parts are through on the machined face (same side as the glazing). (Image.)



Holding the OUTER-DOOR-PANEL at an angle - clear of the adhesive - engage the tips of the M5 screws into the matching holes in the DOOR-WEB-A part. (Image.)



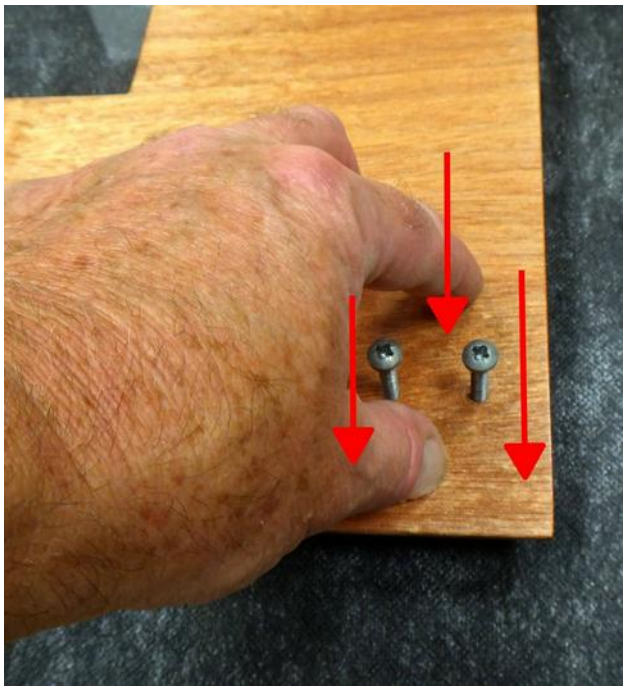
Ensure that the screws are all fully engaged into their four holes and are vertical in those holes. Then tilt the OUTER-DOOR-PANEL down into contact with the adhesive. (Image.)

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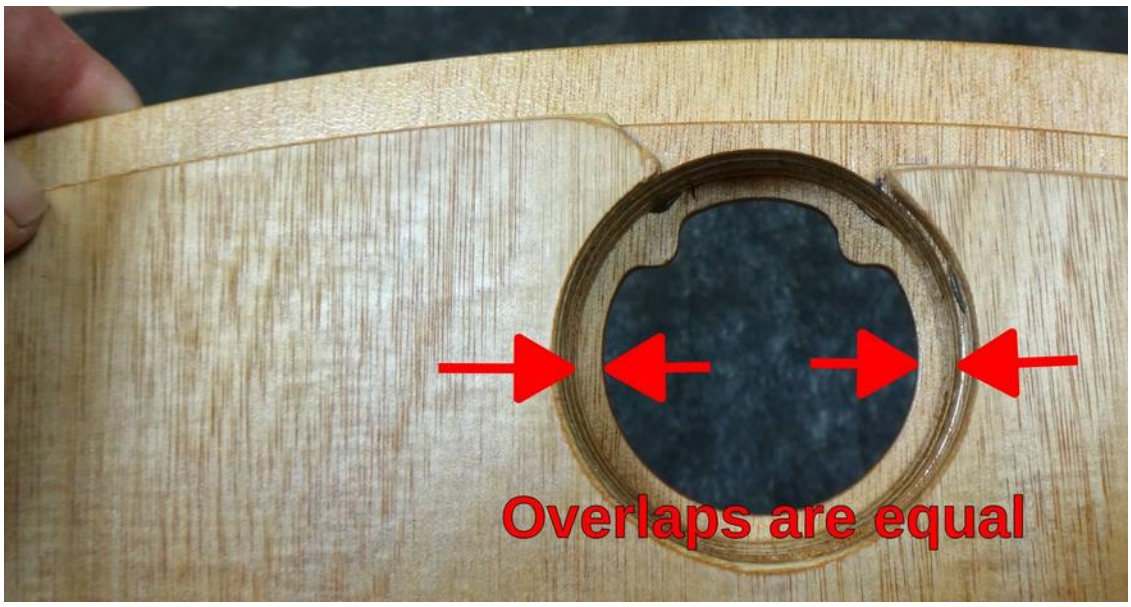
Thread the screws into the captive nuts by two or three turns. Then carefully but firmly press to slide the OUTER-DOOR-PANEL down the threads and into full contact with the adhesive. (Images.)





Press all over the door-assembly very firmly, to ensure the parts are fully bonded together without gaps. Pick up the assembly and examine it all around to confirm no gaps. Look inside the lock hole and check that the overlaps top and bottom are identical. (Image.)

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Note: Adhesive may have oozed out between the glazing and the DOOR-WEB-B. Do **not** touch this adhesive. It will be less messy to remove it later (when semi-cured) than to try to remove it now.

Lay the door-assembly down as before, with the INNER-DOOR-PANEL underneath and the OUTER-DOOR-PANEL on top. Replace the protective sheet onto the outside of the glazing panel **only**. Weight the entire assembly to hold it perfectly flat. (Image.)



Repeat the process for the left door.

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Cure

Allow to semi-cure 10-20 hours. Then - if necessary - carefully remove any oozed adhesive from the inside of the glazing using the edge of a blunt scraper or spatula. Clean up any sticky residue using ethanol. Then replace the door-assembly back onto the worktop, re-weight so that the parts are completely flat, and leave to fully cure for at least 48 hours in total.

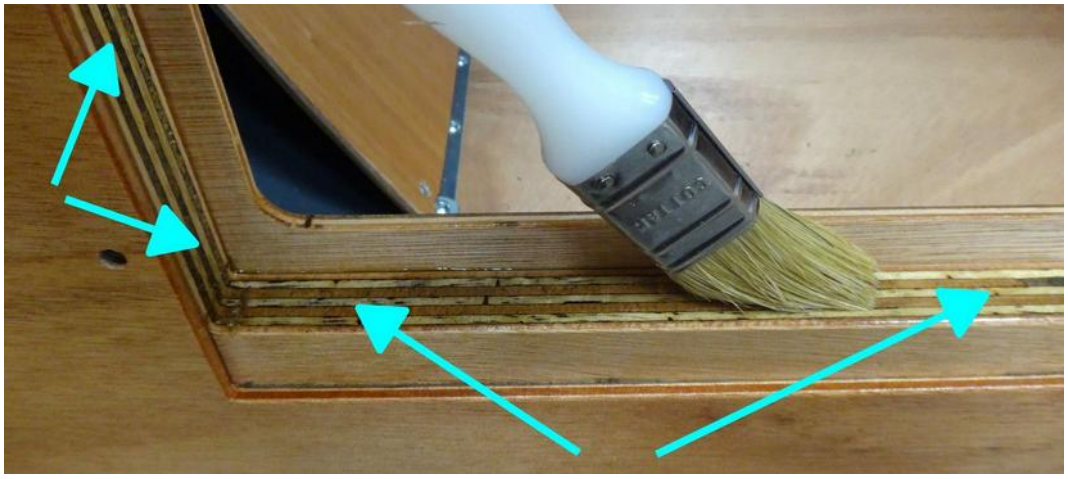


Clean-Up

After full cure, replace the other protective sheet onto the inside of the glazing panel. Any dust or particles that have already been attracted to the glazing by static will be collected into the adhesive of the protective sheets and will come away when the sheets are later removed.

Yacht Varnish

Apply one modest coat of yacht varnish to the outside **cut edges** of the DOOR-WEB. Do not apply varnish to any other parts. Varnish significantly improves the weatherproofing in this vulnerable area. (Image.)



Tip: Immediately after applying the varnish, wipe a rag around the inside face of the DOOR-INNER-PANEL to remove any unsightly overspill.

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Build Stage: Prepare Floor for Fitting Sides

Warning

All work during the building of the pod is carried out from the **outside** of the trailer. There is no need to enter the trailer or to climb onto its floor during construction. Doing so might damage the partially-complete structure and would be dangerous. **Always work from outside of the trailer.**

Note

There are a large number of 2mm dia holes in the floor. **Do not** drill or ream out any of these.

Check 6mm Holes Pt1

Use the temporary front leg to adjust the chassis-floor-assembly so that the floor is approximately level.

Use a spare M6 screw to check clearance in each of the 16-qty 6mm holes which run down each side of the floor. The screw should pass in and out of the hole freely. Where necessary, use a 6mm drill to ream out any blocked hole. (Image.)



Check 6mm Holes Pt2

There are 4-qty other 6mm holes in the FLOOR - 2-qty at the rear above the wiring-box and 2-qty near the front corners. Check these in a similar manner.

Fit Temporary FLOOR-JIG

Adjust the chassis-floor-assembly so that the floor is approximately level.

Fit 2-qty barrels to the FLOOR-JIG.

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Place the FLOOR-JIG on the top of the front of the floor. Pass 40mm screws up through the matching 6mm holes in the floor and thread them into the barrels in the FLOOR-JIG. Tighten gently. (Image.)

Fit Temporary REAR-JIGs

Adjust the chassis-floor-assembly so that the floor is approximately level.

Fit 1-qty barrel to one of the REAR-JIGs.

Pass a 40mm screw up through one of the 6mm holes inside the wiring-box and thread it into the barrel in the REAR-JIG.



Position the REAR-JIG so that the bulk of it overhangs the rear of the floor. Tighten the screw gently.

Repeat for the other REAR-JIG. (Image.)

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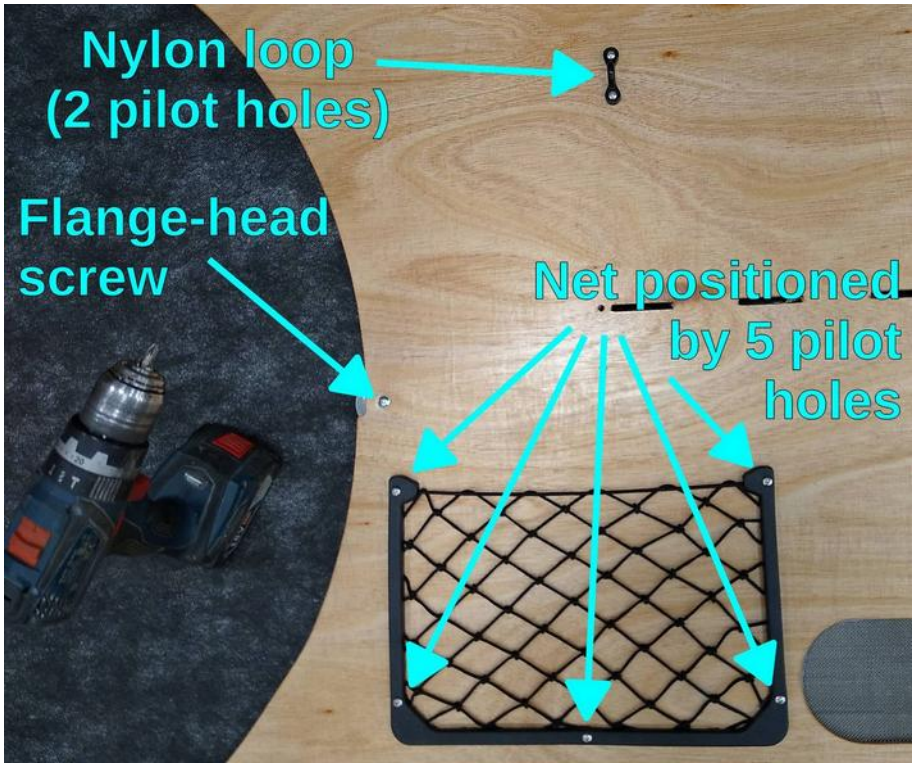
Build Stage: Internal Fittings

There are several fittings which attach to the inside of the side-assemblies. Now is the ideal time to fit them.

Note

When fitting screws through any skin and into a glued-on part behind, always press down on the screw very firmly. This prevents the screw ‘jacking’ the skin away from the glued-on part.

Reference Image



Fit Net Pocket

Lay one side-assembly onto a large, flat workbench or workshop floor with the Bonda-Sealed (i.e. interior) face uppermost. The side-assembly must be completely flat and must be evenly and wholly supported from below by the flat work surface.

Check that the net pocket is properly assembled. (Images.) Pass 2-qty #8 x 3/4” pan-head screws through the holes at the **top** of the pockets. Drive them into the matching pilot-holes in the side-assembly. Drive them fully home but tighten them only moderately - do not crush the plastic.

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Repeat for the central bottom screw of the net. Repeat for the two bottom-corner screws. Ensure all screws correctly enter their small pilot holes.

Fit Shelf Nylon Eyes

Use 2-qty #8 x 3/4” pan-head screws to fasten the nylon eye. Pilot-holes are provided. (See reference image.)

Fit Latch Reinforcement Screw

Drive a #10 x 3/4” flange-head screw into the hole at the centre of the 50mm washer. Tighten firmly. (See reference image.)

Reminder

Have you applied for your IVA inspection? If not, then do it as soon as possible. DVLA can take several weeks to process your application.

See “Build Stage: Register for IVA”, above.

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Build Stage: Fit Side-Assemblies

Adjust the chassis-floor-assembly so that the floor is approximately level.

Lay the left side-assembly on top of the floor with its Bonda-Sealed inner face downwards, its bottom edge facing toward the left side of the trailer, and the door-opening towards the front of the trailer. (Image.)



Use #8 x 1.1/4” woodscrews to fasten two ‘WJT’s (Wall Jointing Tools) to the machined face of the WALL-JOINER on the side-assembly. There are pilot holes ready drilled in the WALL-JOINER. (Image.)

Unscrew **all** the 40mm screws from the bottom of the side-assembly. Place them - and a suitable hex-key - near the suspension-unit ready for use.

Remove any excess adhesive which has previously oozed from the joint at the bottom of the side-assembly, so that the bottom edge is clean and flat.

Run a medium bead of brown Fix-All along the left side of the floor. The bead should begin at the frontmost of the 16-qty 6mm dia holes. The bead should end at the rearmost of those holes. The bead should run along a line exactly through the holes. (Image.)

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Lift the side-assembly to the vertical, then use the WJTs to guide it into position on the edge of the floor. Then lower it **vertically** onto the bead of adhesive - do not slide it sideways.

Slide the side-assembly forwards or rearwards as necessary to align the barrel-nuts with the holes in the floor. Hold the side-assembly upright with one hand. Use the other hand to loosely fit a few M6 screws, which will be sufficient to temporarily hold the part upright in position. (Image.)

Insert all the screws, but tighten them only loosely.

Working from the front, fully tighten every 3rd screw. As each screw is being tightened, push or pull the side-assembly so that its edge is flush with the edge of the floor. Finally, very firmly tighten all 16-qty screws.



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Remove the WJTs immediately.

Repeat for the right side-assembly.

Cure

Remove the WJTs before the adhesive begins to cure. Discard them.

Continue directly to the next build stage: there is no need to leave the adhesive to cure.

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Build Stage: Fit Power Modules

Identify the 12V ‘cigar lighter’ power socket, and the USB power socket. Identify the CENTRE RAFTER. (Image.)



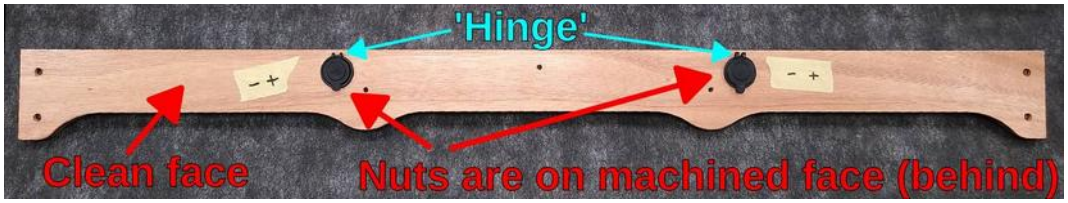
Remove the threaded nut from the USB power socket. Ensure the rubber cover is in place and correctly fitted with its ‘hinge’ part at the top.

Pass the threaded part of the USB power socket through the **clean face** of the CENTRE RAFTER into either of the machined oval holes, so that the ‘hinge’ of the rubber cover is toward the top (i.e. the straight cut edge) of the CENTRE RAFTER.

Fit the threaded nut and tighten firmly by hand only.

Make a note of which way around the ‘plus’ and ‘minus’ terminals of the USB power socket are. Write this information onto a piece of masking-tape and stick it to the clean face of the CENTRE RAFTER.

Repeat the process for the 12V ‘cigar lighter’ socket. (Image.)



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Build Stage: Shelf Assembly

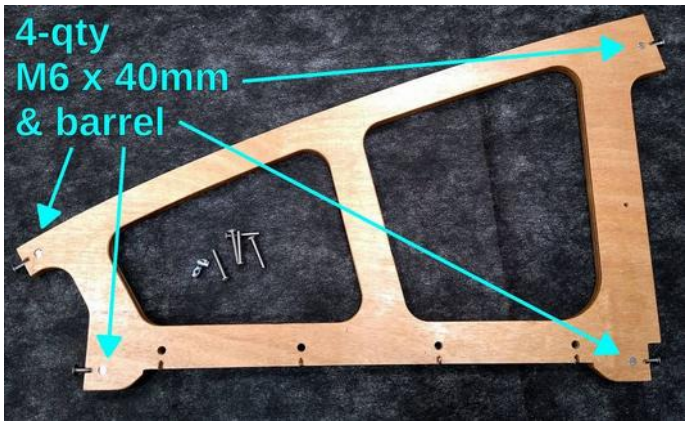
Reference Image



Preparation

Loosely fit 4-qty barrels and M6 x 30mm screws into the ends of both the SHELF-BEAMs. Loosely fit 4qty barrels and M6 x 40mm screws into the **ends** of the SHELF-PURLINs. Leave these screws in place. (Image.)

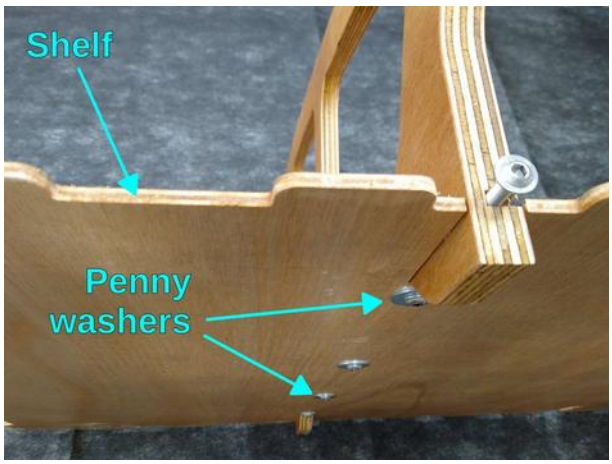


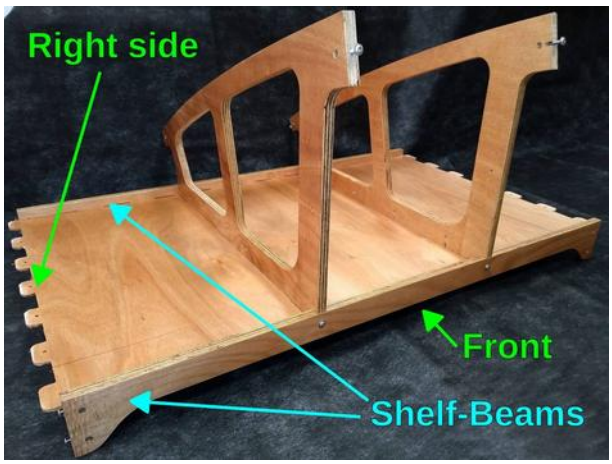


Build Shelf-Assembly

Fit one of the SHELF-PURLINs into the matching slots on the shelf. Use 4-qty barrels, M6 x 30mm screws, **and M6 penny washers** to fasten them together. Tighten very firmly. (Image.) Repeat for the other SHELF-PURLIN, so they make a symmetric pair on the shelf.

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Stand the assembly so that the front edges of the two SHELF-PURLINs are uppermost. Carefully - without disturbing their barrels - remove the two M6 x 40mm screws which are close to the shelf. Drop one slotted SHELF-BEAM onto the assembly, so that the tags on the shelf engage in the slots in the SHELF-BEAM. Reinsert the screws and nip them up, but only gently. Repeat at the rear of the shelf with the other SHELF-BEAM. (Image.)

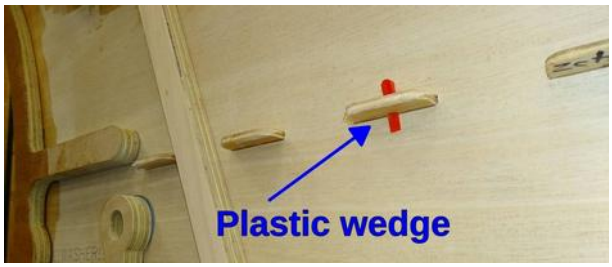
Fit Shelf to Trailer

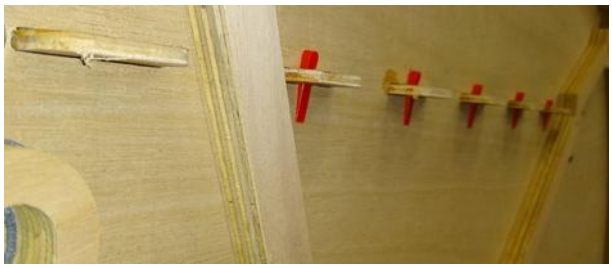
Assistance: If everything up to this step has been built perfectly, then the fitted sides of the trailer should be approximately vertical. If instead they splay out, then an assistant will be required to complete this next step. The assistant should fit the wedges while the shelf is held safely in place.

Remove the 8-qty M6 x 30mm screws in the ends of the SHELF-BEAMs. Try not to disturb the barrels while doing this.

Stand on the workshop floor, at the rear of the trailer. Pick up the shelf-assembly by holding the tops of the two SHELF-PURLINs. Tilting the assembly slightly, slot all the tangs on the right side of the assembly into the matching slots in the right side of the trailer. Spring the trailer sides apart a little, and slot the left side tangs into their slots. (See reference image.)

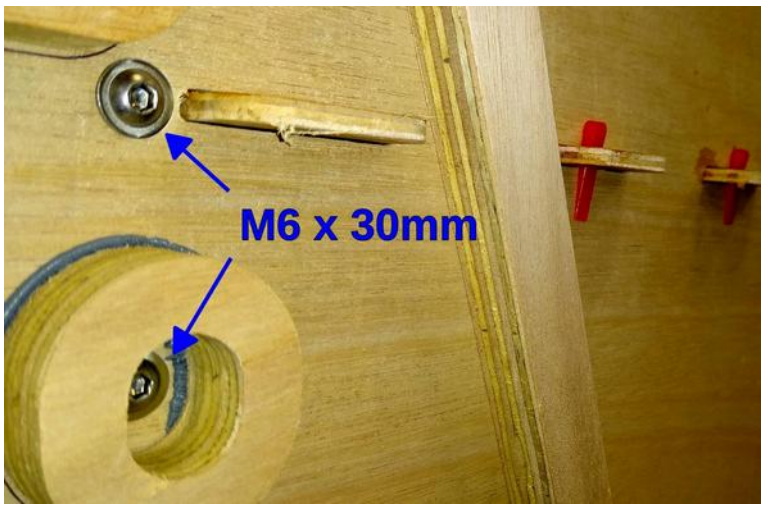
Immediately drop a plastic wedge into the slot in **one** of the tangs on **each side** of the trailer, so that the shelf cannot fall. (Image.) Repeat with all the other slotted tangs on both sides. Gently tap all the wedges down until about two-thirds of their length is visible underneath the tang. (Image.)





Finally, pass the 8-qty M6 x 30mm screws through the matching 6mm dia holes in the side-assemblies, and engage them into the barrels in the SHELF-BEAMs. Fit all 8-qty loosely. Then tighten them all very firmly. (Image.)

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Final Check

The 4-qty M6 x 40mm screws, which hold the SHELF-BEAMs to the SHELF-PURLINs at front and at back, should have been just nipped-up and **not** fully tightened.

All other screws should have been fully tightened.

The wedges should be correctly tapped into place.

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Build Stage: Complete the Frame

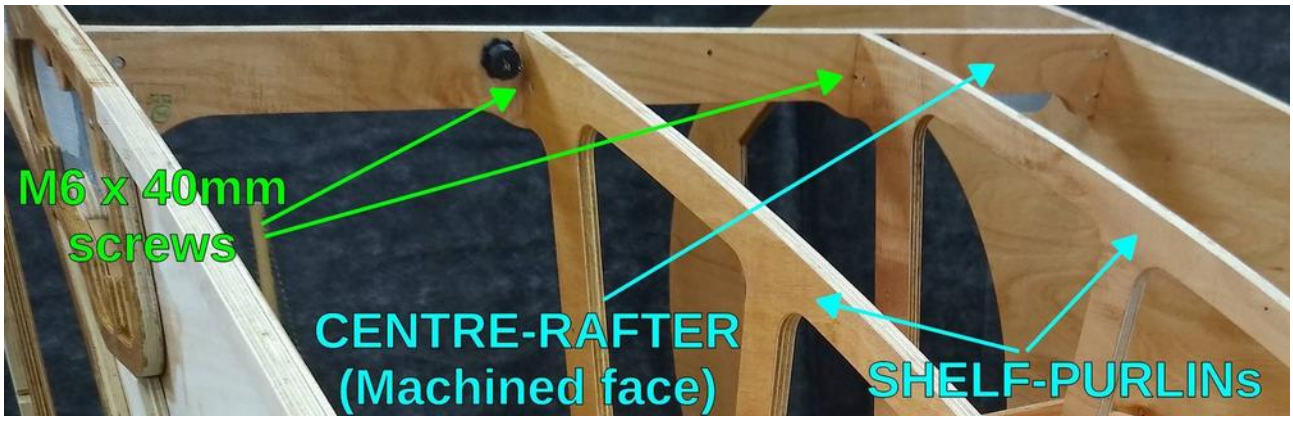
Naming

A “RAFTER” is a part which fits from side-to-side on the trailer and which supports the roof. A “PURLIN” is a part which fits fore-and-aft (between RAFTERs) to support the roof and/or the shelf.

Fit RAFTERs to SHELF-PURLINs Front and Rear

Remove the 2-qty M6 x 40mm screws from the top front of the SHELF-PURLINs, leaving the barrel-nuts in place.

Position the CENTRE-RAFTER across the top of the trailer with the power sockets facing toward the front of the trailer.



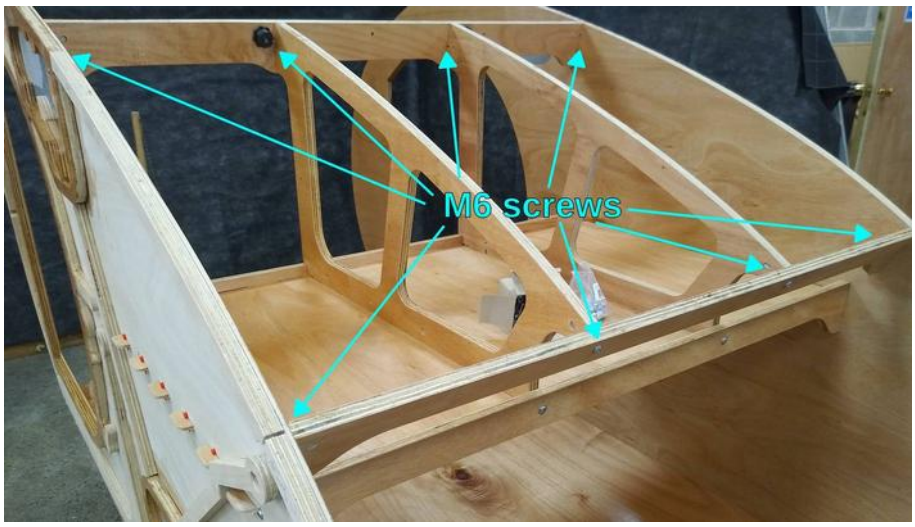
Pass the screws through the CENTRE-RAFTER and refit them into the barrel nuts in the SHELF-PURLINs to hold the CENTRE-RAFTER in place. Nip up these screws but do not fully tighten them. (Image.)

Using 4-qty barrels and 4-qty M6 x 30mm screws, fasten the ends of the CENTRE-RAFTER to the INNER-SIDE-SKINs. Tighten these screws fully.

Similarly, identify the RAFTER which has 2-qty 6mm dia holes drilled in its face. Fasten it to the rear of the SHELF-PURLINs, using the M6 x 40mm screws and barrels that are already fitting in the SHELF-PURLINs. Nip up these screws but do not fully tighten them.

Then use 4-qty barrels and 4-qty M6 x 30mm screws to fasten the ends of that RAFTER to the INNER-SIDE-SKINs. Tighten these screws fully. (Image).

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Fit 3rd RAFTER

Identify the RAFTER which has a **single** 6mm hole drilled in its centre. It also has 2-qty small holes drilled in its machined face.

Identify the two pairs of holes in the INNER-SIDE-SKINs, just above the door-holes, which will be used to fasten this RAFTER in place. Working from the outside of the trailer, push a M6 x 30mm screw into each one, so that the screws all protrude inside the trailer.

Position the RAFTER across the trailer with the **machined face** facing upwards and rearwards. Slightly spring the side-assemblies outwards, to allow the RAFTER to be slotted onto the screws. These will suspend it loosely in place, freeing both hands to fit the barrels one-by-one.

When all barrels are fitted, firmly tighten all the screws.

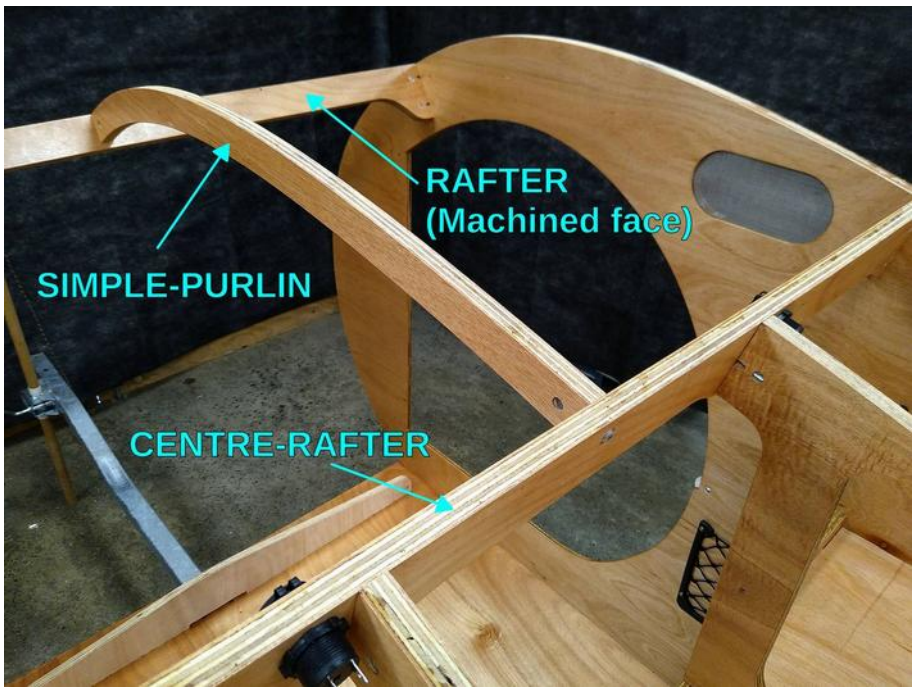
Fit SIMPLE-PURLIN

Identify the SIMPLE-PURLIN (see sanding images, above). Identify its front and rear by matching its curve to the curvature of the side-assemblies.

Use 2-qty barrel nuts and 2-qty M6 x 40mm screws to fasten the SIMPLE-PURLIN between the centres of the CENTRE-RAFTER and the 3rd RAFTER. There are M6 holes drilled in the centres of these.

Align the ends of the SIMPLE-PURLIN vertical using a set-square, then firmly tighten the screws. (Image.)

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Fit Remaining RAFTERs

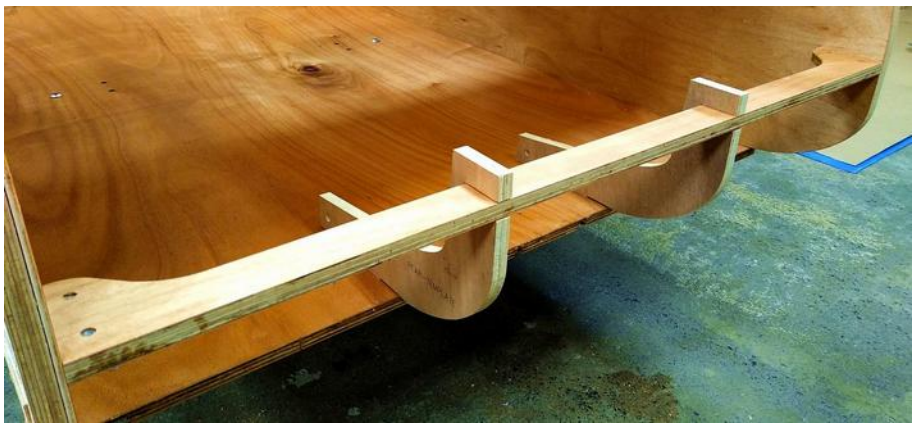
Both of the remaining RAFTERs should be fitted machined-face downwards.

Choose the **straightest** of the two remaining RAFTERs. Use 4-qty barrel-nuts and 4-qty M6 x 30mm screws to fit it at the front of the trailer. Use the same technique as when fitting the 3rd RAFTER, to temporarily suspend it while fitting the barrels. (Image.)



The final RAFTER fits at the rear of the trailer. It slots into the temporary REAR-JIGs. 4qty barrel-nuts and 4-qty M6 x 30mm screws fasten it to the INNER-SIDE-SKINs. (Image.)

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Warning

Do not climb into the part-built trailer: doing so could result in damage. The frame requires fitment of the roof panels to create a monocoque structure. Only then will it have strength and rigidity.

The complete frame:



Cure

There is no need to wait for the adhesive to cure. The next build stage can be begun immediately.

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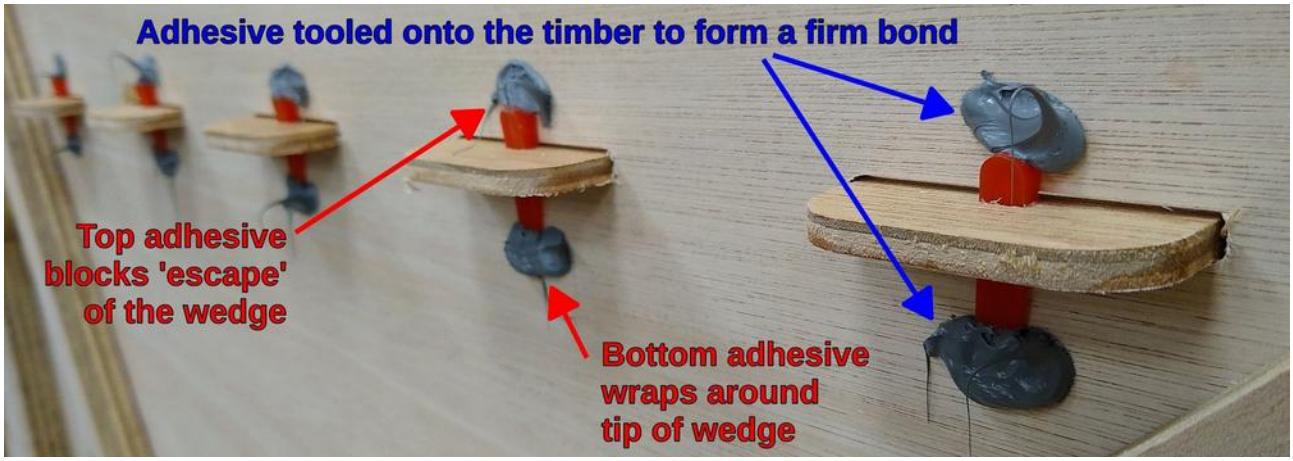
Build Stage: Fasten the Shelf Wedges

Tip: this build stage will leave wet adhesive exposed on the side of the assembly, so is best performed as the last build stage of the day. So, if preferred, this build stage can be carried out **after** the next build stage, which is the fitting of the FRONT-INNER-ROOF.

Process

Apply adhesive to the **timber** around the top and the bottom of each of the wedges, so as to lock the wedges in place and prevent them from escaping their slots.

The adhesive **will not bond** to the wedges: the adhesive must instead be applied to the timber to form a barrier to the movement of the wedges. The adhesive **above** the wedges prevents them slipping upwards out of their slots. The adhesive wrapped around the **bottoms** of the wedges prevents them twisting. (Image.)



Cure

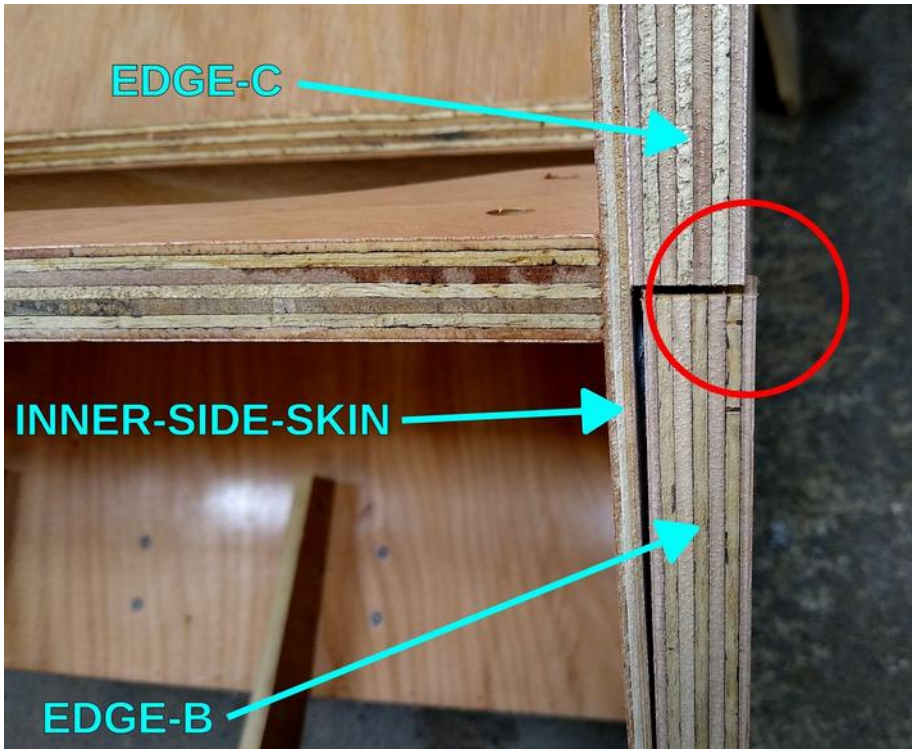
There is no need to wait for the adhesive around the wedges to cure. The next build stage can be begun immediately.

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Build Stage: Reshape Mis-Bonded Parts

This stage can be performed either before or after fitting of the FRONT-INNER-ROOF and REAR-INNER-ROOF plastic. It **must** have been performed before fitting longeron (LONG-x) parts.

During construction of the side-assemblies, some of the EDGE-x parts may not have bonded tight to the INNER-SIDE-SKIN. This can result in uneven steps where parts join. (Image: looking down).



Use a surform (or belt sander) to flatten any steps where EDGE-x parts abut each other, or where an EDGE-x part abuts the WALL-JOINER.

Do **not** apply a surform or sander to any other part of the side-assembly: some of the other parts will be visible in the finished trailer so must not be damaged.

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Build Stage: Front Inner Roof

The INNER-ROOF is made from a tough plastic. Fitting it pulls the frame into correct alignment.

Warning

Do not allow the plastic to bend sharply. The plastic is very resilient but if abused it can fracture, rendering the part useless. Always carry the plastic parts by their **ends**, not by their middles, so that they bend in a large radius. Never let them bend in a tight radius.

Zones

Application of adhesive is divided into three ‘zones’. Each zone is a specific area onto which adhesive is applied. Working on one zone at a time makes it much easier to avoid smearing adhesive onto visible parts.

Always refer to the zone images before applying adhesive.

Assistance: An assistant can be useful to steady the plastic and support its weight. Working with an assistant greatly reduces the risk of adhesive being accidentally smeared in the wrong places.

Fasten the Lower Front Edge

Identify the FRONT-INNER-ROOF. This is the larger of the two grey plastic sheets. Choose the cleanest side to be visible on the inside of the trailer.



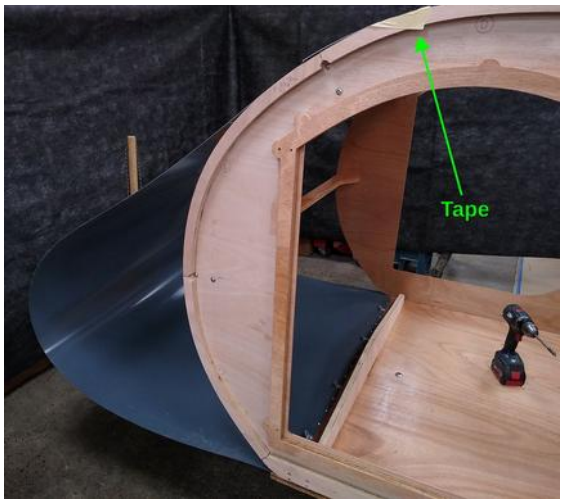
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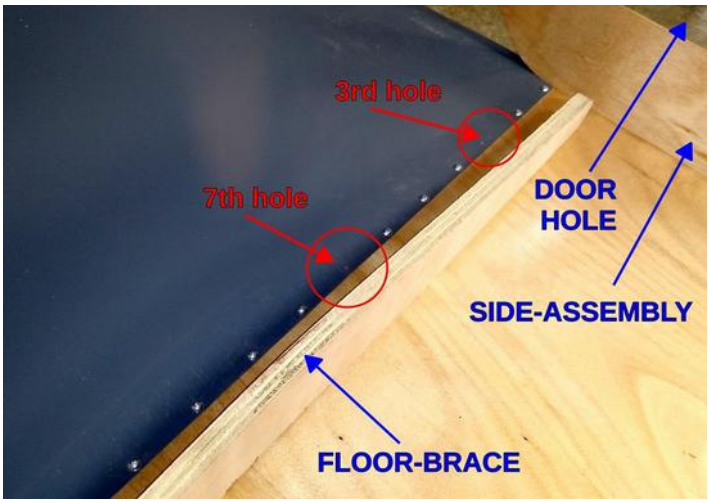
Adjust the trailer assembly so that the floor is approximately level.

Pick up the ends of the plastic sheet in two **wide-spread** hands so that it drapes in a wide U-shape. The chosen inside face should be uppermost.

Maintaining the U-shape, slot the entire length of plastic into the gap between the front of the pod and the temporary front leg. The end of the plastic which has a row of 3mm dia perforations should be towards the pod. (Image, above.)

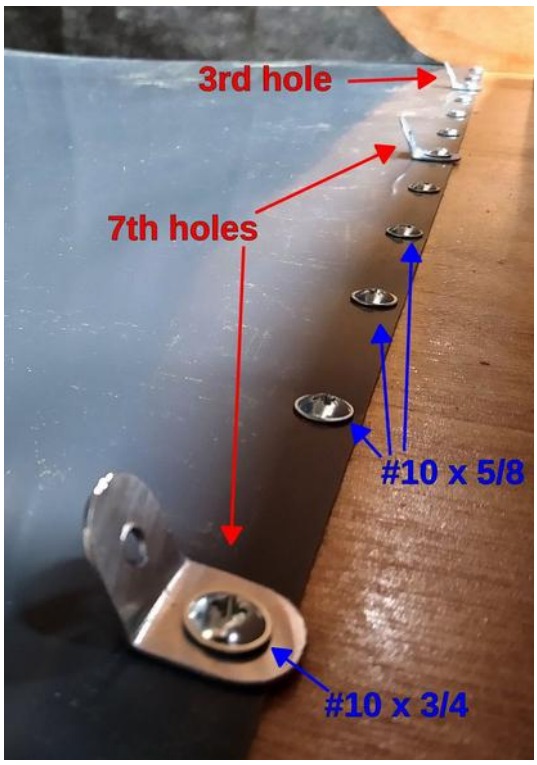
Slide the perforated end of the plastic downwards until the tip of the perforated end can rest on the end of the floor. Temporarily tape the other end of the plastic onto the top of the side-assemblies, to prevent it toppling sideways. (Image.)





Line up the 18-qty perforations in the plastic with the pilot holes in the front edge of the floor. Drive #10 x 5/8” flange-head screws into all these holes **except** the 3rd and 7th holes counting inwards from both sides of the trailer. Use a long screwdriver or extension. (Image.)

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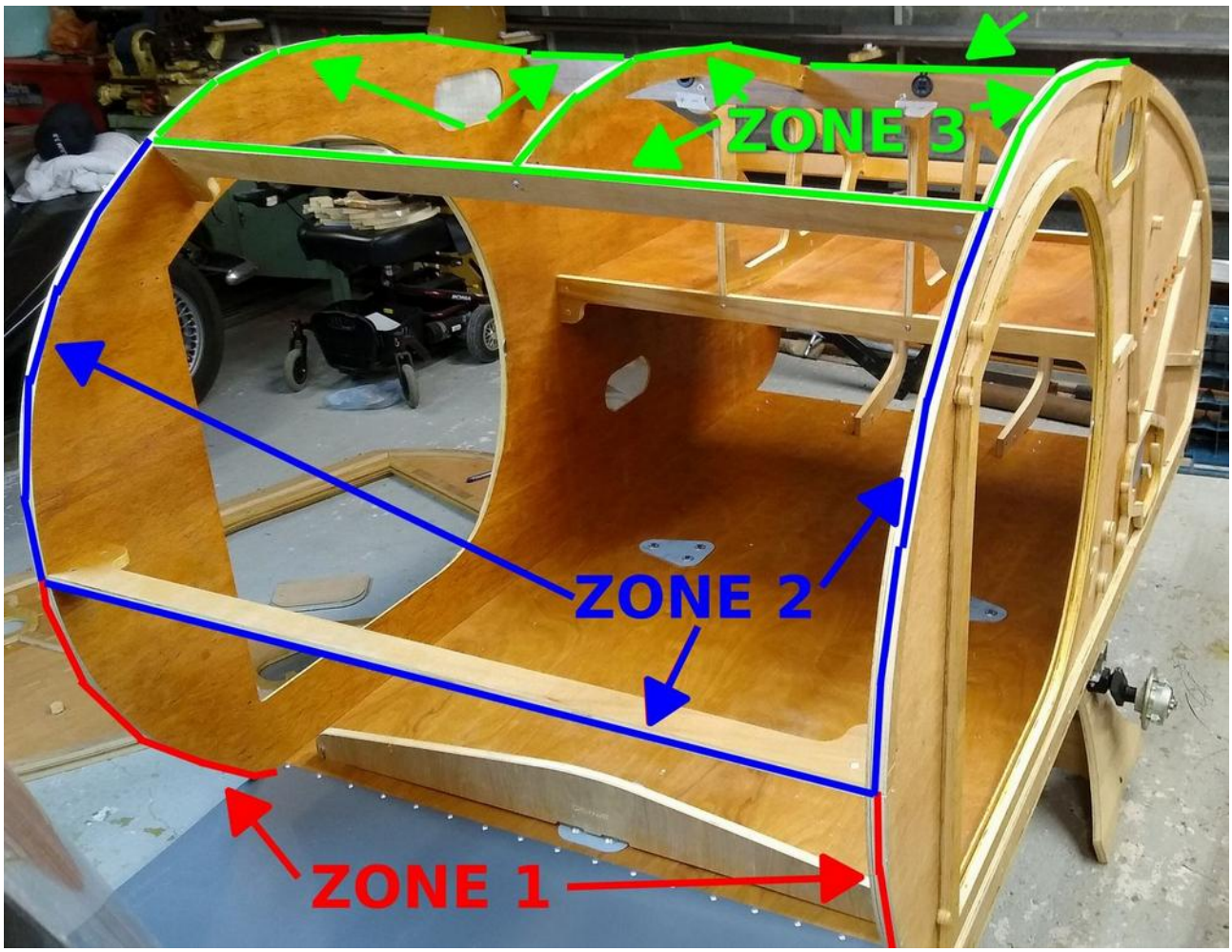
Use a vice to very slightly un-bend the 4-qty 19mm x 19mm angle-brackets (see image above). The resulting internal angle should be about 120 degrees, instead of the original 90 degrees.

Fit the 4-qty SEAT-BRACKETs, using longer #10 x **3/4”** flange-head screws, into those same 3rd and 7th holes. (Image.)

Adhesive Zones

There are three adhesive zones. The FRONT-INNER-ROOF will be glued into place, **one zone at a time.**

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Note

All three zones **must** be bonded, and some exterior parts **must** be fitted, all in quick succession without giving the adhesive time to cure.

Allow time to complete the entire fitting process in one continuous session. Have all parts and tools to hand. Dry-fit and practice the tensioning method, before proceeding.

Typically this entire process is completed in the factory, by one person working solo, in about 20 minutes. We suggest allowing an hour and - if possible - engaging an assistant. We strongly recommend doing a complete dry-run of the entire process before applying any adhesive.

Preparation

Apply Soudal Surface Activator along a 20mm-wide band along both sides of the plastic and across its loose end. This will improve adhesion. Apply with a lightly-damped small cloth. Allow to dry.

Have 6-qty small G-clamps and a strong flat-bladed screwdriver about 150mm-180mm length ready to hand.

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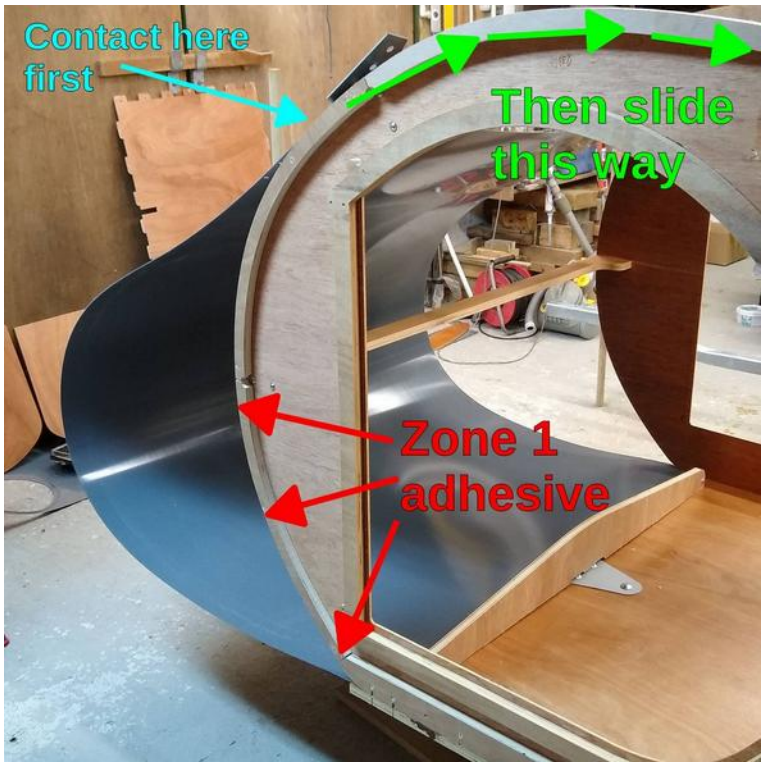
Adhesive Zone 1

Apply a single moderate bead of grey Fix-All adhesive to the Zone 1 areas identified in the image. The adhesive should be applied along the exact centreline of the cut edges of the side-assembly. The beads should stop exactly in-line with the frontmost RAFTER. **!! Do NOT apply adhesive to the RAFTER at this stage: it is Zone 2, not Zone 1 !!** (Image.)

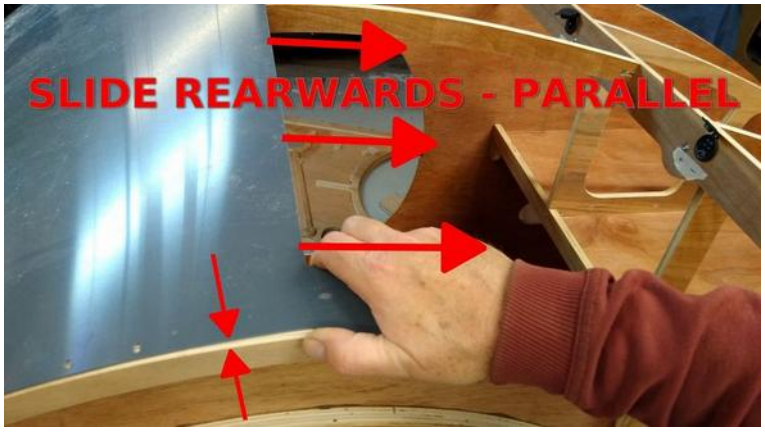
To ensure the plastic makes clean contact with the adhesive, work as follows:

Rest the loose end of the FRONT-INNER-ROOF against the top/front of the pod frame. The plastic will not - at this stage - be touching any adhesive. Remove any temporary adhesive tape. (Images.)





Working at one side of the trailer, hold one corner of the plastic and slide it smoothly rearwards along the top of the pod frame until the plastic pulls taut and makes contact with the adhesive. Be careful to keep the plastic central to the pod and fully supported on the cut edges of the side-assemblies the whole time.

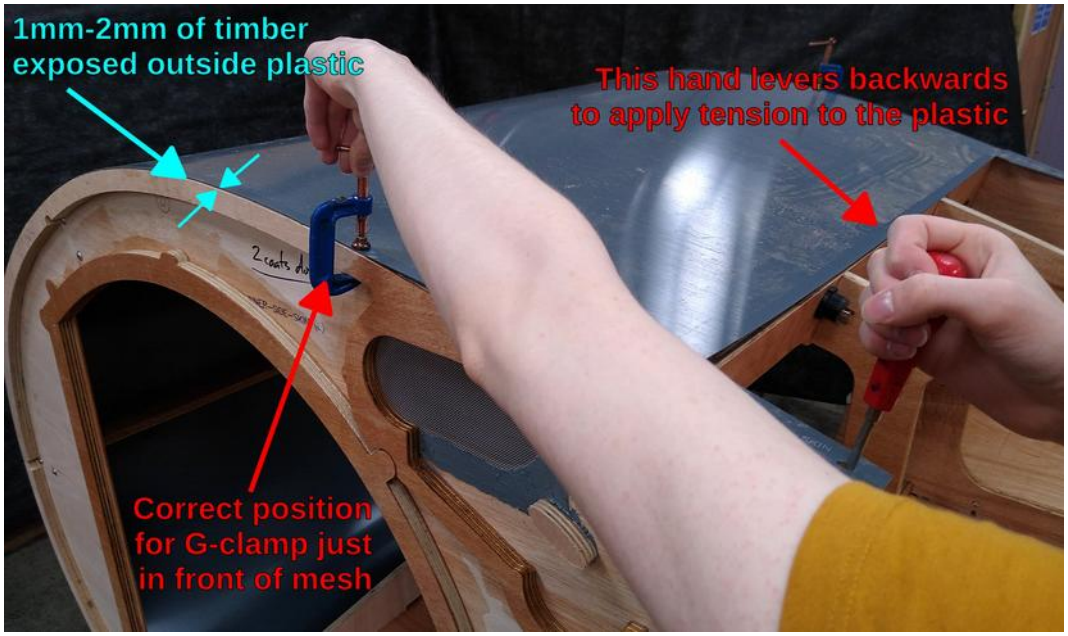


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Maintain the tension on the plastic with a steady pull towards the rear of the trailer. Simultaneously place a small G-clamp **just in front of the upper vent-mesh** and tighten firmly. Repeat on the opposite side.

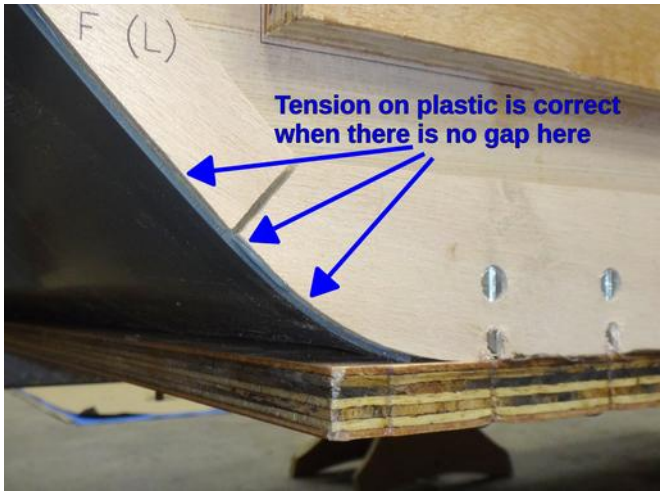
Using a strong flat-bladed screwdriver as a lever, pull rearwards on one corner of the plastic. There are holes in the plastic for the screwdriver shaft and there are matching grooves for grip in the top cut edges of the side-assemblies. (Image.)

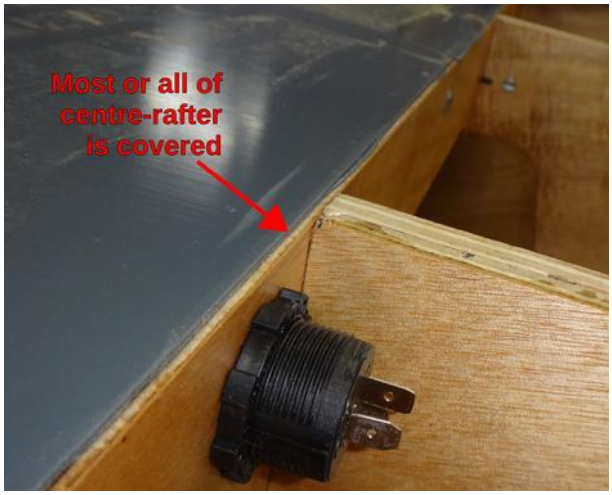
Whilst pulling rearwards with the screwdriver, loosen the G-clamp so that the plastic can slide rearwards. Pull the plastic rearwards then re-tighten the G-clamp to hold the plastic under tension. Repeat on alternate sides until the plastic is tightly stretched around the pod on both sides.



The tension is enough when there is no visible gap between the plastic and the side-assemblies near the floor. When the tension is correct, the plastic should conceal most or all of the top cut edge of the CENTRE-RAFTER. (Images.)

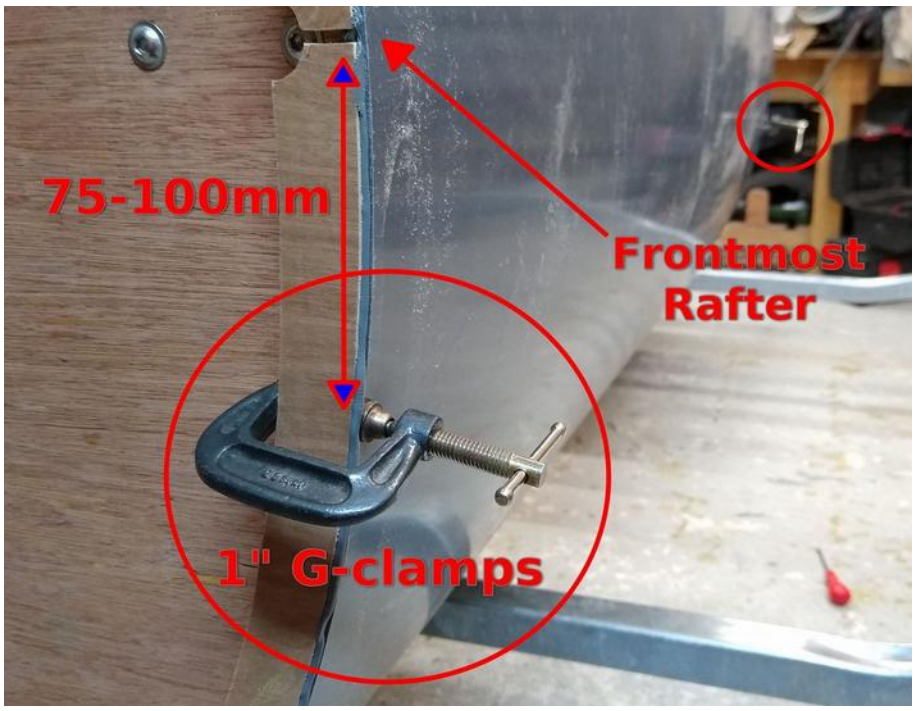
Check that the plastic is centrally positioned at the position of the front-most RAFTER. Push the **frame**, not the plastic, sideways to centralise as necessary.





Use G-clamps to **very firmly** secure the plastic to the front edge of each side-assembly, about

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75mm-100mm below the screws which hold the frontmost RAFTER. (Image.) **!! These two clamps must not be removed until after the adhesive has cured !!**

Continue immediately to Adhesive Zone 2 (below).

Adhesive Zone 2

Release the two clamps near the vent-holes. **!! Do not release any other clamps !!**

Gently curl the plastic forwards, away from the pod, so that it rests against the temporary front leg. It may be necessary to gently press the plastic against the frontmost RAFTER, to allow it to bend smoothly forwards without kinking. (Image.)

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Apply a single moderate bead of adhesive to the frontmost RAFTER and to the side-assemblies in Zone 2. (Image.) The adhesive should be applied along the centrelines of the timbers. **!!Do NOT apply adhesive to the RAFTER which is above the door-holes!!**

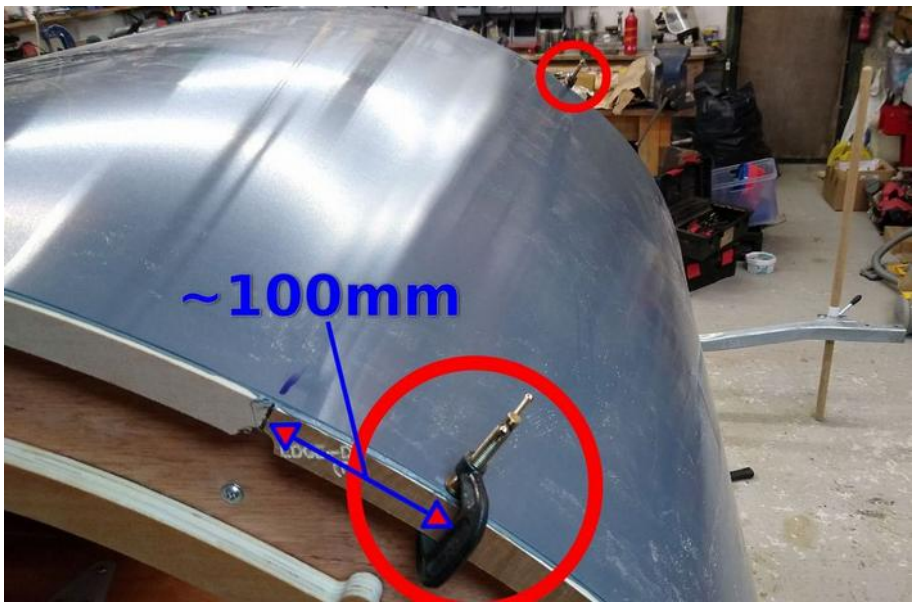
Starting from the lowest point near the frontmost RAFTER, lift and curl the plastic upwards to lay it onto the new adhesive bit-by-bit. Do **not** repeat the previous ‘sliding’ technique - it will not work here.

Repeat the tensioning process, using the screwdriver and G-clamps near the vent-holes exactly as before.

As before, check that the plastic is centrally positioned at the RAFTER just above the door-holes.

Apply G-clamps about 100mm in front of the RAFTER that is above the door-holes. Clamp tightly. (Image.) **!! These clamps must also not be removed until the adhesive has cured !!**

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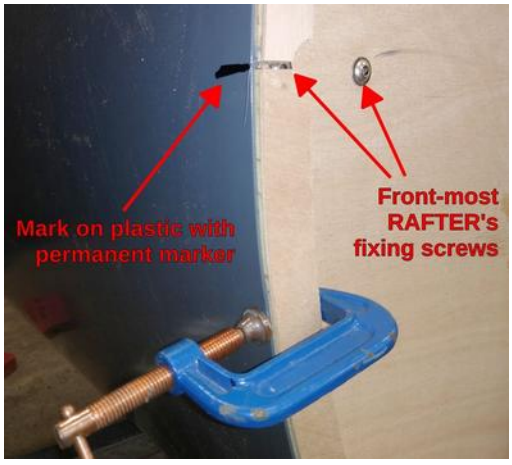


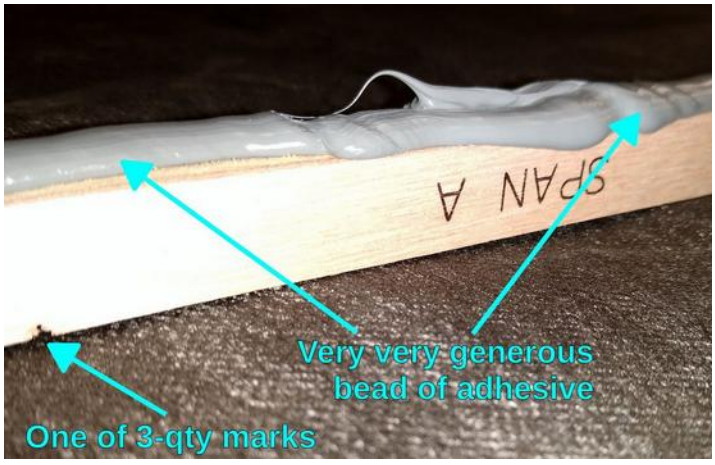
Continue **immediately** to Fit 1st SPAN-A (below).

Fit 1st SPAN-A

Identify the SPAN-A timber part. Also identify its long **cut edge** which **does not** have three marks scored into it: this will be the edge to which adhesive will be applied.

Mark **both** ends of the underlying frontmost RAFTER onto the edges of the plastic - i.e. in-line with the M6 fixing screws. (Image.)





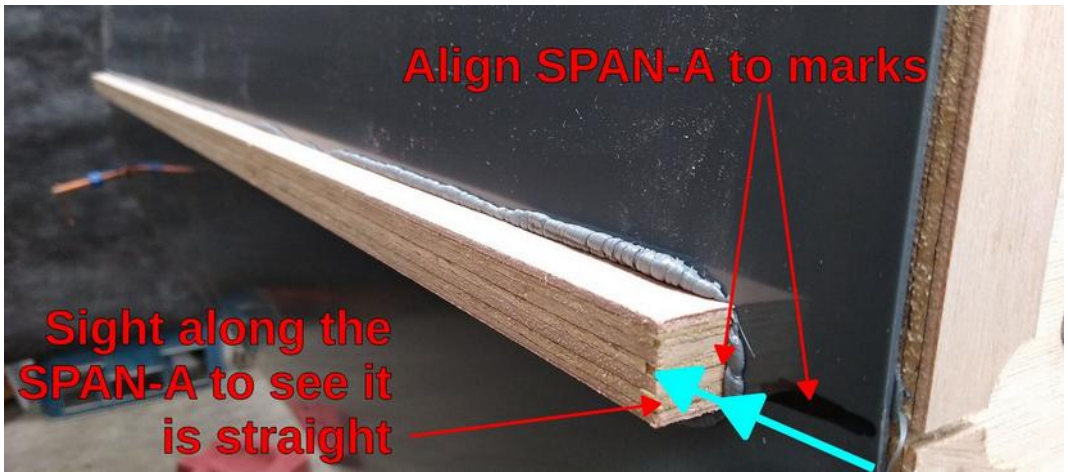
Apply Surface Activator to the full width of the plastic, between the marks. Allow to dry.

Apply a **very very** generous bead of adhesive onto the correct (see above) **cut edge** of the SPAN-A timber part. (Image.)

Position the SPAN-A part across the front of the trailer, and press it firmly onto the plastic, so as to **sandwich** the plastic between SPAN-A and the frontmost RAFTER underneath. Press **very firmly** all along the SPAN-A, to ensure all adhesive (on both sides of the plastic) is firmly tooled-down.

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Sight along the SPAN-A. Ensure it is straight. Ensure it is centrally positioned on the trailer. Ensure it is in-line with its marks. (Image.)



Continue **immediately** to Adhesive Zone 3 (below).

Adhesive Zone 3

Lower the nose of the trailer to the ground.

Loosen the G-clamps near the vent-holes. **!! Do NOT release any other clamps !!**

Gently curl the plastic forwards, away from the pod.

Apply a single moderate bead of adhesive to the Zone 3 areas. Apply first to the SIMPLE-PURLIN. Then apply to the RAFTER above the door-holes **and to the CENTRE-RAFTER**. Finally apply adhesive to the side-assemblies in the Zone 3 areas. The adhesive should be applied along the centrelines of all the timbers.

Working at one side of the trailer, hold the side of the plastic and - in a slow controlled manner - curl it forwards so that it makes direct contact with the adhesive bit-by-bit. An assistant - working on the opposite side - can be a considerable help.

Centralise and tension the plastic as before, using the screwdriver and G-clamps.

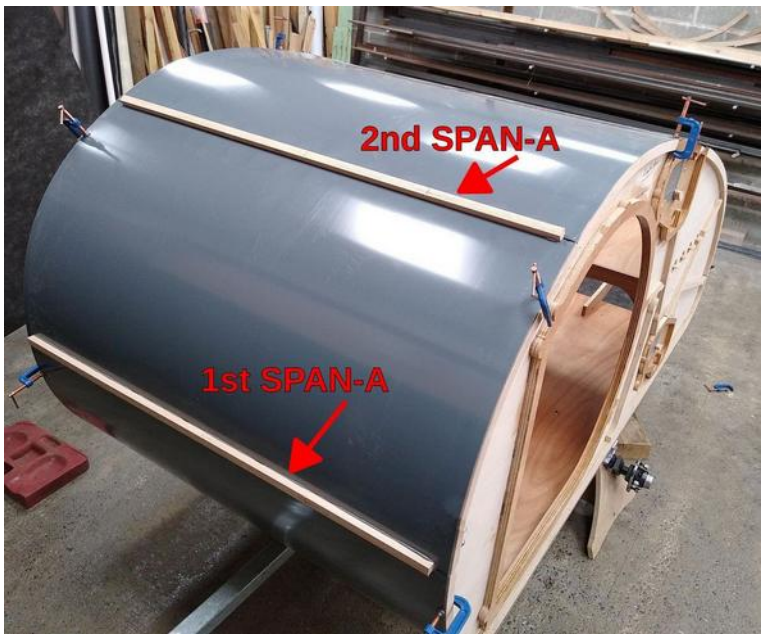
Press the plastic firmly down onto the adhesive on the SIMPLE-PURLIN and on the CENTRE-RAFTER.

Continue **immediately** to Fit 2nd SPAN-A (below).

Fit 2nd SPAN-A

Repeat the process of fitting a SPAN-A part, but this time onto the RAFTER above the front of the door-holes. (Image.)

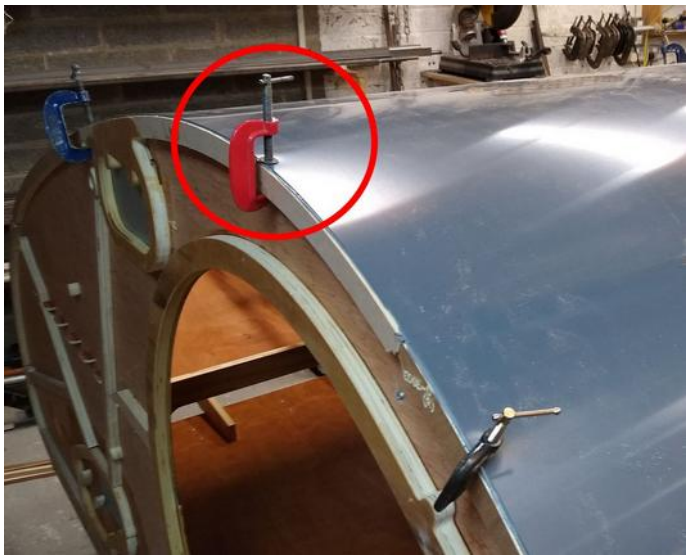
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Continue **immediately** to Final Alignment (below).

Final Alignment

Check that the amount of timber revealed beyond each side of the FRONT-INNER-ROOF plastic is approximately even all around both sides. There should be about 1mm-3mm of (possibly glue-smeared) timber visible. If the width of visible timber is uneven, adjust it by pushing or pulling on the side-assemblies. If necessary, **gently** clamp with spare G-clamps. (Image.)



Cure

Allow the adhesive to cure for at least 20 hours before removing the clamps.

Wedges

If the shelf-wedges have not yet been glued (previous build stage) then now is the ideal time to

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return to that build stage and complete it.

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Build Stage: Rear Inner Roof

The REAR-INNER-ROOF fits in much the same way as the FRONT-INNER-ROOF, with some detailed differences.

Begin this step only after the adhesive holding the FRONT-INNER-ROOF has sufficiently cured.

Preparation

Remove all G-clamps from FRONT-INNER-ROOF. Cut away the tensioning tabs from the FRONT-INNER-ROOF. A hacksaw is ideal. Use a G-clamp to augment the partially-cured glue, while sawing. (Image.)



Identify the REAR-INNER-ROOF. This is the remaining large grey plastic sheet. Also identify the plywood LIGHT-BAR (not to be confused with the LIGHT-JIG) and have it ready together with the 40mm woodscrews and a suitable screwdriver for them.

Tighten Nipped-Up Screws

Now is the time to fully tighten the 4-qty M6 x 40mm screws in the **rears** of the SHELF-PURLINs, while they are still easy to access.

The 4-qty M6 x 40mm screws in the **fronts** of the SHELF-PURLINs should remain only nipped-up. Do not tighten them.

Fasten Lower Rear Edge

Position the trailer so that there is at least a metre of clear space behind the rear of the floor.

Adjust the temporary front leg so that the rear of the floor is touching the ground. Lay the RAMP-JIGs onto the rear of the floor. (Image.) Carry the REAR-INNER-ROOF by its two ends (hanging in a **wide** U-shape). Lower it into the space behind the trailer with its perforated end nearest the floor. Slide its perforated end up the RAMP-JIGs and onto the floor.

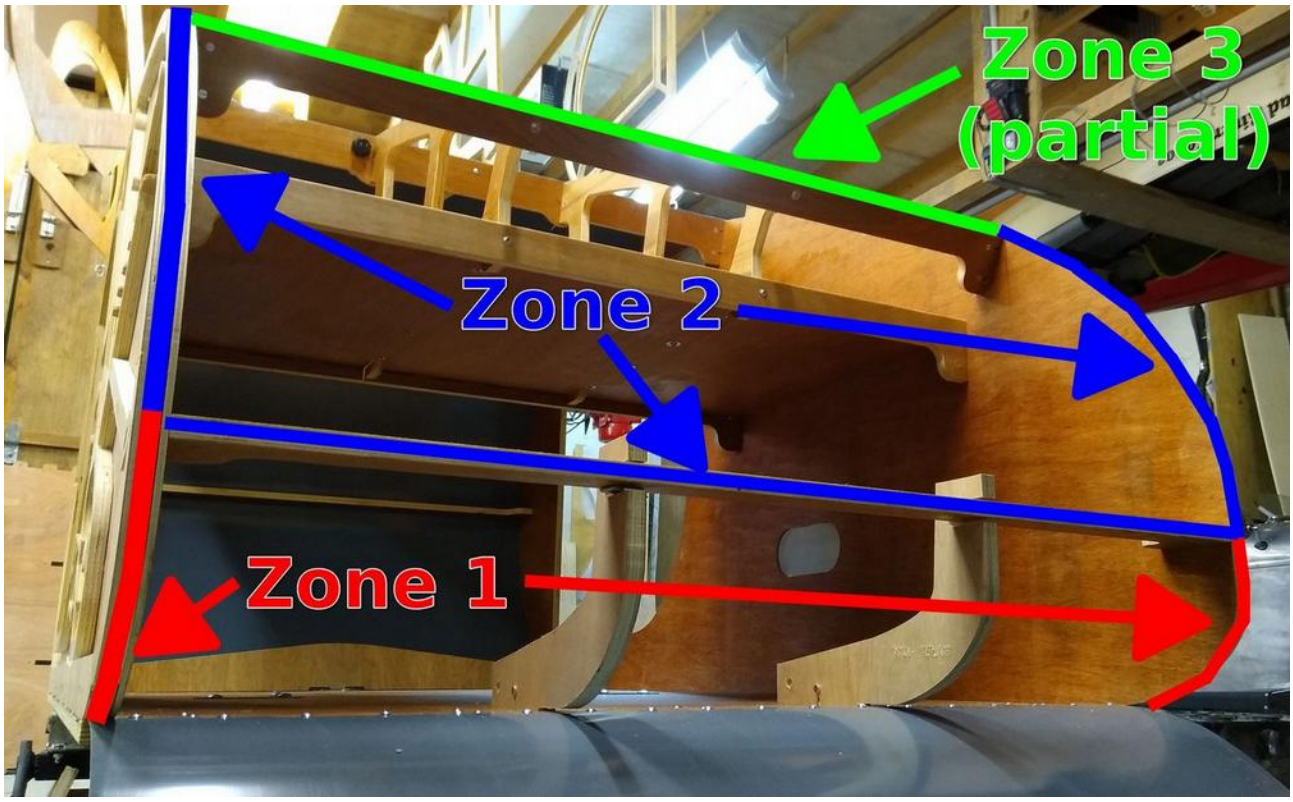
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Align the 18-qty holes in the edge of the sheet with the matching pilot holes in the floor. Insert #10x5/8” screws, removing the RAMP-JIGs as necessary. (Image.)

Adhesive Zones



There are three adhesive zones. Zones 1 and 2 and shown here. Note *carefully* where each zone ends. (Image.)

Preparation

Apply Soudal Surface Activator along a 20mm-wide band on both sides of the plastic and on its loose end. Also apply Surface Activator to the rearmost 60mm of the FRONT-INNER-ROOF plastic.

Adjust the temporary front leg so that the nose of the drawbar is touching the ground.

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Have the small G-clamps and the screwdriver ready to hand.

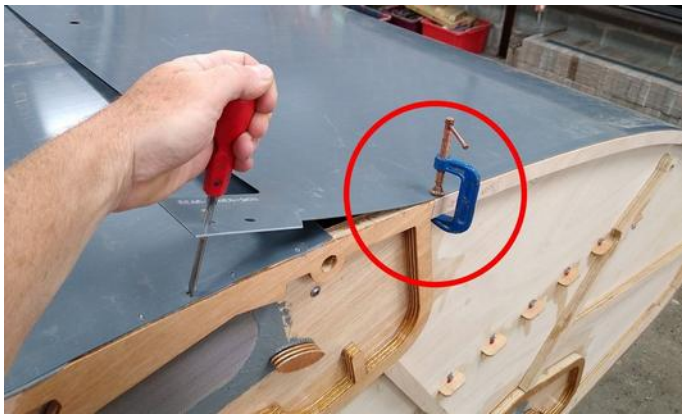
Adhesive Zone 1

The Zone 1 process at the rear is very similar to the Zone 1 process at the front.

Apply a single moderate bead of grey Fix-All adhesive to the Zone 1 areas identified in the image. **!!Do NOT apply adhesive to the rearmost RAFTER at this stage!!**

Rest the loose end of the plastic on top of the frame, then slide it forwards until taut. Clamp in place, positioning the clamps at the very tips of the EDGE-C pieces just behind the vents. (Images.)





Slacken the clamp on one side, tension the plastic using the screwdriver as a lever, then reclamp. Repeat each side alternately until the plastic is evenly tensioned. There will inevitably remain a small gap at the very rear of the trailer near the rearmost RAFTER. This is not a problem.

Check that the plastic is centrally positioned at the rearmost RAFTER position. Then clamp tightly, both sides, as shown, below the rearmost RAFTER. (Image.)



Continue immediately to Adhesive Zone 2 (below).

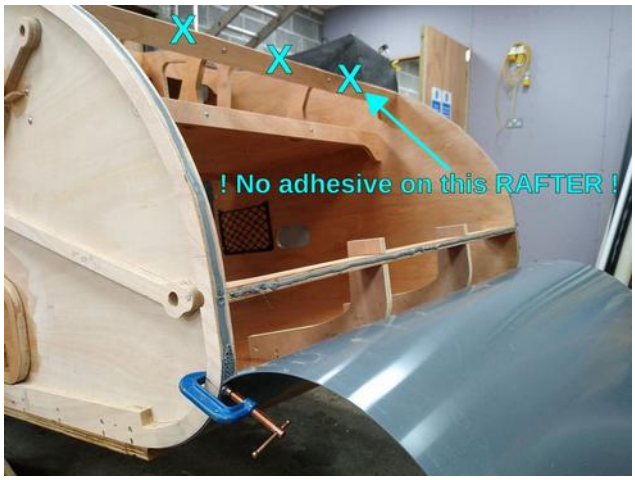
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Adhesive Zone 2

Release the two clamps at the top of the SIDE-ASSEMBLIES. **!!Do NOT release the clamps which are at the rear!!**

Gently curl the plastic rearwards, away from the timbers, to make room to apply adhesive to Zone 2. (Image.)

Apply a single moderate bead of adhesive to the Zone 2 areas: i.e. the rearmost RAFTER and parts of the side-assemblies. **!!Do NOT apply adhesive to the RAFTER which is above the rear of the SHELF!!** (Image.)





Repeat the ‘sliding’ technique to bring the plastic into contact. Tension the plastic, as before.

Centralise the plastic. Clamp the plastic about 100mm rearwards of the RAFTER which is above the rear of the shelf, on both sides. (Image.)



Continue immediately to LIGHT-BAR (below).

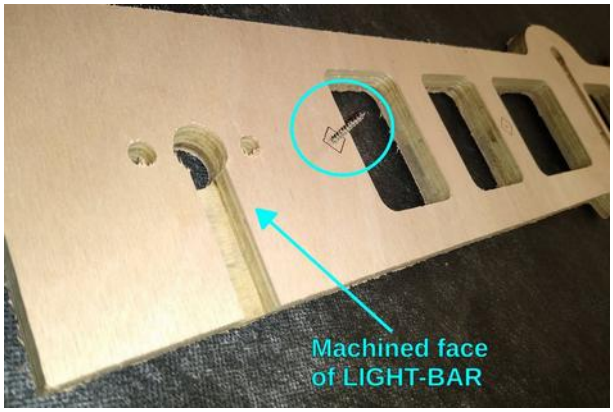
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LIGHT-BAR

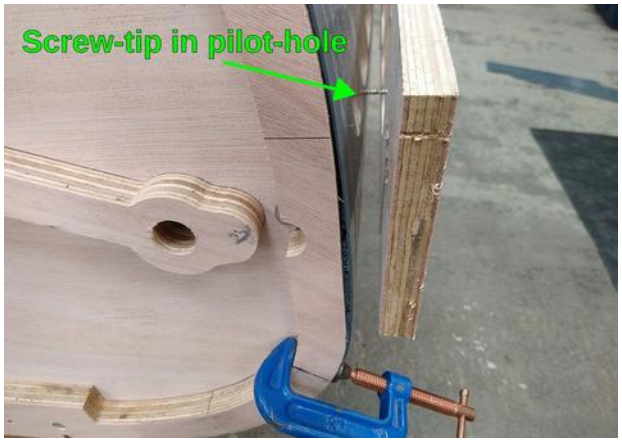
Drive 2-qty 40mm woodscrews through the **end-most** holes in the LIGHT-BAR. Drive the screws **from** the clean face, so that the screw points show on the **machined face**. (Image.) Apply adhesive to the machined face, **exactly** as shown. (Image.)

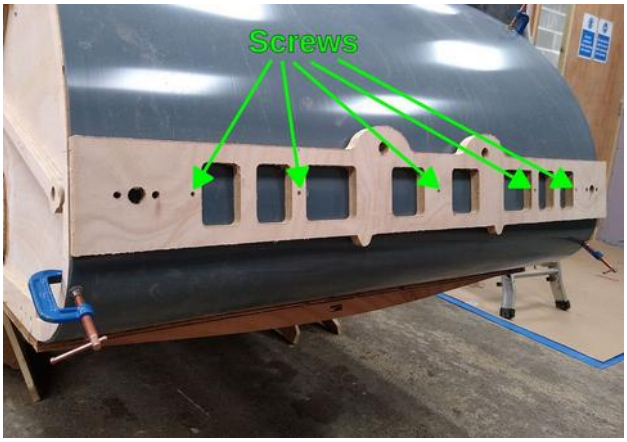


The screw-holes are identified by diamonds on the machined face.



Align the LIGHT-BAR with the outside of the REAR-INNER-ROOF near the rearmost RAFTER. Engage the screw tips into the pilot-holes drilled in the roof. (Image.) Drive those screws fully home. Drive 3-qty more 40mm woodscrews into the remaining holes and tighten fully. (Image.)





Continue immediately to Adhesive Zone 3 (below).

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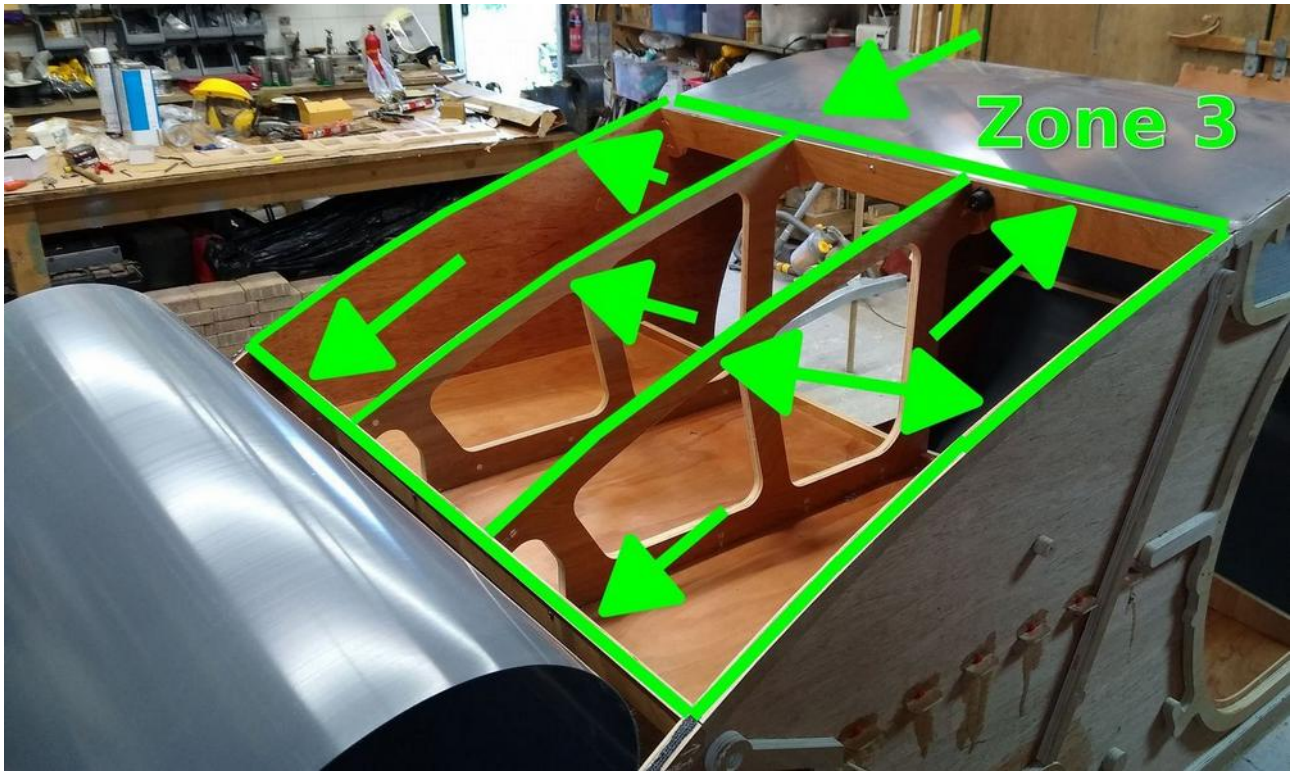
Adhesive Zone 3

Mark the extent of the overlap of the REAR-INNER-ROOF. (Image.)

Release the two clamps at the top of the SIDE-ASSEMBLIES. **!!Do NOT release the clamps which are near the RAFTER behind the SHELF!!** Gently curl the plastic rearwards to make space to apply the Zone 3 adhesive. (Image.)







Apply the adhesive. Note **two** beads of adhesive where the plastics overlap. (Image.)

Working at one side of the trailer, gently curl the plastic forwards to make direct contact with the adhesive. There is no need to re-tension.

Smooth the plastic down onto the Zone 3 adhesive by pressing on its outside, directly above the

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structure. Avoid pressing **between** underlying frame parts, as this would move and distort the plastic.

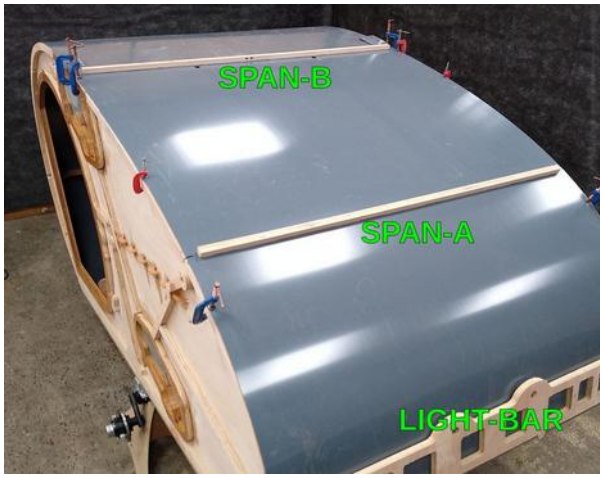
Align the plastic centrally. Clamp gently, directly in-line with the CENTRE-RAFTER, on each side. Check alignment all around and fit additional clamps as required.

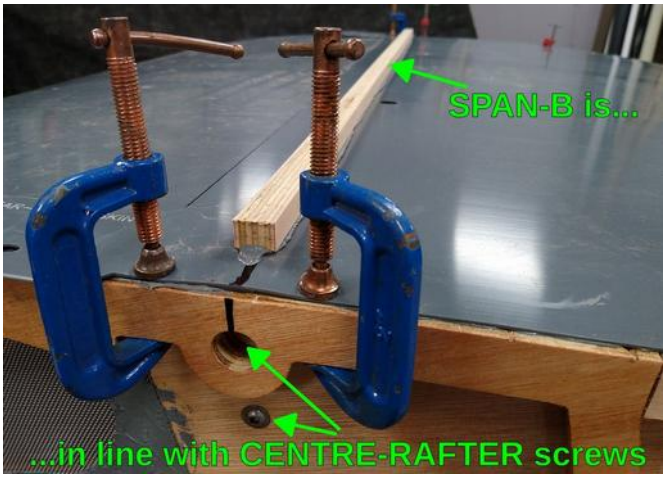
Continue immediately to SPAN-A and SPAN-B (below).

SPAN-A and SPAN-B

Fit the final SPAN-A part onto the REAR-INNER-ROOF in-line with the RAFTER which is above the rear of the shelf. Use surface activator. Apply the adhesive very generously to the **cut edge** of the SPAN-A part which **does not** have three marks engraved into it. Ensure the part is central on the roof. (Image.)

Similarly, fit the SPAN-B part in-line with the CENTRE-RAFTER. (Image.) Note that the SPAN-B part is thinner, to allow for the double thickness of plastic underneath it. It also has larger holes, for threading the wiring harness.





Press these SPAN parts down **very firmly** to ensure the adhesive on both sides of the plastic is properly bedded-in.

Cure

The two rearmost G-clamps (below the LIGHT-BAR) can be removed if necessary. But allow to cure at least 20 hours before removing any other clamps.

The next two build stages can be begun immediately, without waiting for the adhesive to cure, provided the clamps remain in place.

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Build Stage: Additional Bonda-Sealing

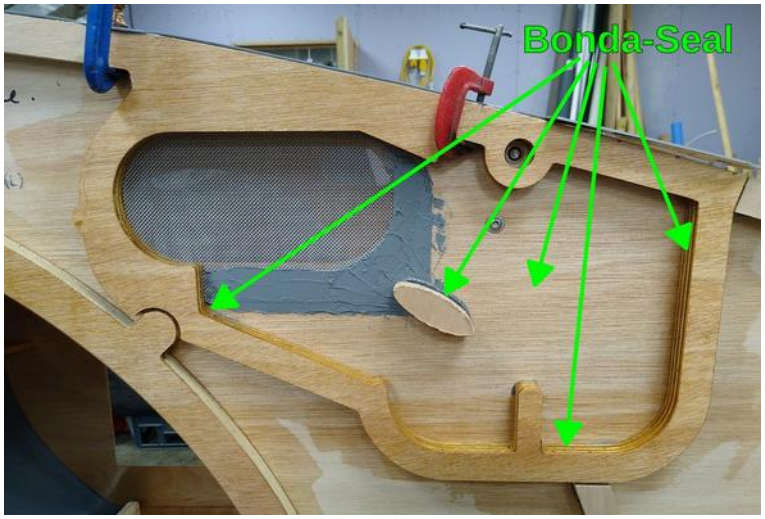
Preparation

If possible, adjust the temporary front leg to level the floor of the trailer.

Vents and DOOR-LINERs

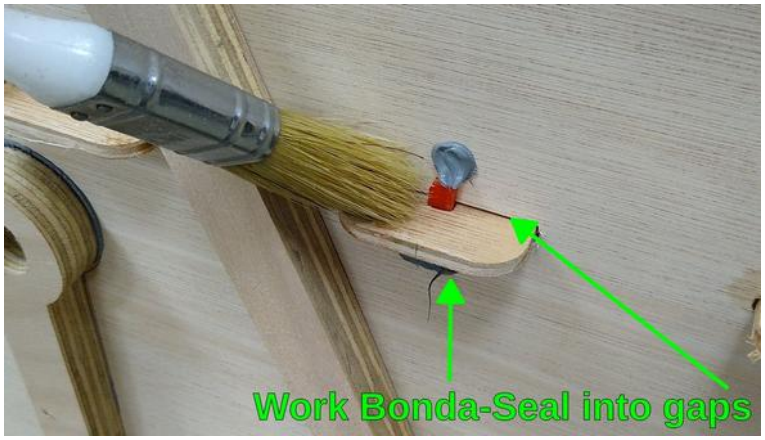
Brush a **modest** extra coat of Bonda-Seal on to the following three locations on each side:

- DOOR-LINER: the straight vertical cut edge, the straight horizontal cut edge, and the lower curve of the cut edge as far as the 50mm washer. Then wipe a clean rag around the internal and external faces of the side-assembly, to remove any runs of Bonda-Seal.
- EDGE-D and RIB-AV: the 6mm ply and the cut edges of the 18mm parts where rain could enter and then stand. Avoid brushing near any areas around the mesh. (Image.)



Shelf

Use the brush to work Bonda-Seal into the gaps where the tangs on the shelf protrude outside the side-assemblies. The Bonda-Seal acts as an adhesive to firmly joint the timbers together. (Image.)



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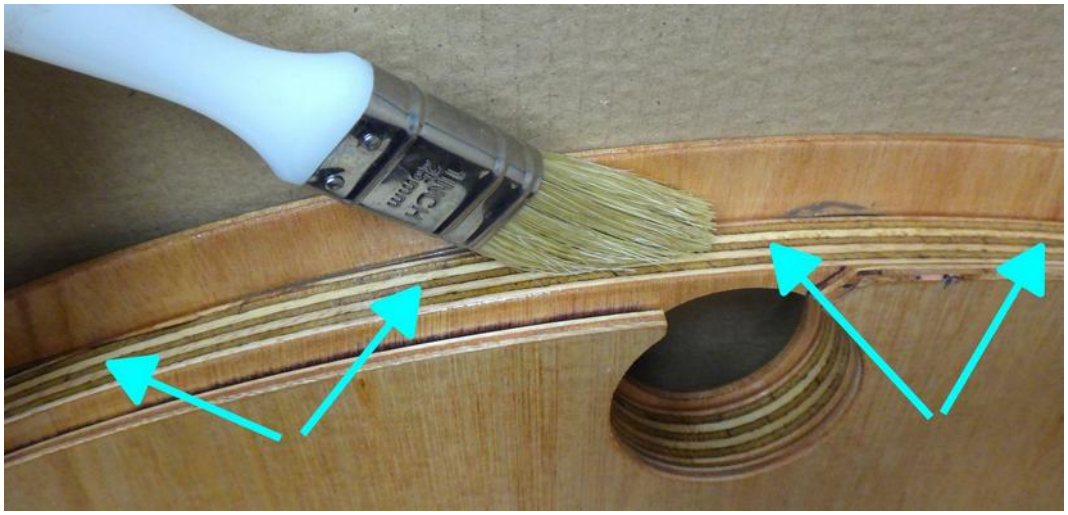
It is **essential** to wipe inside the trailer to remove any drips of Bonda-Seal which run inside through the gaps. Use an absorbent cloth - not tissue. Typically the top of the shelf **and** the side-assembly under the shelf will need wiping free of drips. Reach inside (do **not** climb inside) to wipe, taking care not to tip the trailer. If necessary, temporarily chock the rear of the floor to prevent tipping but remove the chocks immediately afterwards.

Repeat

Repeat this build stage twice more, at convenient intervals, to build up additional coats of Bonda-Seal on these vulnerable parts. For example, after fitting longerons and after fitting insulation.

Yacht Varnish

Apply one modest coat of yacht varnish to the inside **cut edges** of the DOOR-LINER. Do not apply varnish to any other parts. Varnish significantly improves the weatherproofing in this vulnerable area. (Image.)



Tip: Immediately after applying the varnish, wipe a rag around the inside face of the INNER-SIDE-SKIN to remove any unsightly overspill.

Cure

Allow at least 4 hours curing time between each additional coat.

The next build stage (LONG-Fs, LONG-FFs, BEAM) can be begun immediately, without waiting for the Bonda-Seal to cure.

Check occasionally, during first hour of cure, for drips or puddles. Wipe away or brush them out.

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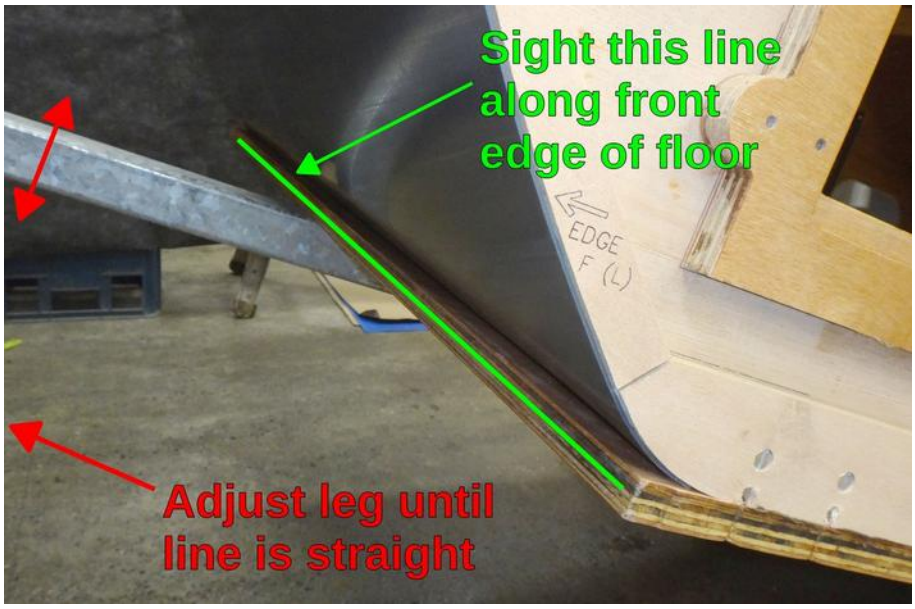
Build Stage: Beam and First Longerons

Preparation

Remove any G-clamps below the LIGHT-BAR at the rear of the trailer.

Use the temporary front leg to tilt the trailer rearwards until the middle of the wiring-box touches the ground.

Sight along the front edge of the floor and adjust the temporary front leg up/down until the edge is straight - the floor edge should be neither bowing up nor sagging down. The trailer must stay in this position while the adhesive cures - so secure the front leg carefully. (Image.)



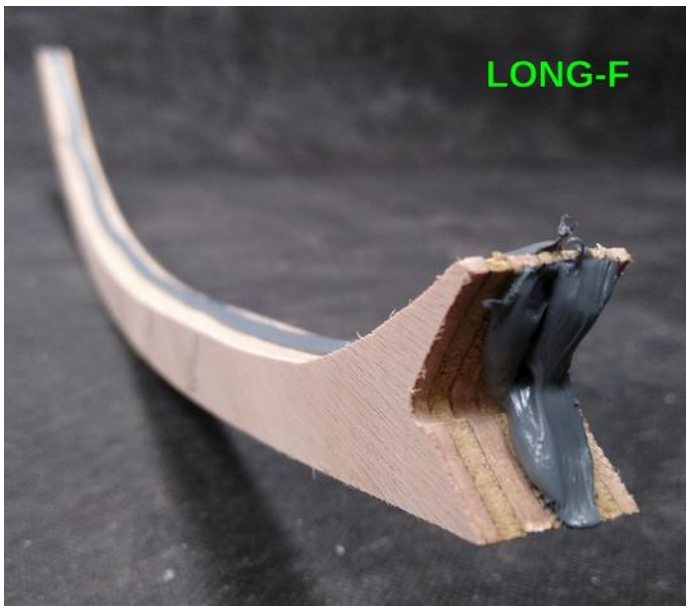
Wipe the entire external plastic area, between the front edge of the floor and the SPAN-A just above it, with Soudal Surface Activator. Allow to dry.

LONG-Fs

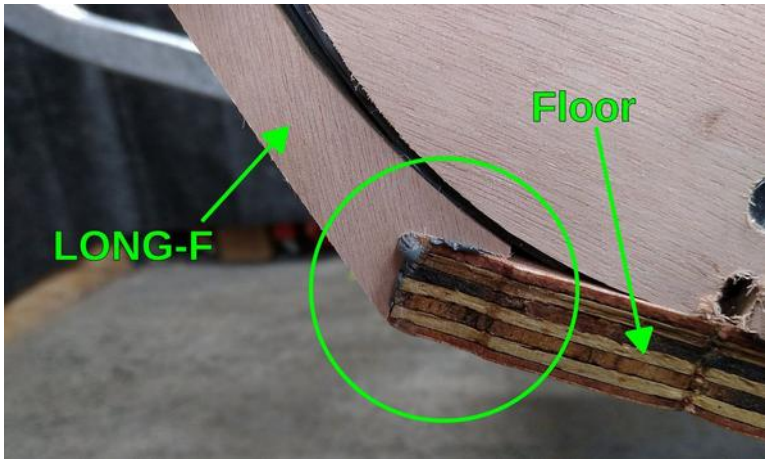
Identify the 2qty LONG-F parts. Do not confuse them with the (3qty) LONG-FF parts.

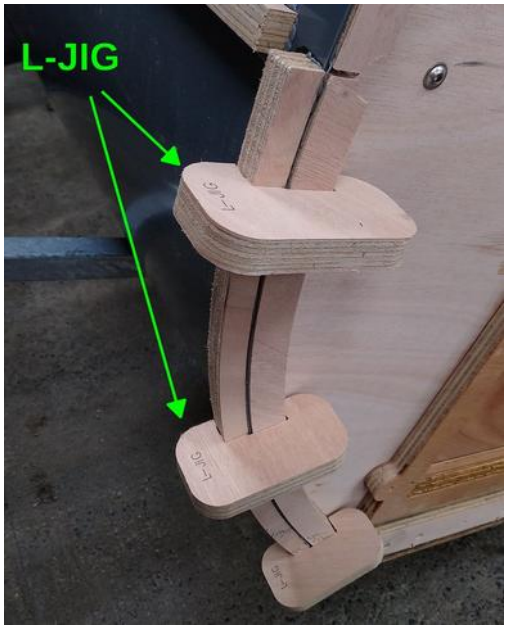
Apply a moderate bead of adhesive all along the inner cut edge of a LONG-F part. Apply a more generous amount inside the notch at the bottom end. (Image.)

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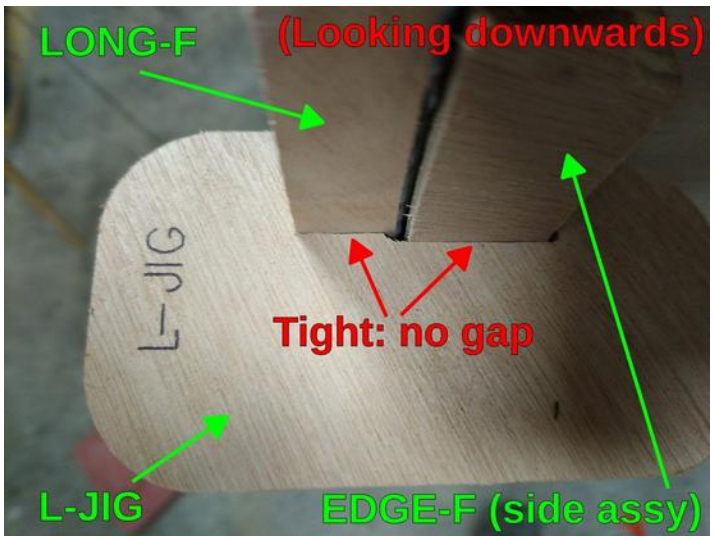
Fit the part to the left edge of the FRONT-INNER-ROOF, pressing the notch tight to the floor. (Image.) Use 3-qty L-JIGs to hold it in place. (Images.) Push a plastic wedge **upwards** into the groove cut for it in each L-JIG. Lightly tap the wedge **upwards** to clamp the LONG-F.

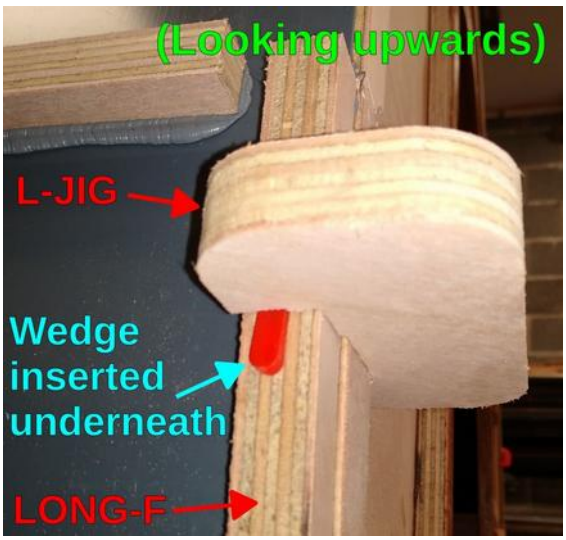




The L-JIGs are shaped to accurately position the LONG-F so that it is slightly set-back from the face of the side-assembly. (Images.) So ensure the faces of the LONG-F and the EDGE-F (which is part of the side-assembly) are tight against the L-JIGs.

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Repeat for the other LONG-F, on the other side.

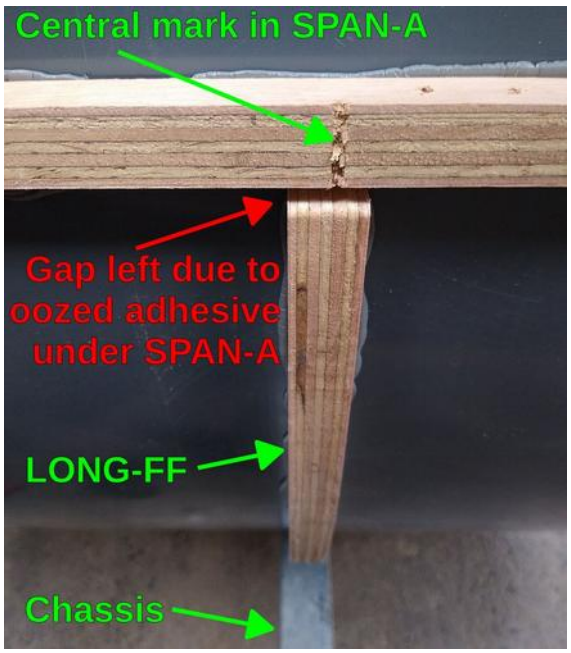
LONG-FFs

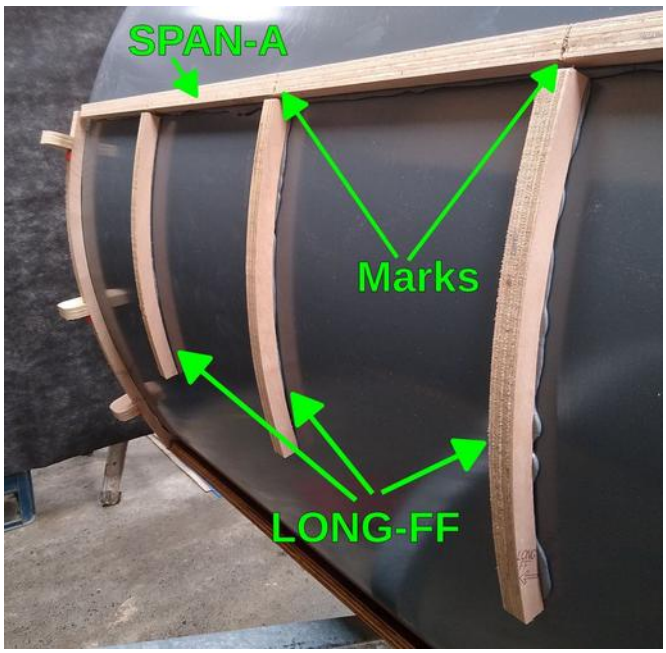
Apply a **very very heavy** bead of adhesive along the inside curve of a LONG-FF part. (Image.)



Align the LONG-FF part correctly (text right-way-up, arrow forwards) and press onto the **centre** of the FRONT-INNER-ROOF plastic just below the SPAN-A part. (Image.) Set the part vertically either by eye or by measuring off the side-assemblies. The part **must** align with the central mark on the SPAN-A. Ensure the part is clear of any hardened oozed adhesive under the SPAN-A. (Image.)

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Repeat for the remaining 2-qty LONG-FFs, aligning them to the remaining marks on the SPAN-A. (Image.)

When fitting each LONG-FF part, work it slightly up-and-down a few times to tool down the adhesive, then re-position it correctly to its mark. Work only from the outside of the trailer. Do **not** press outwards on the plastic from inside the trailer as this would squeeze the adhesive out of the joints.

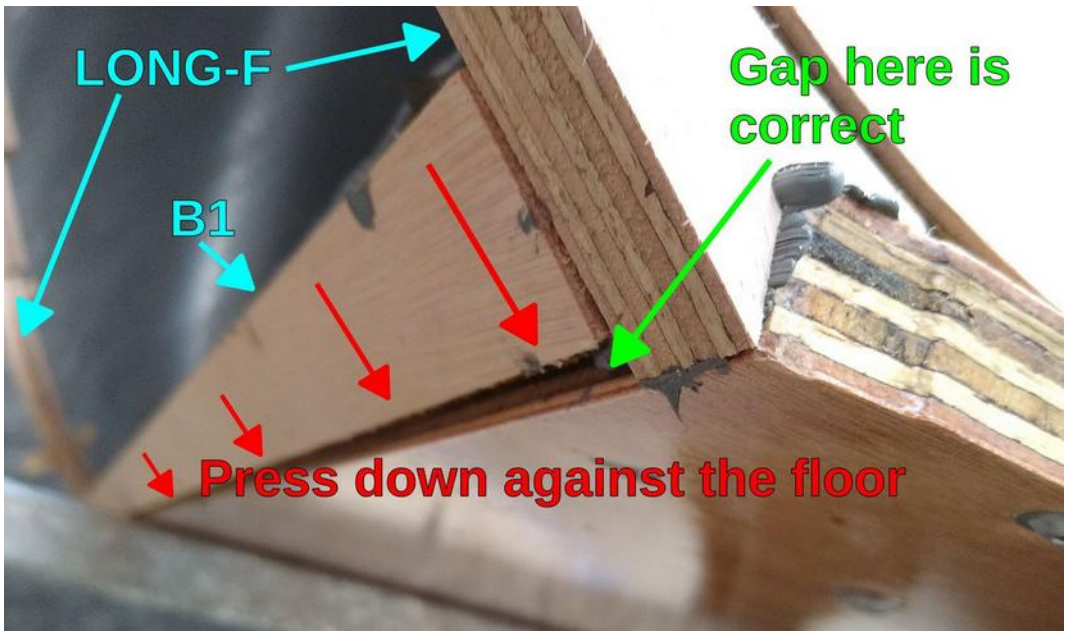
Beam B1

Sight the front of the floor again, to check that it remains straight. Adjust if necessary.

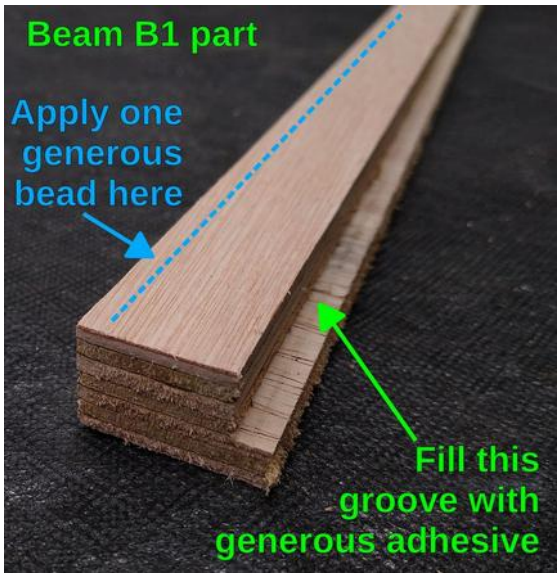
Dry-fit the B1 part to the front of the floor, to ascertain how it fits. It should be fitted with the **machined face** against the plastic. The **clean face** should be parallel to the adjacent LONG-F cut edges. The machined slot should be downwards. The part should be pushed downwards tightly against the floor. There will be a wedge-shaped gap remaining at the bottom. This is correct.

The end result (after fitting with adhesive) will look like this:

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When ready to fit the part, apply adhesive to the **machined face** of the B1 part, as shown in the images. Use **extremely** generous amounts.





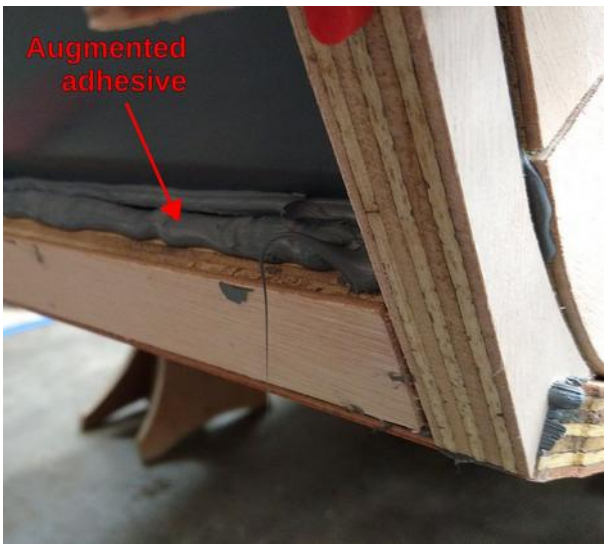
Fit the part to the front edge of the floor. Press all along its length downwards and inwards firmly, to bed in both beads of adhesive.

Beam B1-A

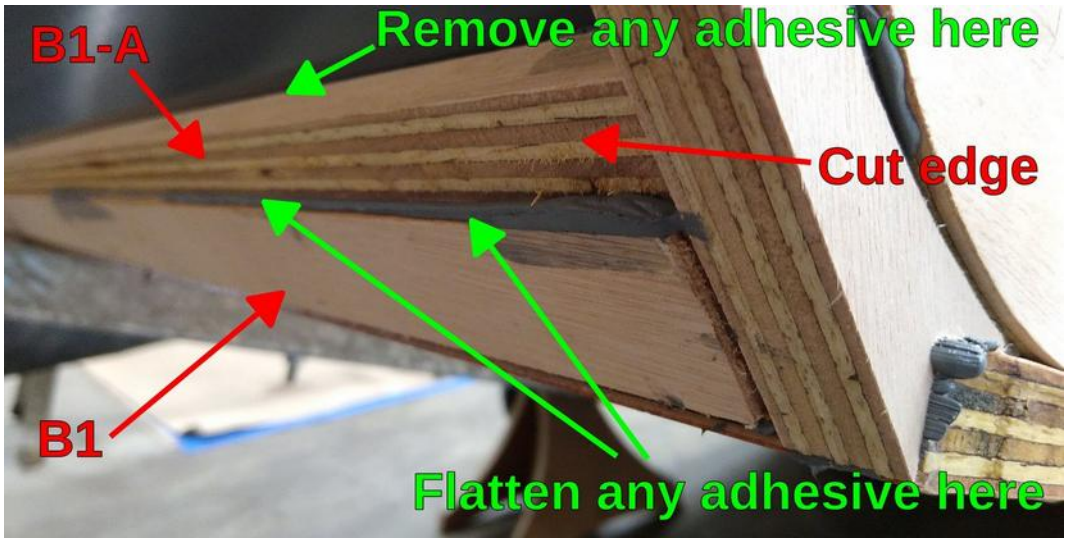
Some adhesive will already have oozed from above the B1 part. Augment this oozed adhesive with some extra adhesive to create a generous - possibly messy - fillet of adhesive. (Images.)

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Press a B1-A part into this fillet so that the adhesive bonds the B1-A part to both the plastic and to the B1 part below it. The B1-A part should be arranged with its **cut edge** against the plastic. Flatten any adhesive which oozes out of the front of the joint. **Remove** (by scraping away) any adhesive which oozes out between the B1-A part and the plastic. (Image.)



Note: it is **not** necessary to completely fill the interfaces around the B1-A part with adhesive. Just ensure that the entire length of the corner of the part is well bedded into the adhesive bead, and that the part is tight against both B1 and the plastic.

Cure

Leave to cure for 20 hours. Do not adjust the temporary front leg during the during the cure time. Do not disturb the trailer. Do not carry out any other work on the trailer during the cure time.

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Build Stage: Second Longerons and Beam

Tighten Nipped-Up Screws

While the trailer is still tipped backwards on the extended temporary front leg, now is the ideal time to fully tighten the 4-qty M6 x 40mm screws in the **fronts** of the SHELF-PURLINs. Working from outside the trailer, reach in through the door to tighten the screws.

Preparation

Leave the trailer as it is already positioned: temporary front leg extended and the rear end touching the ground. Remove all G-clamps from REAR-INNER-ROOF. Remove L-JIGs from the LONG-Fs.

Cut away the tensioning tabs from the REAR-INNER-ROOF. Use a G-clamp to augment the partially-cured glue, while sawing. (Image.)



Ensure that the top of the previously fitted B1-A part is free of any lumps of adhesive: a further B1-A part must now be fitted closely to the plastic and to the existing B1-A part.

Dry-Fit Reminder

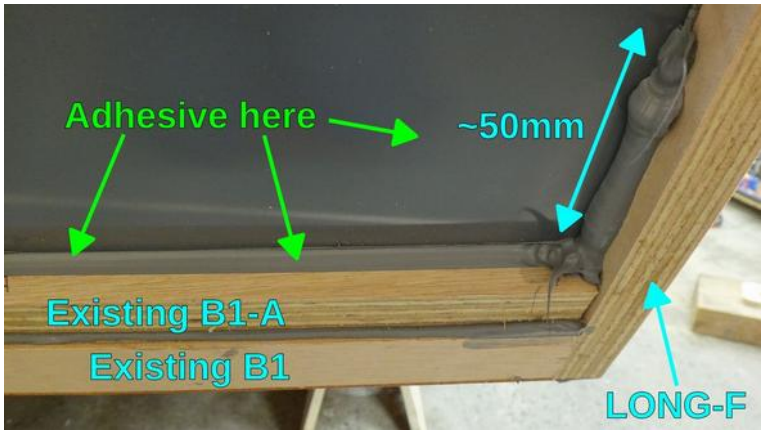
During this build stage, **dry-fit all parts** to test that they are clear of any previously oozed lumps of adhesive. If any previously oozed adhesive does obstruct a part, the lump can locally be removed using a blunt scraper or screwdriver. (Image.)

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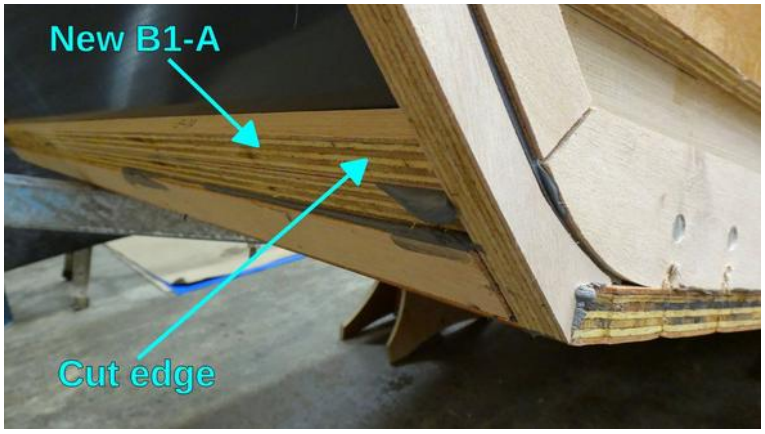


Remaining B1-As

Run a 50mm-long heavy fillet of adhesive between LONG-F and the plastic roof, each side. Run another fillet of adhesive along the full length of the top of the previously-fitted B1-A part. (Image.)

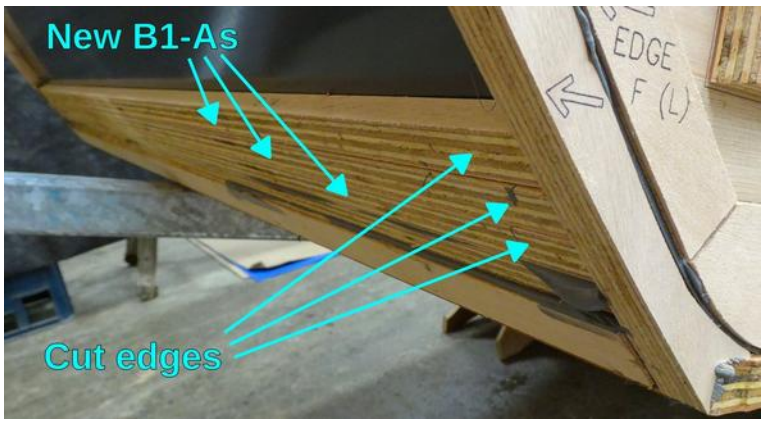


Press a new B1-A part into the fillet of adhesive on top of the existing B1-A part. The new B1-A should be fitted with its **cut edge** against the plastic. Press the new B1-A firmly down against the existing B1-A. (Image.)

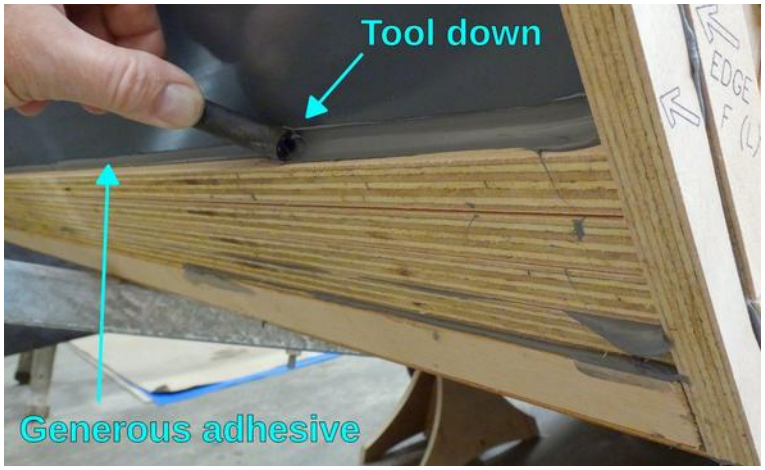


Work quickly to repeat for the remaining two B-1A parts. In each case, the **cut edge** of the part should be against the plastic, and the part should be firmly bedded into a fillet of adhesive. (Image).

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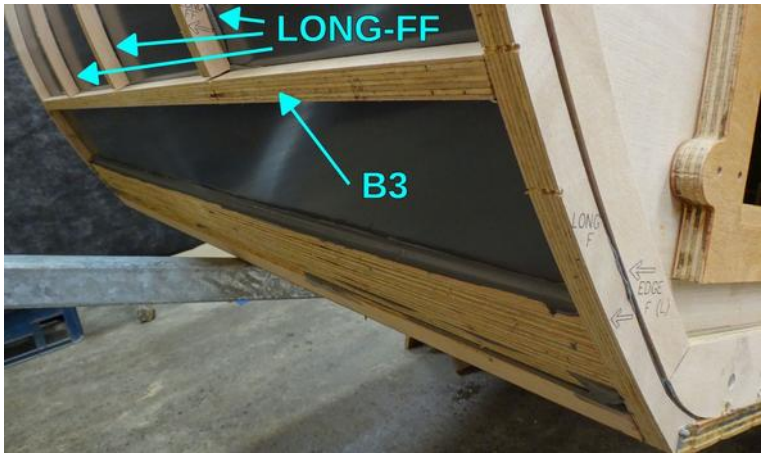


Finally, apply a generous bead of adhesive along the top of the topmost B1-A, then tool it down against the timber and the plastic. (Image.) A scrap piece of rubber tube is ideal for tooling-down.



Beam B3

Apply a generous bead of adhesive along one **cut edge** of the B3 part. Glue the B3 part onto the plastic, directly below the existing LONG-FF parts. (Image.) Position the B3 part clear of any oozed lumps of adhesive.



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Longerons - Notes

These notes apply to all longeron ('LONG-…') parts except LONG-A.

Take care to differentiate the 'LONG-x' and 'LONG-xx' parts:

- The single-letter parts (LONG-E, LONG-D, etc) fit on the edges of the roof. They are designed to butt tightly against each other, with no gaps.
- The double-letter parts (LONG-EE, LONG-DD, etc) fit onto the middle portion of the roof. They are deliberately shorter than the spaces they fit into. Gaps at their ends are intended.

Dry-fit each part to check clearance - especially check for lumps of adhesive underneath. Apply Soudal Surface Activator to the plastic, and allow to dry. Then finally refit the part with adhesive.

Take care to fit the longeron parts the correct way around: arrow pointing towards the front of the trailer, and the writing approximately upright.
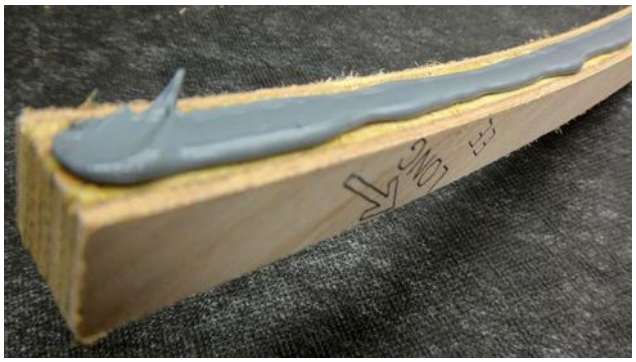
Four parts (LONG-Cs and LONG-Ds) are handed so must be fitted to the correct side of the trailer.

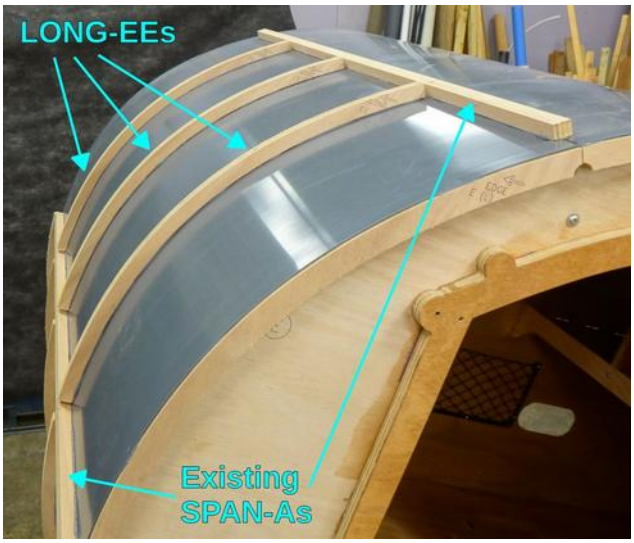
The fitting positions for all double-letter parts (LONG-EE, etc) are engraved on the existing SPAN-A, SPAN-B, and LIGHT-BAR parts. (Image.)



Longerons LONG-EE

Fit the LONG-**EE** parts, using a **very heavy** bead of adhesive on each one, into the space above the frontmost SPAN-A part. (Images.)

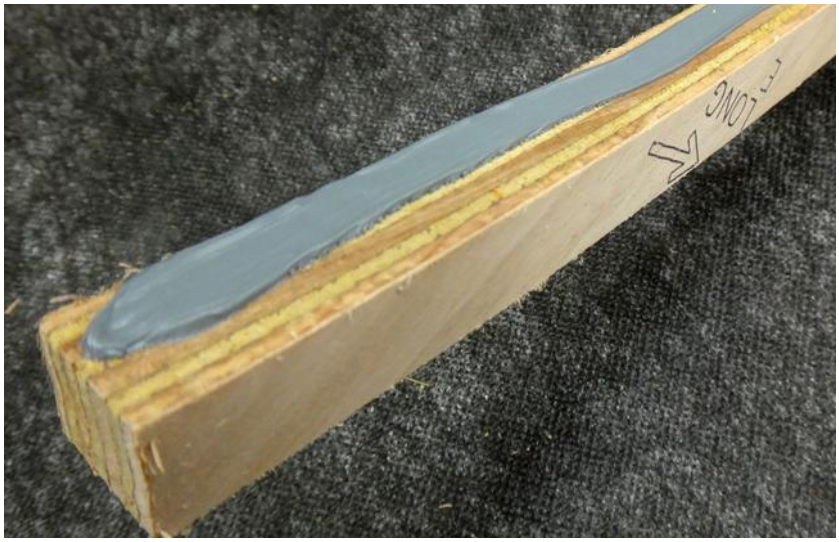




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Longerons LONG-E

Fit one LONG-**E** part, using only a **modest bead** of adhesive, onto the left side of the trailer, abutting against the existing LONG-F. (Images.) Position it and clamp it using 3-qty L-JIGs and plastic wedges, in the same way as the existing LONG-Fs were fitted.





Refer back to the LONG-F instructions (above) for a reminder how to use the L-JIGs to precisely position the part and set it back from the outside edge. **Always** fit the wedges into the L-JIGs from the front (i.e. the thin wedge tips should all be pointing toward the rear of the trailer).

The LONG-E should butt tight against the existing LONG-F below it. Adhesive is **not** required on the ends of the part, only on the curved cut edge.

Repeat the process for another LONG-E on the other side.

Longerons LONG-DD, LONG-CC

Tilt the trailer forwards. Lower the nose of the trailer to the ground.

Fit the 3-qty LONG-DDs in the same way as the LONG-EEs, in the gap between the SPAN-A and SPAN-B just behind the LONG-EEs.

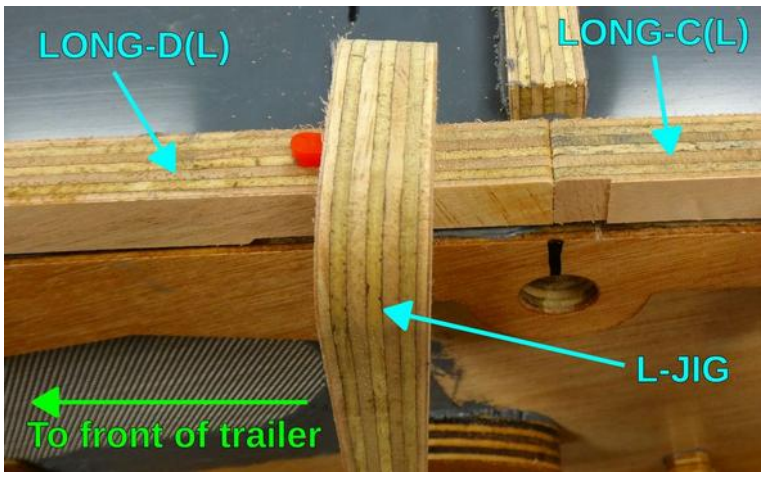
Fit the 3-qty LONG-CCs in the same way, in the gap behind the SPAN-B.

Longerons LONG-D, LONG-C

Fit the LONG-Ds and LONG-Cs in the same way as the LONG-Es, but note:

- These parts are handed (L)/(R) and must be fitted on the correct sides of the trailer.
- There is a useful location for an L-JIG just behind the mesh of the upper vent. (Image.)

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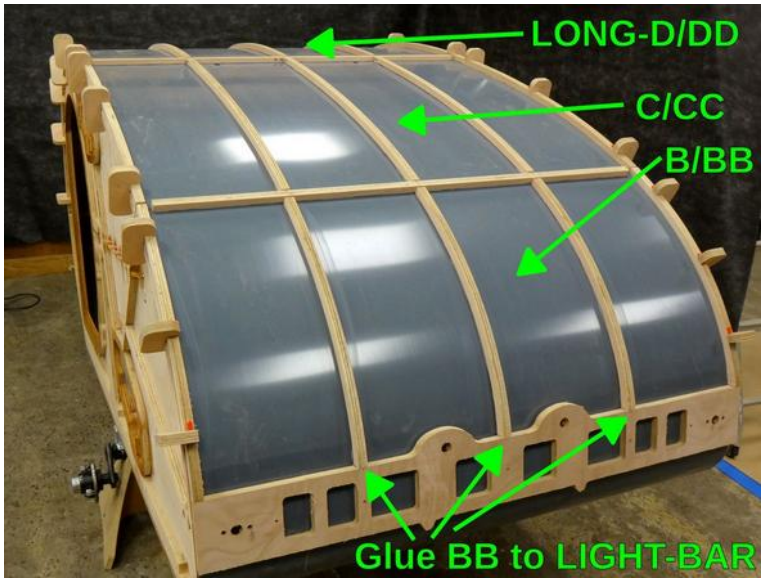


Use 3-qty L-JIGs on each part.

Longerons LONG-BB

Fit the LONG-BBs in the same way as the LONG-EEs, in the gap above the LIGHT-BAR, but note:

- The bottom tips of the LONG-BBs should be glued to the top of the LIGHT-BAR.



Longerons LONG-B

Fit the LONG-Bs in the same way as the LONG-Es, but note:

- Use 3-qty L-JIGS but position the lowest one approx 120mm from the bottom end of the part, because the part becomes too wide for the L-JIG to fit any lower.

Longerons LONG-A

Wipe the entire plastic area below the LIGHT-BAR with Soudal Surface Activator.

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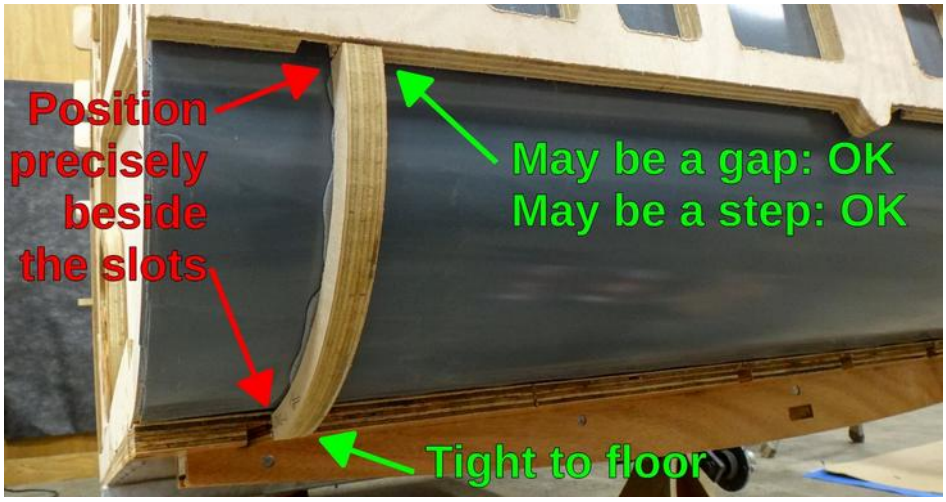
Identify the 5-qty slots cut into the floor. There are matching slots in the underside of the LIGHT-BAR, above them:

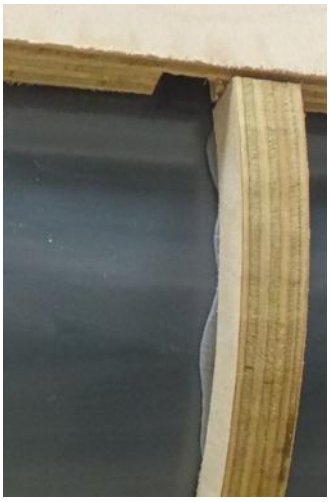
- The **centre three** slots will have a LONG-A fitted **each side** of them.
- The **leftmost** slot will have a LONG-A fitted **on its right side only**.
- The **rightmost** slot will have a LONG-A fitted **on its left side only.**

Identify the 2-qty engraved marks in the rear of the floor. There are matching engraved marks in the underside of the LIGHT-BAR, above them:

- Each pair of marks will have **one** LONG-A fitted at them.

Apply a **very heavy** bead of adhesive onto a LONG-A, and press it against the plastic just to the right of the leftmost slot. Align the side of the part to the edges of the slots. Slide the part down into contact with the floor. There will be a gap and/or a step between the LONG-A and the LIGHT-BAR - this is correct. (Image.)



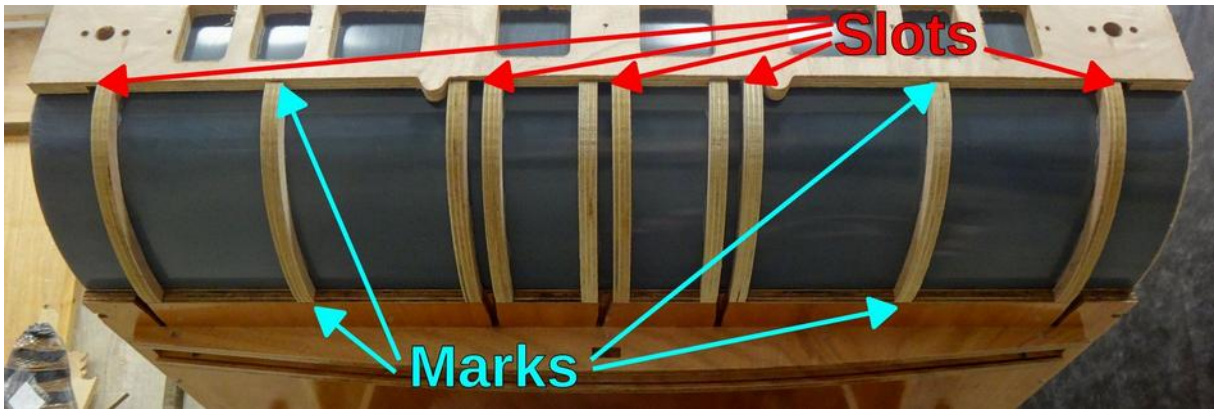


NB: The slots in LIGHT-BAR and floor **must** be kept open and clear.

Repeat for the LONG-A on the opposite side of the trailer: fit it to the **left** of its slot.

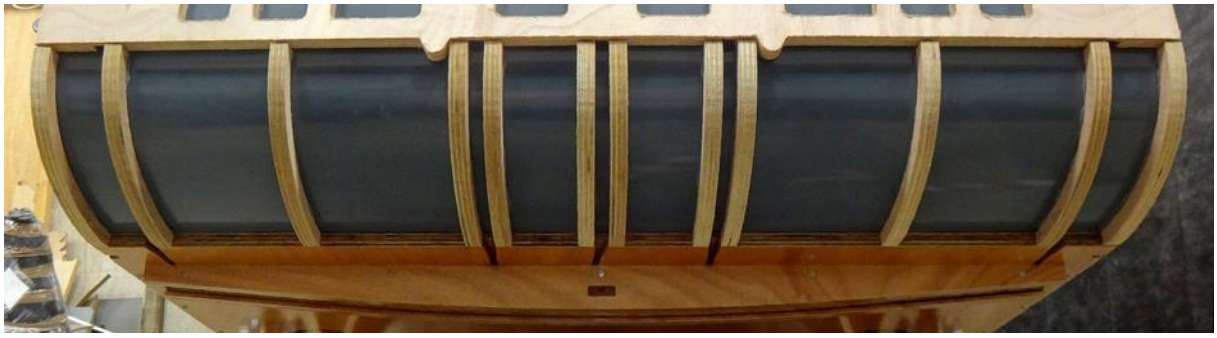
Repeat for the 6-qty LONG-As which fit either side of the 3-qty slots in the middle of the trailer.

Fit one LONG-A in-line with each of the 2-qty pairs of marks engraved in the floor/LIGHT-BAR.



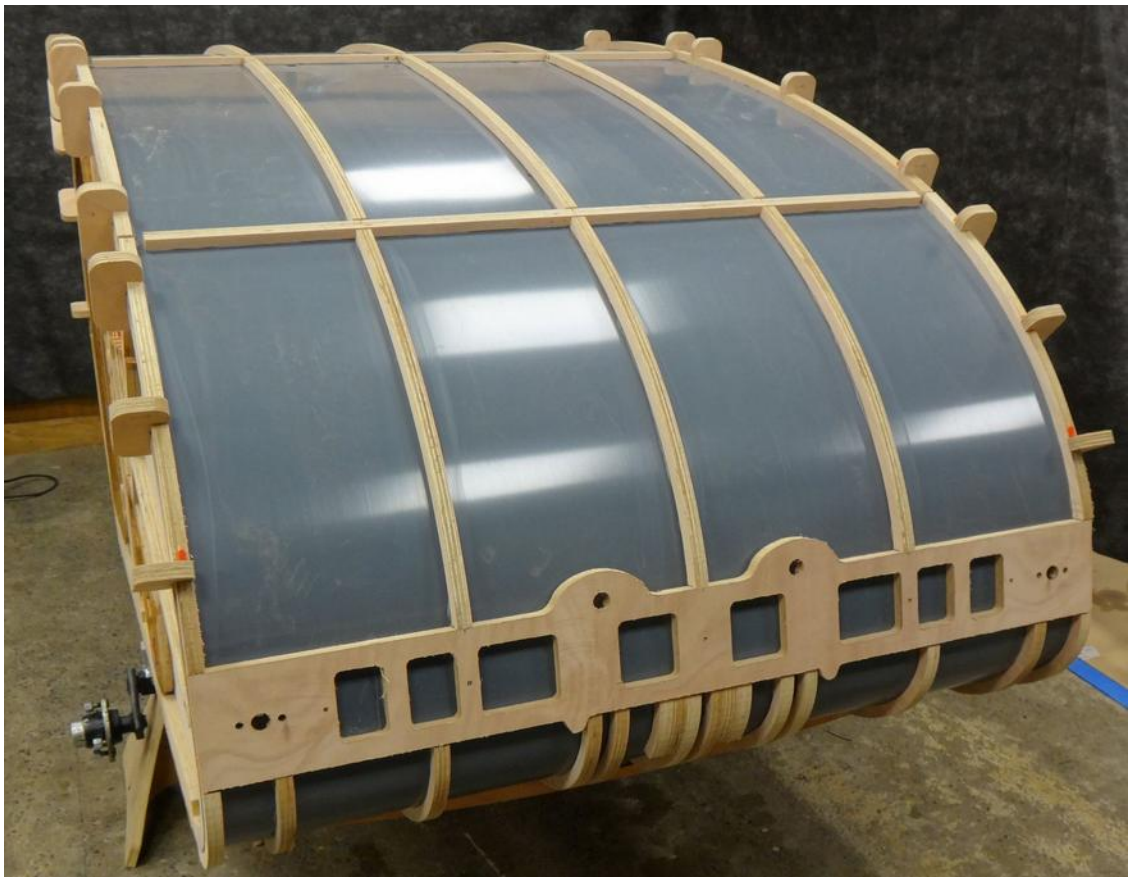
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Fit one LONG-A to the left side of the trailer. By eye, set it back from the face of the side-assembly by approximately the same amount as the LONG-B parts. The recessed edge of the **floor** can be used as a guide. But do **not** use the end of the LIGHT-BAR as a guide. Repeat on the right side. L-JIGs are not required on these parts.



Cure

Allow the parts to cure at least 10 hours - to at least a modest level of ‘grab’ - before continuing.



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Build Stage: Fog Light Attachment Parts

Identify the pair of LONG-A parts which are glued to the centreline of the trailer.

Apply adhesive to a FLA part and glue it to the left side of the left member of the LONG-A pair, with its top touching the LIGHT-BAR. Take note of the orientation arrow on the part, and align it with text upright.



Glue a second FLA part to the left side of the existing FLA part. (Image.)



Repeat for two more FLA parts to the right. (Image.)

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Cure

Do not disturb these parts during cure. It is safe to carry on to the next build stage immediately, with care.

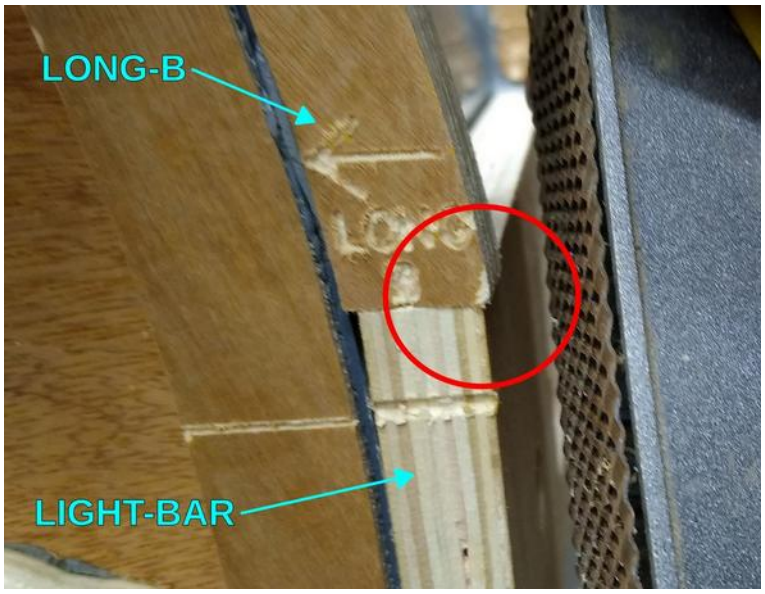
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Build Stage: Reshaping

Tilt the trailer nose-down. Rest the front of the drawbar on the ground.

Reshape LONG-As, LONG-Bs, LONG-BBs

Where any LONG-B or LONG-BB stands proud of the LIGHT-BAR, use a surform (or belt sander) to flatten it back. Do **not** cut away material from the LIGHT-BAR.



Similarly, where any LONG-A stands proud of the underside of the floor, flatten it back. Do **not** cut away material from the floor.

Reshape Top of LIGHT-BAR

Hold a **thin** straight-edge across the top of the LIGHT-BAR, so that it is resting on top of one of the half-round protrusions and is also resting against the outside faces of the adjacent LONG-BBs. Mark on the top cut edge of the light-bar exactly where the straight-edge is touching it. (Image.)

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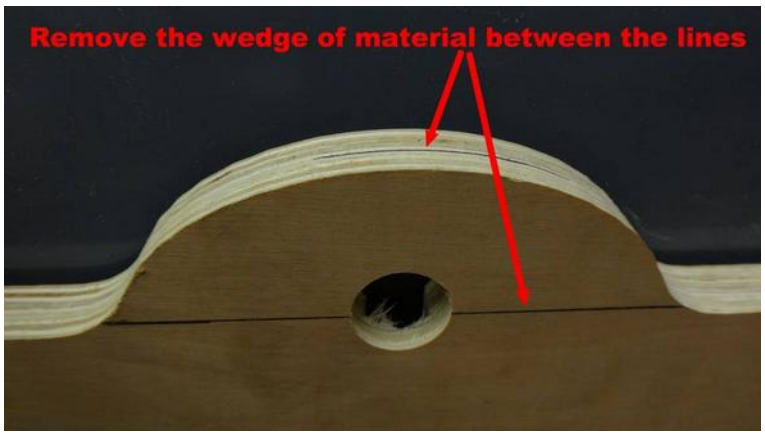


Now hold the straight-edge flush with the straight upper edge of the LIGHT-BAR, and mark a line across the bottom of the half-round protrusion. (Image.)



Use a surform (or a belt sander) to remove all the material between these two lines. This creates a flat chamfer which runs between the two sets of marks on the half-round protrusions. (Image.)

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Trim the wedge away bit-by-bit, repeatedly checking with the straight-edge.



The trimmed face should exactly match the adjacent LONG-BBs, but if it is slightly sunk below it will not matter. It must not stand proud of the LONG-BBs. (Image.)

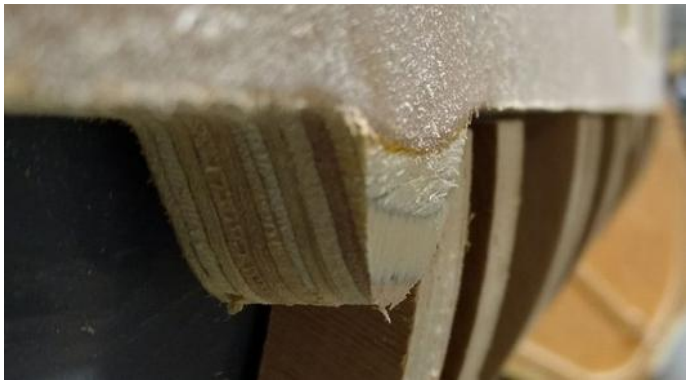


Repeat for the other protrusion.

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Reshape Bottom of LIGHT-BAR

Similarly, use the surform to create a very slight - and much smaller - chamfer on the two small protrusions which are below the LIGHT-BAR. (Image.) This chamfer must **not** be matched to the LONG-A parts.



Reminder

Have you applied for your IVA inspection? If not, then do it as soon as possible. DVLA can take several weeks to process your application.

See “Build Stage: Register for IVA”, above.

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Build Stage: Third Beam

Requirement

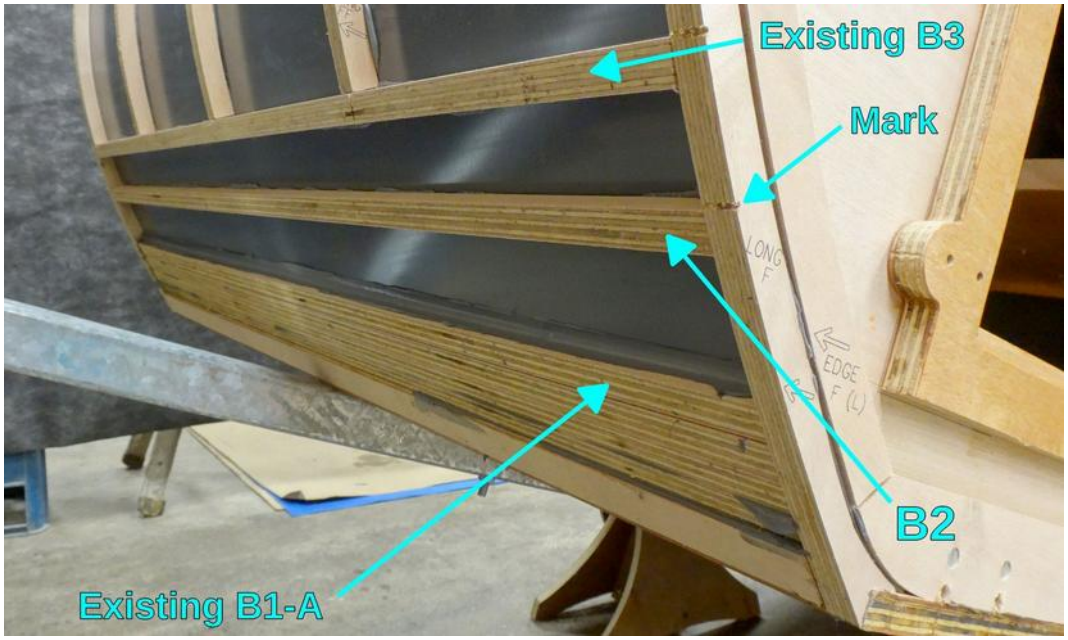
This stage should not be attempted until the adhesive holding the B1-A and B3 parts has had at least 20 hours of cure time. This stage can be postponed until after the next few stages, to wait for B3's adhesive to cure, if necessary.

Fitting B2

Fit B2 in the same way as B3 was previously fitted.

Use a very generous bead of adhesive on the **cut edge** of the part.

B2 fits across the front of the trailer approximately mid-way between the existing topmost B1-A and the existing B3 part. There are marks on the EDGE-F parts to act as a rough guide. (Image.)



Cure

Provided care is taken not to disturb the B2 part, work on the next build stage can commence immediately.

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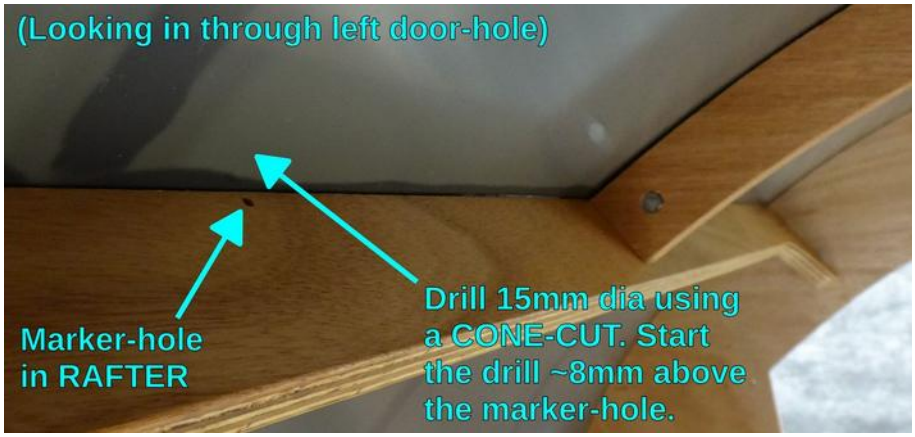
Build Stage: Install Interior Lights

Preparation

Remove the temporary front leg and lay the nose of the trailer on the ground. To access the work area, kneel on the ground just outside the door of the trailer. Reach inside to work. Do not enter the trailer.

Drill Wiring Holes

Identify the very small marker-hole in the top (machined) face of the RAFTER which is fitted just above the corner of the door-hole. This little marker-hole indicates where the hole for the interior light's cable needs to be drilled in the plastic. (Image.)



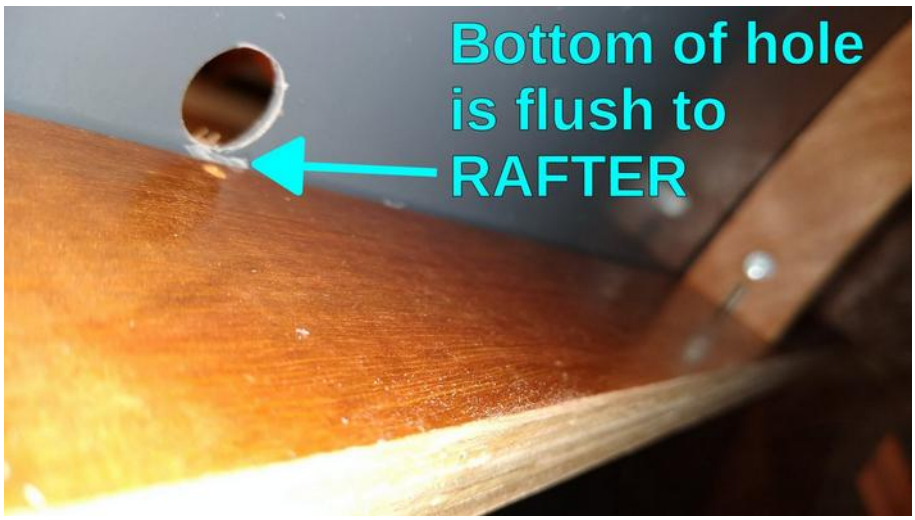
Use a small **cone-cut** drill (or a small stepped cone-cut) **with an extension-piece**. Drill a 15mm dia hole through the plastic directly above the marker-hole. The point of the cone-cut should be started into the plastic approx 8mm above the RAFTER, so that the bottom edge of the finished 15mm hole will be approximately flush to the RAFTER. Drill from the inside of the pod. The extension-piece keeps the drill chuck clear of the RAFTER. (Image.) The bottom edge of the hole should finish flush to the RAFTER.



!! Do not use a regular twist-drill, a spade-bit, nor an auger: they are all too aggressive and WILL crack the plastic, destroying the inner roof. --- Use. A. Cone. Cut. --- !!

Repeat for a second hole on the other side of the trailer.

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Fit Lights

Unbox one of the LED interior lights. Remove any clear protective plastic from the lens. Discard the metal brackets and screws.

Gently warm the paper sticker attached at one end. Peel it away. Remove any residue.



Thoroughly clean the backs of the white plastic areas with Soudal Surface Activator and allow to dry completely. Apply a **very very small dab** of grey Fix-All to each end (image).

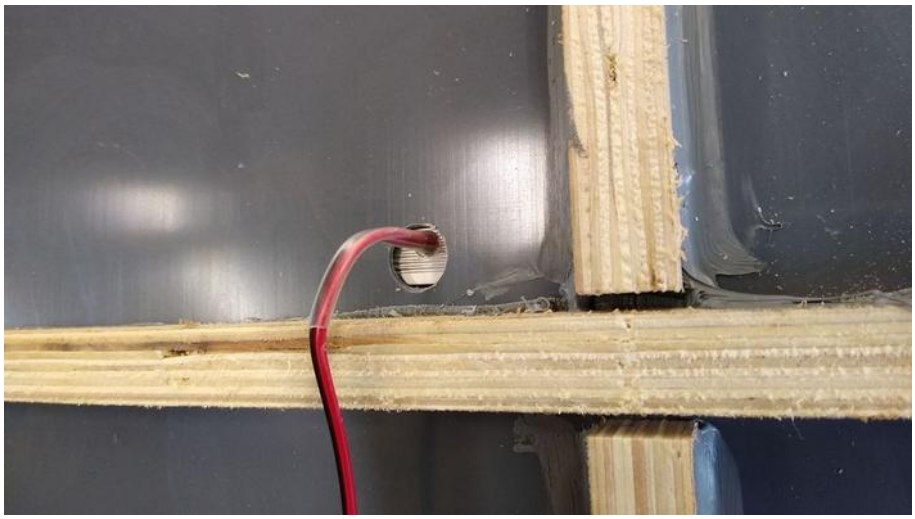
Align the light so that its switch is toward the centreline of the trailer.

Pass the end of the light's cable up through the cone-cut hole and - keeping the cable aligned exactly to the hole - press the light into place against the INNER-ROOF. The edge of the light should be resting on top of the RAFTER. (Image.)

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The cable should pass through the hole to the outside of the roof, clear of the plastic edge. (Image.)



Repeat for the other light, to make a symmetrical pair.

Do **not** use excessive adhesive. Do **not** glue the cable in-place: because if the light fails in future it will need to be easily removable together with its wiring.

Cure

Take great care not to disturb the lights during the cure time. Take especial care during the first 4 hours of cure while the adhesive ‘grabs’.

This is an ideal opportunity to repeat the ‘Additional Bonda-Seal’ build stage.

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Build Stage: Insulation and Reinforcing

Preparation

Tilt the trailer forwards, resting the nose of the drawbar on the ground.

Identify the 2-qty 20mm dia holes in the top of the inner roof, just behind SPAN-B. Working from outside the trailer, fit a rubber grommet into each one. (Image.)



In an early build stage the insulation was cut into 1.2m x 280mm slices and put aside to flatten.

Description

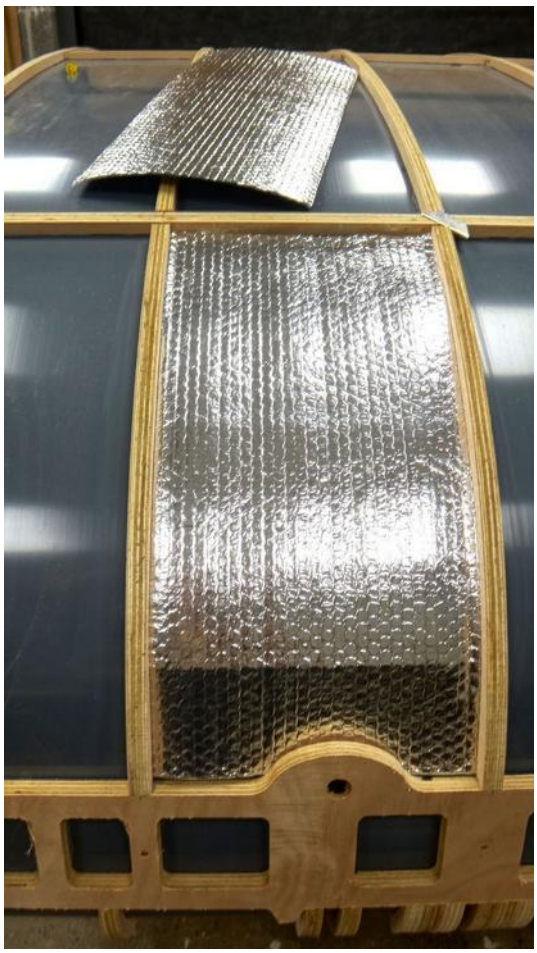
The inner roof of the trailer is divided into ‘bays’ which are demarcated by longerons (each side) and variously by SPAN-A / SPAN-B / B3 / LIGHT-BAR (front and back).

Working one bay at a time, the timber-to-plastic adhesive in each bay will be augmented with an additional fillet to add strength to the bond. The insulation will then be bedded into that same fillet before moving on to the work on the next bay.

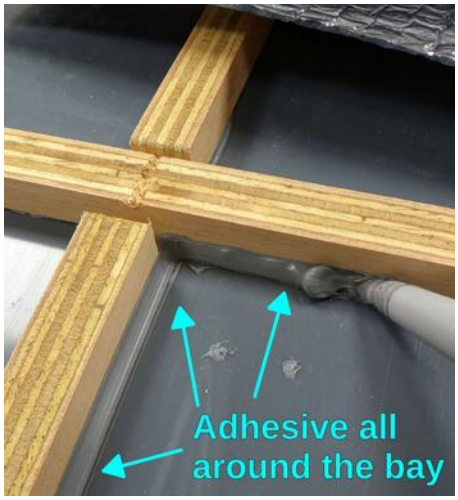
Cut Insulation to Length

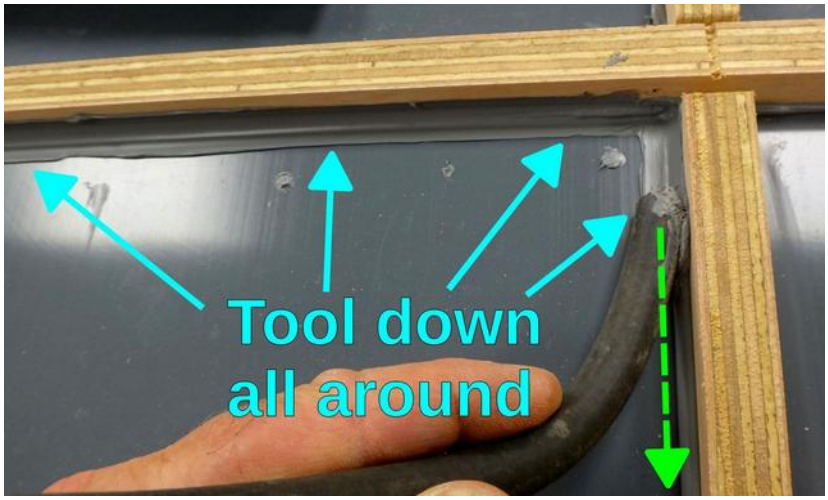
Lay a 1.2m slice of insulation into one of the central bays just above the LIGHT-BAR. Tuck it under the round protrusion. Mark where it touches the SPAN-A above the LIGHT-BAR. Cut it to length. (Image.)

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Run a moderate fillet of adhesive all around the edges of the bay, **but not on the LIGHT-BAR**, between the timber parts and the plastic. Use a piece of pipe to firmly tool-down this adhesive. (Images.)

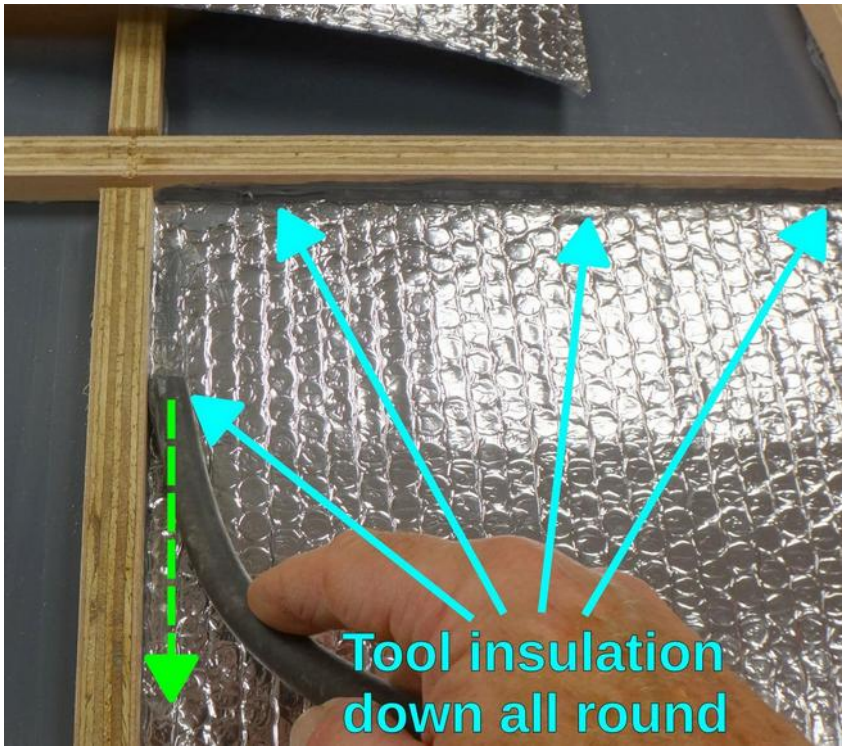




Add some dabs of adhesive in the middle of the bay. Lay the insulation into the bay. Press its middle down onto the adhesive dabs. Use the rubber tube to press it into the fillets of adhesive all

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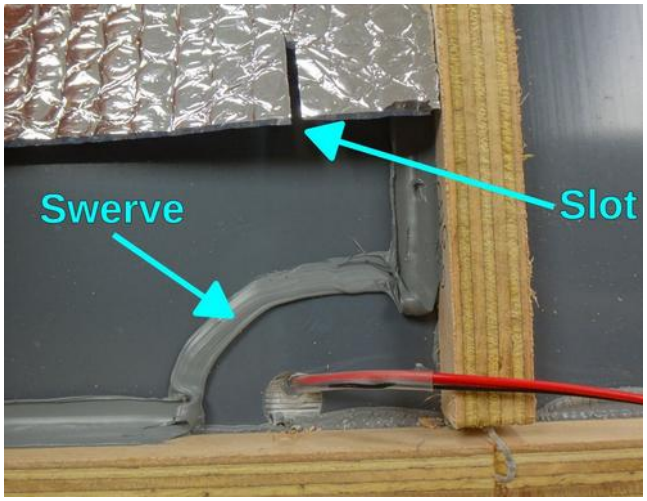
around the edges of the bay. (Images.)

Repeat

Repeat the process for all twenty bays on the top of the trailer.

For all the other bays (except the LONG-B bays) apply the adhesive to **all** four sides of each bay.

For the central LONG-D bays (where the light cables emerge), ‘swerve’ the adhesive around the cable-entry hole and cut a slot in the insulation for the cable to emerge. The light cable must **not** be glued. (Images.)





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The insulation slices can be divided up as follows:

- 2-qty slices: each slice will cover two “LONG-B” bays (directly above the LIGHT-BAR).
- 4-qty slices: each slice will cover one “LONG-C” bay (the next bays forwards).
- 4-qty slices: each slice will cover one “LONG-D” bay.
- 4-qty slices: each slice will cover one “LONG-E” bay **and** one “LONG-F” bay.

Insulating Other Bays and Trailer Sides

There is much less benefit in insulating other areas of the trailer:

- The underside of the roof is neither exposed to the hot sun nor to the cold night sky.
- The sides are relatively small compared to the roof and are not made of dense heat-conductive materials.
- The doors have minimal free area which can be insulated.

If the builder does prefer to insulate these areas then additional insulation will be required.

The vent channels in the sides of the trailer must be kept clear: insulation cannot be fitted inside these.

Adhesive Cure

Take great care not to disturb the insulation during cure time. Preferably, leave the pod undisturbed for the first 4 hours of cure to allow the adhesive to ‘grab’ before beginning the next build stage.

This is another opportunity to repeat the ‘Additional Bonda-Seal’ build stage.

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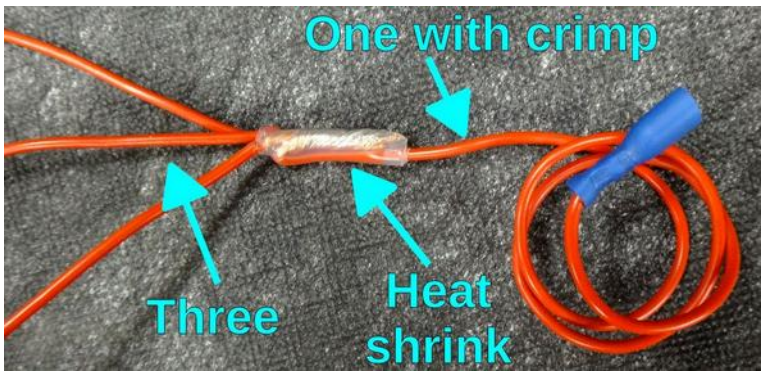
Build Stage: Wiring Harness



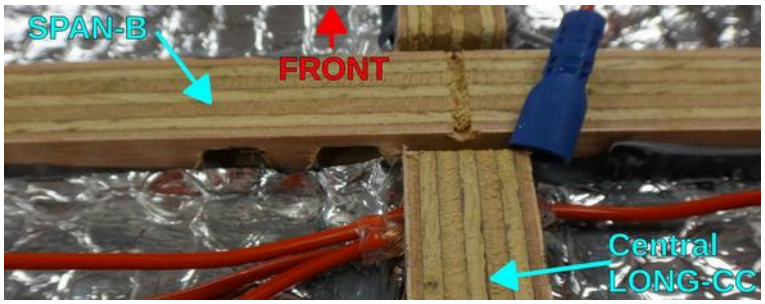
An appendix contains the instructions for making the simple wiring harnesses.

Threading the Red Harness

Identify the three-into-one joint. The ‘one’ has a crimped connector on it. (Image.)

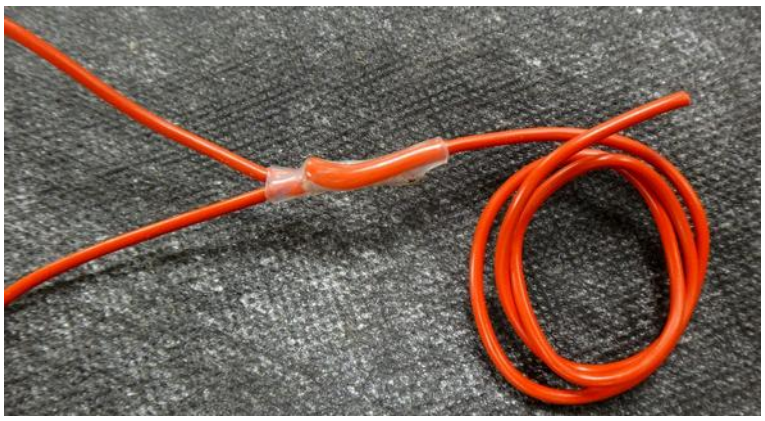


Working from the **left** side of the trailer, push the crimp connector through the front-most of the two oval holes in the central LONG-CC longeron. The single wire with the crimp should emerge on the right side of the longeron. The heat-shrink should be inside the oval hole. (Image.)

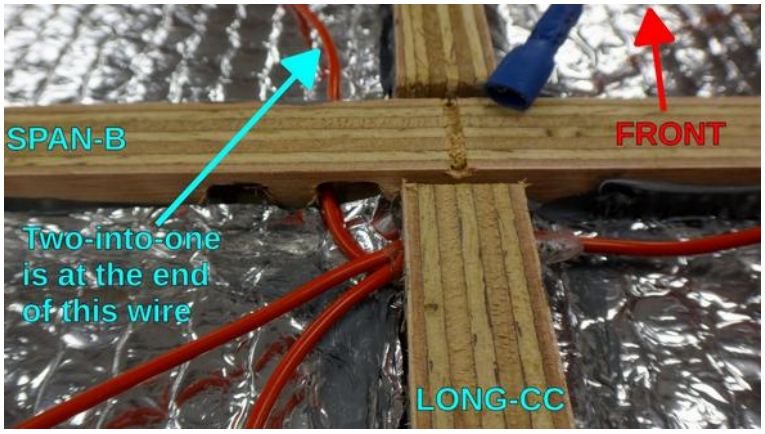


Identify the two-into-one joint. (Image.)

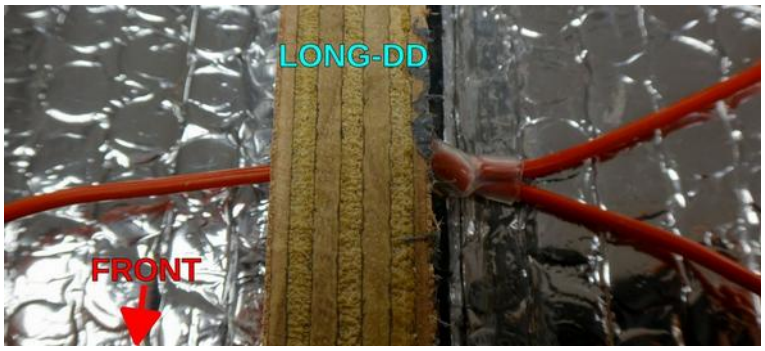
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Push this entire joint clear through the oval hole in the SPAN-B part, and pull all the attached wire through that hole. Do not disturb the three-into-one joint which has already been threaded. (Image.)

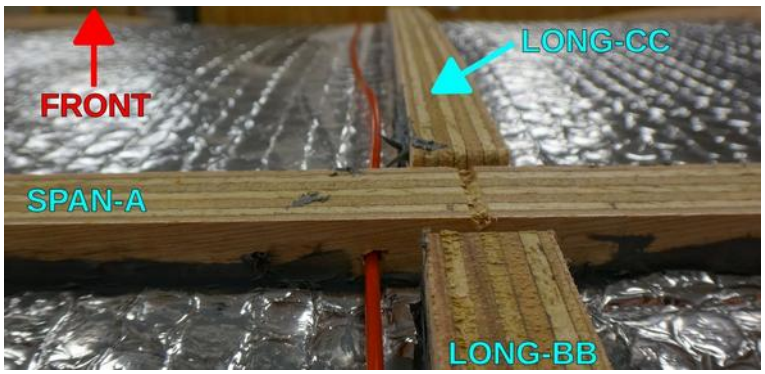


Now working at the **front** of the trailer, push the single wire of the two-into-one joint through the round hole near the front of the central LONG-DD part. The single wire should emerge on the **right** side of the LONG-DD. The heat-shrink should be inside the round hole. (Image.)

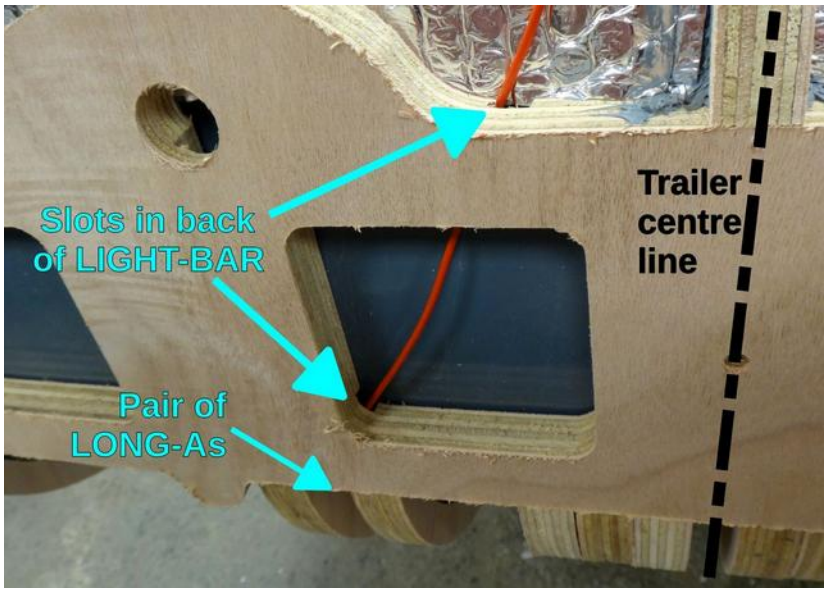


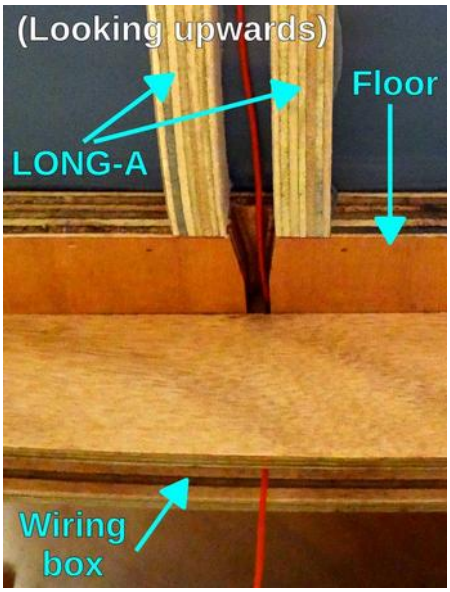
Now working at the **rear** of the trailer, thread the longest remaining wire through one of the two small holes in the SPAN-A. (Image.)

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Thread the same wire down behind the LIGHT-BAR so that it emerges between the pair of LONG-A parts which are just to the left of centre. Then, working underneath the trailer, continue through the slot in the floor. The wire should emerge inside the wiring-box. (Images.)





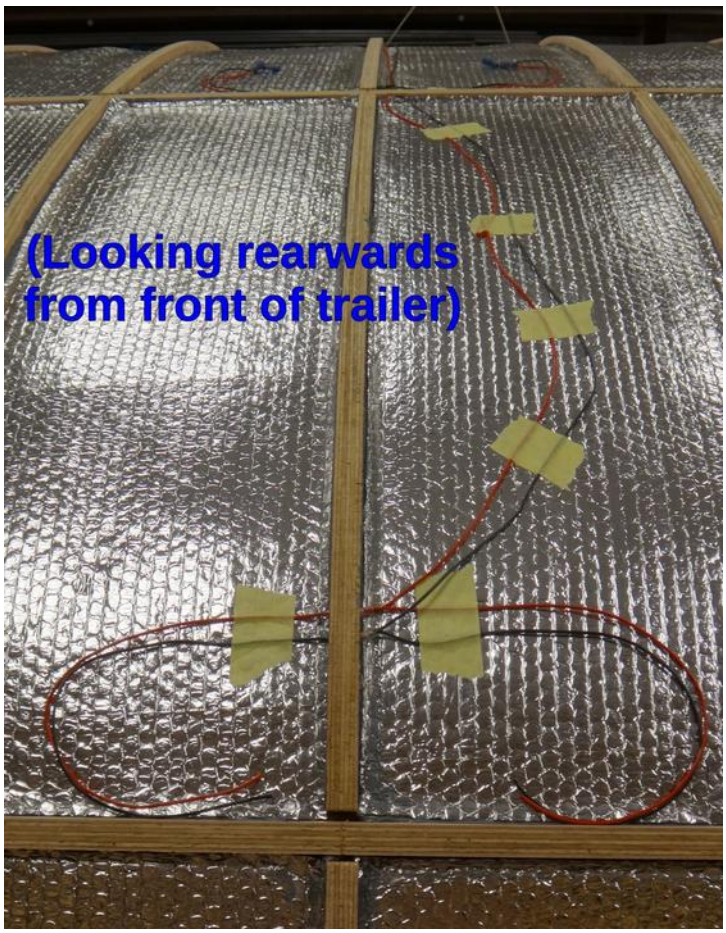
Threading the Black Harness

Repeat the entire process, with the black part of the harness. There are separate holes in the SPANs and longerons for the black wires. When the black wire reaches the LIGHT-BAR, it should follow the red wire into the same slots.

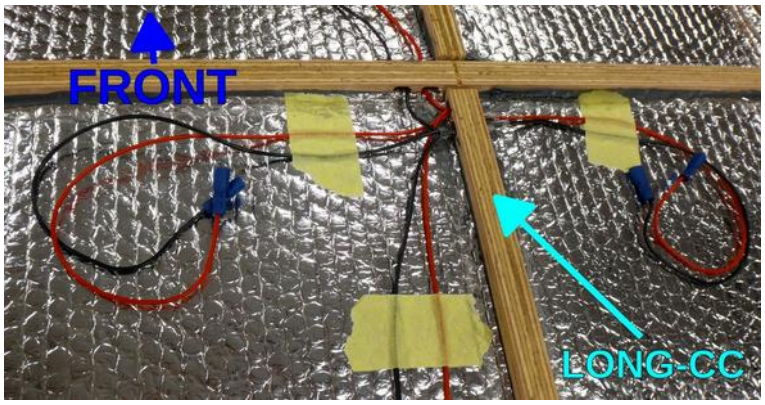
Securing With Tape

Use adhesive tape to secure the wires neatly in place, but allow a little slack for thermal movements. Apply tape close to wherever the wires pass through a timber part and at intervals elsewhere. (Images.)

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Secure the wires in the centre of the trailer. (Image.)

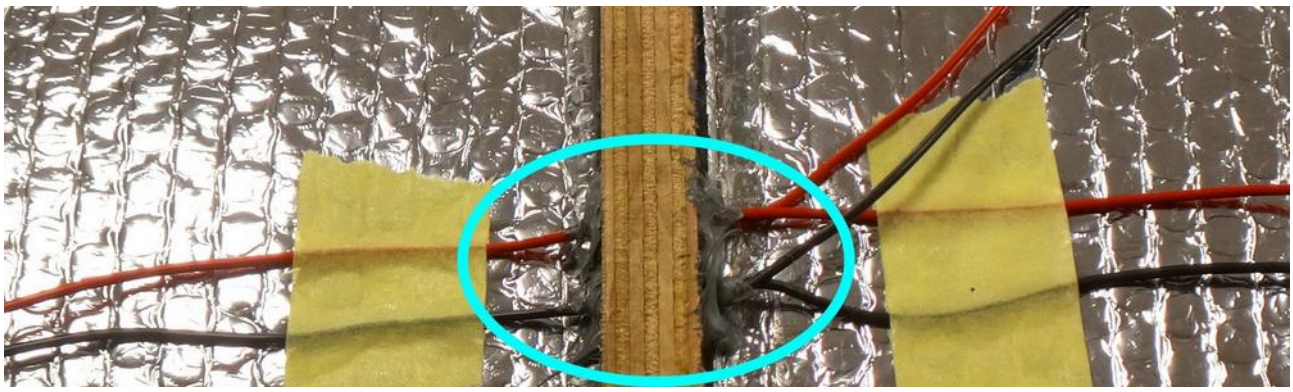


Anti-Vibration Adhesive

Apply adhesive in the following locations where the wires pass through a timber part:

- At the front - where the heat-shrink is inside the holes in LONG-DD.
- At the centre - where the wires pass through oval holes in SPAN-B.
- At the centre - where the heat-shrink is inside the holes in LONG-CC.
- Towards the rear - where the wires pass through a SPAN-A.
- At the rear - both of the slots in LIGHT-BAR where the wires pass through.

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Do **not** apply adhesive where the wires pass into the LONG-A parts, nor where they pass into the floor. These areas **must** remain clear of adhesive ready for later wires to be threaded.

The adhesive should be tooled into the faces of the timbers, to form a good bond to prevent the wires moving.

Connect to Lights

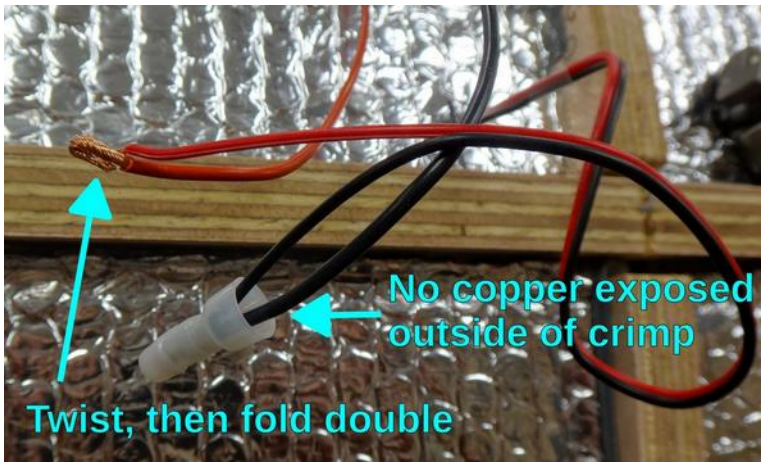
Lower the nose of the trailer so that the drawbar is touching the ground.

Working at the front of the trailer, strip 15mm of insulation from the end of the **red** harness wire on the left side of the trailer. Strip 15mm of insulation from the **red** wire on the left interior light. Twist the wires tightly together, then fold the twisted section double.

Either:

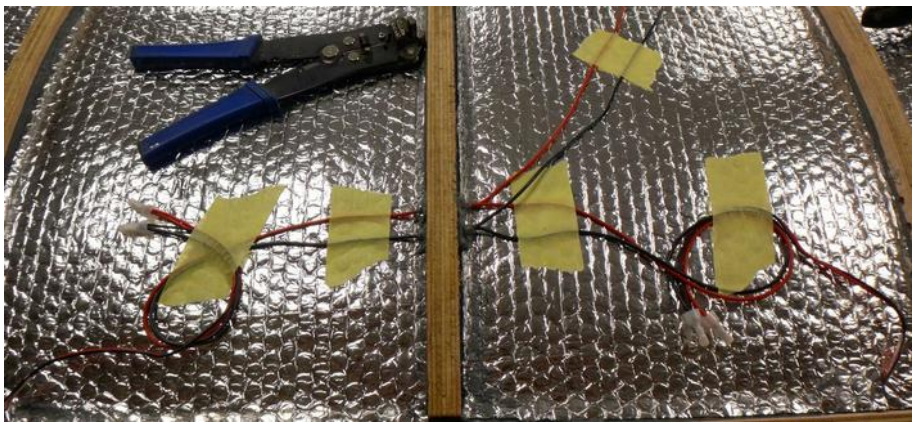
- Solder the joint then insulate with heat-shrink (this is the preferred method if you have soldering skills and equipment).
- Lock and insulate the joint with a ‘closed end’ crimp (see Bill Of Materials).

Repeat for the remaining three pairs of wires, always matching red-to-red and black-to-black. (Image.)



Tape down the wires neatly, in such a way that a firm pull on the wires (from inside the finished trailer) would unseat them from the tape so that the crimp/solder joints could be pulled through and

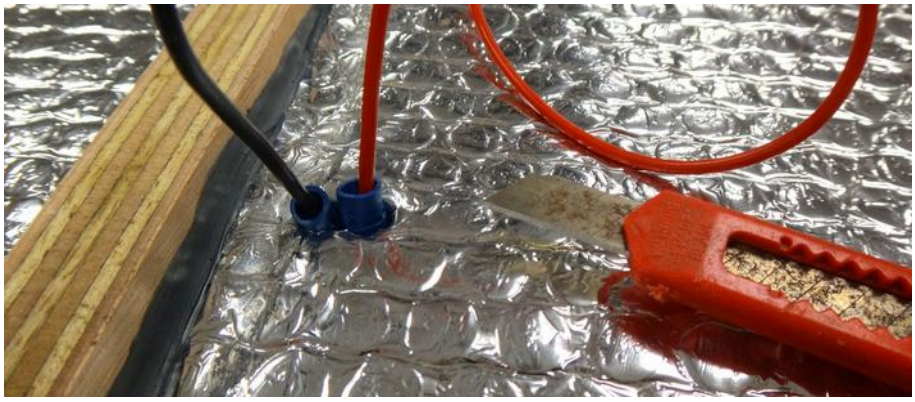
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accessed for replacing the light fitting. (Image.)

Connect to 12V Socket and USB

By feel, find the grommets in the holes just behind the SPAN-B part. Make a small incision in the insulation in the middle of each grommet. Pass a pair of red/black crimp connectors down through each hole into the interior of the trailer. (Image.)



Reach in through the doorways (do not enter the trailer) and push the crimp connectors onto the connection tabs on the backs of the USB and 12V sockets. Refer to the '-' and '+' marked on the CENTRE-PURLIN: black wire goes to '-', red wire to '+'.

Push the spare wire back to the outside of the trailer's inner-roof. Secure the spare wire neatly but in such a way that it could be pulled back inside the finished trailer if required.

Review

After the outer roof is fitted, it will be impossible to access most of the harness. So carefully examine the entire of the harness installation. Check that:

- There is no bare copper exposed anywhere in the harness.
- Red is connected to red, and black is connected to black, at the lights.

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- Red is connected to ‘+’, and black is connected to ‘-’, at the power socket and USB.
- The wires are not at risk from abrasion, movement, stretching, kinking, or crushing anywhere along their lengths.
- The wires will not be able to rub on the aluminium outer roof, after it is fitted.
- All wire joints are secure and permanent and are permanently insulated.
- All wires are securely and permanently fixed in place. If in doubt about the longevity of the tape’s adhesive*, then augment the tape with blobs of Fix-All adhesive to independently secure the wires to the insulation at intervals.

*Bearing in mind that the tape may be exposed to very high temperatures, due to sunshine on the adjacent aluminium roof.

Test

Before fitting the outer roof, it is essential to test the harness. If in doubt about how to do this, request help from someone with electrical experience.

Connect a fused (8A max) 12V source to the wires at the rear of the trailer. Red to positive, black to negative. Check that:

- Both interior lights work, at both low and high settings, and that they turn off and on reliably.
- There is a blue light illuminating the USB sockets.
- That a low- or moderate-power USB device plugged into a USB socket operates correctly.
- That a low- or moderate-power 12V device plugged into the 12V socket operates correctly.
- That all of the above things continue to work correctly, when operated all at the same time.

Correct any failures before proceeding.

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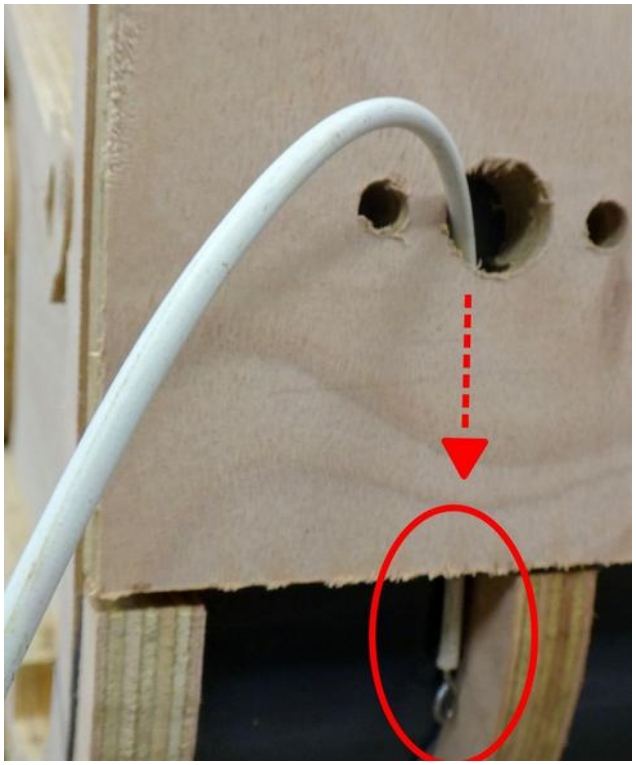
Build Stage: Checks Before Fitting Roof

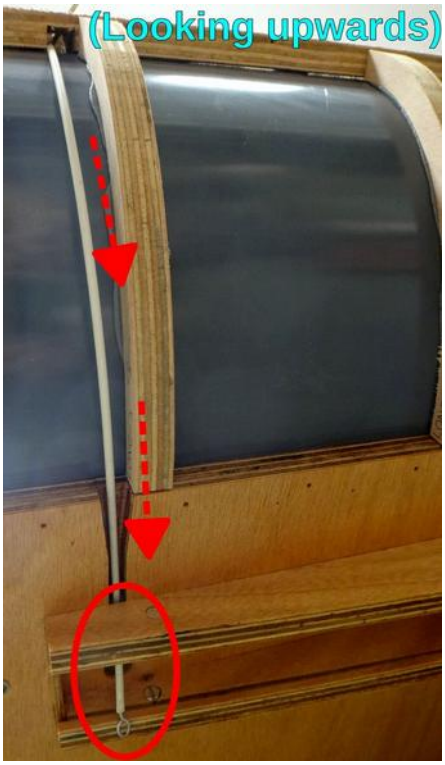
Wiring Slots

Create a wiring-tool by screwing one small screw-eye into one end of the net-curtain wire. (Image.)



Thread the wiring-tool into the left-most large hole in the LIGHT-BAR. Thread the tool around the wiring-bay beneath the LIGHT-BAR and into the wiring-box. (Image.)

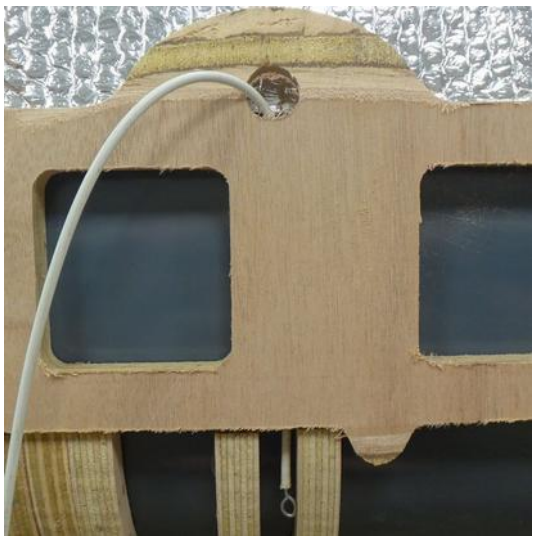




Check that the tool can pass freely. Remove any large adhesive lumps which obstruct or deflect it.

Repeat for all the four other wiring slots at the rear of the trailer. (Images.)

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Contact Faces

Check all faces, where the outer roof will make contact, for oozed adhesive or other obstructions. Locations to check include:

- Under the front of the floor.
- The B1, B1-A, B2, B3 parts at the front of the trailer.
- All longerons.
- SPAN-As and SPAN-B.
- The LIGHT-BAR.
- The LONG-A pieces.
- Under the rear of the floor.
- Harness wires and the adhesive holding the harness in place.



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Note: the longerons stand proud of SPAN-As and SPAN-B. This is correct.

Note: the beam parts will not be exactly flush to the LONG-F parts. This is correct.

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Build Stage: Prepare Rear Outer Roof

The rear outer roof is cut from one 2.5m x 1.25m x 0.9mm aluminium sheet. This can either be machined to the drawings, or it can be cut using hand-tools and a template. The template method is preferred, as the part will then not be oily from the machining process. A cutting/drilling template is created when the REAR-INNER-ROOF plastic is machined.

Handling

To minimise unsightly scratches, avoid sliding the aluminium sheet on the work surface and avoid sliding the template on top of the sheet.

To avoid instant and permanent finger-marks on the metal, wear gloves whenever handling the aluminium. Even thin vinyl gloves will prevent fingermarks. But stronger gloves may be required if the metal is sharp.

To avoid kinking, the sheet should be carried on-edge, with wide-spread hands holding the top long edge of the sheet. All handling can - with care - be done solo. But a (gloved) assistant can be a great help.

Beware that a dropped sheet will act as a guillotine. Appropriate footwear and leg-wear are required to prevent injury.

Preparation

A large, flat, abrasion-free surface is required. A workbench with a clean sheet of cardboard on top is good. Taping the tissue (usually supplied with the aluminium) onto the cardboard may help.

Aluminium Selection

Aluminium is soft. So after delivery the aluminium sheets are likely to have some handling marks or damage.

Moderate damage and dints along the sides (the long edges) are not important: about 20mm will be trimmed off of each side later. And a further 10mm of each side will be beaten-over. So up to 30mm of slight damage each side is unlikely to affect the result.

However, **at least one perfect end** (short edge) is required for the **front** outer roof. So put aside whichever sheet which has the best end to use later for the front outer roof.

Pre-Trim

Select the **worst** sheet now, for the **rear** outer roof.

Approx 50mm of one of its ends will be concealed under the front outer roof. This end needs to be **perfectly flat** but the cut end will not be visible. So choose the **best** end of the sheet for this end. And, only if necessary, use the nibbler to slice across the aluminium - no more than 150mm from

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the end - to remove bends or creases. The resulting end must be perfectly flat. But if the cut wanders off-line it will not matter.

The other end will now be marked-up using a template, drilled, cut off, and - when fitted - it will then tucked underneath the floor of the trailer.

Cutting Oil

The nibbler instructions will advise oiling the workpiece. We advise **against** this, because it leaves permanent oily marks on the aluminium. Oil the nibbler tip instead with a drop of oil. (Image.)

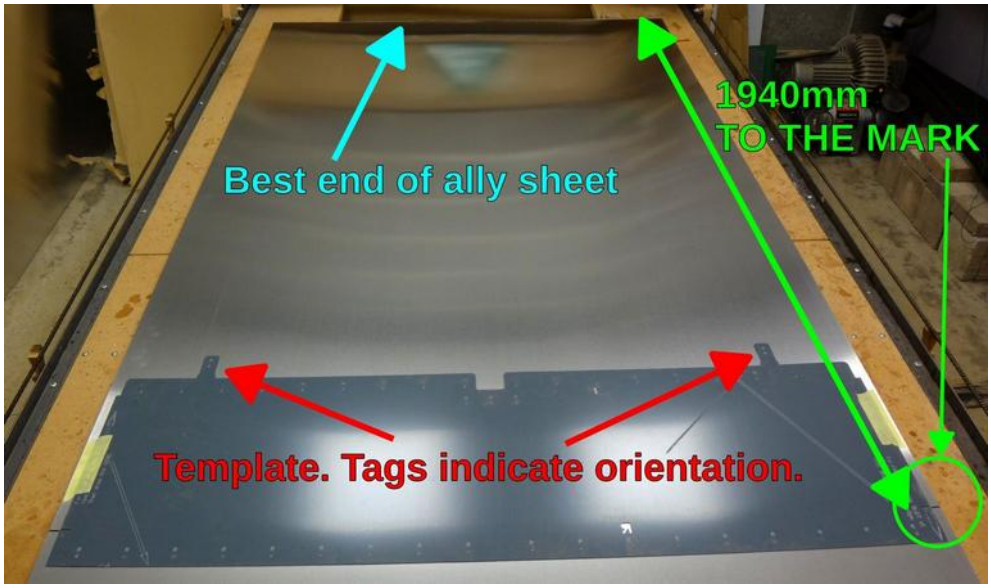


Mark Up and Drill

This description assumes starting from a sheet with at least one perfectly flat end. It assumes that the perfect flat end is cut perpendicular across the sheet. Adapt these instructions as necessary, if the end is not perfectly perpendicular.

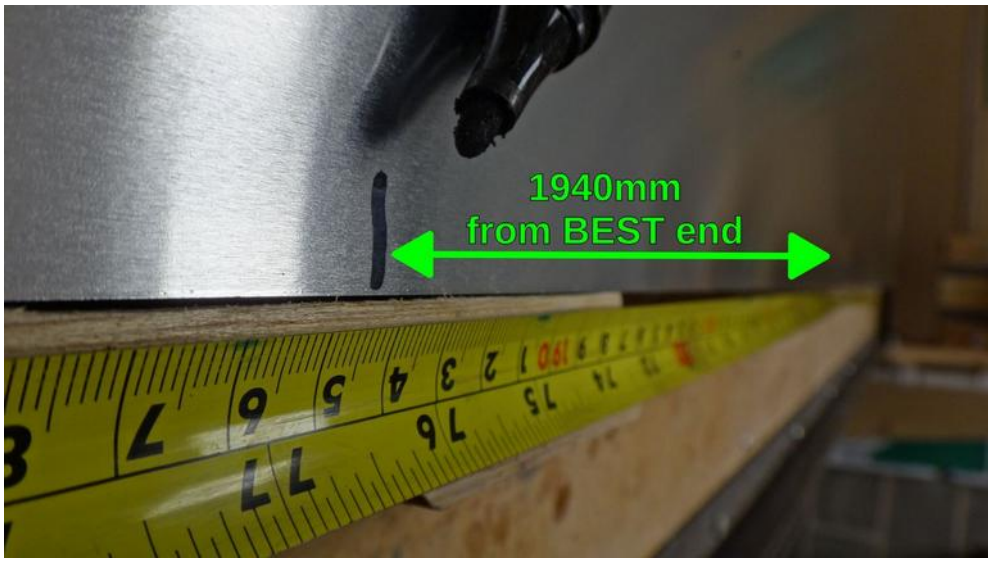
Lay the selected aluminium sheet (i.e. the worst of the two sheets) onto the work surface.

Having selected the worst sheet for the rear outer roof, now select that sheet's **worst** end. Position the dual-purpose template close to that worst end. This is the end which will be cut off and discarded. Orient the template correctly. (Red text in image.)

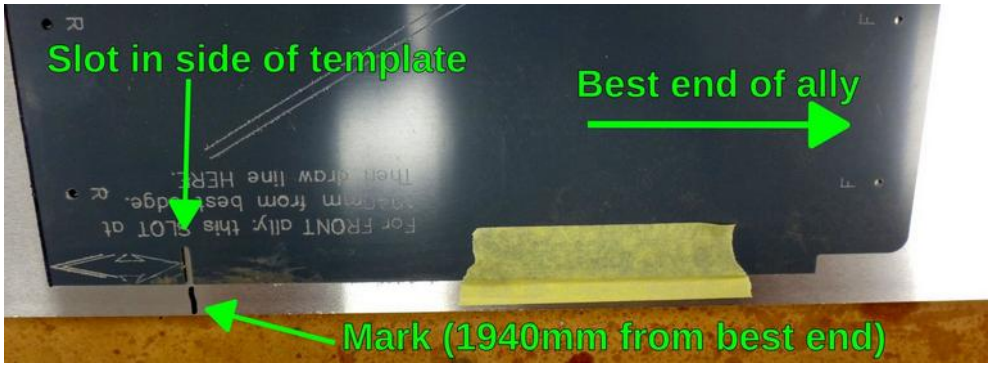


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To correctly position the template, measure from the **best** end of the sheet and make a small mark at the side of the sheet exactly 1940mm from the **best** end. Repeat on the opposite side of the sheet. Do **not** mark in the centre of the sheet: only mark near the edges. The marks must be perpendicular across the sheet - so if the best end has been cut slightly askew, make allowances when measuring. (Image.)



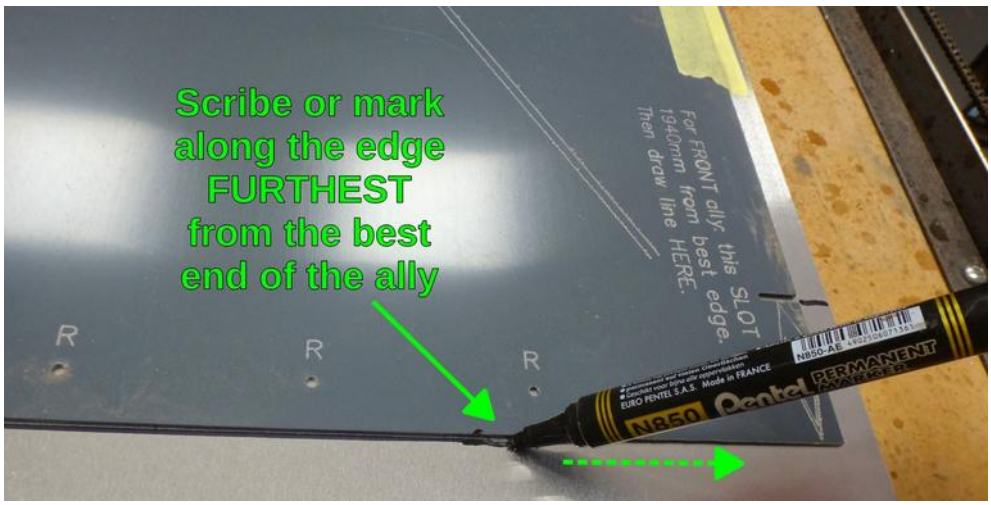
Align the template with the marks, as shown. Keep it oriented correctly. (Image.)



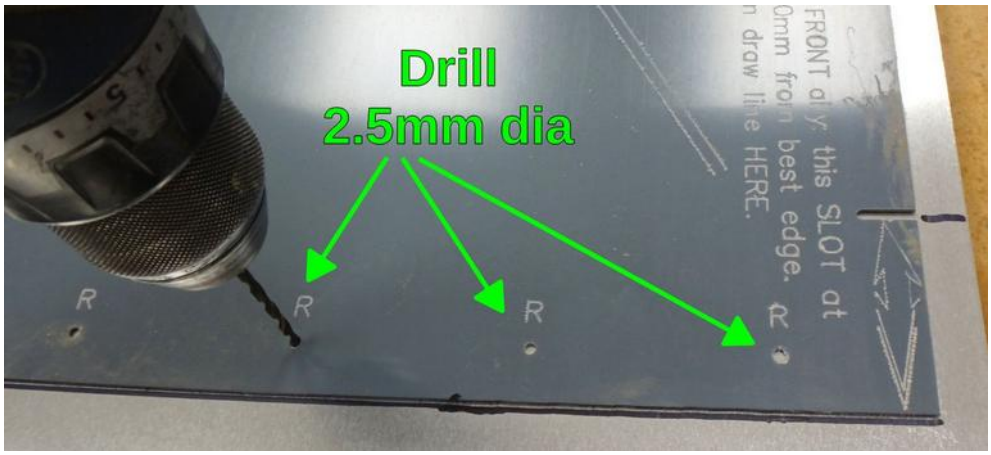
Ensure the template is central across the aluminium (i.e. same gap each side). Ensure it is perpendicular to the long sides. Tape the template into place with masking-tape. (Image above.)

Scribe or mark along the edge of the template. *(Double-check: this scribe mark should be approximately 2000mm from the best end of the aluminium, when the template has been correctly positioned.)* (Image.)

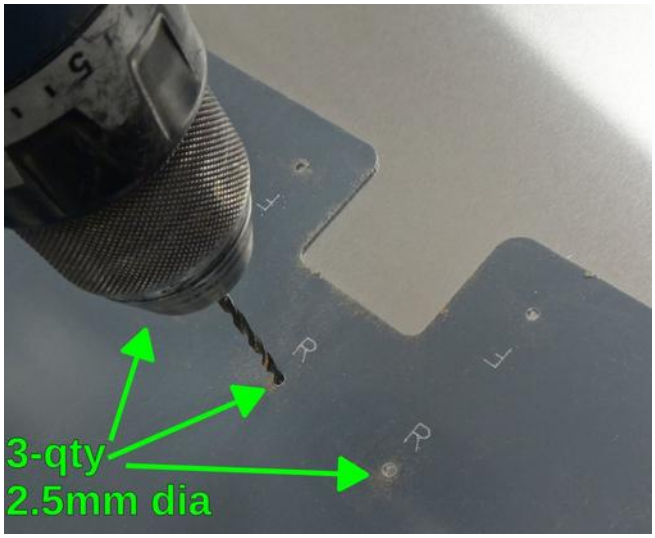
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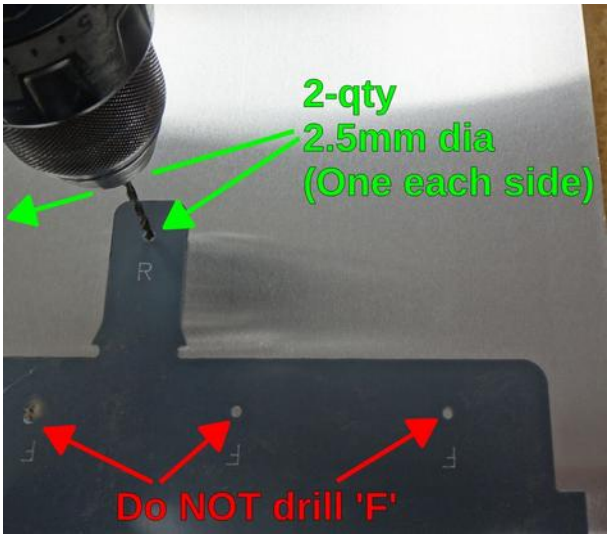


Drill a 2.5mm dia hole through the aluminium at every hole in the template marked with “R”. Do **not** drill holes marked with “F”. Include all the holes along the scribed edge, the three holes near the centre, and the two holes in the ‘tangs’ of the template. (Image.)



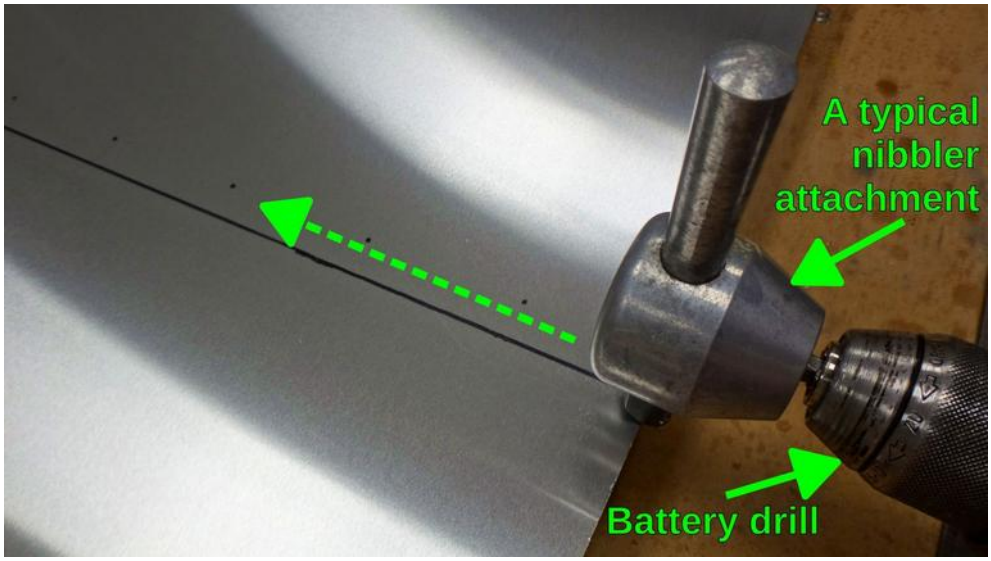
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Remove the template and save for later. Use a nibbler to cut across the aluminium sheet at the scribed mark. A nibbler cuts neatly without distorting the sheet. Do **not** attempt to cut with snips: the result will be untidy and the sheet will be distorted. There is no need to allow for the kerf of the cutter*, so simply guide it directly along the scribe mark. (Image.)



*Assuming the nibbler has a small cutter - no more than 3mm kerf.

Discard the cut-off end.

The rear-outer-roof is now ready for fitting to the rear of the trailer.

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Build Stage: Fit Rear Outer Roof

Fitting is divided into two adhesive ‘zones’. The entire build-stage must be completed in one continuous session, without allowing time for the adhesive to cure in between zones.

It is strongly advised to dry-fit the entire process before committing to adhesive.

Safety

The part-fitted roof will have exposed edges and corners of aluminium until the OUTER-SIDE-SKINs are fitted (in a later stage). Take great care when moving around the trailer to avoid injury. Keep spectators, children and animals away from the part-built trailer.

To prevent injury, an assistant should augment the props which are occasionally used during this build-stage. Their job being to hold the props in place, to prevent the aluminium falling onto the builder during adhesive application.

There will be sharp exposed edges and corners during this build stage. Fit high-visibility covers to prevent injury. Appropriate PPE, including eye and face protection, will be required.

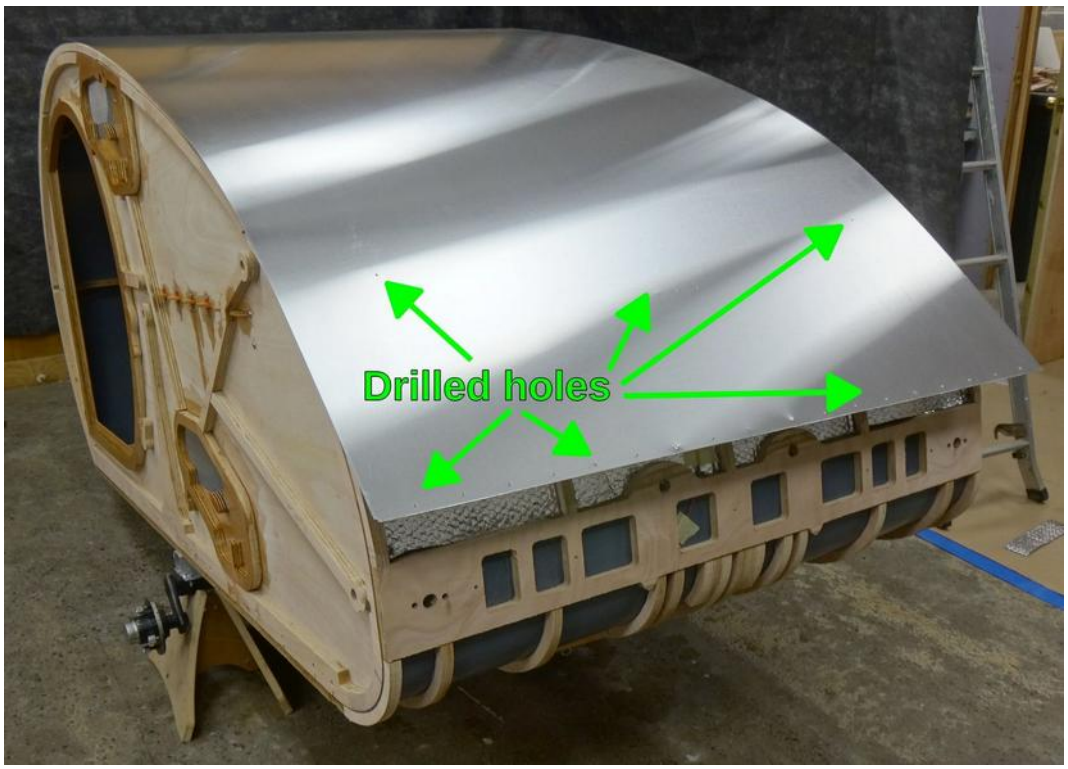
Preparation

Tilt the trailer forwards, so that the nose of the trailer is touching the ground.

Wear vinyl gloves to avoid leaving marks on the aluminium.

Lay the rear-outer-roof centrally atop the trailer. The drilled end should be towards the rear. (Image.)

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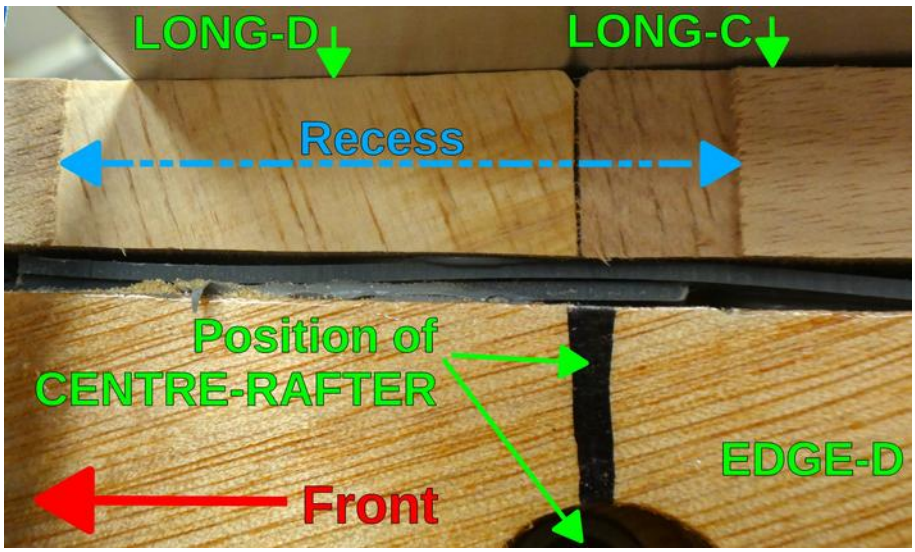
Apart from the usual (tools, adhesive, etc), also have the following items close to hand:

- 2-qty 2” G-clamps.
- 2-qty JOINT-JIGs and 2-qty REAR-JIGs and 3-qty UNDER-JIGs.
- 14-qty C-JIGs.
- The LIGHT-JIG and 5-qty 40mm woodscrews.
- 18-qty #8 x 5/8” self-tapping s/s screws and a driver.
- 3-qty M5 washers and 3-qty #6 x 5/8” woodscrews.
- A lightweight prop approx 1.5m long.
- A crate or box approx 300mm tall.

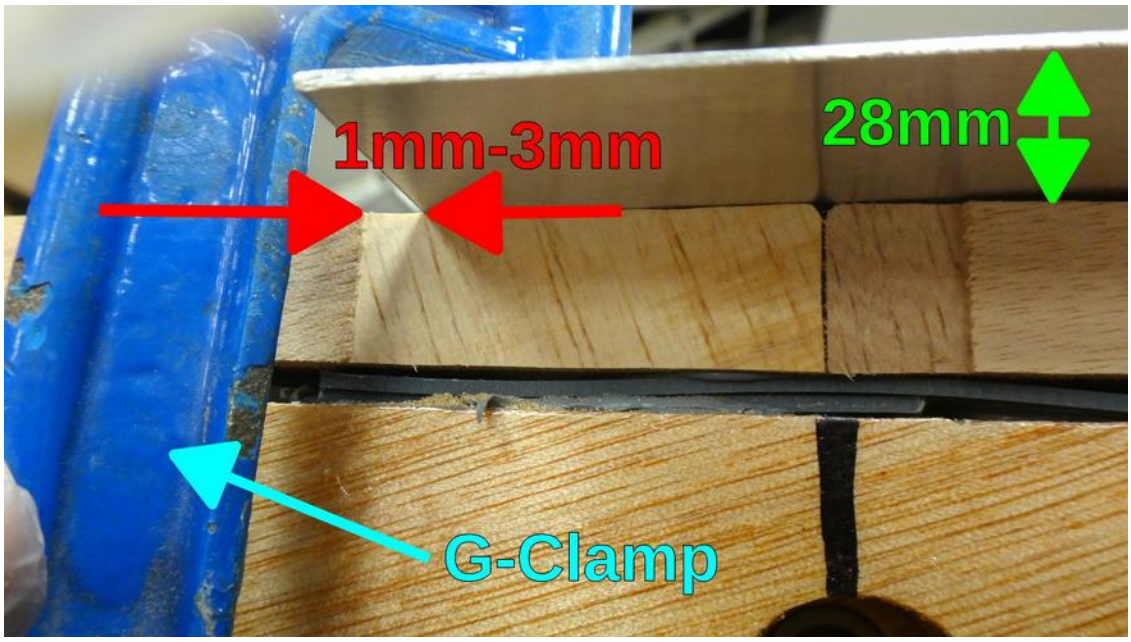
Align and Clamp

Stand at one side of the trailer. Identify the recess where LONG-C and LONG-D meet. (Image)

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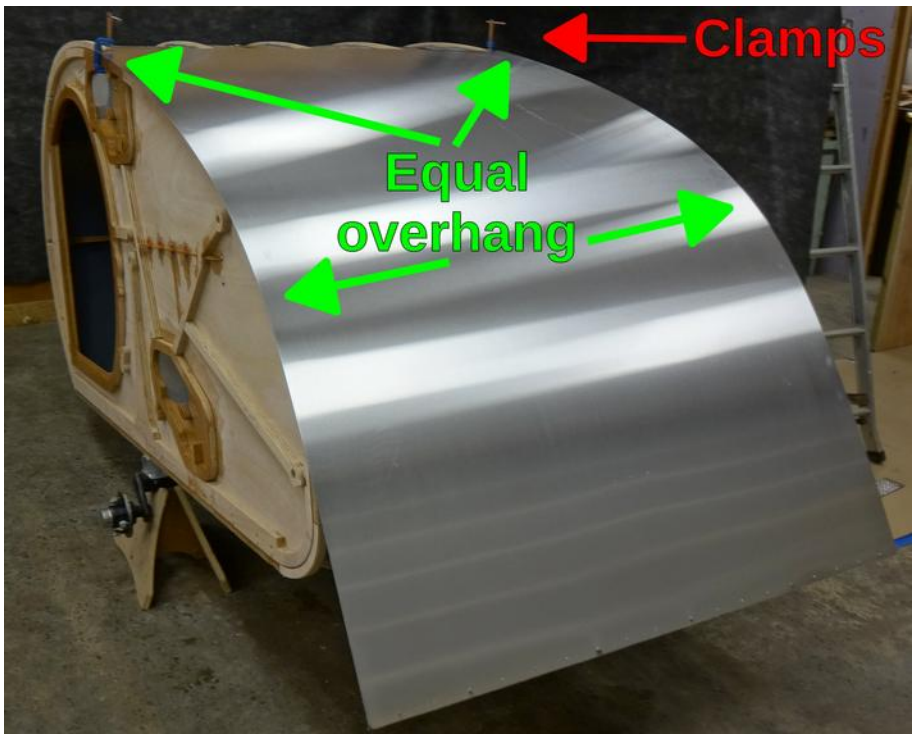


Slowly slide the aluminium rearwards (do not let it slide off into the ground) until its frontmost edge is 1mm-3mm **behind** the front of the recess. Adjust sideways so that there is approximately 28mm overhang. Clamp **gently but securely** in place. Do not distort or crush the aluminium. (Image.)



Adjust until the overhang is equal on both sides and is parallel along the length of the trailer. Then gently clamp the other side. (Image.)

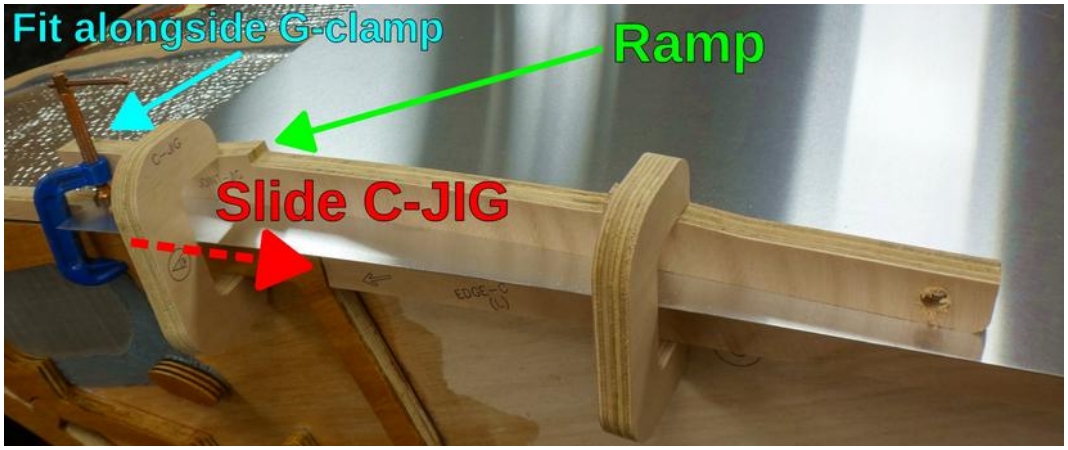
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Equal overhang **at the rear** is doubly important, to ensure the pre-drilled holes are correctly placed.

Fit a JOINT-JIG beside and behind the clamp on the left side. Orient it correctly: a mark aligns to the joint between EDGE-C / EDGE-D (**not** LONG-C / LONG-D) and an arrow points forwards.

Clamp the JOINT-JIG into place using two C-JIGs. The C-JIGs can be tightened by sliding them up the ramps machined into the backs of the JOINT-JIG. Repeat on the other side. (Image.)



Tighten the C-JIGs very firmly, on both sides of the trailer, clamping the aluminium in place.

Tip: a C-JIG can be firmly tightened by pulling alternately on its top and bottom to ‘walk’ it up the ramp. Take care to prevent the JOINT-JIG from sliding.

First Adhesive Zone

Check that the aluminium remains correctly positioned and aligned. Then prop up the rear edge of the aluminium using a lightweight rod 1.5m long. (Image.) **Cover the sharp corners and edges.**

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Take great care to avoid the aluminium edges when moving around the trailer.

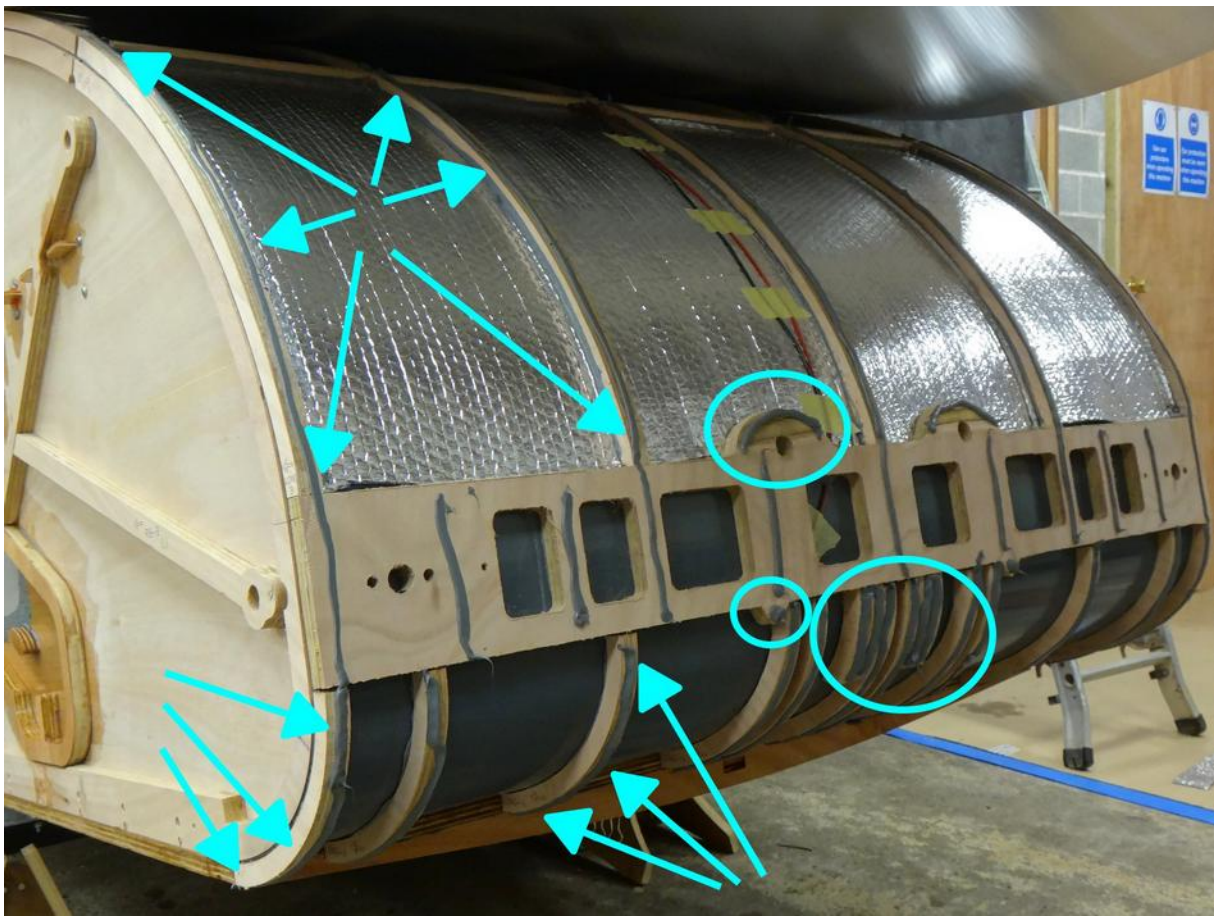
Fit safety covers on any exposed sharp edges and corners. Wear appropriate PPE

Apply adhesive as follows:

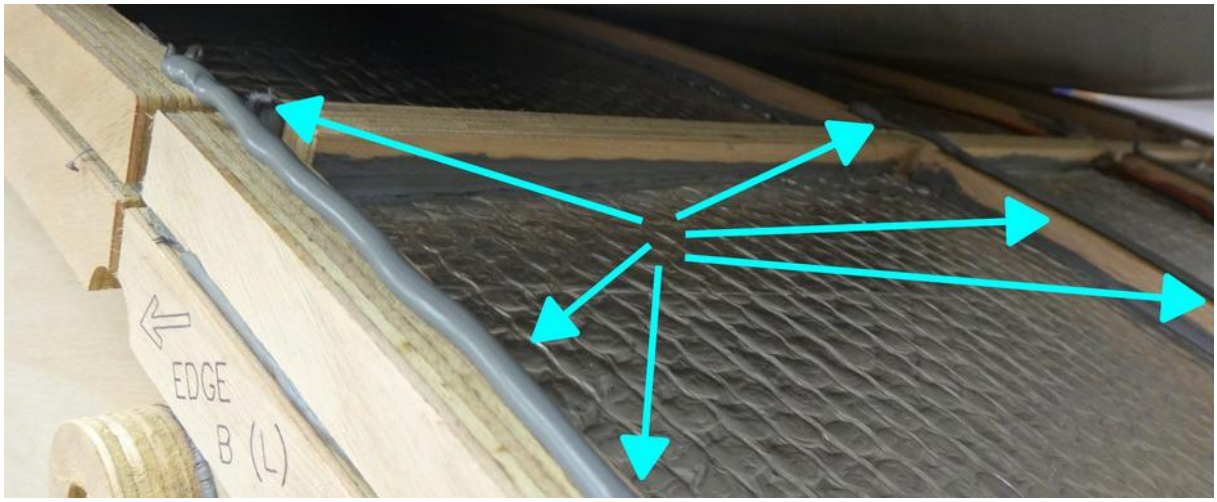
- **Moderate** beads of adhesive on cut edges of both LONG-Bs.
- **Heavy** beads of adhesive on cut edges of all LONG-BBs.
- Heavy beads of adhesive around the tops of the curved protrusions on the LIGHT-BAR.
- Very heavy blobs of adhesive on the small protrusions at the bottom of the LIGHT-BAR.
- Moderate vertical stripes of adhesive on the rest of the LIGHT-BAR, keeping well clear of the holes in the LIGHT-BAR.
- Heavy beads of adhesive along all the LONG-A and FLA parts.
- A moderate bead of adhesive along the very rear edge of the underside of the floor, but well clear of the slots in the floor.

Keep the adhesive **well clear** of the slots between pairs of LONG-A parts where the wiring-tool was previously tested. (Images.)

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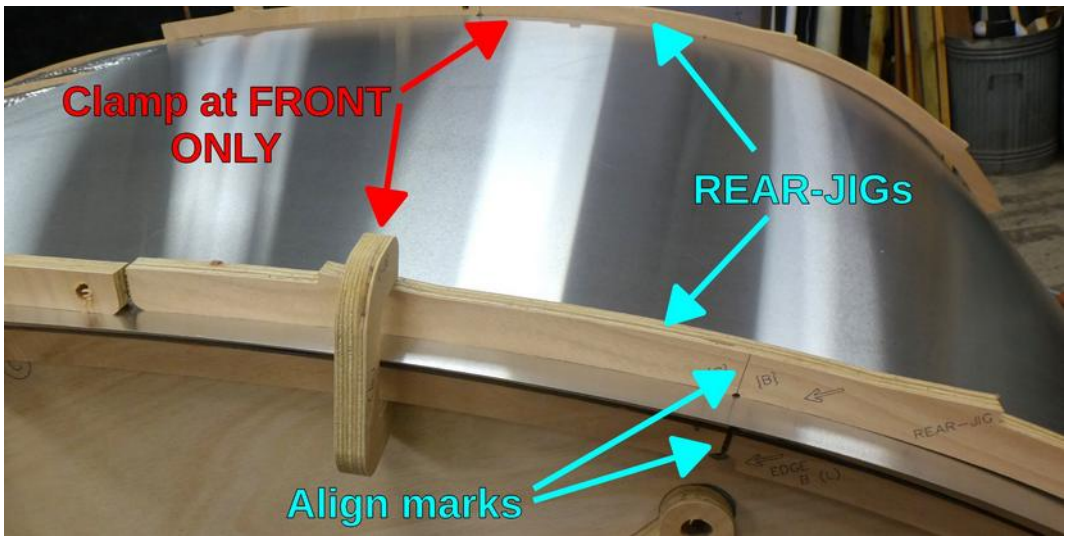


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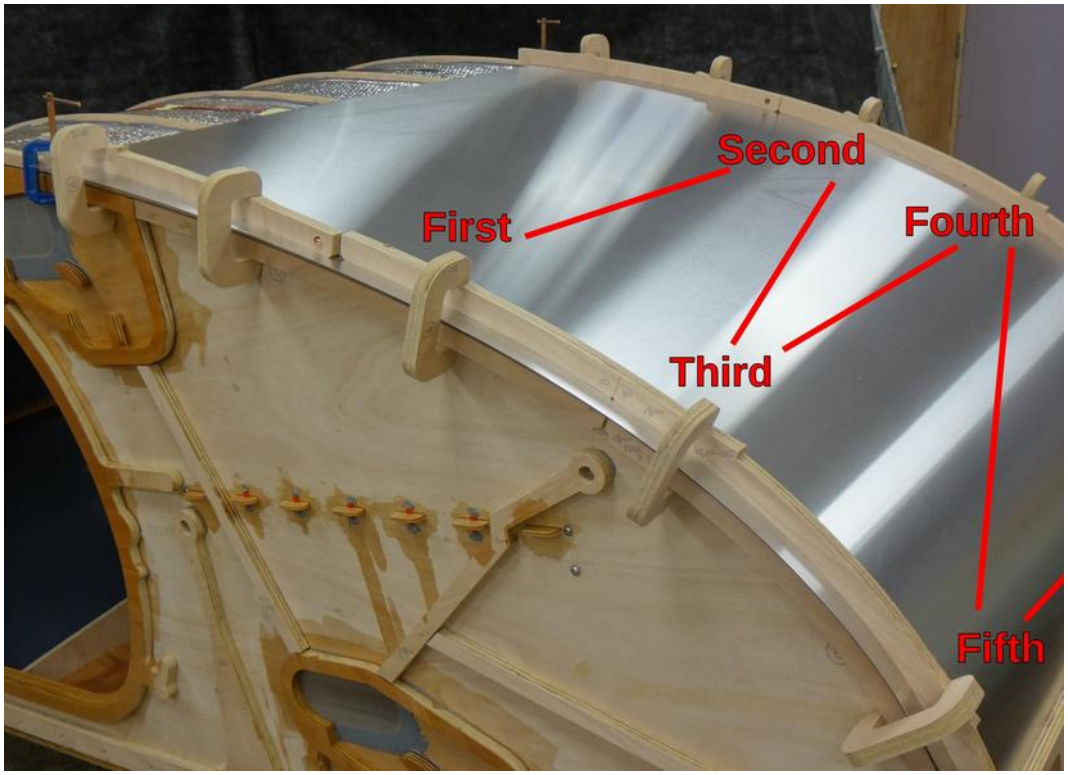


Remove the lightweight prop and gently lower the aluminium into contact with the adhesive. Lay a REAR-JIG onto the left side of the trailer and align its mark to the joint between EDGE-B / EDGE-C. Clamp it tightly in place with **one** C-JIG **at its frontmost** location **only**. Repeat on the other side. (Image.)

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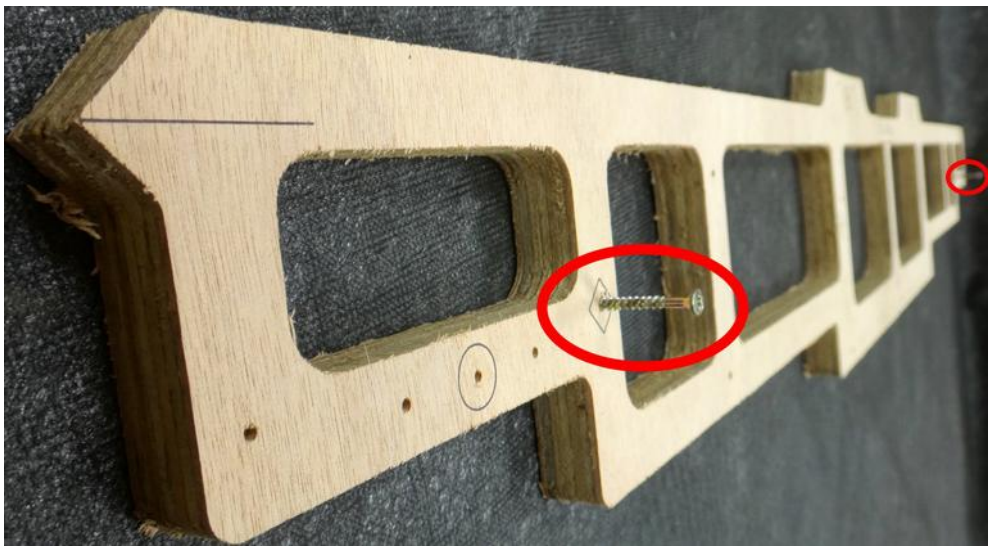


Then fit the remaining C-JIG clamps one-at-a-time on **alternate sides** of the trailer. Tighten each C-JIG very firmly before moving on to the next C-JIG. A total of three C-JIG clamps should be fitted to each REAR-JIG. (Image.)



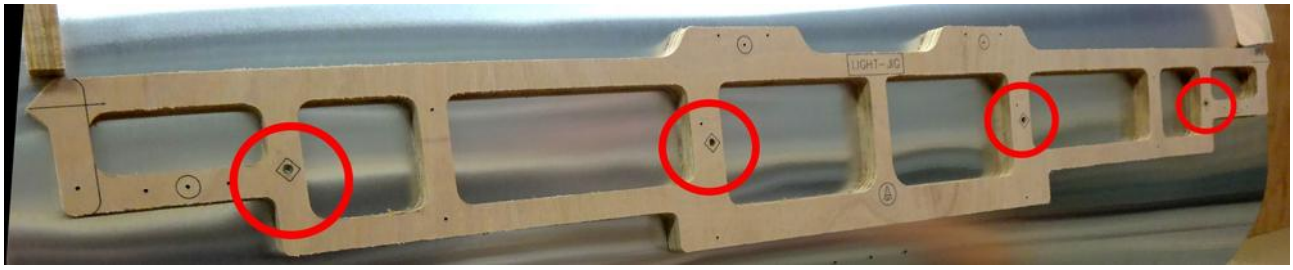
Fit 2-qty 40mm woodscrews into the LIGHT-JIG. One screw goes into the hole marked with a **diamond** at each end of the LIGHT-JIG. Ignore, for now, the other holes with diamonds. (Image.)

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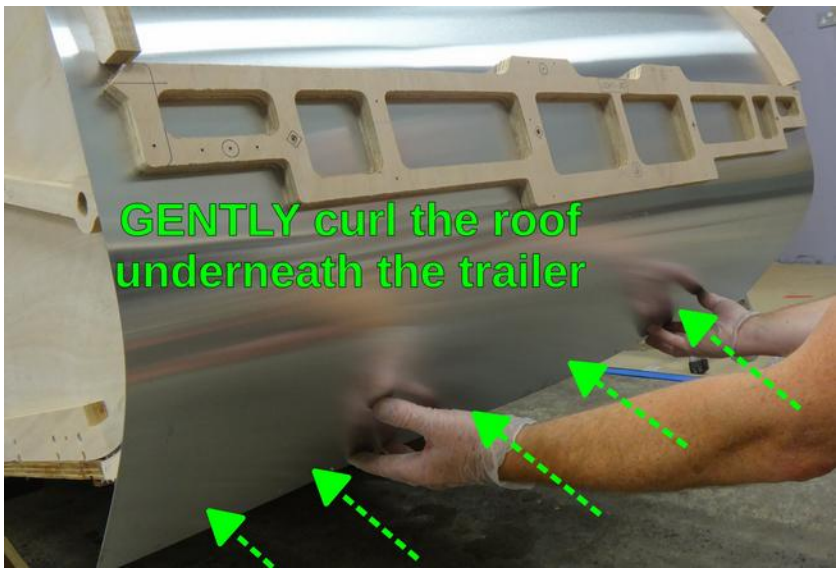
Align the LIGHT-JIG correct way up (text upright) across the rear of the trailer just below the rearmost tips of the REAR-JIGs. Engage the screw-tips into the two matching holes already drilled in the aluminium.

Keeping the screws engaged, press downwards and forwards on the LIGHT-JIG to lay the aluminium firmly against the LIGHT-BAR at rear of the trailer. Drive the screws fully home to clamp the LIGHT-JIG into place. Insert another 40mm woodscrew into each of the two remaining holes marked with a diamond. Drive them tightly home also. (Image.)



Using both hands, with fingers spread wide, gently and repeatedly press the remaining aluminium forwards and underneath the rear of the trailer, until it accepts a slight permanent curl.

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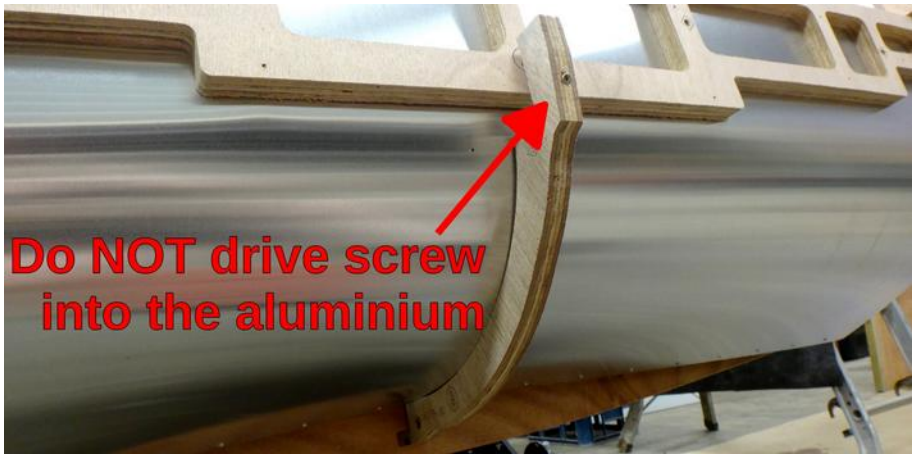


Holding the aluminium in place with one hand, use the other hand to insert the tip of an UNDER-JIG into the fuse-holder hole in the middle of the WIRING-B part. (Image.)

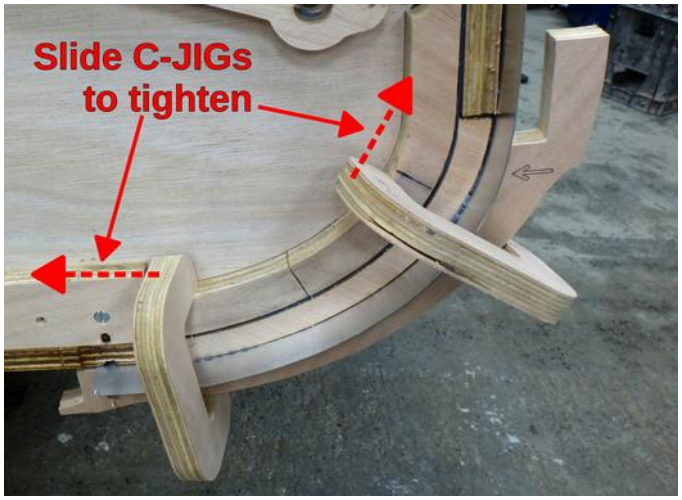


Rotate the UNDER-JIG upwards until its full length is in contact with the aluminium. Use the final 40mm woodscrew - driven 45-degrees skew - to **lightly** fasten the top of the UNDER-JIG to the LIGHT-JIG. Take care that the screw does not pass through into the aluminium. It does not need to be driven fully home. (Image.)

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Working at the left rear corner of the trailer, clamp the aluminium in place against the outermost LONG-A part using one UNDER-JIG and two C-JIG clamps. (Images.)





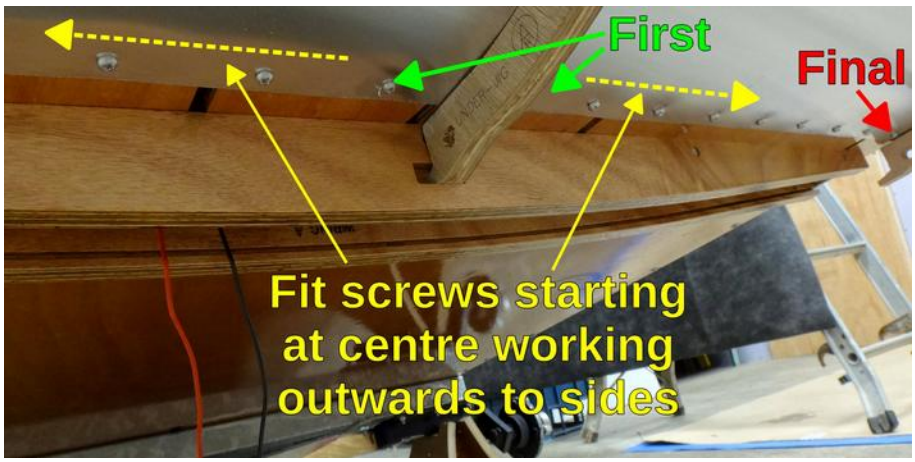
Repeat at the right rear corner.

Continue immediately to underfloor fastening.

Underfloor Fastening

Working underneath the rear of the trailer, fasten the aluminium sheet to the underside of the floor with 18-qty #8 x 5/8” s/s screws. Start at the central pair of holes pre-drilled in the aluminium and work outwards towards the edge of the aluminium on each side. There are **not** any matching pilot holes in the timber. (Image.)

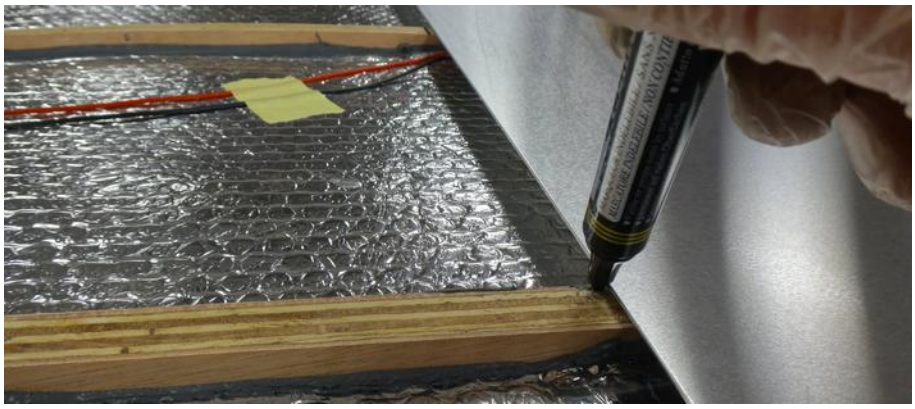
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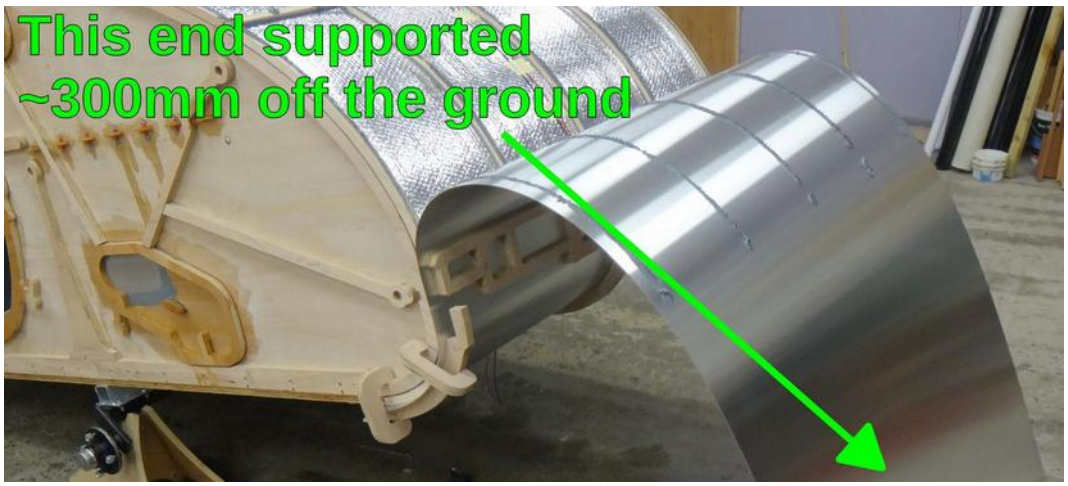
Continue immediately to the second adhesive zone.

Second Adhesive Zone

Mark the extent of the front edge of the aluminium roof. (Image.)

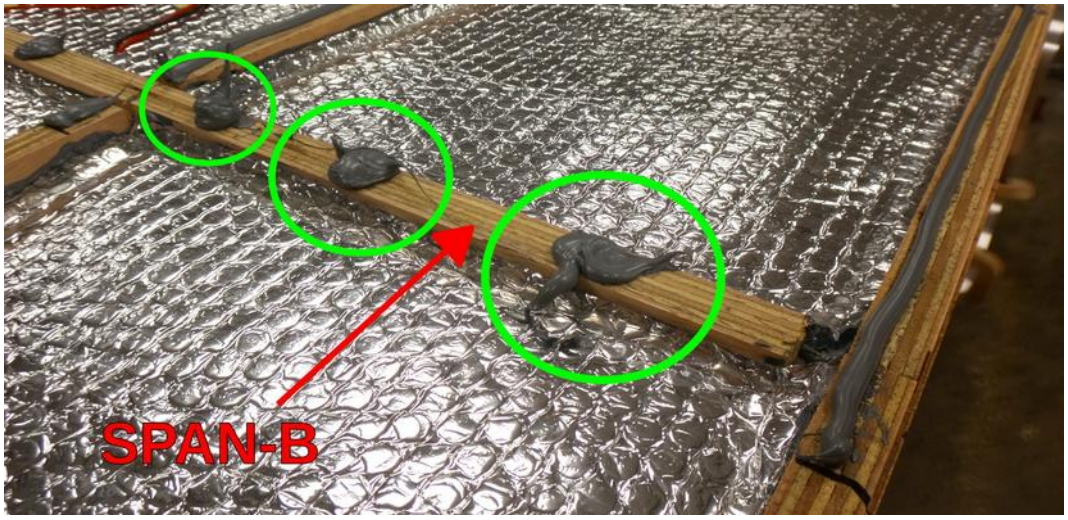


Remove the G-clamps, the JOINT-JIGs, and the REAR-JIGs. Very gently curl the aluminium backwards and rest it on a crate or box approx 300mm high. Do **not** allow it to kink. (Image.)



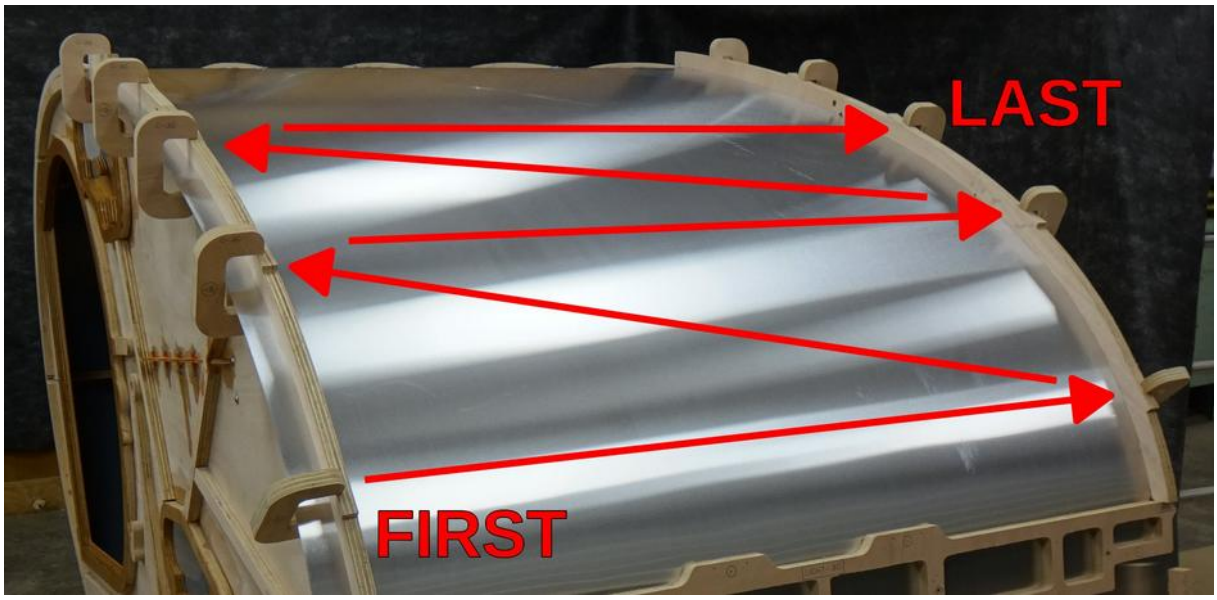
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Apply adhesive to the longerons as far as the marks. Moderate beads on the outer longerons. Heavy beads on the inner longerons. Apply **extremely heavy** blobs of adhesive onto the SPAN-B part - heavy enough so that the aluminium is guaranteed to bed well into them. Three blobs between each pair of longerons. (Image.)



Carefully curl the aluminium forwards onto the adhesive.

Refit the REAR-JIGs. **Apply the C-JIG clamps in the order shown**. Tighten each C-JIG clamp **very firmly** before moving on to the next clamp. (Image.)



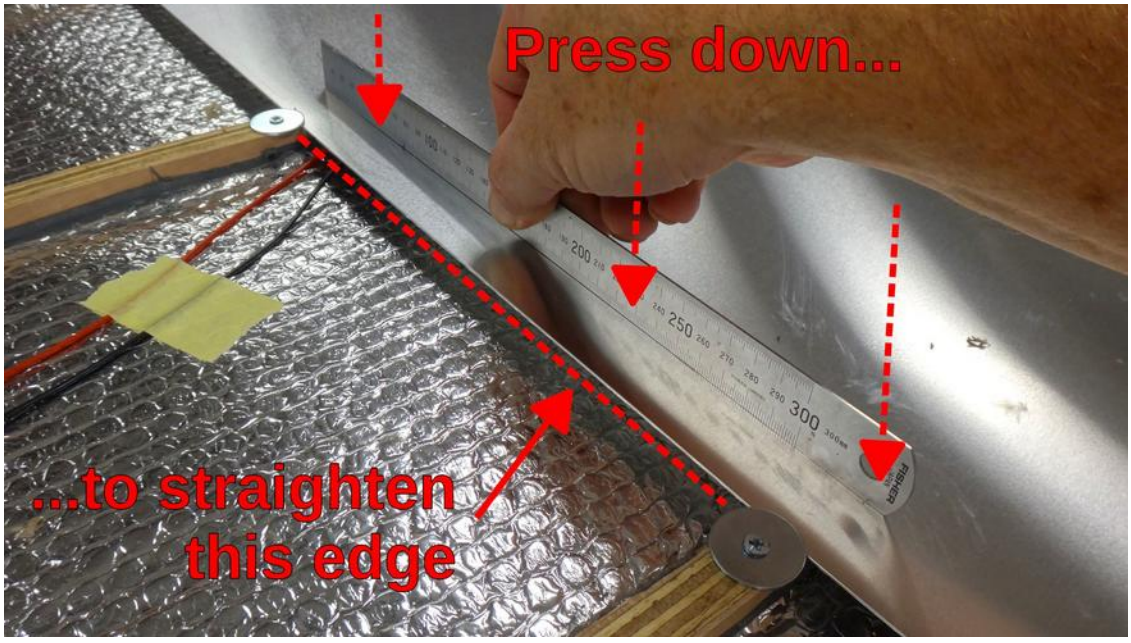
I.e. work forwards, one jig at a time on alternate sides. It is **vital** that each clamp is full tightened before the next is begun. Refit the JOINT-JIGs and clamp them in the same way.

At the front edge of the aluminium, use M5 penny washers and #6 x 5/8” woodscrews to **gently** nip the aluminium down against the three longerons across the middle of the trailer. (Image.)

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Finally, lay a straight-edge across one pair of longerons. Press the straight-edge down to bed the aluminium into the blobs on the SPAN-B part. (Image.)



Sight along the full width of the edge of the aluminium, to confirm it is straight.

Cure

Leave to cure at least 20 hours before removing any jigs.

This is another opportunity to repeat the ‘Additional Bonda-Seal’ build stage.

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Build Stage: Clean and Trim Rear Outer Roof

Drill for Lights

Use a 3mm dia drill. Drive the drill into each one of the 22-qty holes pre-drilled in the LIGHT-JIG that do not already have screws in them. Drive the drill **only just far enough** to cut fully through the 0.9mm aluminium. Do **not** drill into the timber or any other structure behind.

Remove Jigs

Remove all the C-JIGs, the REAR-JIGs, the JOINT-JIGs, and the UNDER-JIGs.

Remove the LIGHT-JIG. Tip: To avoid scratching the aluminium with its screw tips: remove the two outer screws completely, then remove one of the inner screws completely, then unscrew the final screw and pull the LIGHT-JIG cleanly away from the surface without letting it rotate or fall.

Remove the 3-qty woodscrews and M5 penny washers on the top of the trailer.

Clean Away Oozed Adhesive

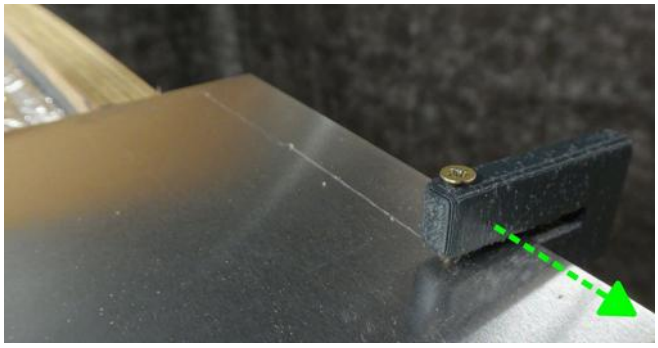
Use the blunt corner of a scraper to cut through and remove any oozes of adhesive. (Image.)



Mark Aluminium for Trimming

Use the TRIM-GUIDE to scratch a line all around the outside face of the aluminium, each side. Fit a 3.5mm dia ForgeFast woodscrew into the relevant hole, to act as a scribe point. (Images.)

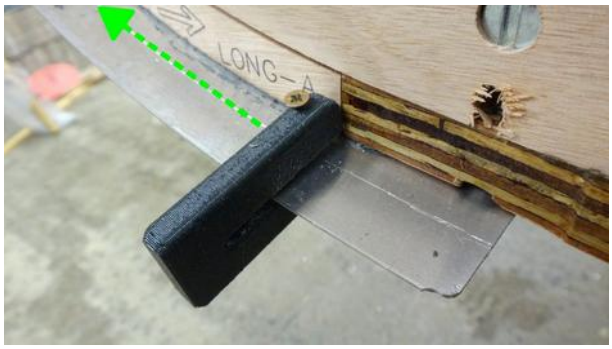




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Where the aluminium is ‘upside-down’ at the rear, mark the other face also. (Images.)





Using the marks as a guide-line, cut the excess aluminium away with the nibbler, each side of the trailer, to leave an overhang of approx 8mm-11mm. (Image.)



Minor deviations from the line are not critical. (Image.)



Warning

The cut sides of the roof are sharp. Cover the edges and take great care when working around the trailer during the next build-stages.

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Build Stage: Prepare Front Outer Roof

The front outer roof is cut from one 2.5m x 1.25m x 0.9mm aluminium sheet. At least one very good end (short side) is required, otherwise fitting will be impossible. A cutting/drilling template is provided.

The front outer roof is cut from one 2.5m x 1.25m x 0.9mm aluminium sheet. At least one very good end (short side) is required, otherwise fitting will be impossible. The part can either be machined to the drawings, or it can be cut using hand-tools and a template. The template method is preferred, as the part will then not be oily from the machining process. A cutting/drilling template is created when the REAR-INNER-ROOF plastic is machined.

Do Not Pre-Trim

At least one end of the sheet, as supplied cut from the metalworks, must already be perfectly flat and straight without kinks or dints. If it is not, source another sheet of aluminium.

Do not attempt to trim one end to make the perfect edge. The resulting nibbler marks would render the sheet impossible to fit.

Handling and Preparation

See notes for the rear outer roof.

Mark Up and Drill

Lay the aluminium sheet onto a large, smooth, clean non-abrasive work surface.

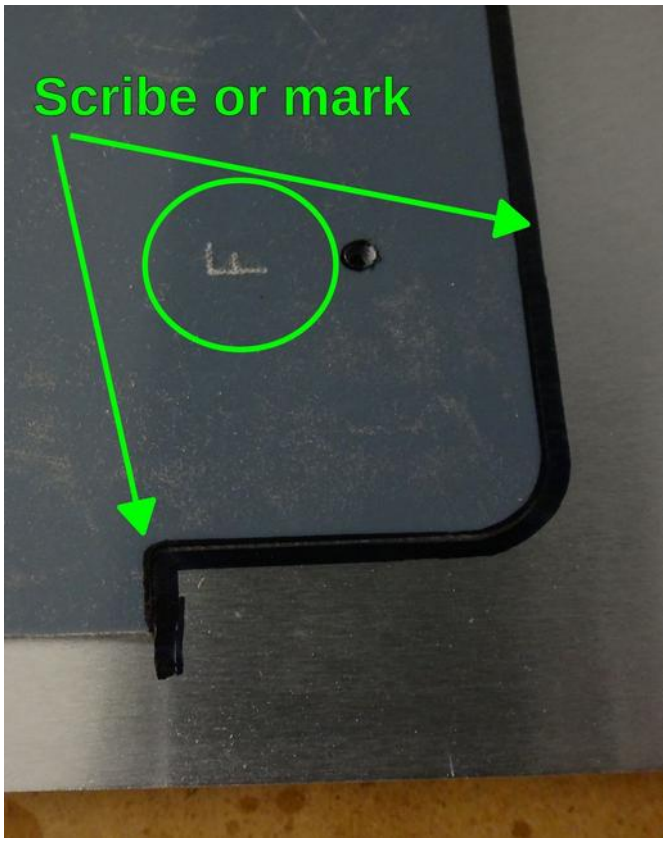
Select the sheet's **worst** end. Position the dual-purpose template close to that worst end. This is the end which will be cut off and discarded.

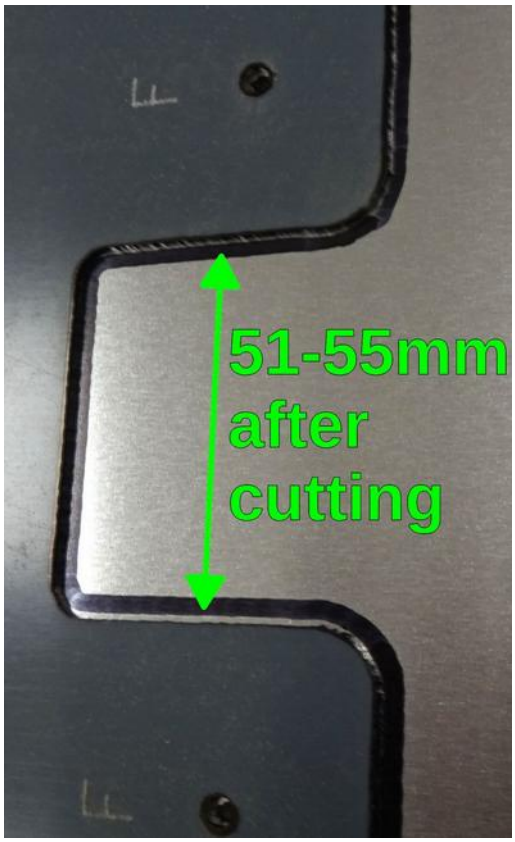
To correctly position the template, measure from the **best** end of the sheet and make a small mark at the side of the sheet exactly 1940mm from the **best** end. Repeat on the opposite side of the sheet. Align the slots in the template with the marks. Ensure the template is central across the aluminium. Tape down the template. (Image.)

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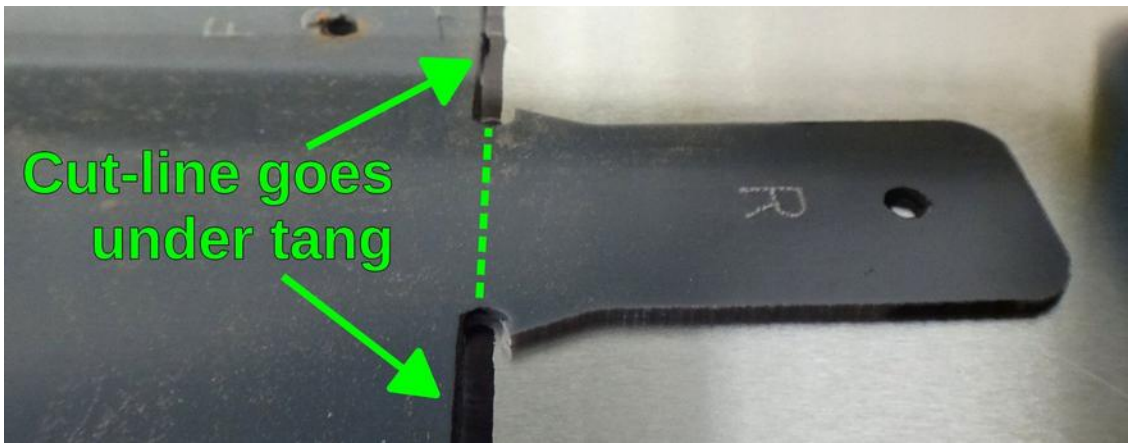
Scribe or mark along the edge of the template. *(Double-check: this scribe mark should be approximately 2245mm from the best end of the aluminium, when the template has been correctly positioned.)* (Image.)



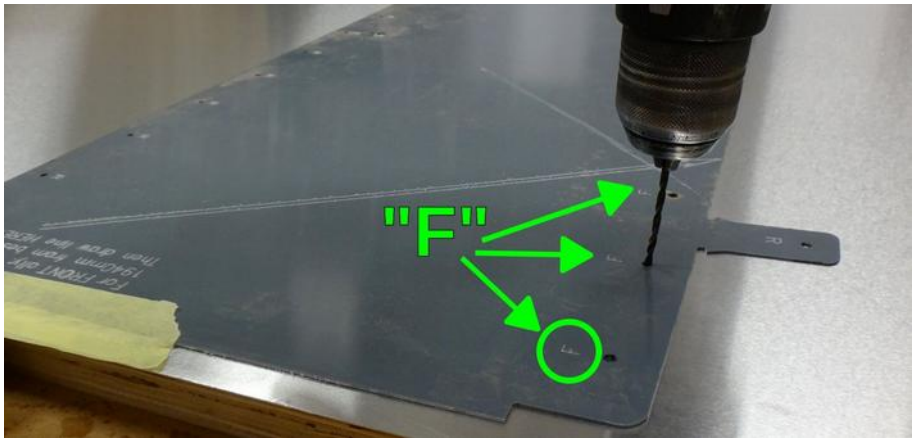


The scribe-mark continues straight ‘under’ the two tangs - not around them. (Image.)

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Drill a 2.5mm dia hole through the aluminium at every hole in the template marked with “F”. Do **not** drill holes marked with “R”. All the “F” holes are close to the scribed edge. (Image.)



Remove the template. Cut across the aluminium sheet at the scribed mark. See tips, below.

Tip #1: initially, cut straight across the sheet, skipping the cut-aways at centre and edges. There is no need to allow for the kerf thickness of the cutter for this cut, so simply guide it along the scribe mark. Then form the three cut-aways afterwards and, for these, do make allowance for the kerf. The central cut-away, in particular, should be 51mm to 55mm wide, when finished. So steer the nibbler appropriately.

Tip #2: The top edge of the central cut-away is difficult to reach with a nibbler. An alternate method here is:

- Nibble both sides of the central cut-away, at the correct width.
- Score the aluminium between the tips of the two nibbled cuts with a heavy-duty knife.
- Bend the aluminium away from the cut (i.e. downwards) about 10 degrees. Then bend up-and-down a small amount each way until the aluminium fatigues and snaps across the score-mark.
- There is no need to form the curves in the corners accurately: ideally they would be radiused, but the sheet will work fine even if they are angular.

Discard the cut-off end. Remove any oil deposited on the aluminium during cutting.

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The front-outer-roof is now ready for fitting to the front of the trailer.

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Build Stage: Fit Front Outer Roof

Fitting is divided into two adhesive ‘zones’. The entire build-stage must be completed in one continuous session, without allowing time for the adhesive to cure in between zones.

It is strongly advised to dry-fit the entire process before committing to adhesive.

Safety

To prevent injury, an assistant should augment the props and bulldog clips which are occasionally used during this build-stage. Their job being to hold the aluminium in position, to prevent it falling onto the builder during adhesive application.

There will be sharp exposed edges and corners during this build stage. Fit high-visibility covers to prevent injury. Appropriate PPE, including eye and face protection, will be required.

Preparation

Tilt the trailer rearwards, so that the wiring-box is touching the ground. Prop it firmly in this position using the temporary front leg.

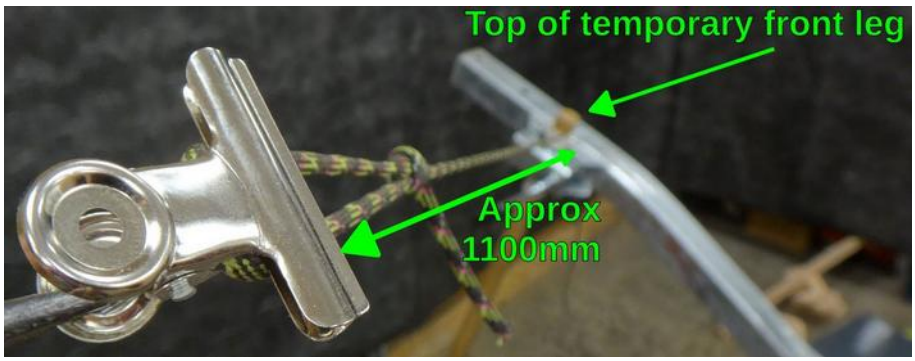
Have the following ready to hand:

- 1-qty 3” or 4” G-clamp.
- A large-faced wooden mallet, or large-faced nitrile hammer, or similar.
- 1-qty L-JIG
- 1-qty JOINT-JIG
- 2-qty FRONT-JIGs and 2-qty TOP-JIGs.
- 12-qty C-JIGs.
- 18-qty #8 x 5/8” self-tapping s/s screws and a driver.
- A couple of metres of string or light cord.
- 2-qty small bulldog clips. Traditional type is best - they grip tighter than fold-back types.
- 38mm professional grade yellow masking tape. **Not** budget tape.

Make a Hold-Back

Tie one of the bulldog clips to a secure screw-eye or hole at the top of the temporary front leg. The cord should measure 1.1m from the top of the leg to the bulldog clip. (Image.) It will be required to hold back the aluminium during the second adhesive zone.

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Clean away any oozed adhesive at the front of the rear-inner-roof which might interfere with fitting the front-outer-roof.

Fitting

Lay the front-outer-roof aluminium atop the trailer. The drilled end should be at the front. (Image.)



Working at the front of the trailer, gently pull the aluminium downwards until the central slot just engages onto the drawbar. Slide the aluminium rearwards on top of the drawbar until it is firmly against the B1 beam part of the pod behind. (Image.)

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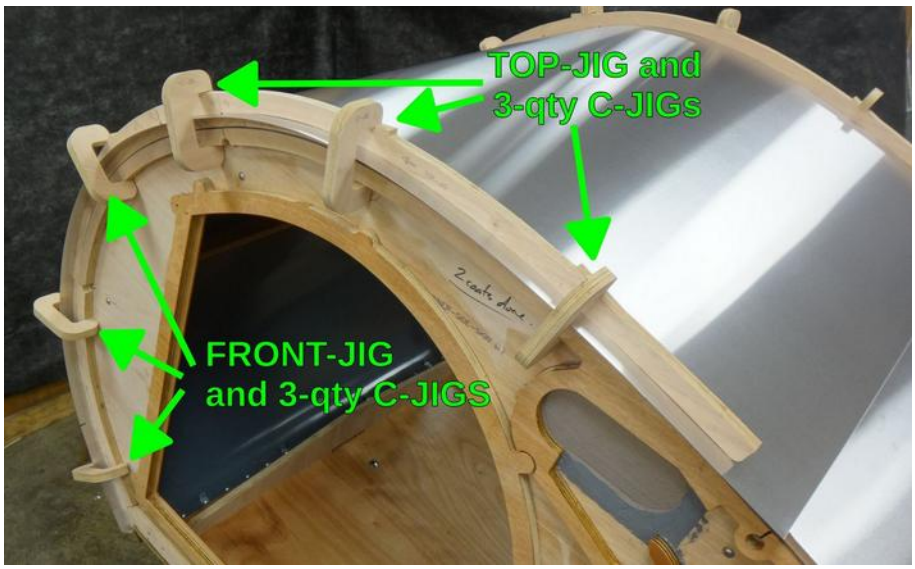


Centralise the cut-away left/right, then clamp **firmly** into place using a L-JIG part and G-clamp. (Image.)



Install a FRONT-JIG on each side of the trailer using 3-qty C-JIGs on each one. Tighten the C-JIGs starting at the front (bottom) of the trailer and working towards the rear (top) of the trailer. Tighten alternately on each side, just as for the rear-inner-roof. Then fit the TOP-JIGs in the same way. All JIGs have guide-marks to align them to matching joints on the side-assemblies. Ensure the FRONT-JIGs are correct way up. (Image.)

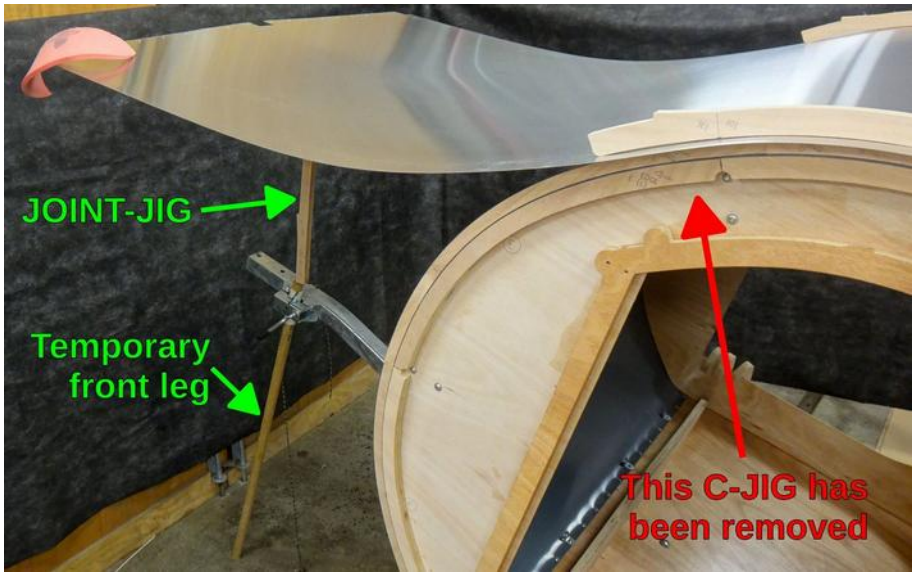
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Tighten the **rearmost two** C-JIGs of each TOP-JIG **very firmly**.

First Adhesive Zone

Remove the front C-JIG from each TOP-JIG. Remove the FRONT-JIGs completely. Remove the G-clamp and L-JIG from the drawbar. Lift up the front of the aluminium and prop it above the nose of the drawbar using the JOINT-JIG. Take care not to allow the metal to kink. (Image.)



Fit safety covers on any exposed sharp edges and corners. Wear appropriate PPE.

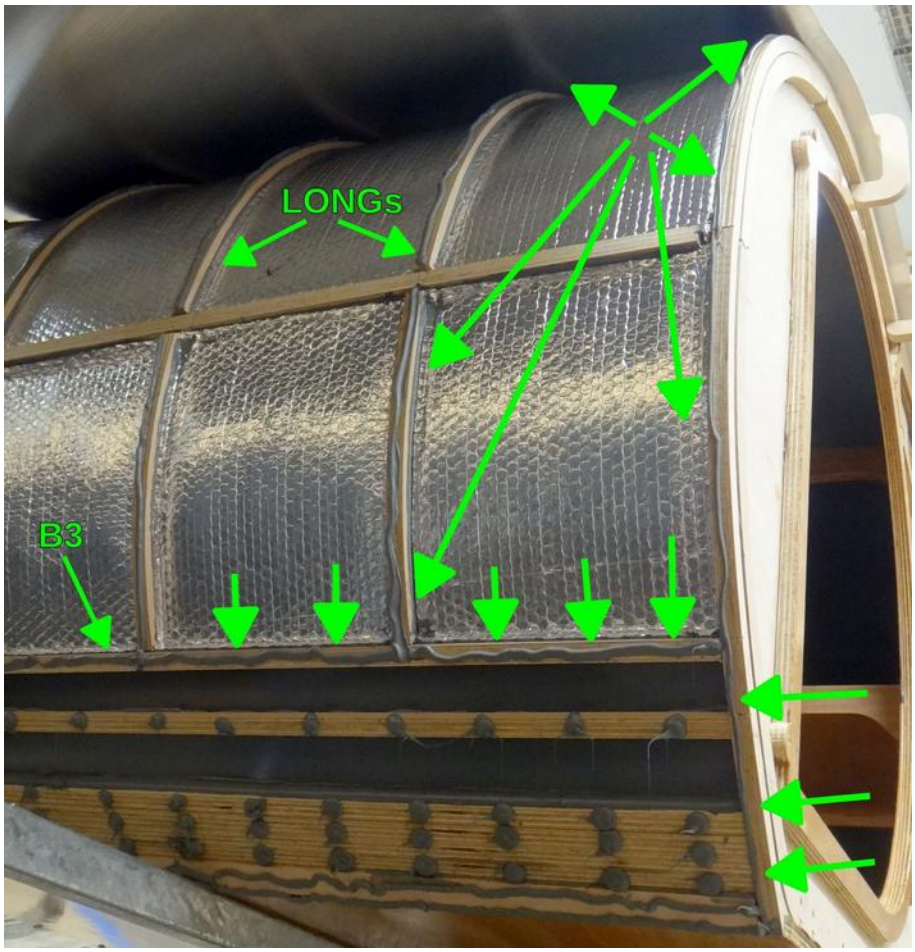
Apply adhesive as follows:

- **Very heavy** beads on the three inner longerons, starting as far up under the aluminium as is possible to reach.
- **Modest** beads on the outer longerons, all the way down to the floor.
- **A very heavy** bead on the B3 part.

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- **A very heavy** bead across the middle of the B1 part.
- **A very heavy** bead completely filling the V-groove below, between the B1 part and the floor.
- **Extremely heavy** blobs of adhesive at intervals across the B2 part and the B1A parts.

See images below for details.



..



Apply a very heavy bead into the corner where the B1 and the drawbar meet. (Image.)

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Carefully remove the JOINT-JIG which is propping up the front of the aluminium. Return the aluminium to its fitted position. Slide the cut-away, as before, rearwards along the drawbar until it makes contact with the adhesive. Clamp in place in the following order:

- Loosely refit the FRONT-JIGs on each side. Loosely fit 3-qty C-JIGs to each one.
- **Tightly** clamp the aluminium against the B1 part at the front using the G-clamp and a L-JIG.
- **Firmly** tighten all the C-JIGs on the FRONT-JIGS.

Do **not** attempt to tool-down or otherwise modify any adhesive which oozes out between the cut-away and the top of the drawbar.

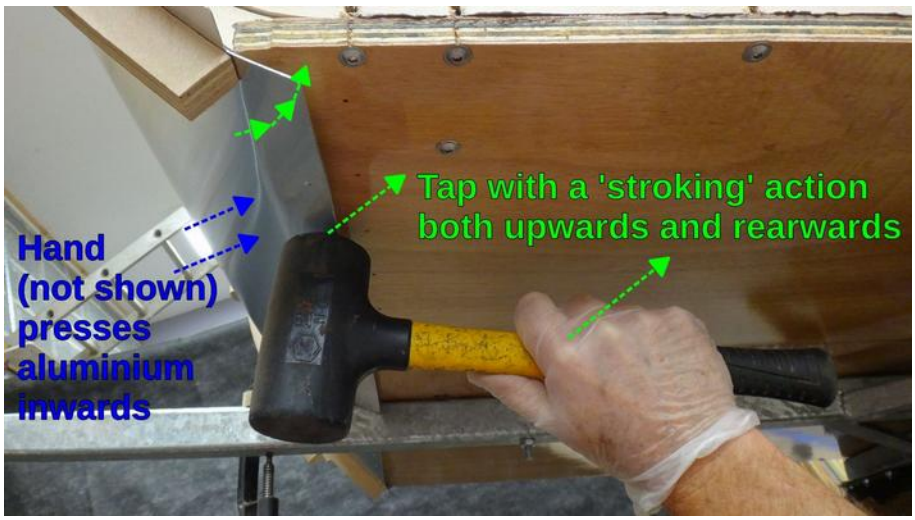
Continue immediately to underfloor fastening.

Underfloor Fastening

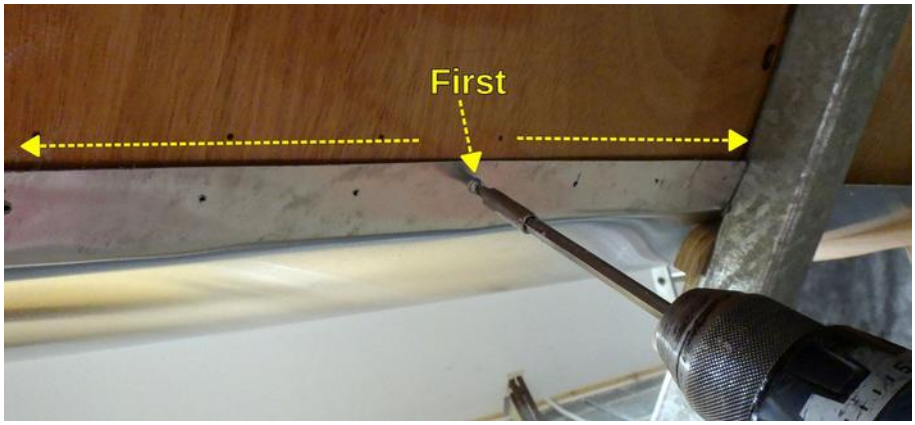
Work underneath the front of the trailer, to the left of the drawbar. Use the flat of one gloved hand to hold the aluminium against the B1 and B1-A parts underneath. Use the mallet in the other hand to dress over the aluminium flat against the floor.

Tip: work along the whole width of aluminium on one side of the drawbar with the mallet. First dress it all half-way, then dress it fully down. This reduces stretching and distortion of the sheet. Apply the mallet **only** to the aluminium which is **underneath** the floor. **Never** tap on the bend itself. Use a stroking action to encourage the aluminium to fold rearwards. (Image.)

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Starting from the **middle** of the left segment of aluminium, fasten tightly down with a #8 x 5/8" screw. From that first screw, work outwards towards the drawbar and outwards towards side of the trailer, fitting the remaining screws. There are **no** pilot holes in the timber. (Image.)



Repeat for the aluminium underneath the right side of the trailer.

Continue immediately to the second adhesive zone.

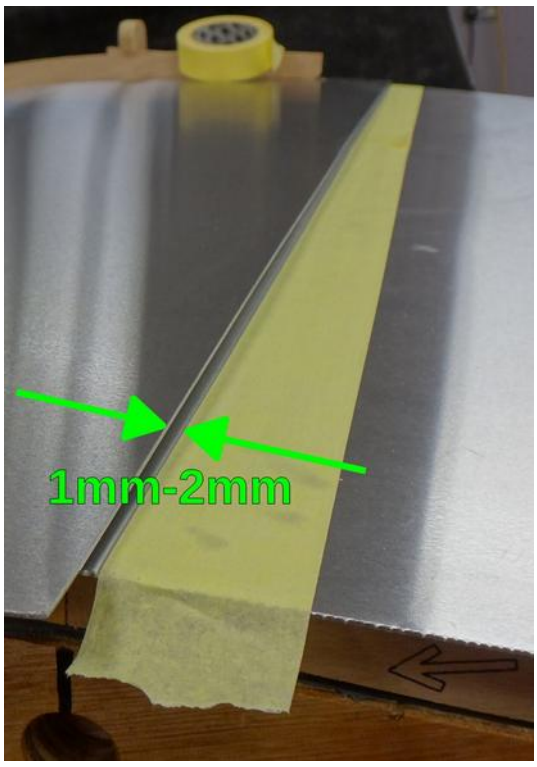
Second Adhesive Zone

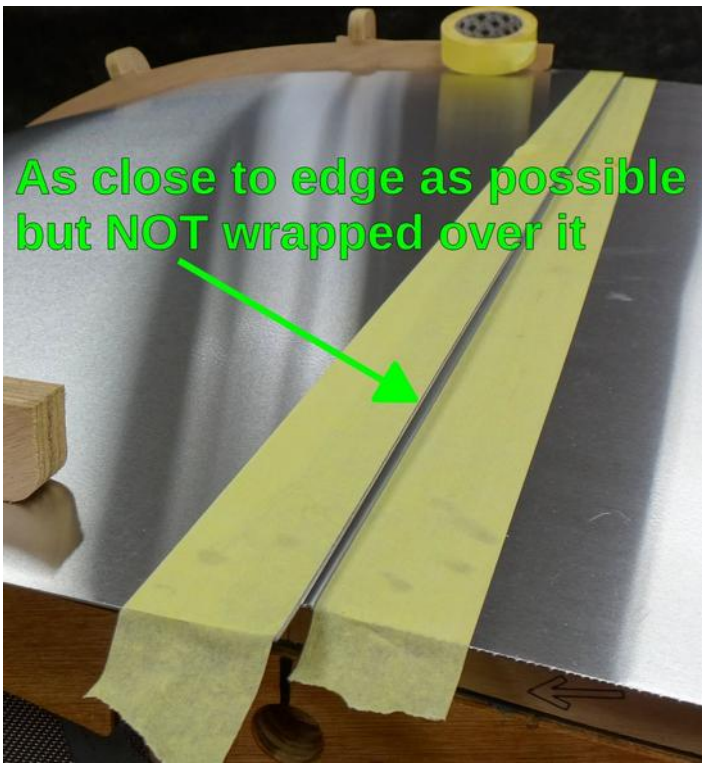
Lower the nose of the trailer to the ground. Tightly clamp the temporary front leg into its holder on the drawbar. The bulldog clip and string should remain attached to the top of the leg.

Leave both FRONT-JIGs and both TOP-JIGs in place, clamped with C-JIGs.

Run a strip of professional grade 38mm masking tape across the **rear**-outer-roof, 1mm or 2mm behind the edge of the **front**-outer-roof. Leave a little overhanging to aid removal later. (Image.)

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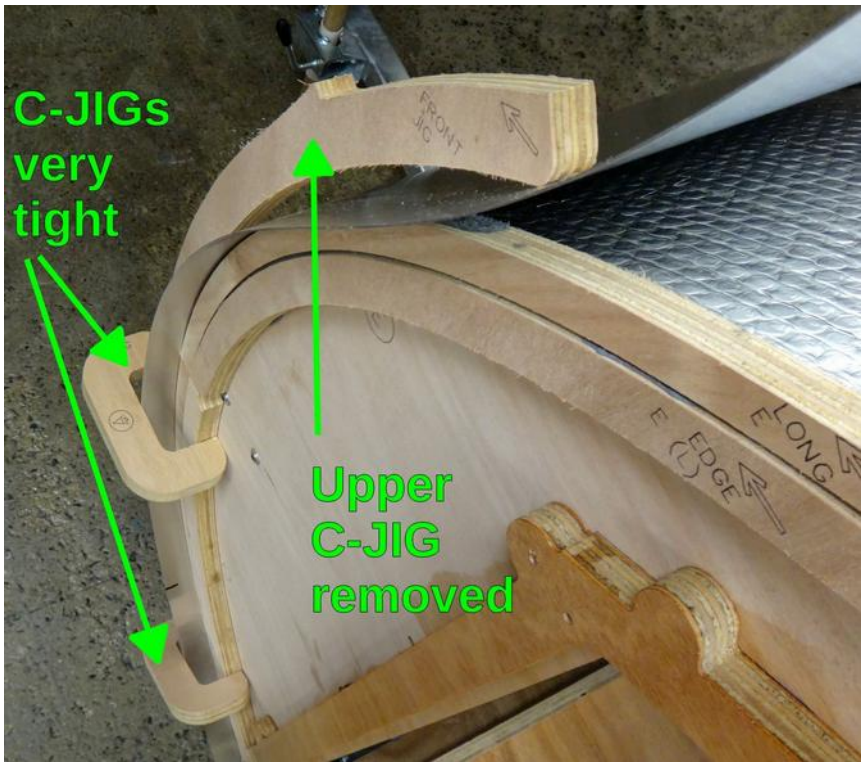




Apply another length of tape across the **front**-outer-roof. This must be close to the cut edge of the aluminium. But it **must not** wrap over the edge. Aim to position it 0.5mm - 1mm away from the edge. (Image, above.)

Tighten the frontmost (lowest) **two** C-JIGs on each FRONT-JIG. Remove both TOP-JIGs. Remove the rearmost (topmost) C-JIG from each FRONT-JIG. Lift the aluminium rearwards and fasten the bulldog clip onto the middle of the short edge. Take care not to damage the tape. (Images.)





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Apply adhesive as follows:

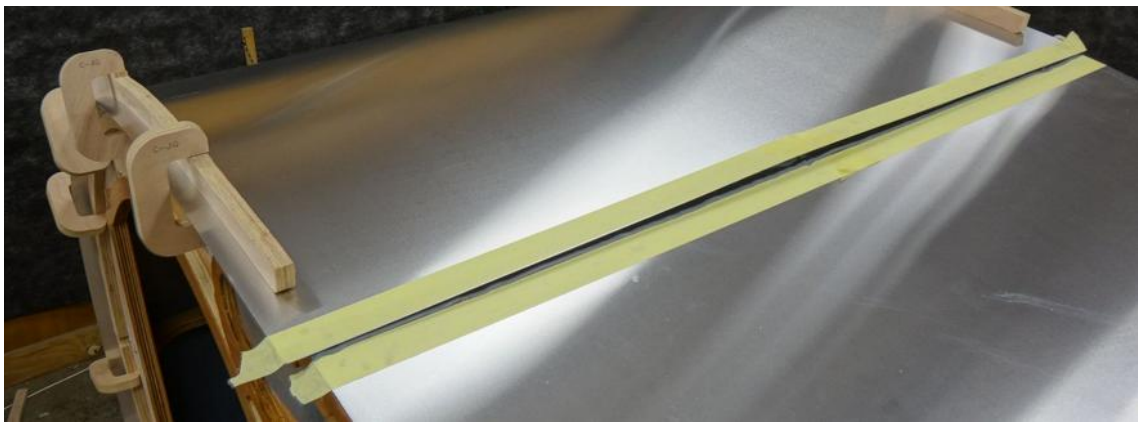
- On the three central longerons, apply very heavy beads.
- On the outer longerons, apply modest beads.
- Apply three **modest** beads evenly spaced across the end of the rear-outer-roof. One of these beads should be on the aluminium but also just **touching** the edge of the tape.

Do **not** use excessive adhesive on the aluminium. **Do** ensure the beads across the aluminium are continuous across the trailer. **Do** ensure that the rearmost bead is very close to, or even touching, the tape everywhere. Add a little extra - if necessary - on the back of this bead. (Image.)



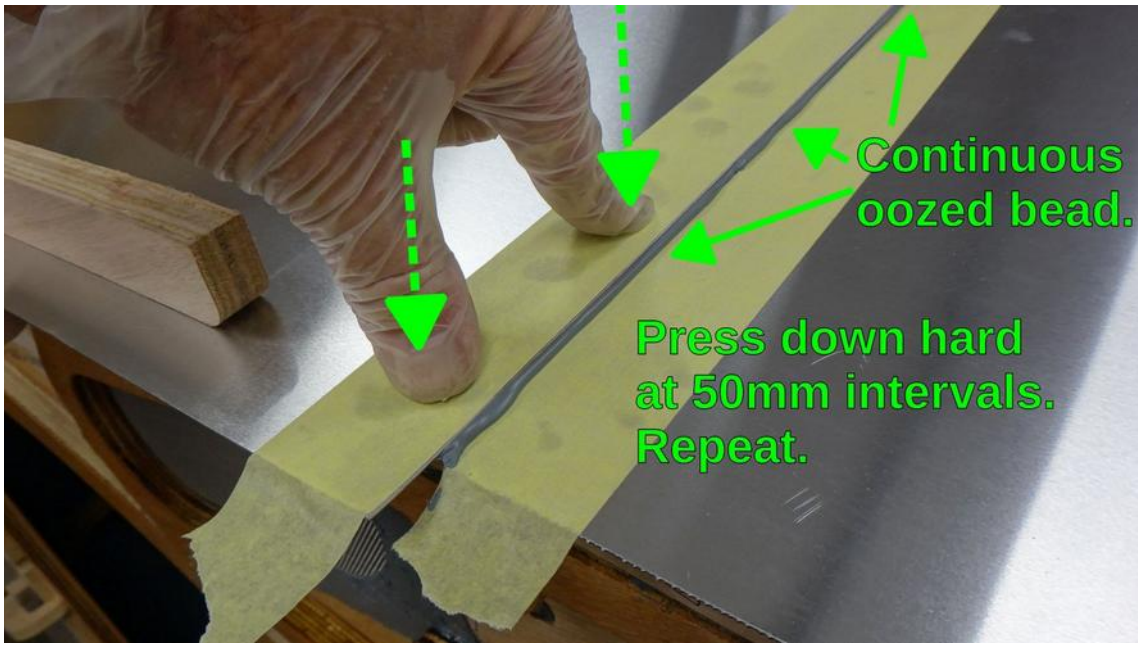
Undo the bulldog clip then - working at the side of the trailer - lower the aluminium into contact. Do **not** yet press the aluminium down onto the adhesive.

Refit the TOP-JIGs. Refit all the C-JIGs **working on alternate sides** and working **from front towards the back** of the trailer. The aluminium should then be almost - but not quite - flat across its rear edge. (Image.)



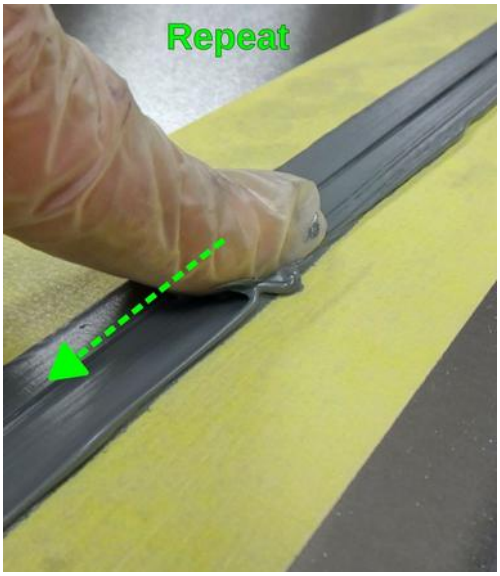
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Reach over to the **centre** of the trailer and press the front-outer-roof down into the adhesive. Press down firmly and continue pressing for a few moments to allow the viscous adhesive to ooze. Then move the hand along by 50mm and repeat the press, gradually moving 50mm at a time toward the outside of the trailer, until the part has been pressed down all the way to the edge. Repeat on the other side. Then repeat again on both sides. (Image.)



A continuous bead will have oozed out from the joint. Tool down this adhesive with a gloved finger. Start at the middle of the trailer, dragging toward the side. Repeat on the opposite side. Then repeat again. The total amount of adhesive remaining should be reduced to a very small fillet. Repeat again - with clean gloves - if necessary. (Image.)

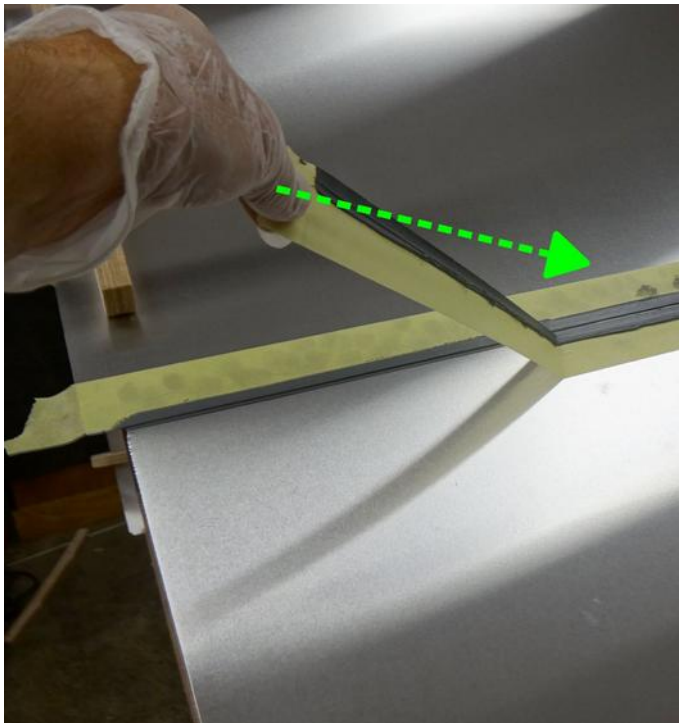




Check that the joint is tightly closed along its full length, and is not moving.

Finally, tilt the trailer rearwards and secure it with the temporary front leg. Immediately peel away the **rearmost** tape in one clean motion without allowing it - or the adhesive it carries - to re-contact

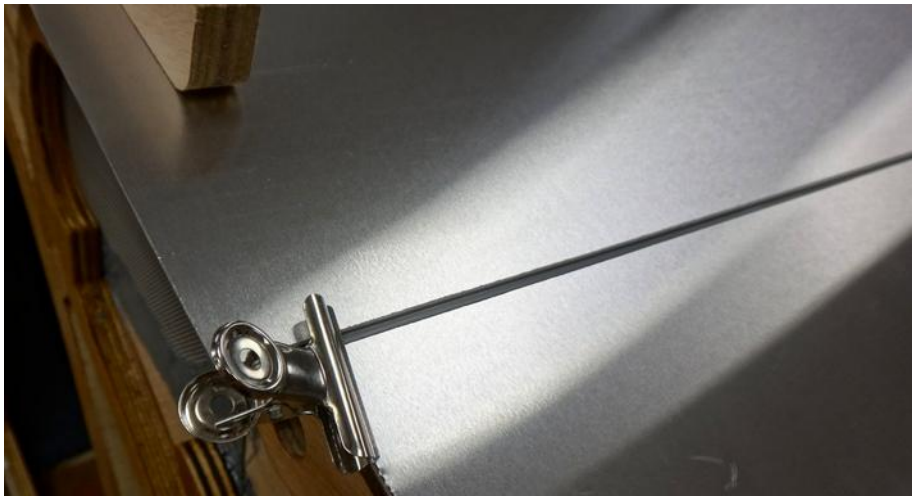
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with the roof. Then peel away the **frontmost** tape in the same way. (Images.)

Apply a bulldog clip on each side of the front-outer-roof, as shown. (Image.)



Cure

Leave the trailer undisturbed. The adhesive should cure for 20 hours.

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Build Stage: Clean and Trim Front Outer Roof

Repeat the process of trimming the side of the aluminium, as performed on the rear-outer-roof:

- Set the trailer approximately level.
- Clean up any oozed adhesive under the sides of the aluminium, where it overhangs the longerons.
- Mark the aluminium with the TRIM-GUIDE tool, setting its screw appropriately.
- Cut away the excess material with the nibbler, leaving 8mm-11mm overhang.

Refer to the relevant previous build stage, for details.

Do **not** modify the oozed bead of adhesive at the front of the trailer, on top of the drawbar. This oozed bead is its finished shape.

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Build Stage: Dress Aluminium Edges

In this stage the aluminium edges are dressed down against the sides of the outer longerons.

Preparation

Check all around under the aluminium for any obstructions, such as oozed adhesive, which would prevent the aluminium folding neatly down onto the longerons.

Tools

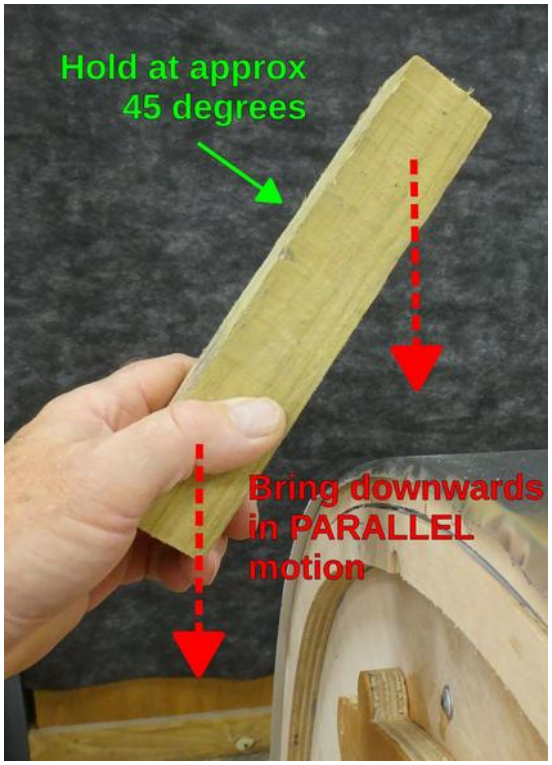
Required for this build stage are:

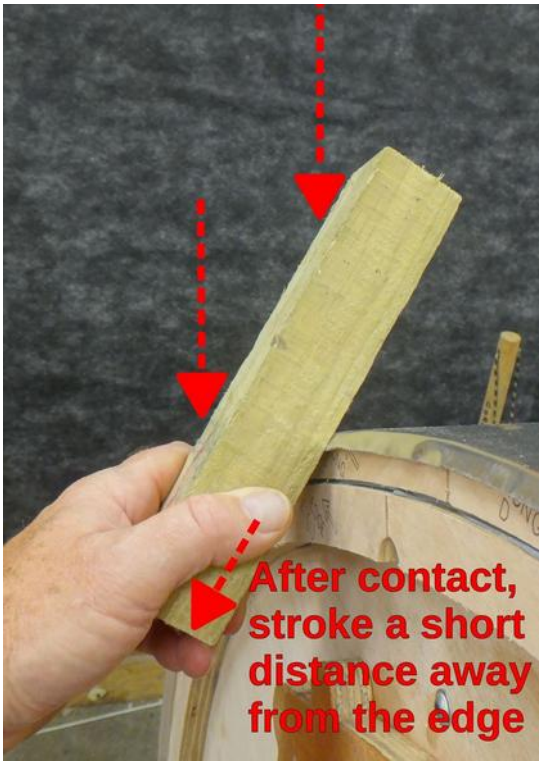
- A dressing tool - which need be nothing more than a short piece of timber (see below).
- A regular hammer.
- A straight-edge.

An ideal dressing-tool is a simple 200mm length of 50mm x 38mm softwood. Alternatively a **large** soft-faced hammer (minimum 50mm dia face) or wooden mallet. Specialist lead-dressing tools are **not** suitable. (Image.)

Dressing-Tool

Working on the left side of the trailer, work around the entire edge of the aluminium dressing it down by about 30-to-45 degrees all around. (Images.)





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When the entire edge is bent 30 or 45 degrees down, repeat with the tool held at a steeper angle, to achieve about 60 degrees of bend.

Repeat one more time at the steepest achievable angle. At this point, the aluminium will be close to the sides of the longerons, but will not be touching everywhere. (Image.)



Put aside the dressing-tool.

Work all around the edge of the aluminium with an ordinary hammer, tapping it down against the timber. Rapid, **very light** taps are effective. Lift the hammer 25mm-50mm per tap, no more. Do not batter the aluminium hard - this would stretch it. Move along the aluminium edge, rapidly tapping at approx 5mm intervals. A single pass is usually sufficient. (Image.)



Never hit onto the bend itself. This would create an unsightly flat on the corner.

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After tapping with the hammer, the aluminium will lay evenly and very close to the timber. (Image.)



Use a straight-edge, laid against the **EDGE-x** parts of the side-assembly, to check for bumps in the aluminium. Any parts which stand proud of the EDGE-x parts (**not** the longerons) should be dressed down. (Image.)



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Repeat on the other side of the trailer.

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Build Stage: Fit Outer Side Panels

Before this build-stage begins, it is essential that other build-stages have been completed:

- Build Stage: Fasten the Shelf Wedges (with adhesive)
- Build Stage: Additional Bonda-Sealing (performed at least three times in total)

Preparation

Check **all around** the cut edge of the left OUTER-SIDE-SKIN for any sharp protrusions or edges which might injure a finger, when tooling-down a fillet. **Lightly** sand the corners, if necessary.

Check all around the left face of the trailer for anything which might prevent the side panel from fitting tight to the timbers. Any burrs on the faces of timber or oozed adhesive should be removed. Take care **not** to scratch the **clean face** of the DOOR-LINER while doing this: much of the face of this part will still be visible after fitting the OUTER-SIDE-PANEL.

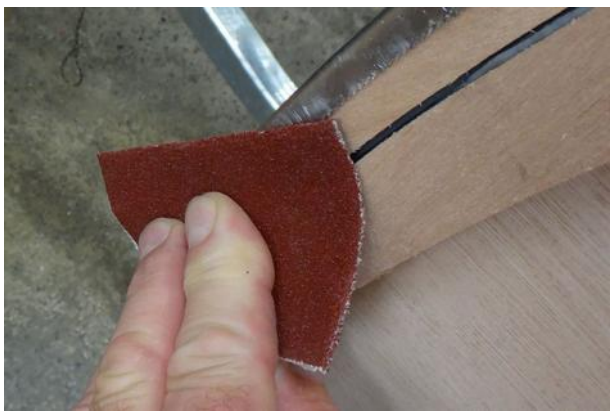
Ensure the following parts and tools are immediately ready to hand:

- 4-qty M5 screws and a suitable driver for them (manual, not electric.)
- **Brown** Fix-All adhesive. Including at least one whole spare tube.
- A knife or other tool to open the spare tube, should it be required.
- Vinyl gloves - ready for tooling-down the adhesive.
- A rag to dispose of excess adhesive while tooling-down.
- Professional grade 38mm masking tape.

Setting-Up

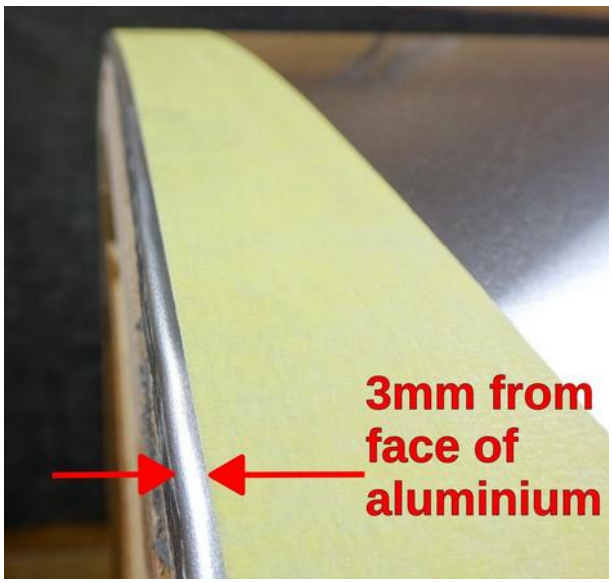
Adjust the trailer approximately level.

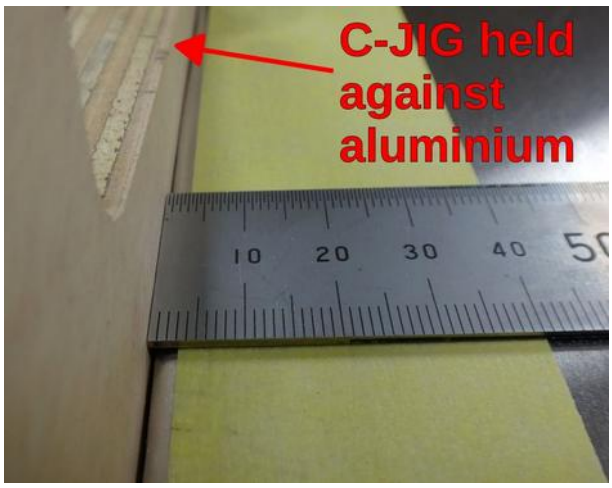
Lightly sand the aluminium lip of the roof, only where it overlaps the longerons, to clean it and to provide a key. Take great care not to scratch the roof. (Image.)



Apply 38mm professional-grade masking-tape all around the left-side edge of the aluminium, as

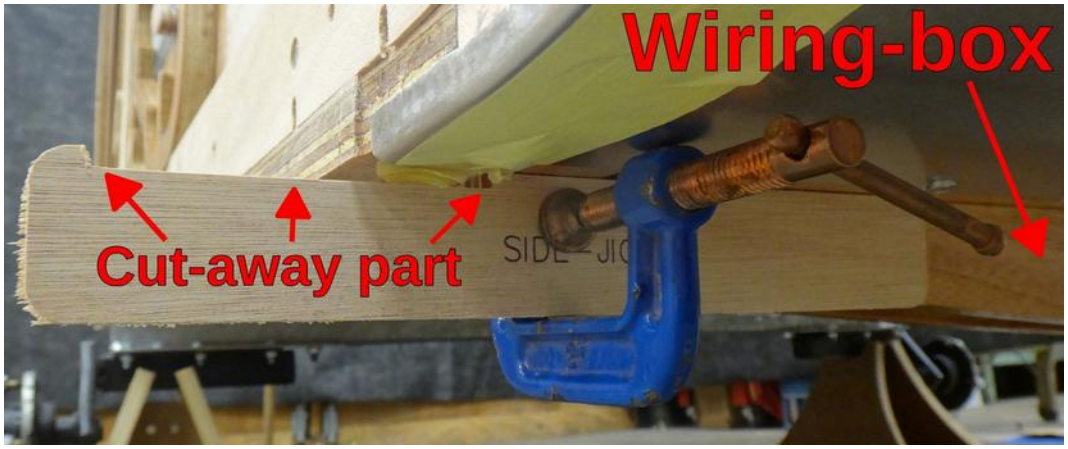
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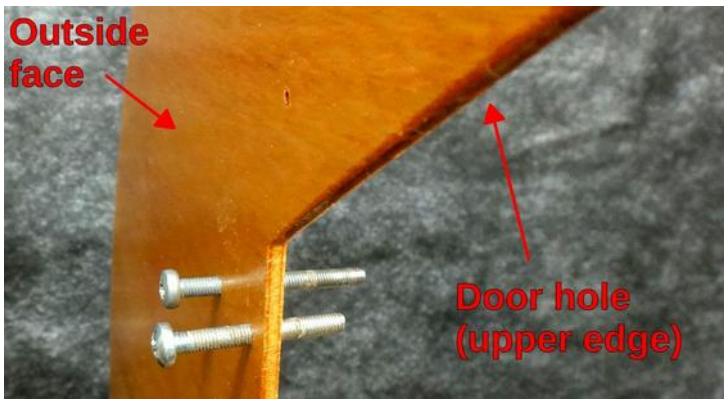
shown. The tape should be applied at an even distance all around, about 2mm-4mm inwards from the folded-over face of the aluminium. Tip: to judge whether the tape has been applied at the correct distance, hold a scrap C-JIG against the aluminium (**not** against the EDGE-x parts) and measure the gap. (Images.)

Clamp a SIDE-JIG onto the wiring-box assembly, underneath the trailer, as shown using a 50mm G-clamp. The SIDE-JIG should be pushed up tight under the floor of the trailer. **Only** the cut-away part of the SIDE-JIG should extend beyond the side of the trailer. (Image.)



By hand, screw 4-qty M5 screws through the 4-qty hinge-screw holes just in front of the door-hole in the left OUTER-SIDE-SKIN. The screws should pass from the outside toward the inside. Most or all of their length should be exposed on the inner face (machined face) of the part. (Image.)

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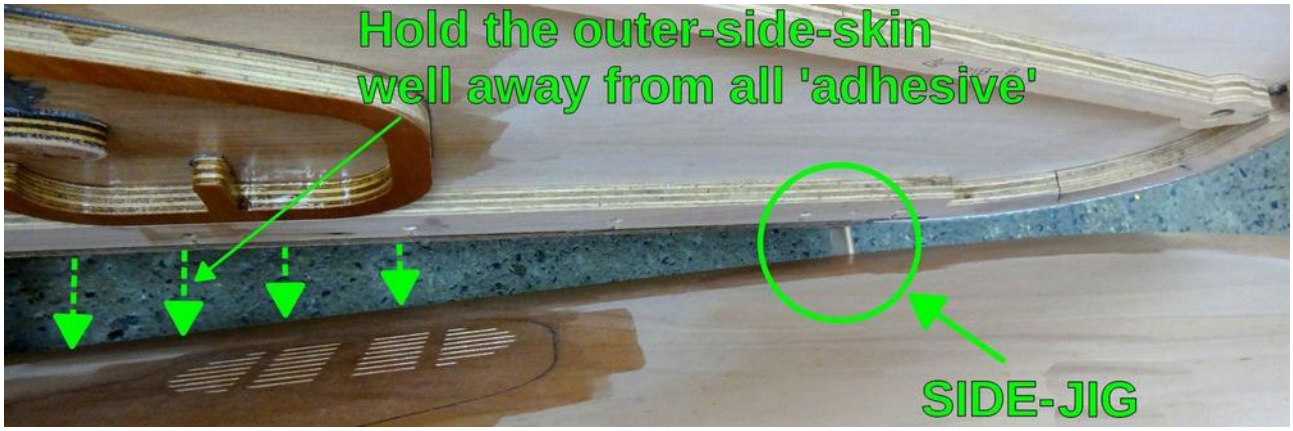


Dry-Fit Rehearsal

It is essential to dry-fit at least the first OUTER-SIDE-SKIN, to understand where the adhesive will need to be applied.

During the dry-fit rehearsal, it is useful practice to act as though the entire outer face of the side-assembly on the pod has had adhesive applied to it. It will be important - when re-fitting **with** adhesive - to prevent the OUTER-SIDE-SKIN contacting that adhesive until after it is correctly aligned onto the SIDE-JIG and the screws. This description is written as if the adhesive **has** been applied.

Pick up the OUTER-SIDE-SKIN by its top edge. Stand its rear lower edge onto the SIDE-JIG, spaced well away from the adhesive. Keep the rest of the OUTER-SIDE-SKIN well clear of the adhesive. (Image.)



Hold one of the top-most M5 screws and, keeping the rest of the OUTER-SIDE-SKIN clear of the adhesive, press the tip of the screw into its matching hole on the side of the trailer. (Image.)

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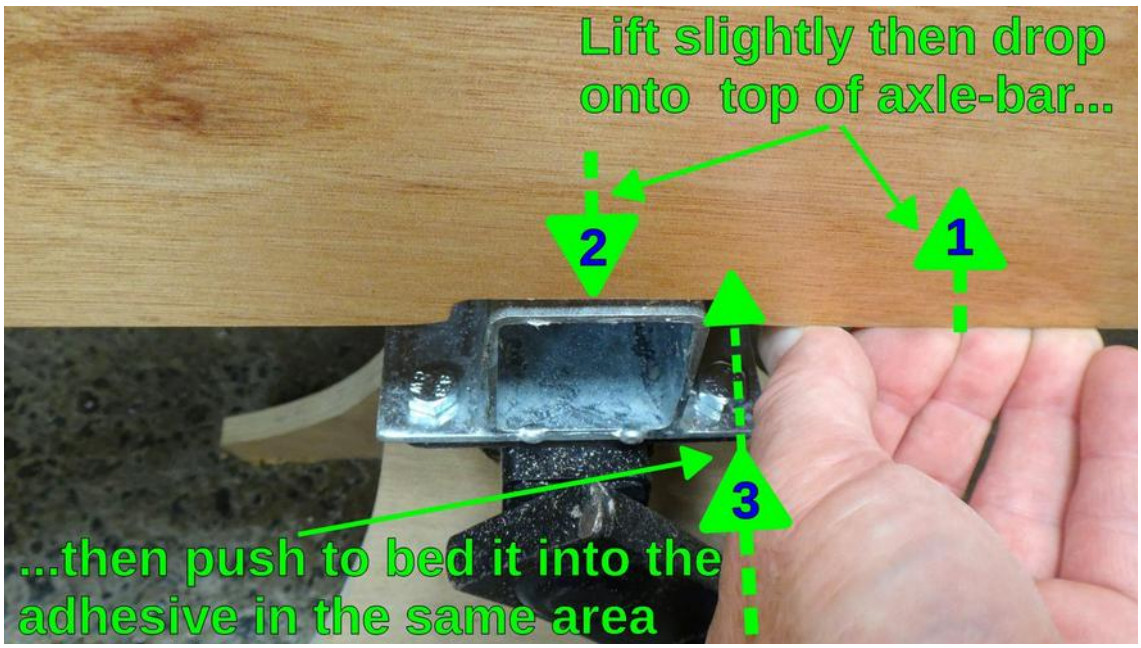
Immediately, use a screwdriver to thread the screws **two or three turns** into the captive nuts, buried inside the side-assembly. At the same time, keep the OUTER-SIDE-SKIN spaced away from the adhesive as much as possible. (Image.)



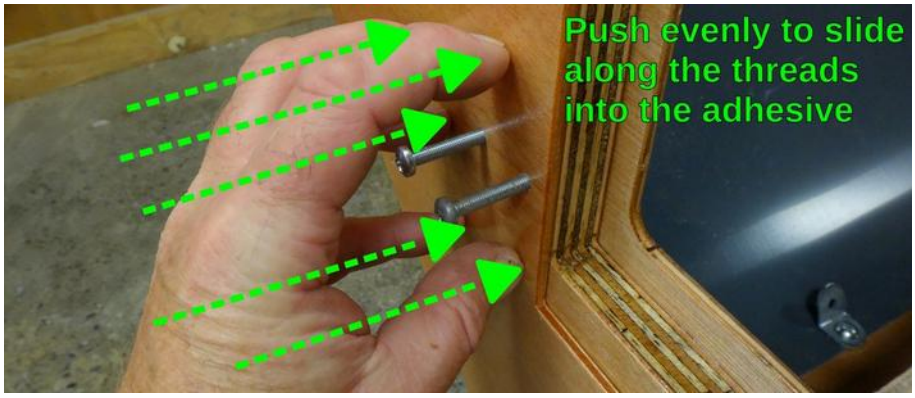
Repeat for the screws at the bottom of the door-hole. It does not matter if adhesive is smeared onto the screw threads: it will not prevent them being undone later.

The OUTER-SIDE-SKIN is now approximately aligned. But **before** pressing it fully home into the adhesive, first lift it onto the edge of the axle-bar and bed-in to the adhesive there. (Image.)

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Immediately return to the area around the M5 screws. Near the **bottom** M5 screws, press firmly with wide-spread fingers to slide the OUTER-SIDE-SKIN along the screws and bed it into the adhesive. (Image.) Do **not** use the screws to clamp it in place: they are positional guides **only**.



Repeat for the area around the **upper** M5 screws. Pressing the skin into the adhesive. The adhesive is viscous so moves slowly: press firmly and steadily for a few moments at each location to allow the adhesive time to flow.

This completes the dry-fitting rehearsal. Leave the part in place, for the next step.

Marking Coverage Extent

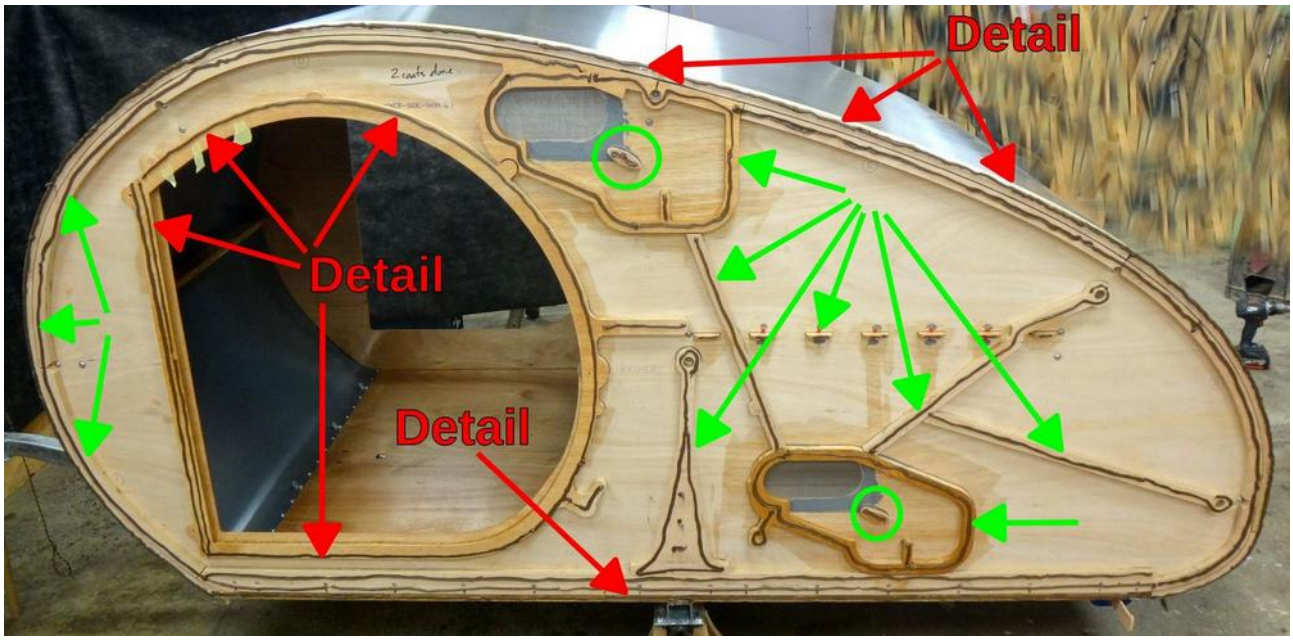
The OUTER-SIDE-SKIN does not completely cover the DOOR-LINER on the side-assembly. Note carefully that the DOOR-LINER's vertical straight face is completely covered, but the rest of its face is part-exposed. Apply pieces of masking-tape to visually indicate the limit of the coverage. (Image.)

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Final Fitting - With Adhesive

Remove the OUTER-SIDE-SKIN. Leave the M5 screws fitted to it.



When working with such a large area of adhesive it is necessary to work quickly. Strain on the hand operating the glue-gun can be considerably reduced by cutting the nozzle to a larger size - but take care that the resulting adhesive beads are not over-generous.

The image above is an adhesive application overview. **Simply put: apply adhesive to every part which protrudes on the side-assembly. Also apply to the cut edge of the floor. Also apply to the folded-over edge of the aluminium.** Details below, including more images:

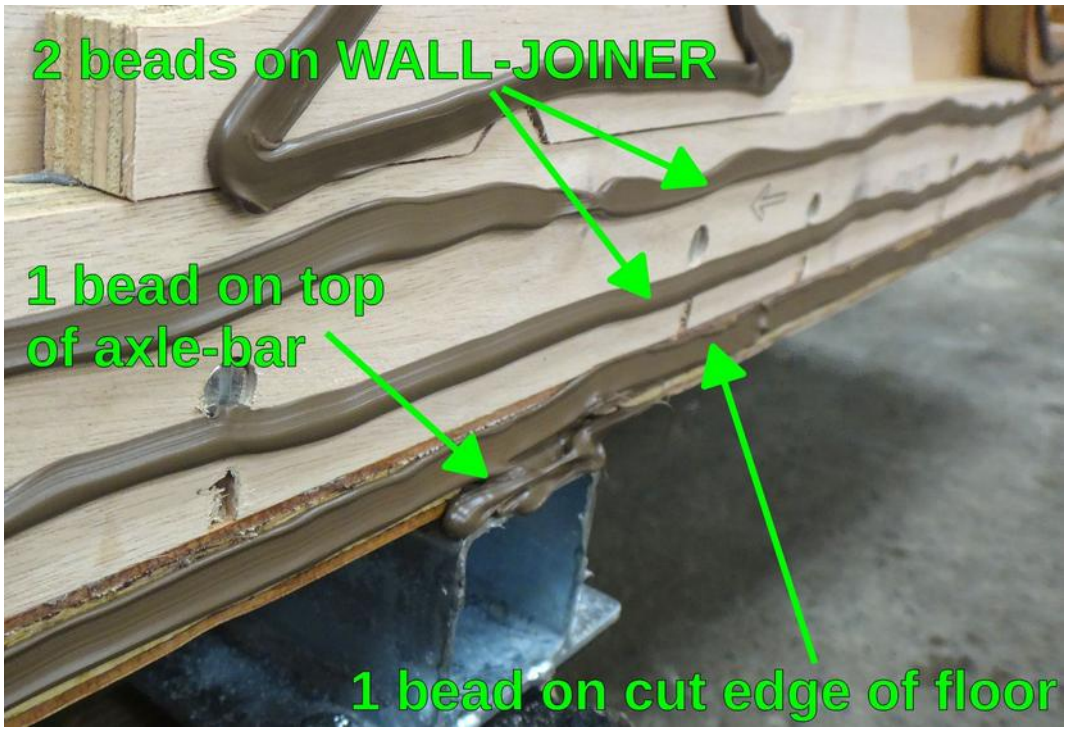
Apply heavy beads of **brown** adhesive to the following locations:

- The entire length of the cut edge of the floor.
- The entire length of the WALL-JOINER (two beads - detail image below.)

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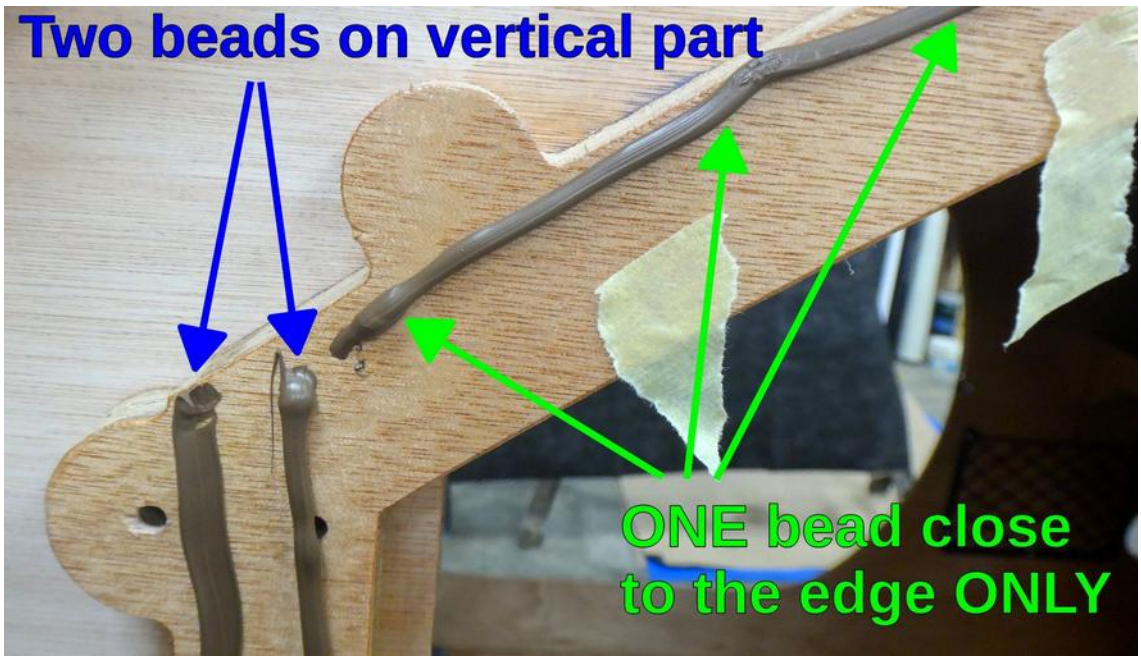
- The ends of the shelf tabs. (A blob on each prevents the side flexing against the tabs).
- The entire lengths of RIB-A, RIB-B, RIB-C.
- All around RIB-D.
- All around RIB-AV and EDGE-D, where they surround the ventilator channels.
- The SB parts, inside the ventilator channels. (A blob on each.)
- The entire outside lengths of EDGE-B, EDGE-C, EDGE-D, EDGE-E, EDGE-F.
- The vertical front part of the DOOR-LINER (two beads - detail image below).
- The rest of the DOOR-LINER (one bead, carefully positioned - detail image below.)
- Finally, apply one medium bead of **brown** adhesive all around the dressed-down face of the aluminium, as close as possible to the outer edge but without touching the masking-tape. (Detail image below.)

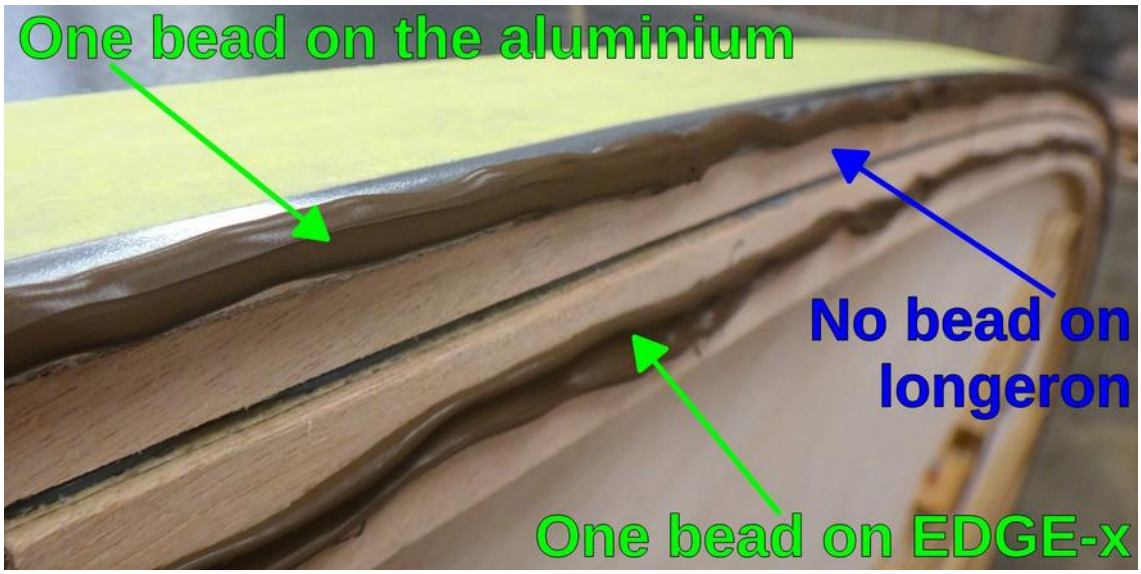
Detail - WALL-JOINER:



Detail - DOOR-LINER:

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Detail - Aluminium:

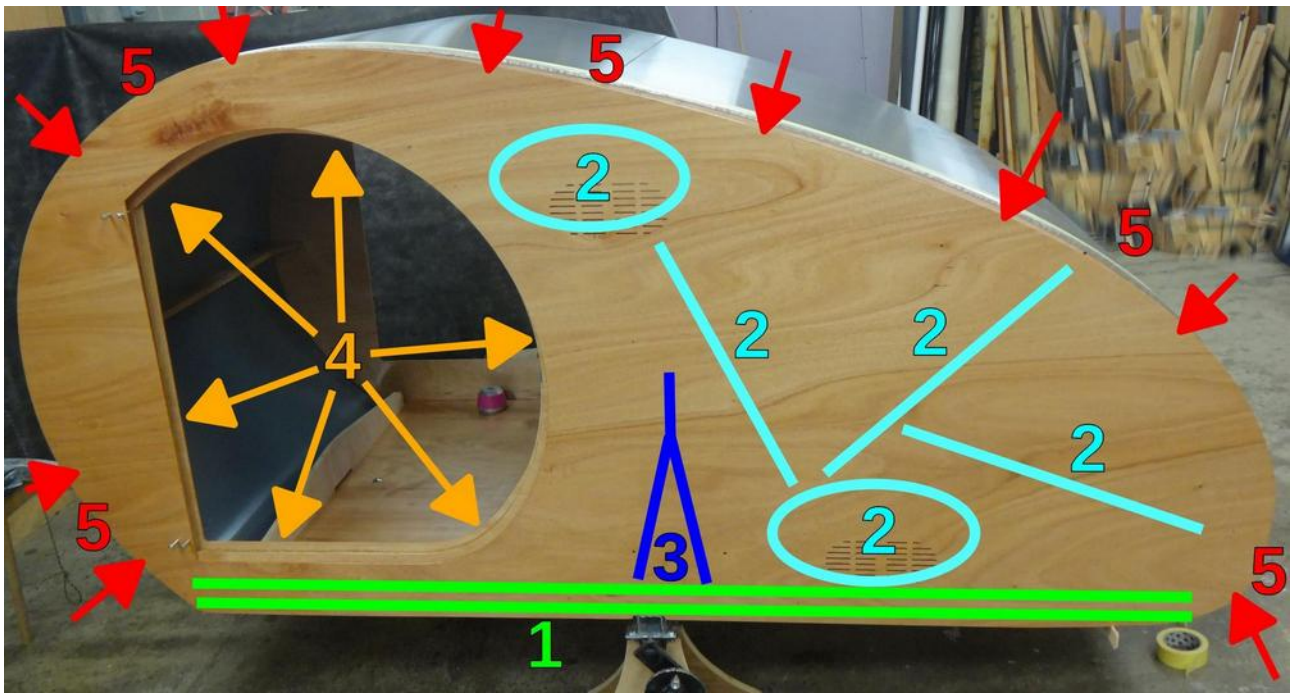
As soon as the adhesive has all been applied, immediately refit the OUTER-SIDE-PANEL, following exactly the procedure of the dry-fit rehearsal.

Continue immediately to the next step.

Bed Into Adhesive

Bed the part down in the following sequence (annotated image below) by pressing the OUTER-SIDE-SKIN firmly into the adhesive for several moments at every location, in the order listed in the image:

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1. The entire length of the WALL-JOINER. Tip: hold the suspension unit to prevent the trailer sliding away.
2. The large area covering RIB-A, RIB-B, RIB-C, and the ventilation channels.
3. The area above the axle-bar covering RIB-D.
4. All around the DOOR-LINER at intervals of a few centimetres (see detail image below.)
5. All around near the edges covering EDGE-B, EDGE-C, EDGE-D, EDGE-E, and EDGE-F, at intervals of a few centimetres.
6. Finally, revisit the DOOR-LINER and check it is fully bedded-down with no gap.

DOOR-LINER detail:



Take care not to touch any adhesive which oozes out, especially around the DOOR-LINER or through any pilot-holes in the OUTER-SIDE-PANEL. These oozes can be cleaned up later, after part-cure.

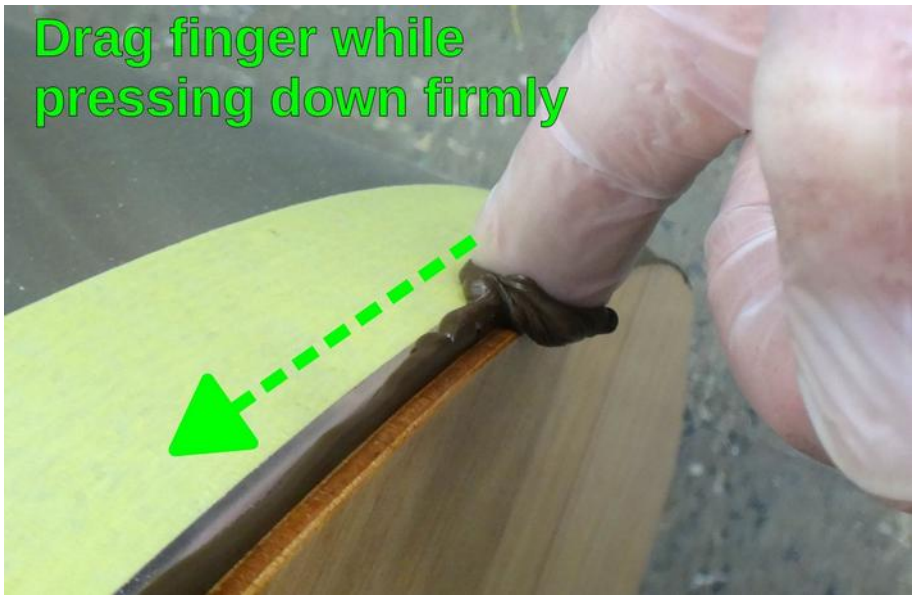
Continue immediately to the next step.

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Fillet Around Aluminium

The wet adhesive in the gap between the aluminium and OUTER-SIDE-PANEL must now be quickly tooled-down into a neat fillet. The goal is a continuous fill of adhesive between the parts, with a neat fillet on the outside.

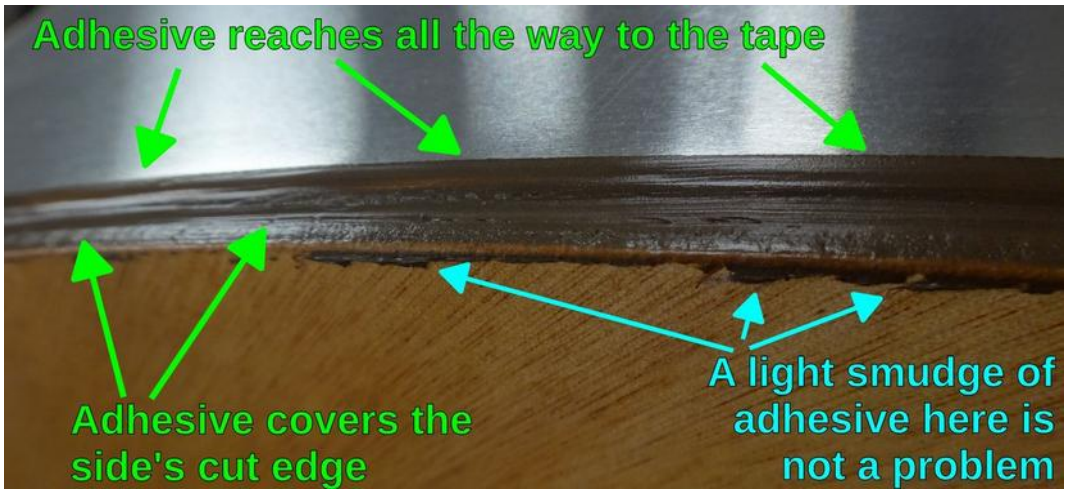
Use a gloved finger to form a continuous fillet around the outside. For a neat finish, there should be a layer of adhesive covering all the exposed aluminium up to the masking-tape. Similarly the cut edge of the OUTER-SIDE-SKIN should be covered, too.



Tip: use the rag to remove any excess build-up of adhesive on the finger, occasionally, to prevent the excess adhesive being dragged onto the side of the trailer where it would be unsightly.

Review the fillet. Top-up any areas that lack adhesive, and repeat the filleting process as necessary. The adhesive fillet can be reworked many times without loss of quality, provided all work is completed within ten minutes or so.

When correctly done, the fillet will look like this:



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When a good fillet has been formed all around, **immediately remove the masking tape**. Take care not to allow the wet adhesive on the tape to contact the roof.

Do not, yet, attempt to remove any adhesive which has smudged onto the side of the trailer.

Continue immediately to the next step.

Fillet Under Trailer

Look underneath the trailer, from the front and from the rear. If any adhesive has oozed out underneath, gently tool it down into a rough fillet with a clean gloved finger. This area will be revisited later, after cure, so neatness here is not a priority.

Repeat

This completes the fitting of one side.

Repeat for the other side. There is no need to wait for the first side to cure.

Cure and Clean-Up

Allow to cure between 7 and 12 hours (or even as much as 20 hours is likely to still be practical) then clean up:

- Use the blunt edge of a scraper to cut away any oozes around the door-hole.
- Use a blunt scraper to remove any adhesive which is over-hanging the side and smudged onto the clean face of the OUTER-SIDE-SKIN.
- Wipe away any remaining adhesive with a cloth damped with ethanol, taking great care to avoid dragging the cloth on the adhesive fillet.

A total cure time of at least 20 hours is required before installing external fittings such as door hinges, side reflectors, and eyebrows.

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Build Stage: Fillet Underneath the Outer Sides

Tilt the trailer nose-down. Work under the rear of the trailer.

Apply a modest bead of brown Fix-All along the entire length of the underhang of the OUTER-SIDE-SKIN from the axle to the rear end of the OUTER-ROOF on the right side. (Image.)



Tool down the bead into a neat fillet, using a gloved finger. (Image.)



Repeat on the left side.

Tilt the trailer nose-up and secure safely with the temporary front leg. Repeat the process to create fillets from the axle to the front of the trailer.

Cure

Leave all fillets to cure for at least 12 hours before touching them. There is no need to wait for the fillets to cure before beginning the next build stage.

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Build Stage: Eyebrows

This stage is documented here, directly after completing the side skins, for ease of reference. But this stage cannot be begun until the side skin adhesive has cured at least 20 hours. Other stages can be carried out in the meantime. Return to this stage when convenient.

This stage requires the trailer to be left undisturbed for 20 hours while the adhesive cures. So, ideally, schedule it as the final build stage of a day.

Nails

Remove the plastic caps from 4-qty of the stainless-steel ring-nails. The caps peel off easily with pliers. (Images.)





Tap a nail through each of the 4-qty pilot holes in the left EYEBROW so the heads are driven tight against the clean face. A pair of scrap jigs closely-spaced back-to-back makes a convenient anvil. (Image.)

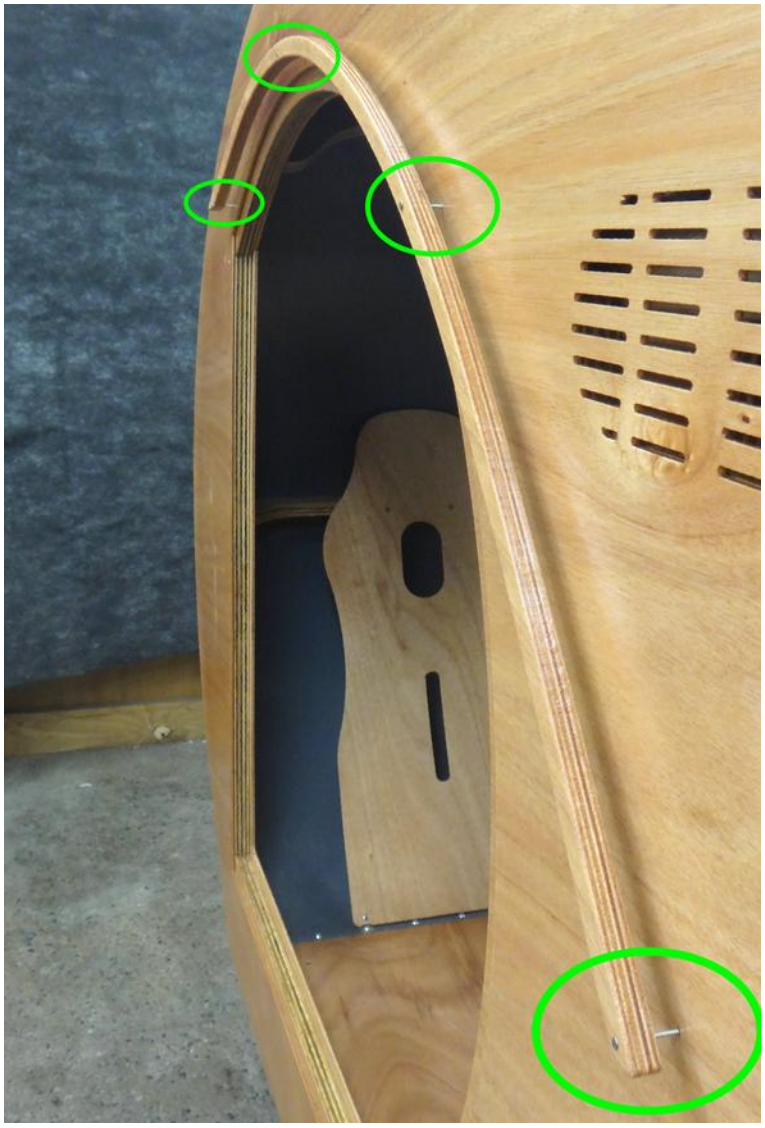


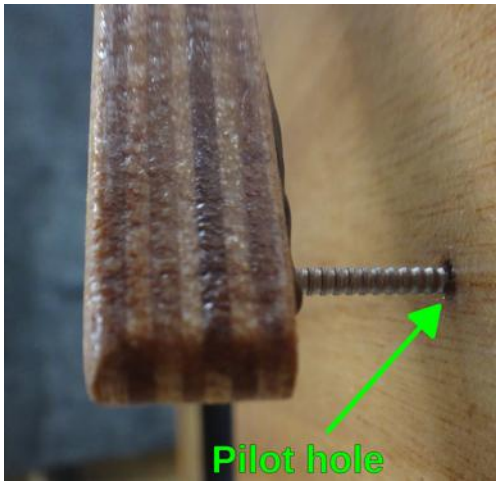
Lay the EYEBROW machined-face-upwards. Apply a **very small** continuous bead of adhesive along the entire length of the machined face. Tip: Use a new unmodified/uncut adhesive nozzle, to obtain a small bead. (Image.)

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Align the points of the four nails with the four pilot-holes in the side of the trailer. Tap each nail to start its point firmly into its pilot-hole, sufficiently to support the part in place. (Images.)





Hammer all of the nails partially home, then drive them all fully home. Whenever hammering any nail, also press a weight on the inside of the trailer directly behind the nail. A heavy soft-faced mallet or a heavy piece of timber is ideal. (Image.)

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Quickly repeat the process for the other EYEBROW on the right side, before the adhesive on the left side has time to part-cure.

Bed-In and Clamp

Press along the full length of the left EYEBROW, to bed-in the adhesive.

Use a few E-JIGs, as required, to gently glamp the EYEBROW tightly against the side. (Image.)



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Repeat for the right EYEBROW.

Cure

The E-JIGs are easily disturbed. So leave the trailer completely untouched for at least the next 20 hours. Do no other work on the trailer in the meantime.

The E-JIGs can be removed after 20 hours. But the adhesive will require a total of 40 hours to cure to a good level of bond. Take great care not to disturb the parts during that time.

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Build Stage: Hitch and TIN-Plate

This stage assumes that a T-form chassis, made from 50mm x 50mm box section, is to be used.

If using some other trailer base (for example a repurposed dinghy trailer) then adapt these instructions as necessary to achieve a similar result.

A hitch compatible with your tow-ball (usually 50mm) is required.

The TIN-plate is the trailer's information plate which is required by law on all new-built trailers.

Process: Hitch

Check that the hitch fits neatly onto the front of the drawbar. Remove any excess zinc from the drawbar which interferes with the fit. A coarse flat file is ideal, alternatively coarse abrasive wrapped on a scrap of timber.

Raise the handle of the hitch, to gain best access to the bolt-holes in the top plate of the hitch. **!!Beware that the hitch-handle is strongly spring-loaded and will snap vigorously down if the hitch is accidentally triggered. Keep unprotected hands and wrists away from the underside of the hitch handle!!**

Position the hitch on the front of the drawbar, lined-up with the ready-drilled bolt-holes.

Place M12 Form-A washers on the two M12 bolts. Drop the two bolts through the hitch and down through the draw-bar. The longer M12 bolt goes in the rearmost hole.

On the rearmost bolt's threads, fit *only* a M12 **flanged** nut with no washer underneath the drawbar.



On the frontmost bolt, fit a Form-A washer and a M12 nyloc nut. (Image.)

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Tighten each nut very firmly to 50Nm (37 ft.lb).

Thread the **small** eye of the SAFETY CABLE onto the rearmost M12 bolt. Follow it with a M12x50mm washer. Follow that with a M12 Form-G washer. And finally a nyloc nut.

Hold the rearmost bolt still with a spanner and tighten the nyloc nut firmly against the flanged nut. Take care not to pinch the SAFETY CABLE. (Image.)



The SAFETY CABLE should be free to move on the bolt, but impossible to remove over the large washers. The front end of the SAFETY CABLE should reach at least to the front tip of the hitch.

Process: TIN Plate

The TIN plate must be fitted only in the location specified. Before fitting, check that the chassis number on the plate matches the number stamped into the chassis.

Position the TIN plate on top of the drawbar 15mm rearwards of the hitch. It **must** be on top of the chassis and it **must** be positioned so that the text can be read from the **right-hand** side of the trailer.

Hold firmly in place and match-drill 3.5mm through the TIN plate and the top of the chassis.

Drop a 1/8” pop-rivet into the hole, but do not compress it yet.

Hold the TIN plate firmly in place again and match-drill the other hole. Remove the plate and clean away all swarf. Refit and compress both pop rivets to hold the TIN plate in place. (Image.)

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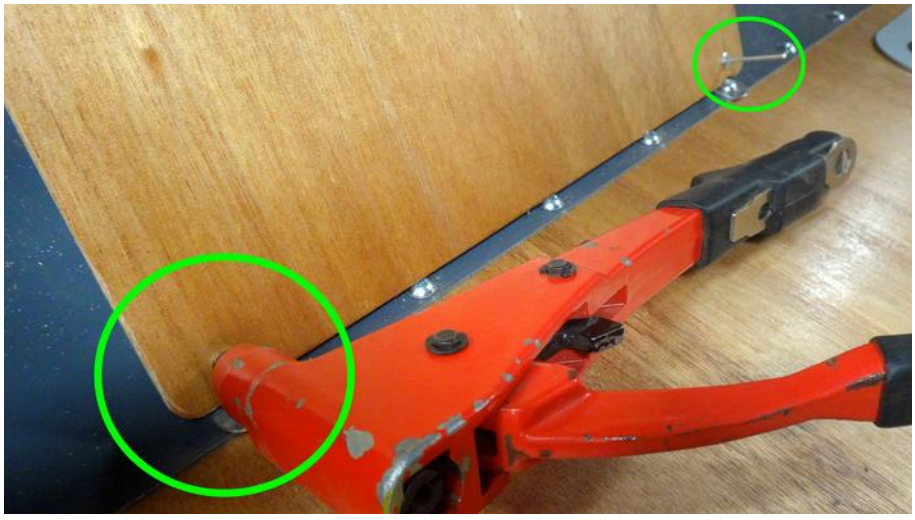


Build Stage: Seats

Remove the screws holding the FLOOR-JIG in place. Remove and discard the jig. Drive a M4 threaded captive nut into the resulting bare holes in the floor, for a neat finish. (Image.)

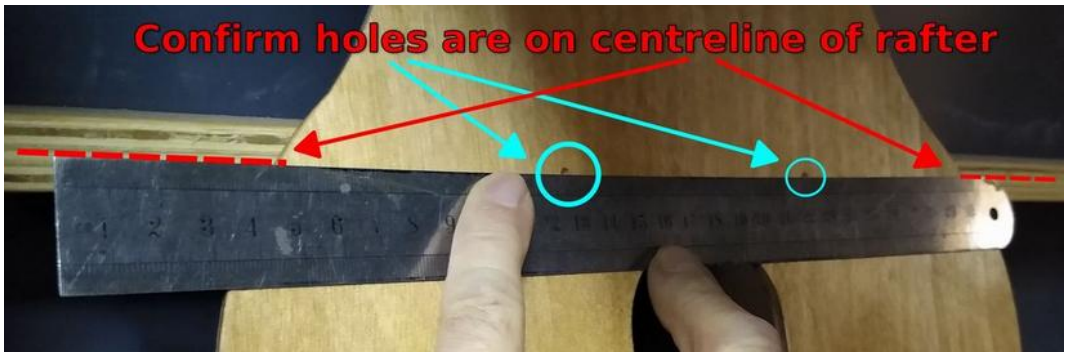


Position one seat against its brackets near the left side of the trailer. Pass a 4mm pop-rivet through each of the small holes in the bottom of the seat and into the brackets. Only after **both** rivets have been satisfactorily positioned, compress them both to secure the seat to the brackets. (Image.)



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Spring the seat against the front RAFTER. Use a ruler aligned with the pilot-holes to check that the pilot-holes are in-line with the centre of the RAFTER behind. (Image.)



Drive a 40mm woodscrew into each of the pilot-holes near the top of the seat so that they go **horizontally** through the seat and into the RAFTER. It is essential that the screws are **horizontal**: this means they will be skew compared to the seat. The screw-head should *just* bury into the timber but no more. (Image.)



Feel carefully behind the seat, to check that the screws have not emerged from the bottom face or top face of the RAFTER due to being non-horizontal.

Repeat for the seat on the other side.

Shutter Stowage

Take the right shutter and slot it behind the **left** seat-back, curved edge upwards. Drop the handle into the slot in the seat-back: this prevents it coming free except in extreme road conditions. (Image.)

Repeat for the other shutter.

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Build Stage: Door Furniture

Lay the left door onto a clean workbench, exterior side upwards.

Use 4-qty M5 screws to fasten hinges at the top and the bottom of the door. Take care to thread the screws into the captive nuts (within the door structure) **very** carefully. Use only a manual screwdriver, **never** an electric screwdriver. Only fingertip torque will be needed to drive the screws home.

Tip: If a screw feels **at all** 'tight' before it has been fully inserted, then it is likely that the timber is gripping the screw and preventing its thread starting properly in the captive nut. Stop driving the screw **immediately** if this happens. Continuing to drive the screw against the resistance **will** destroy the captive nut.

To overcome this effect, push the screw firmly **inwards** but while turning it **in reverse**. This will break any grip that the varnished timber has on the screwthread, allowing the screw to start properly into the captive nut without cross-threading.

When the screws have safely engaged in the captive nuts and have appeared through the back (inside) of the door, then it is safe to full tighten them. Screw them as tight as possible. (Image.)



Tighten an M5 nyloc nut onto the end of each screw until the screwtip is just flush - or slightly proud - of the end of the nut. (Image.)

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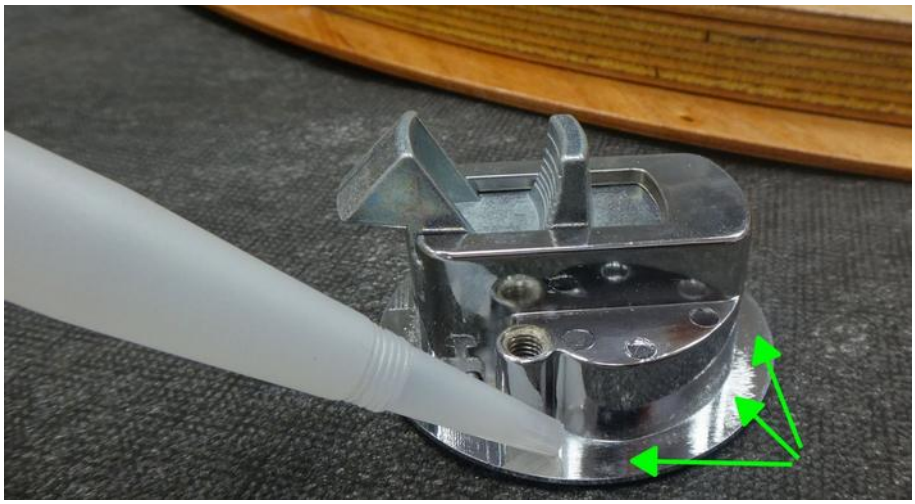


Use 2-qty M4 screws to fasten an interior handle in place. (Image.) Tighten each screw only until the handle contacts the wood, then continue three-quarters of a turn further, then stop.



Use one of the childlock keys to unlock a latch, so that the external handle moves freely. Unscrew and remove the latch's installation ring.

Apply a very small bead of silicone around the latch flange. (Image.)



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Taking great care not to touch the silicone, pull out the external handle to hold back the slider. Pass the latch through the latch-hole from the outside of the door. Still holding the handle, drop the installation ring back onto the lock. Release the external handle.

Re-insert the screws and tighten the installation ring so that the latch is pulled completely tight against the outside of the door. Do not allow any oozing silicone to contact the workbench below. (Image.)



Taking care not to touch the silicone, turn the door over. Silicone will have oozed out under the latch. Do not touch it. Instead, leave the door undisturbed for a few hours, for the silicone to part-cure.

Repeat for the other door.

Cure

When the silicone is dry to the touch - but before it is fully cured - the excess silicone can simply be pulled away from the door by hand. The door can then be installed.

Note: Silicone bonds extremely poorly to Bonda-Seal. The trapped silicone forms an unbonded gasket which can easily be removed, should the lock ever need to be replaced in future.

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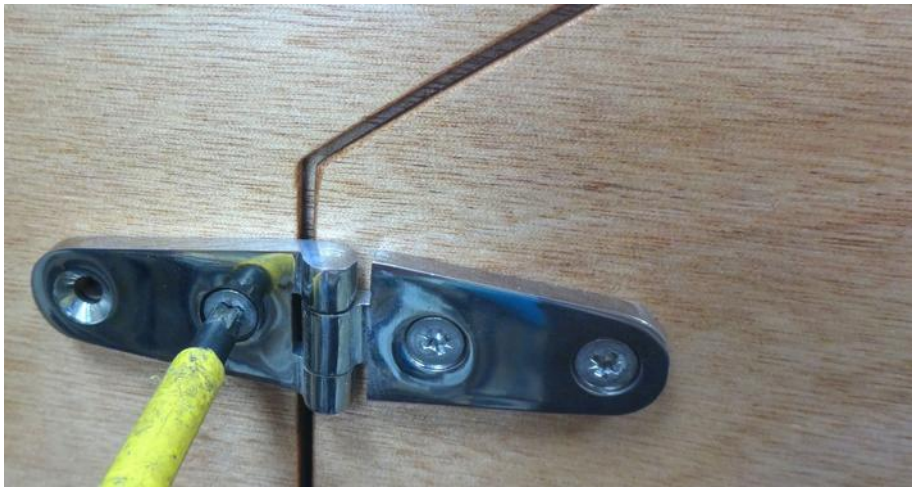
Build Stage: Install Doors

Before fitting each door ensure M5 screws and a suitable driver are immediately to hand.

Hang Door

Insert the left door into the door-hole on the left side of the trailer. Engage the latch with the latch-plate fitted into the side assembly, to keep the door in place.

Prevent the door from falling out by firmly holding the top hinge against the side of the trailer. Simultaneously, align the top hinge with the matching holes in the side assembly and fit M5 screws, engaging them into the captive nuts. Nip up the screws gently. See the tip in the previous build stage to prevent cross-threading. (Image.)



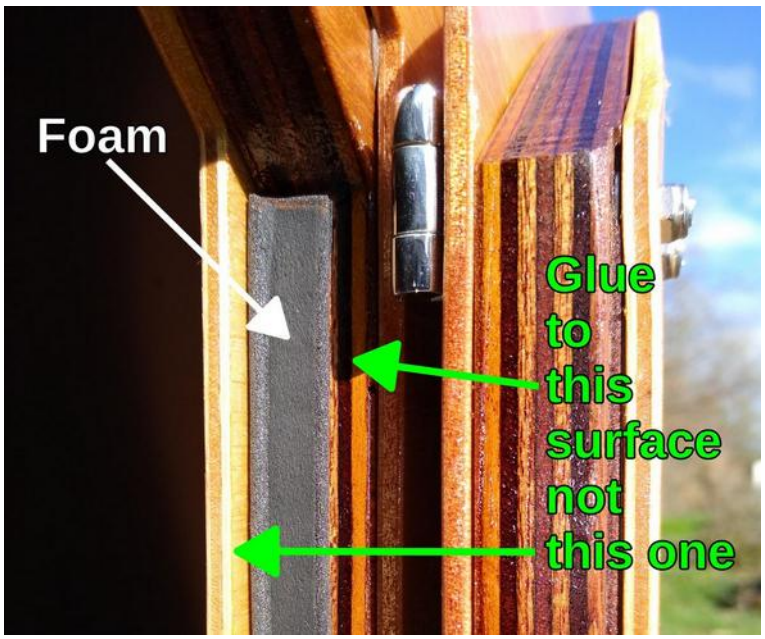
Repeat for the bottom hinge. Then tighten all four screws very firmly.

Open the door. Working from outside the trailer, reach inside to fit nuts on these four screws' tips, as described in the previous build stage.

Install Foam

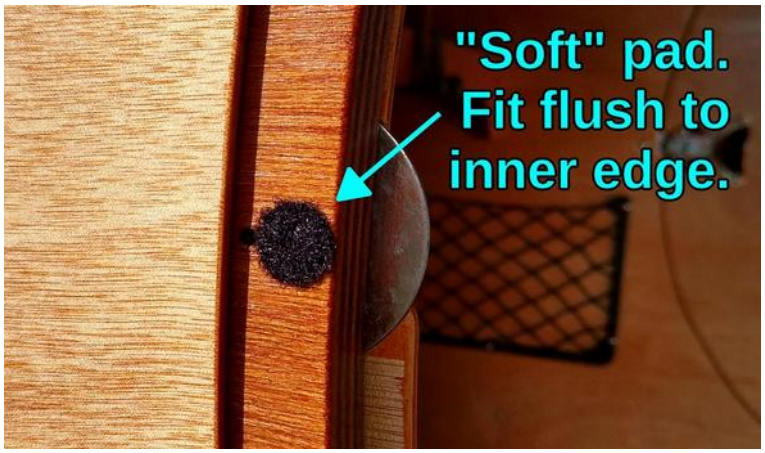
Bond a strip of anti-draught foam to the front vertical part of the DOOR-LINER. The adhesive side of the foam should be bonded to the **cut edge** of the DOOR-LINER itself. The foam should tightly abut the INNER-SIDE-SKIN which overlaps the door liner.

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Damper Pads

Stick one adhesive damper pad to the clean face of the DOOR-LINER near to the latch plate.



Repeat

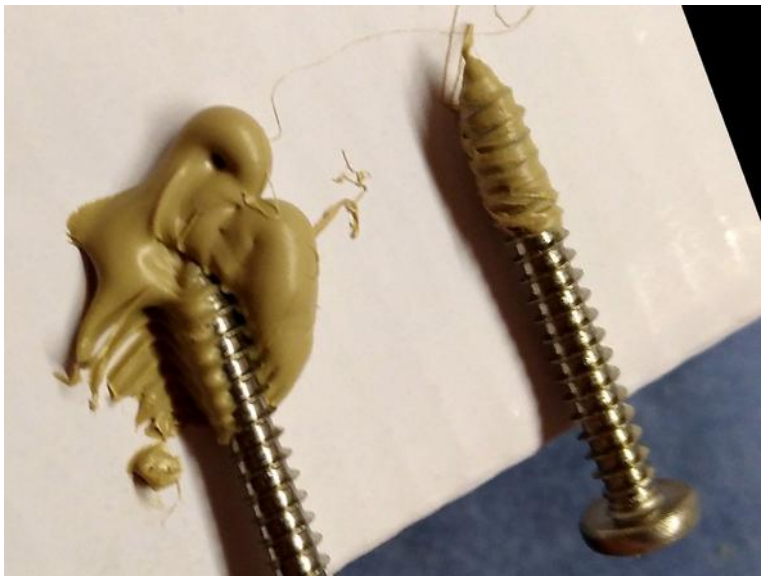
Repeat for the other door.

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Build Stage: Rear Hardware and Drilling

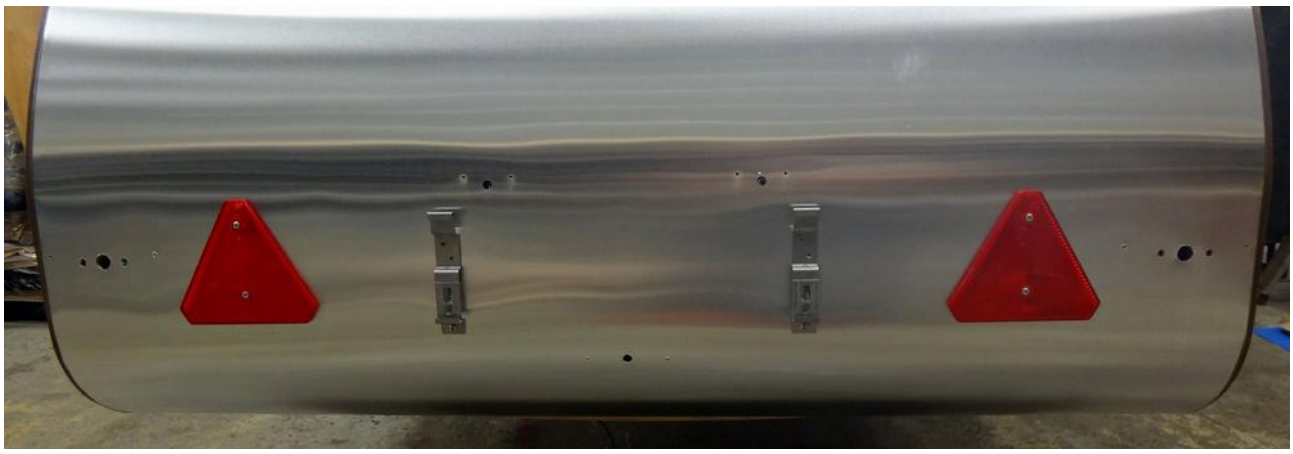
Notes

Before fitting any external screw through timber or aluminium, first roll the screw's tip in some IDL 99 mastic to seal the hole against moisture. (Image.)



When fitting screws through the glued-on aluminium and into a timber part behind, always press down on the screw very firmly. This prevents the screw 'jacking' the glued-on aluminium away from the timber part.

Reference Image



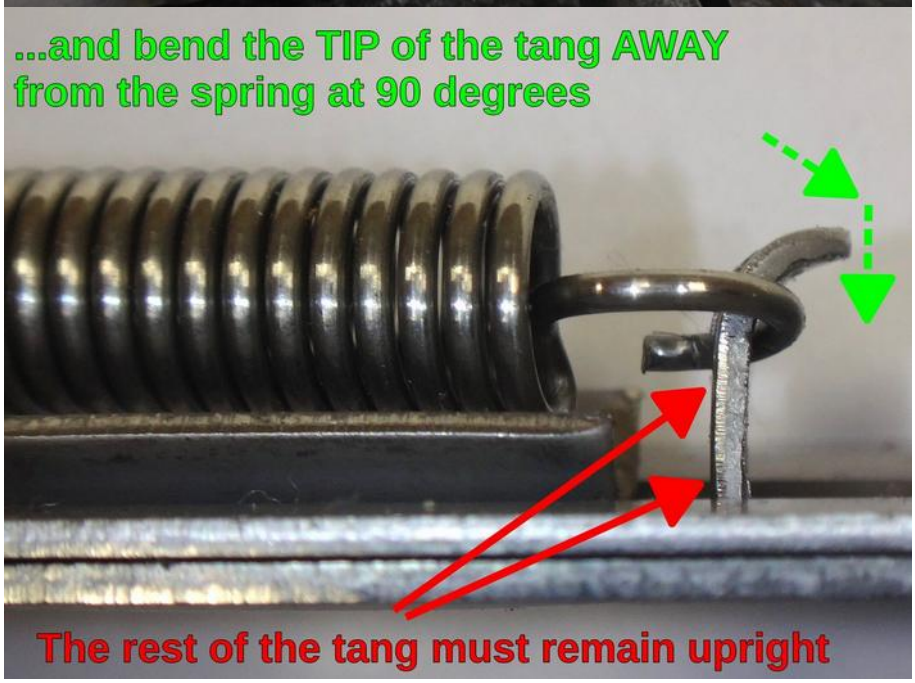
The reference image shows the rear of the trailer with triangular reflectors and the number-plate holders fitted. The holes for the light fittings have been opened-out.

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Modify the Number-Plate Holders

Using the following images as a guide, modify the tangs which hold the springs on the number-plate holders. Twist the **very tip** of each **tang** away from the spring, so it better clears the structure of the trailer when installed. (Images.)





Fasten the Number Plate Holders

Note: When driving a screw through the aluminium and into timber behind, take great care to keep the screw straight - it may otherwise have a tendency to start askew. The short screws are more prone to this problem than the longer ones.

Tilt the trailer forwards.

Fasten the number-plate holders with #8 x 5/8” screws to the rear of the trailer. Two groupings, each of three pilot-holes, match the holes in the hardware. (See reference image.)

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Before fitting, it may be necessary to slightly bend the bottom of the number-plate holder, to match the slight curve of the trailer. (Image.)



Tip: To use the number-plate holders, stand a regular number-plate in the bottom hooks of the pair of holders. Press the number-plate downwards to stretch the springs slightly. Engage the top of the number-plate with the top hooks and release.

Fasten Triangular Reflectors

Fasten the triangular reflectors with #8 x 3/4” screws. Two pairs of pilot-holes match the hardware. (See reference image.)

Drill for Light Cables

Using the annotation on the LIGHT-JIG as a guide, identify and drill-out the following holes in the aluminium at the rear of the trailer:

- 4-qty holes to clear the screws of the ‘hamburger’ light clusters. Marked ‘6’ on the jig.
    - Drill-out with a 6mm twist-drill.
- 2-qty holes to thread the cables of the ‘hamburger’ light clusters. Marked ‘15’.
    - Drill-out in stages with a 6mm drill, then a 9mm, then a 15mm drill.
- 2-qty holes to thread the cables of the number-plate illuminators. Marked ‘9’.
    - Drill-out in stages with a 6mm drill, then a 9mm drill.

Under the rear curve of the trailer, identify the 3-qty pilot holes which are drilled in the aluminium, in a horizontal line, close to the centreline. Drill-out the **one** centre hole of this triplet in stages to 6mm, then 9mm. (See reference image.)

Remove REAR-JIGs

Undo the two M6 screws inside the wiring-box which hold the REAR-JIGs in place. Working from **outside** the trailer, use a long-handled tool (e.g. a soft broom) to gently pull the jigs to the front of the trailer. Extract them and dispose of them.

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Build Stage: Lights and Reflectors

Notes

Before fitting any external screw through timber or aluminium, first roll the screw's tip in some IDL 99 mastic to seal the hole against moisture.

Before fitting the external rear lights, extend their wiring. An appendix, at end of this document, shows how.

The OUTER-SIDE-SKIN adhesive should have cured at least 20 hours before fitting external parts.

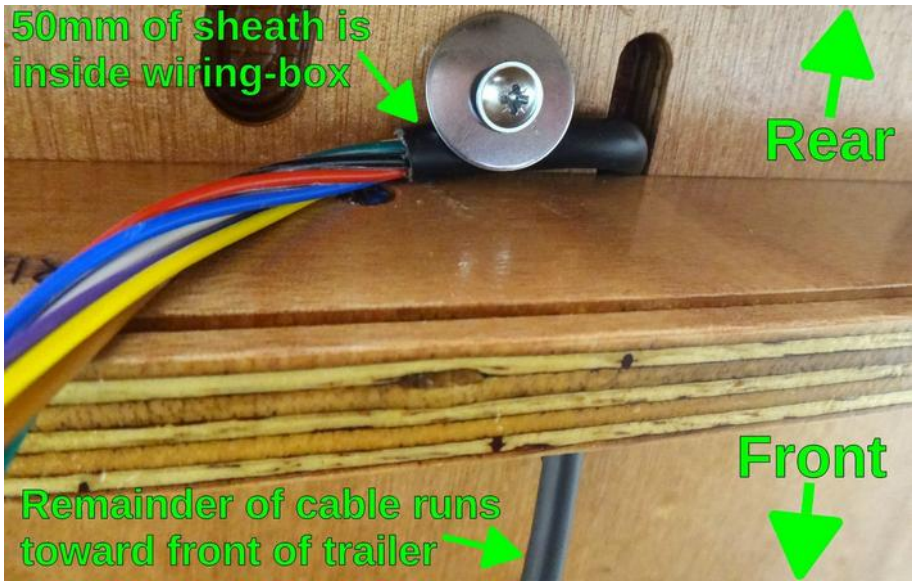
When fitting screws through the glued-on skin and into a part behind, always press down on the screw very firmly. This prevents the screw 'jacking' the glued-on skin away from the part.

Lighting Cable

Strip 0.5m of cover-sheath from one end of the 8-core cable.

Working at the rear of the trailer, thread these loose wires into the wiring-box via the slot which is machined in the underfloor. Pull 50mm of the sheath into the wiring-box.

Bend the cable at 90 degrees toward the left side of the trailer. Trap the end of the cable into place with a #10 x 3/4" flange-head screw and an M5 penny washer. A pilot-hole is provided. Grip the cable tightly but do not crush it. (Image.)



Feed the remainder of the cable forwards. Pass it over the top of the axle-bar where another slot is machined for it in the underfloor. Pass it forwards over the diagonal brace of the chassis.

Pull the cable tight, so it straightens. Fit 3-qty P-clips using #8 x 1/2" flange-head self-tapping

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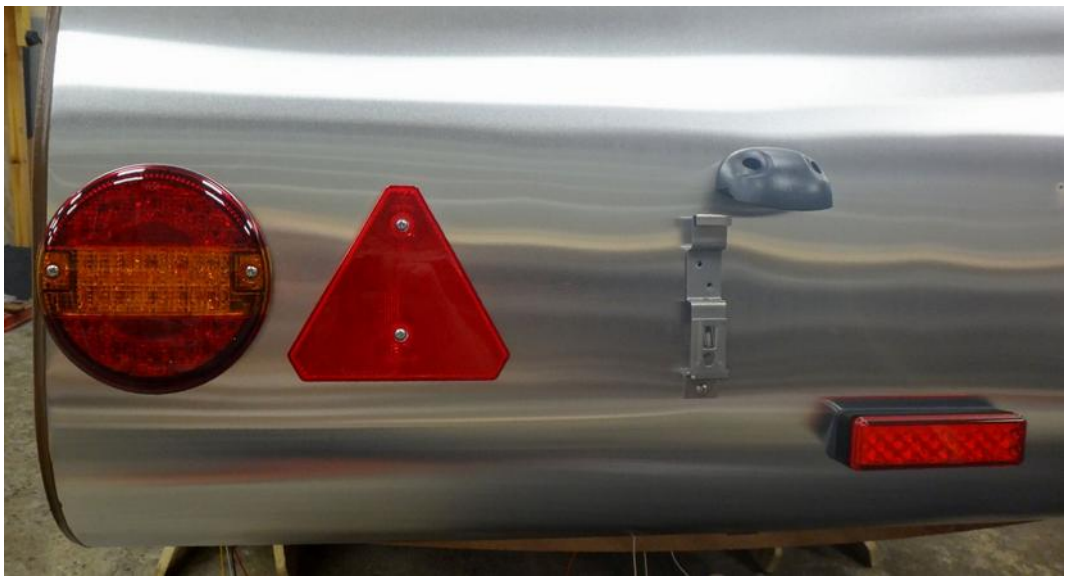


screws to fasten it to the underfloor between the wiring-box and the axle-bar. Pilot holes are provided. (Image.)

Lighting Reference Image

This reference image shows the fog-light and the left-side LED lights in relation to the left triangular reflector.

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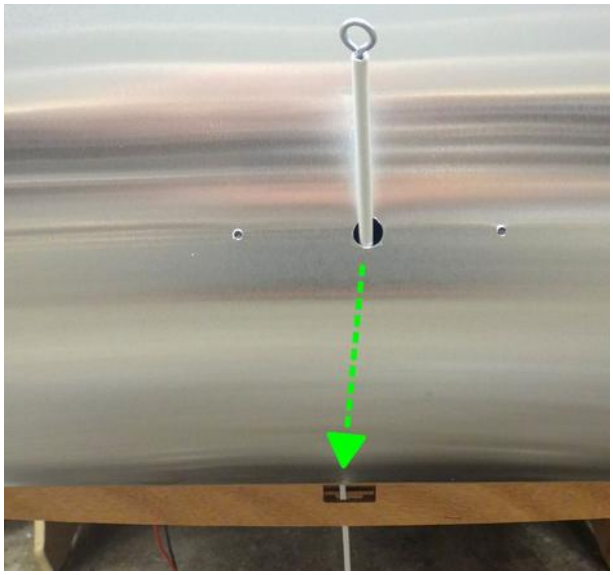


Fog Lamp

Check that the screw-eye on the wiring-tool can pass through the 9mm dia holes where the lights will fit. Modify the eye slightly, by squeezing with pliers, if necessary.

Loosely assemble the lamp and its base. Mark the wires where they will be in contact with the aluminium, once the lamp is fitted. Protect the wires at this location with a short length (20mm or so) of sleeving or heat-shrink.

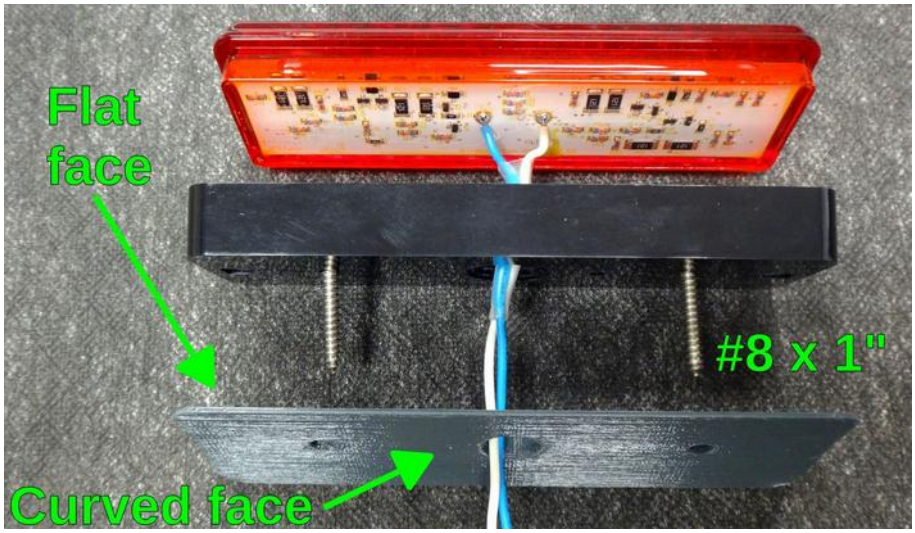
Thread the **bare** end of the wiring-tool into the lowest central 9mm hole in the aluminium at the rear of the trailer, until it passes into the wiring-box. A finger, held underneath the trailer at the edge of the aluminium, will assist in feeding the tool into the wiring-box. Pull the tool through until a few centimetres remain outside the aluminium. (Image.)



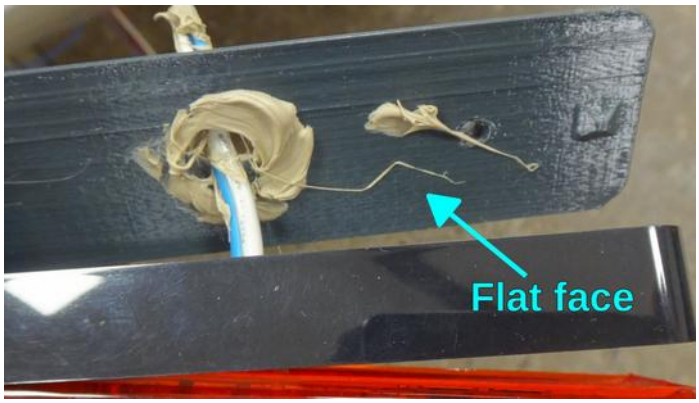
Disassemble the fog lamp from its holder using the biggest available screwdriver fitted into the slot at its end.

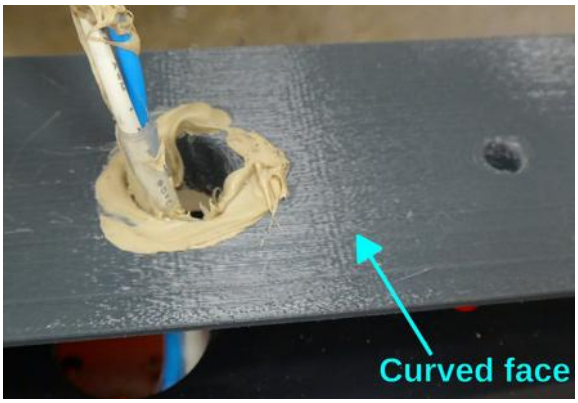
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Feed the mounting bracket onto the wires, as shown, flat face first. (Image.)



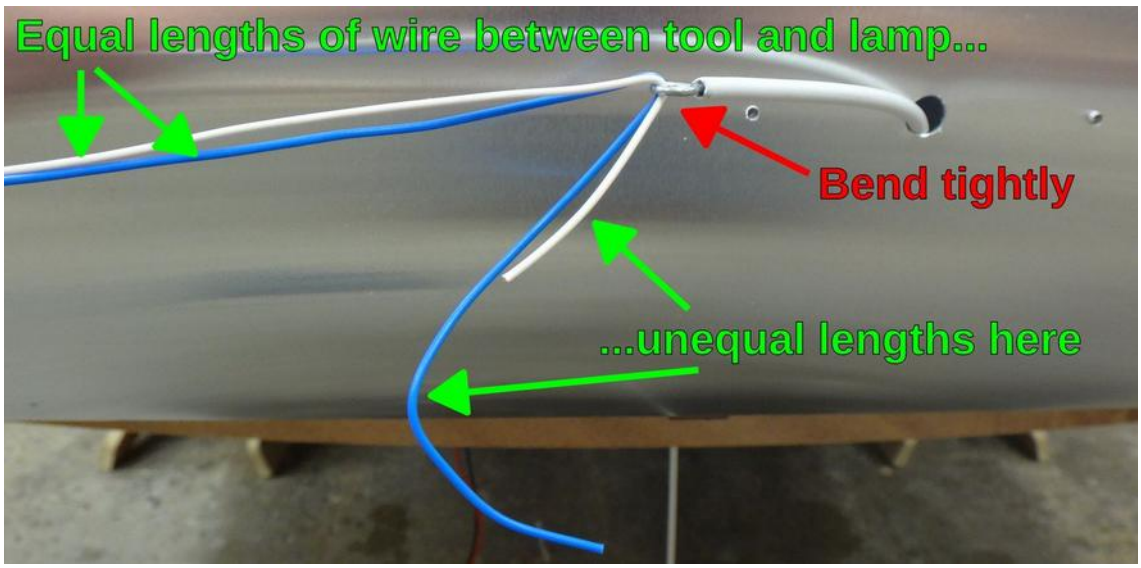
Apply mastic to both sides of the mounting bracket, as shown. (Images.)



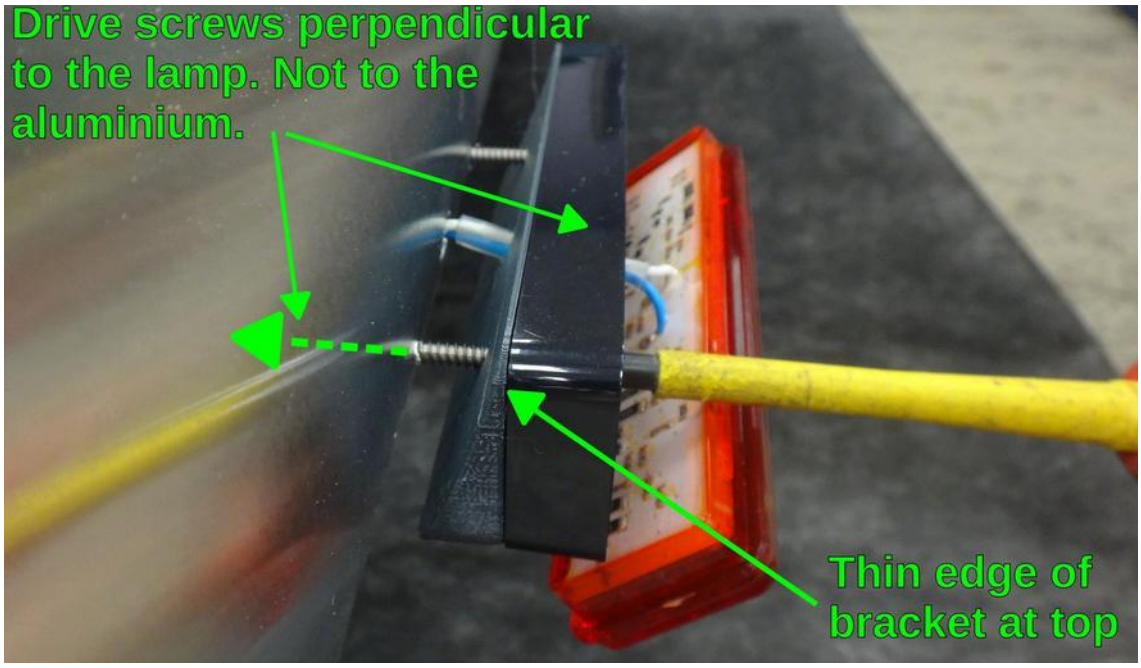


Thread the tips of the blue and white wires through the eye of the wiring-tool. Fold them all the way back on themselves, 180 degrees. Ensure that the length of the wires between the wiring-tool and the fog lamp itself are exactly equal. Uneven amounts of wire will have to be passed through the wiring-tool to achieve this. (Image.)

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Feeding the wires carefully into the hole, gently pull them through into the wiring-box using the tool. Each piece of heat-shrink (at the joints) will need to be feed into the hole one-at-a-time. Screw the bracket and the holder onto the rear of the trailer using #8 x 1” screws. (Image.)



Ensure that the heat-shrink sheath, pre-fitted to protect the wires from the edge of the aluminium, passes partially into the hole in the aluminium.

Other Lamps

The number-plate lamps and the ‘hamburger’ light clusters are fitted in a similar way, with the following differences:

- Left-side lamps include a **black** wire. (b’L’ack)
- Right-side lamps include a **brown** wire. (b’R’own)

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- The number-plate lamps use #8 x 3/4” screws. They have gaskets so require no mastic.
- The clusters use #8 x 1.1/4” screws. They require copious mastic around the cable-entry and the 6mm threads which protrude from their rears, to seal to the aluminium. (Image.)



Ensure the left-side and right-side lamps are fitted to the correct sides, for ease of wiring later.

Dry-fit the ‘hamburger’ clusters before applying mastic, to check that all the five holes for each cluster have opened-out true. Do **not** attempt to force the lamps into place - if necessary adjust the opened-out holes to achieve **zero-strain** fitment. Discard their M6 nuts and washers.

Note that the hamburgers do not require sleeving to protect the wires from the aluminium. The number-plate lights do require sleeving.

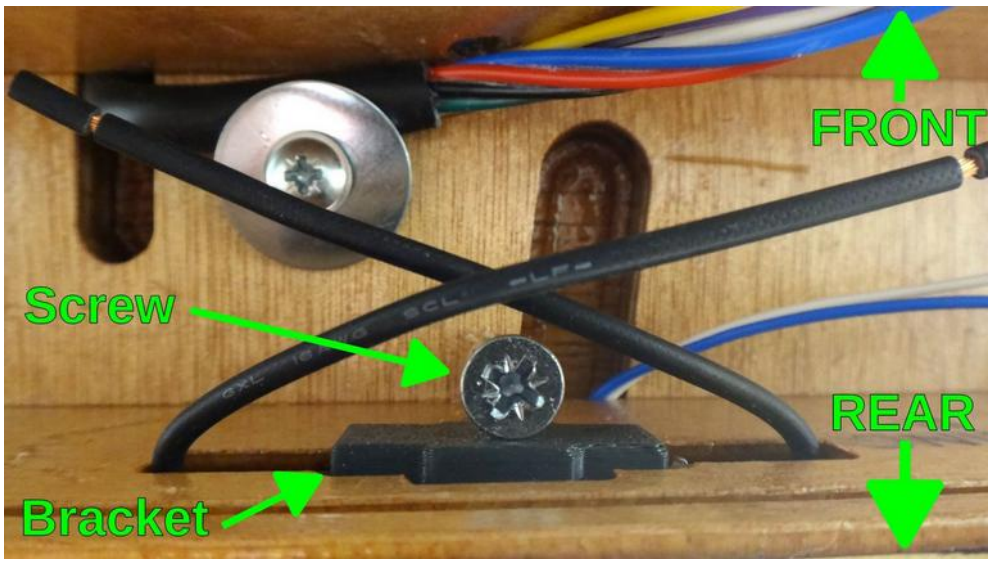
Fuse Holder

Working underneath the trailer, pass the lid of the fuse-holder through its machined rectangular hole. Thread it through from the inside of the wiring-box to the outside. Press the body of the fuse-holder into its recess inside the wiring-box. Install the fuse (8 Amps max) and fit the lid of the fuse-holder **before** clamping it into place.



Press the **shaped** face of the fuse-holder-bracket against the fuse-holder. Drive a #10 x 2.1/2”

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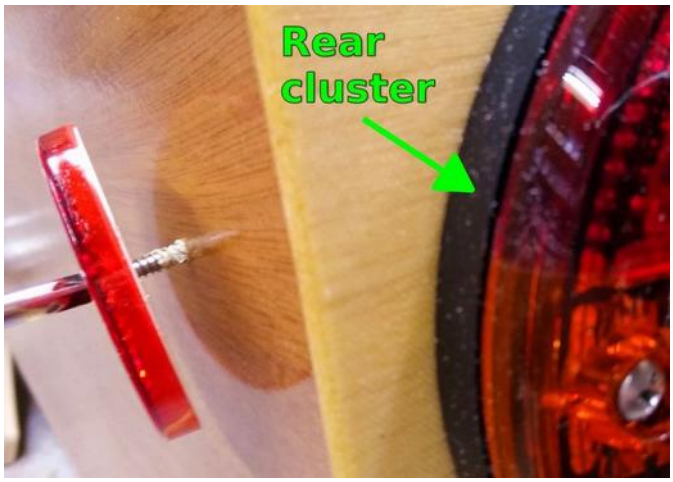


woodscrew into the pilot-hole directly above the back of the fuse-holder. Drive it in until the head of the screw springs tightly against the **centre** of the fuse-holder-bracket. !!Do **not** drive it through the interior floor!! Check that the fuse-holder is fixed firmly in place. (Image.)

Side Reflectors

Set the trailer level.

Identify the pilot-hole on the left side of the trailer, near the light cluster. Use a #8 x 3/4” screw, into the pilot hole, to fasten a red reflector. (Image.)





Identify the pilot-hole on the left side of the trailer, about 70mm behind the bottom-rear corner of the door-hole and at the same height as the red reflector. In the same way, fit an amber reflector. (Image, above.)

Repeat on the other side of the trailer.

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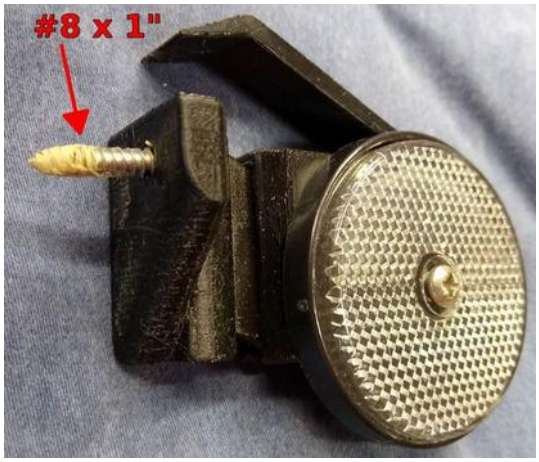
White Reflectors

Use #8 x 3/4” stainless-steel self-tapping screws to fasten a white reflector onto each of the two reflector-stalks. (Image.)

Identify the pilot hole at the front edge of the left side of the trailer, at approximately the same height as the bottom of the door hole.



Use a #8 x 1” screw to fit the left reflector-stalk into place. Do not overtighten. Align vertical. (Image.)





Repeat on the other side of the trailer.

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Build Stage: Inside the Wiring-Box

Lower the nose of the trailer to the ground. Work from behind the trailer.

There is no need to shorten **any** of the wires, except where stated. All wires require plenty of slack.

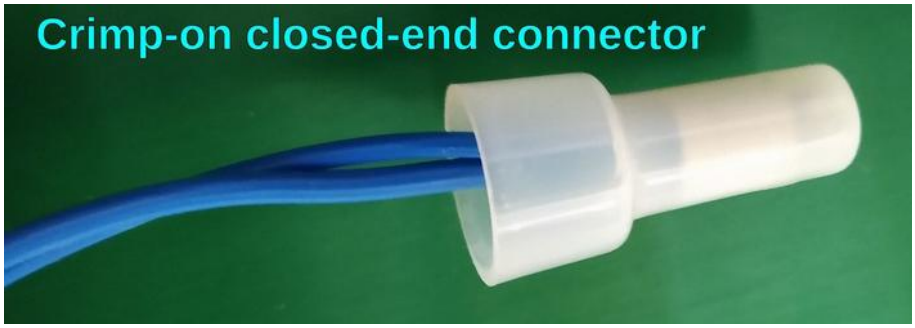
Blue, Yellow, and Green Wires

Identify the two **blue** wires, one from the fog-light and the other from the lighting cable. Strip 25mm insulation from the end of each. Hold the ends **parallel** and twist them together, then fold the twisted part double. (Image.)



Either:

- Solder the joint then insulate with heat-shrink. (This is the preferred method if you have soldering skills and equipment). Or
- Lock and insulate the joint with a **small** ‘closed end’ crimp. (Image.)



Repeat for the pair of yellow wires.

Repeat for the pair of green wires.

Red Wires and Brown Wires

Repeat the same process, for the **triplet** of red wires. If crimping, then a **larger**-sized connector will be needed wherever there are more than two wires jointed.

Repeat for the triplet of brown wires (right side of trailer).

Thin Black Wires

Identify the **thin** black wires from the left number-plate lamp and the left light cluster. In the same

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way, connect these together with the black wire from the lighting-cable. Do **not** connect either of the **thick** wires coming from the wiring harness, nor the **thick** wires from the fuse-holder.

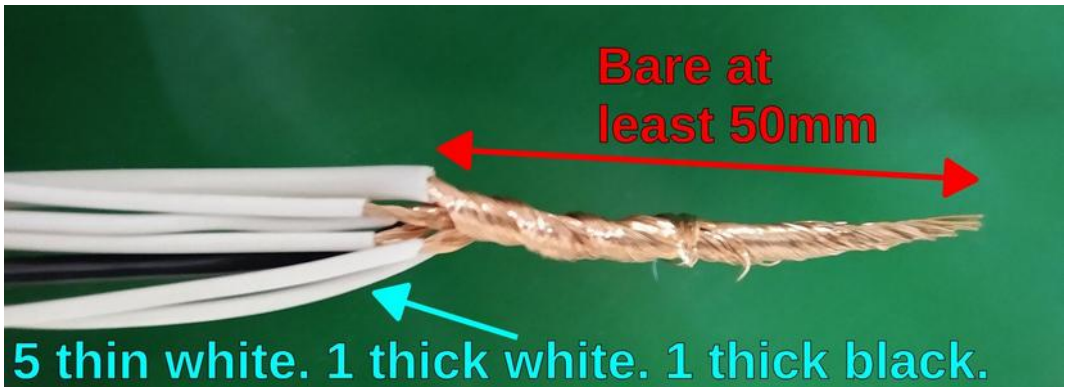
Earth Wires

Strip **50mm** of insulation from the ends of the 5-qty **thin white** wires coming from the light fittings.

Shorten the **thick white** wire coming from the lighting cable to about 200mm. Strip **50mm** of insulation from its end.

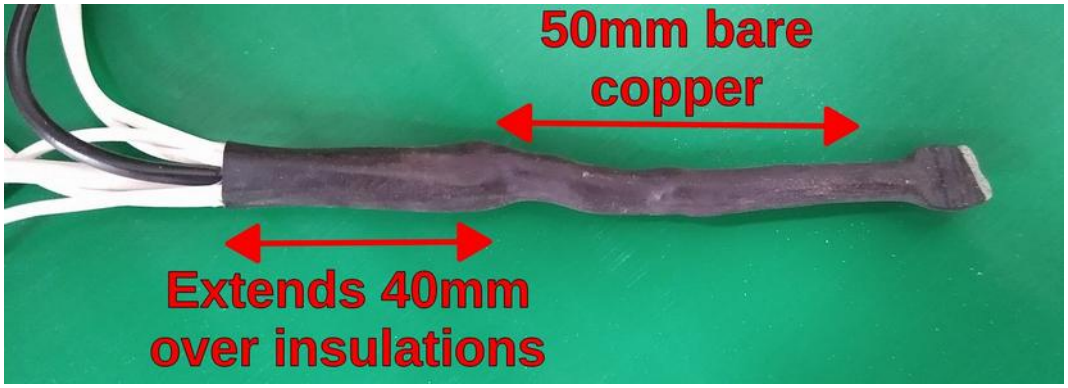
Strip **50mm** of insulation from the **thick black** wire coming from the wiring harness.

Bundle all these stripped ends parallel and twist them tightly together. Do not fold double. (Image.)



Either:

- Solder the joint then insulate with heat-shrink. (This is the preferred method if you have soldering skills and equipment). Or...
- Lock and insulate the joint with a long length of glue-lined heat-shrink. Extend the heat-shrink 40mm over the insulated parts of the wires, to strengthen the joint. (Image.)



Thick Red Wire and Fuse Holder

Identify the **thick** red wire from the wiring harness that emerges from under the roof. Identify one of the thick black wires on the fuse-holder. Join these two wires together in the same way.

Identify the last remaining wire from the lighting cable. It will usually be **pink** or **purple**,

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sometimes **orange**. Shorten this pink/purple wire to about 150mm. Join it to the remaining black wire from the fuse holder.

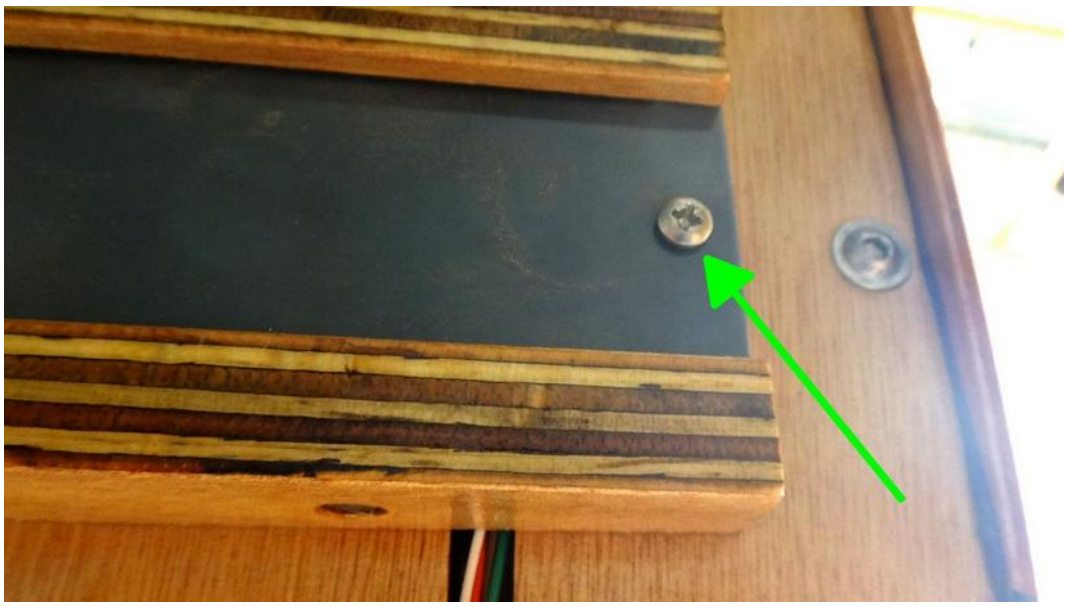
Fit Wiring-Box Cover

Do **not** plait, twist, knot, cable-tie, or in any other way bundle the loose wires together. They must be laid **loose** inside the wiring-box to prevent the weight of several wires putting undue strain on any single wire.

Slot the WIRING-COVER into one end of the grooves cut into the inside of the wiring-box.

Slide the WIRING-COVER slowly closed, carefully tucking the wires inside as it progresses. Make sure no wire is trapped into either of the grooves.

Lock the WIRING-COVER into place using 2-qty #8 x 1” screws. Pilot holes are provided. Take care to keep the wires clear of the screws. (Image.)



Ensure the drain-hole (centre of the WIRING-COVER) is clear.

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Build Stage: Lighting Cable and Plug

Tilt the trailer nose-up until the wiring box touches the ground. Safely secure the trailer in this position. Work under the front of the trailer.

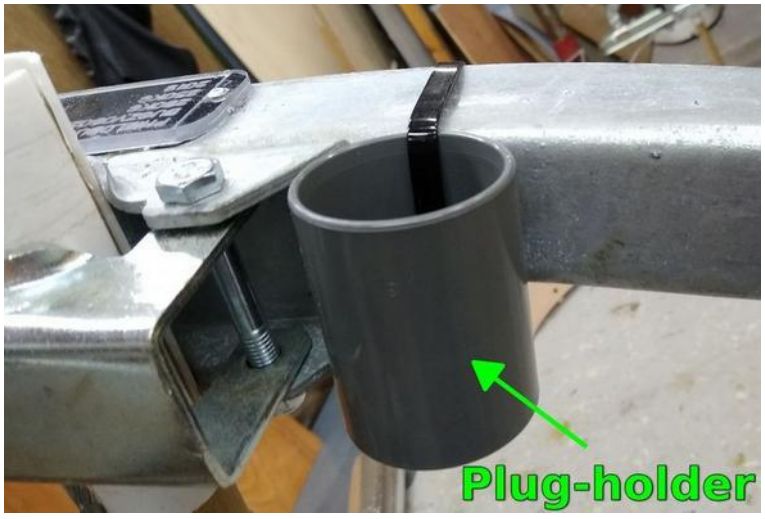
Check that the 8-core lighting cable is threaded over the top of the axle and over the top of the diagonal brace of the chassis.

Fit 4-qty P-clips, using #8 x 1/2” flange-head self-tapping screws, to hold the cable at intervals along the underside of the floor, on the right side of the drawbar. Pilot holes are provided.



Fit cable-ties at intervals of no more than 250mm to hold the cable against the right side of the drawbar. (Image.)

Drill the trailer plug holder (the FloPlast fitting) 8mm dia at about 1/3rd up from its bottom. When fitting the front-most cable-tie, also loop the cable-tie through the plug-holder and secure that against the **left** side of the drawbar, tight up against the front leg clamp. (Image.)



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Wire the 13-pin plug onto the end of the cable. (A 7-pin plug is not suitable, because it cannot supply power to the harness. Use a 13-to-7 adapter, if a 7-pin plug is required when towing.)

If unsure how to do this, we advise seeking help from someone knowledgeable.

The wires go to the following pins, which are numbered inside the plug:

Colour	Pin	Purpose
Yellow	1	Left indicator
Blue	2	Foglight
White	3	Ground
Green	4	Right indicator
Brown	5	Right sidelight
Red	6	Brakelights
Black	7	Left sidelight
Pink or purple	9 (*not 8)*	12V permanent supply from car to the trailer's interior wiring harness
Not used	13	Do *not* cross-connect to pin 3
Not usually used	12	Unless your vehicle requires it, there is no need to cross-connect this to pin 3

Crimp 'bootlace' ferrules onto all the stripped wires before clamping them into the trailer plug - this will substantially increase electrical reliability. Note that a sleeve, to increase the diameter of the cable's sheath so that it properly fits the plug's gland, may be required.

For PhieldBug's interior lighting and power-points to work, requires that the tow vehicle's 'Pin 9' is connected to the vehicle battery via a suitable fuse. This connection may, or may not, have already been made by the tow-bar installer.

Optional Adapter

If using an external power-supply (such as a power-brick) to supply 12V to PhieldBug when pitched, an adapter lead will be required. If you are able we suggest you make your own as it will save considerable cost. The following parts would be required:

- 13-pin flying socket. Maypole's MP125B will work, but there are much cheaper (and sleeker) alternatives. Ensure the socket has 13 connectors inside. Some have only 7 or 8.
- 2-core cable, at least 1.5mm^2 conductor area. 0.8m-1.0m length. Do *not* make over-long.
- User-wireable cigar-lighter plug. Typically from ebay or Amazon. *Must* be fused.

The 2-core cable will usually have one red and one black core.

Wire the red core from the **centre-pin** (fused) of the cigar-lighter-plug to **Pin 9** of the 13-pin flying socket.

Wire the black core from the **side-connector**(s) of the cigar-lighter-plug to **Pin 3** *(not Pin 13)* of the 13-pin flying socket.

Check there is no short-circuit between red/black before connecting. Use a max 8A fuse in the plug. Carry spare fuses.

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Build Stage: Mudguards and Wheels

This stage assumes that the chassis holds the wheels in *exactly* the drawn positions is used.

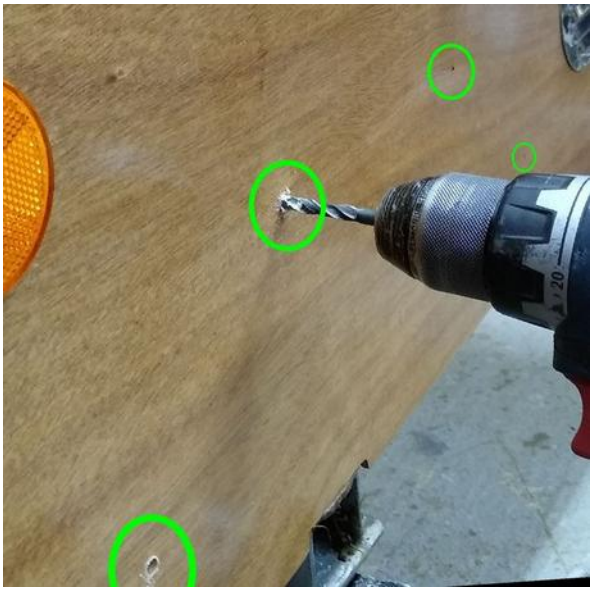
If using some other trailer base (for example a repurposed dinghy trailer) then adapt these instructions as necessary to achieve a similar result. In many cases, the mudguards will mount directly to the chassis, so it will not be necessary to drill the pod at all. In such case, carefully fill the pilot holes with brown Soudal Fix-All.

Mudguards

Drill the mudguards, using the template. See .DXF drawing for details.

Identify the 4qty pilot-holes in the left OUTER-SIDE-SKIN around the axle area. Using these pilot-holes as a guide, drill 4qty 6mm holes clear through the side of the trailer into the interior. (Images.)





Press M6 x 40mm flange-head M6 screws through the holes, from the inside to the outside. Apply mastic around the screws, on the outside. (Images.)

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Prepare 4-qty M6 nyloc nuts and 4-qty M6 penny washers. Note which holes on the mudguard the bolts should go through (image below). Slot the mudguard onto the bolts and quickly thread the nuts - with washers underneath - onto the bolt-tips.

Hold the M6 screws stationary and tighten the nuts until the boltheads just begin to be crushed into the interior timber by a fraction of a millimetre.



Repeat on the other side.

Wheels

Set the trailer level. Place a temporary chock under the rear of the trailer so as to support the end of the wiring-box. An axle-stand with padding on top is suitable. Or a suitably **reinforced** milk-crate.

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Taking great care to lift safely, slowly raise the nose of the trailer until the axle - on the same side as the temporary chock - is lifted off of its support. Clamp the temporary front leg in this position. (Images.)

Tip: if the drawbar is too heavy to lift safely, then position the chock further forwards. This will reduce the lift required at the drawbar. If still too heavy to lift, then use a jack or similar equipment.

Chock the drawbar to prevent the trailer falling. When the trailer has been made secure with chocks, fit the wheel and tighten the nuts reasonably tight.

Slide out the chock which was originally under the axle and remove it. Lower the trailer nose so the weight is taken by the wheel. Remove the temporary chock at the rear.

Wedge the wheel to prevent it rolling, then torque the wheelnuts to 61Nm (45 lb.ft). (Image.)





Set the tyre pressure to 22psi. Double-check that there is a split-pin on the end of the axle. Then fit the hub-cap. (Images.)

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Chock the wheel **front and back** to prevent it rolling, then repeat on the other side of the trailer.

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Build Stage: Front Leg

This stage assumes that a T-form chassis, made from 50mm x 50mm box section, is to be used.

If using some other trailer base (for example a repurposed dinghy trailer) then adapt these instructions as necessary to achieve a similar result.

The front leg is a galvanised cruciform part about 700mm long.

Use a file or coarse abrasive to remove any sharp points of zinc coating on the front leg.

Tap the large bung into the end of the large-diameter tube of the front leg. (Image.)



Tap a small bung into each end of the small-diameter tube of the front leg. (Image)



Support the front of the trailer, then unscrew completely the clamp which holds the temporary front leg. Remove the temporary front leg and replace with the galvanised front leg.

Position the front leg with the point downwards and touching the ground, and with its cross-piece aligned fore-and-aft (to avoid trip-hazard).



Clamp the front leg tightly, and let it take the weight of the nose of the trailer. (Image.)

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Build Stage: Shelf Retainer

Warning - Choke Hazard

Remove the shelf retainer from the trailer whenever the trailer is occupied, especially by youngsters. The shelf retainer could be a choking hazard, especially for babies, toddlers and small children.

The retainer can be completely removed from the trailer by unsnapping both hooks and unthreading it. No tools are required to do this. Stow it outside the trailer and out of reach of children.

See website **capt.org.uk/blind-cords** for information relevant to cord and elastic dangers.

Preparation

Set the trailer level, on hard level ground. Firmly tighten the front leg in its clamp. Press hard down on the hitch, to confirm the leg is properly clamped. Chock the rear of the trailer to prevent tilting. Chock the wheels to prevent it rolling.

Enter the trailer and sit at the front, facing the rear.

Fitting

Fit a hook onto the end of the elastic. (Image.)



Snap the hook onto the eye on the right internal wall of the trailer. Thread the 5mm elastic through the large holes in the SHELF-RAFTERs, engaging it in its slots. (Image.)

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Cut off the elastic approximately 75mm beyond the second SHELF-RAFTER. Fit the other hook. (Image.)



Snap the hook onto the left eye. (Image.)



The retainer helps to keep bulky lightweight items, such as duvets and pillows, on the shelves while travelling. To load and unload the shelves, unsnap one or both hooks from their eyes.

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PhieldBug Logo

Your trailer is complete. But before you set off on the first adventure, can we make a plea...

Many, many thanks for putting your trust in PhieldBug Open Source Version. We hope the build process was straightforward and enjoyable.

Now that your ‘Bug is complete, we’d love to have to see a logo on it, to help others identify the trailer and encourage them to find out more and even to build one for themselves.

A tough sticky-back logo is available from us - free. Fitting it is, of course, at your option but we’d be very grateful if you did.

Application instructions follow.

Introduction

This section shows how to apply the self-adhesive vinyl logo onto PhieldBug.

Read this entire section before beginning.

Assistant

An assistant can be useful, particularly for those without previous experience of applying vinyl.

Prepare the Trailer

Conditions

The logo can only be applied when the surface is completely dry. Do not attempt to apply it when rain or condensation - however slight - affects the surface of the aluminium roof. If working outdoors, beware possible dew especially in the evening. Do not work in direct sunshine.

Set the trailer slightly rearwards-tilted for this work. Be prepared to kneel at the rear of the trailer when applying the logo, so as to get a good sight-line for positioning it. Do not tilt the trailer forwards: the logo would then tend to flop, uncontrollably, onto the sloping surface.

Clean the Surface

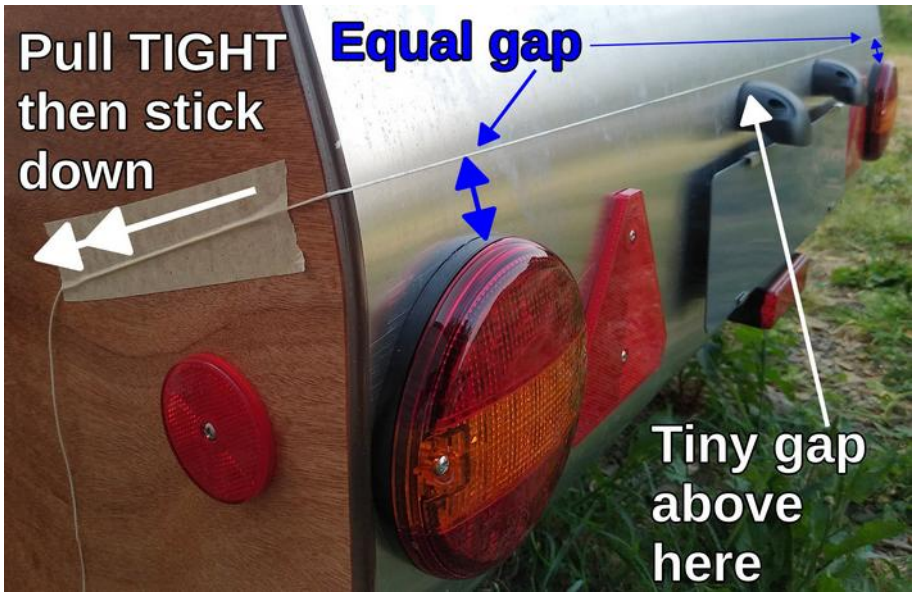
The logo fits to the aluminium just above the right-hand rear light. (See image above). Lightly brush this area clear of any dust or other solid contaminants. If necessary also clean this area with de-natured alcohol to remove any oil, grease, or fingermarks. *Tip: make all brushing or wiping movements fore-and-aft, not side-to-side: the aluminium is soft and will slightly mark when any cloth or brush is moved over the surface. Fore-and-aft marks will blend into the existing slightly brushed surface of the aluminium, whereas sideways marks would be more prominent.*

Allow to dry.

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Install a Guideline

Run a length of very light thread or cord across the width of the trailer, as shown. The cord must be lint-free, so parcel-string, wool, or sewing-cotton would not be suitable. Whipping twine and dental floss are examples of suitable cord.



Keep the cord *just* clear of the number-plate lights. Ensure the cord is pulled very taut. Ensure it is exactly level across the trailer by measuring equal heights above the two rear light-clusters.

Stick the cord to the sides of the trailer with masking-tape, keeping strong tension on the cord.

Prepare the Logo

All logo preparation work must be carried out on a clean, *dust-free* surface. Preparation involves exposing the vinyl's adhesive side. Any dust which is accidentally transferred onto the vinyl adhesive will ruin the logo.

The logo is supplied in four layers. Which are (from rear-most to uppermost):

- A blank A4 sheet of white paper.
- The waxed backing-paper to which the vinyl is currently stuck.
- The vinyl lettering.
- The clear transfer-tape.

The vinyl lettering has to be unstuck from the other parts in the correct order, as follows.

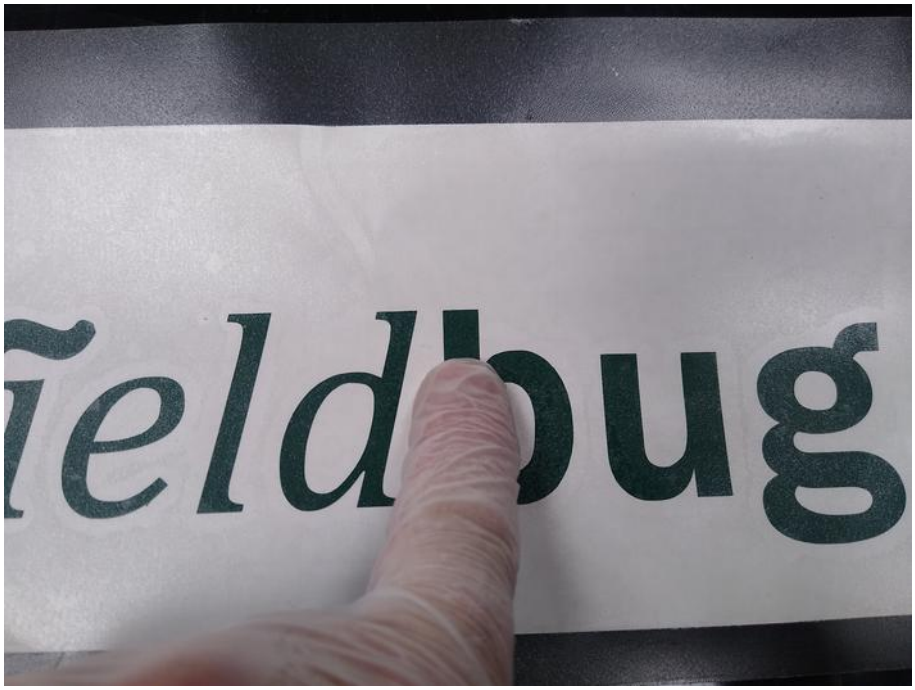
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Remove the A4 Paper

The A4 paper is stuck at the top and the bottom of the logo, only. Flip the logo upside down, and peel away the A4 sheet of plain white paper. Peel it sideways, so as not to curl or bend the logo.

Bond the Transfer-Tape

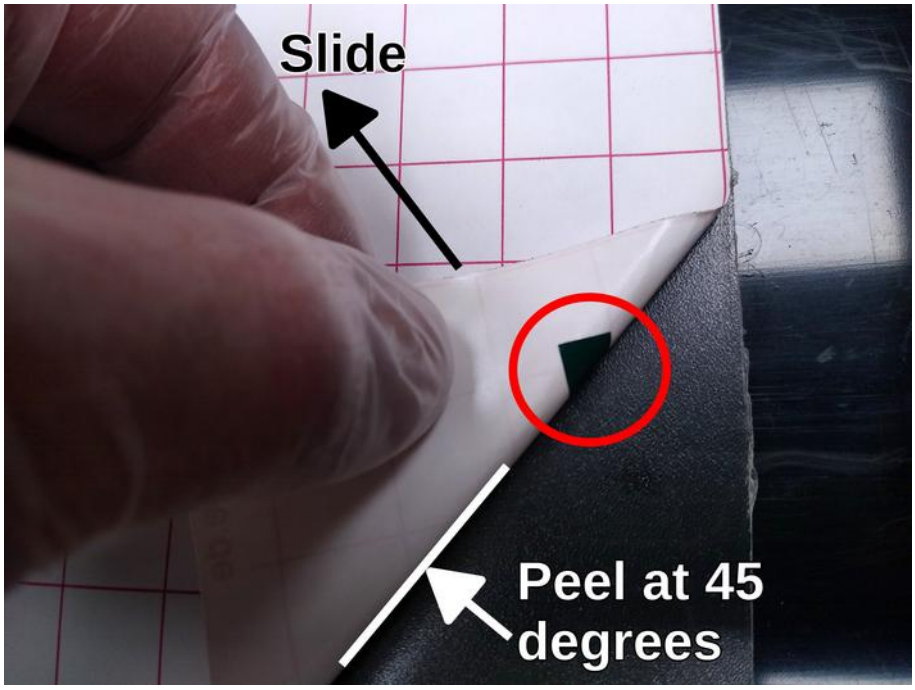


Firmly bond the tacky transfer-tape onto the vinyl lettering. Do this by laying the logo face-up onto a clean smooth hard surface and pressing the transfer-tape firmly down onto the lettering with a fingertip, taking particular care at the corners and edges of the lettering.

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Remove the Waxed Paper

This is the most difficult part of the job. Work very slowly. The goal is that the waxed paper comes away, leaving just the logo's vinyl lettering stuck onto the clear transfer tape.



After this step the vinyl's adhesive will be fully exposed, so be sure that the trailer is ready to immediately have the logo applied to it.

Flip the logo upside-down onto the work-surface, so that the waxed paper is on the top. Peel up one corner of the waxed paper and - s-l-o-w-l-y - slide it back upon itself to peel it away from the transfer-tape and the vinyl. Aim to peel at a 45-degree angle to the lettering.

The waxed paper **will** pick up the logo and try to peel it away from the transfer-tape. Which mustn't be allowed to happen. So observe the peeling edge of the waxed paper carefully: if any corner or edge of lettering appears then carefully reverse the waxed paper down onto the transfer-tape, then press down **through the waxed paper** to re-bond the vinyl at that point, then resume peeling. (See red circle in image above.)

Apply the Logo

Position

Do not touch the adhesive of the vinyl lettering.

Pick up the transfer tape by the top edge. Carry it to the trailer.

Hold the top two corners of the transfer-tape, with the adhesive facing away from you. Keep light tension on the tape to maintain the logo flat. *Tip: An assistant, lightly holding the bottom two corners to pull the adhesive tape clear of the surface, can be very useful at this point.*

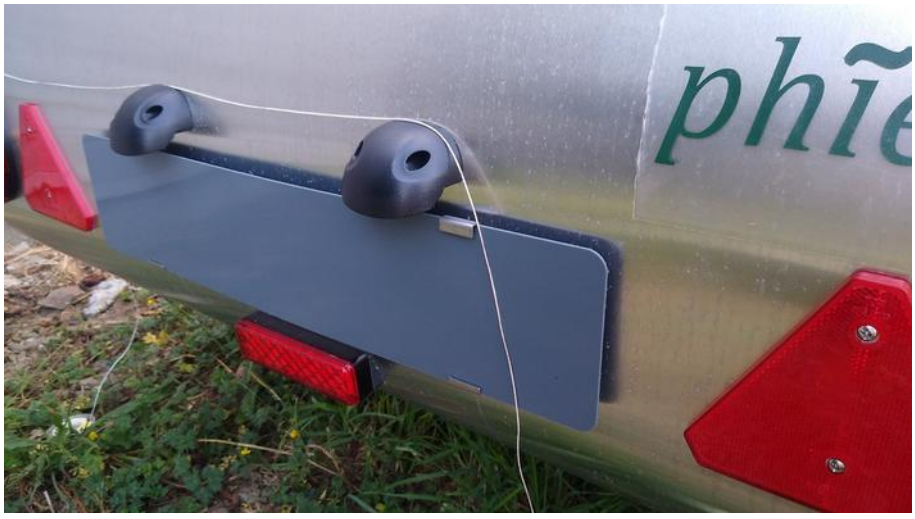
Holding the logo slightly away from the trailer, align the bottom edge of the letters "hieldbu" with

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the taut cord. The right-hand side of the logo should be about 30mm-60mm from the edge of the trailer. Maintaining the alignment, and keeping the tension on the tape, stick the top of the transfer-tape onto the aluminium.

Un-tape the guide-line from the side of the trailer and let it drop away.

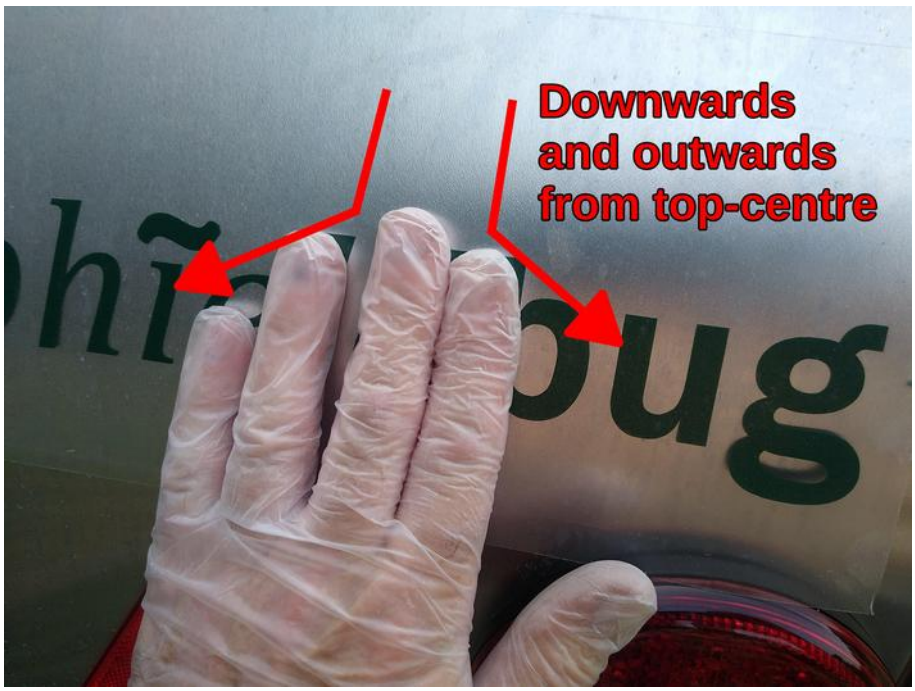


Smooth Down

Working **downwards** from the **top**, and **outwards** from the **centre** of the logo, smooth it gently into contact onto the surface.

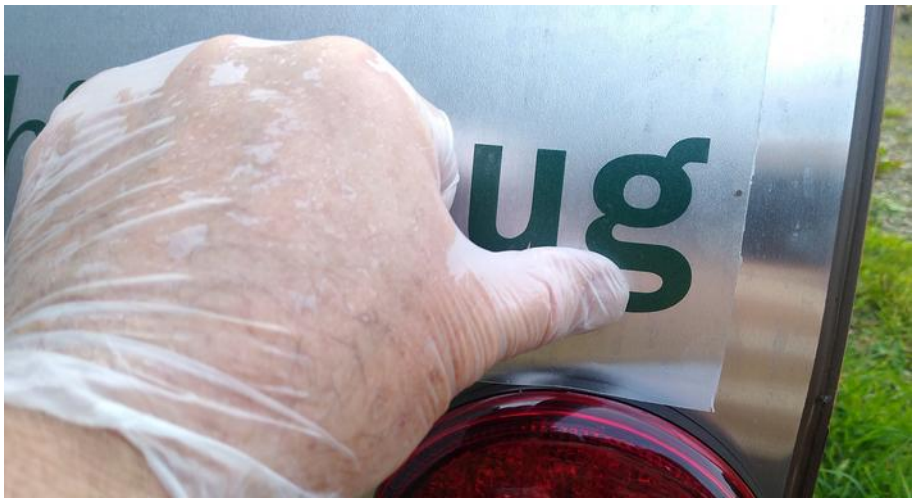
It may help to keep a light tension on the bottom corners, to prevent wrinkles.

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Bond

When the transfer-tape (and the logo) are stuck to the surface over their entire area, use a finger to press moderately firmly through the transfer tape to bond the vinyl onto the aluminium.



Do not press so hard as to dent the aluminium. Do ensure that all the vinyl is securely bonded, pressing smoothly through the transfer-tape onto every part of the vinyl underneath.

Remove the Transfer-Tape

Remove the transfer-tape using the same technique as previously used for the waxed paper: peel it by folding it back against itself, with a 45-degree peeling edge. Work very slowly until the transfer tape is completely removed.

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In the rare event that there is an air bubble underneath the vinyl at any point, use a dressmaking pin to puncture the centre of the bubble and then carefully press the vinyl down to expel the air. *Tip: do not confuse a trapped dust particle for a bubble - trapped solid contaminants cannot be removed although any air around them can still be expelled using the pin technique.*

Cure

The trailer is ready for use immediately, but avoid vigorous washing for the first few days while the adhesive cures. The adhesive bond will gradually increase. Do not rub on the vinyl in an attempt to increase the bond - doing so risks marking the aluminium or even tearing the uncured vinyl.

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Commissioning

Double-check that all parts of the trailer are correctly fitted and secure.

Read the PhieldBug owners manual.

Obtain the IVA certificate (if necessary).

Enjoy.



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Appendix: Wiring Harness

This appendix shows how to build the internal 12V wiring harness for the PhieldBug kit.

Purpose

This extremely simple wiring harness fits inside the air-gap in PhieldBug's roof. It supplies 12V power to the internal lights and to the internal 12V/USB sockets.

The harness is in two parts: RED and BLACK. Oversized cable is used, to minimize resistance.

Essential Tools and Materials

Required:

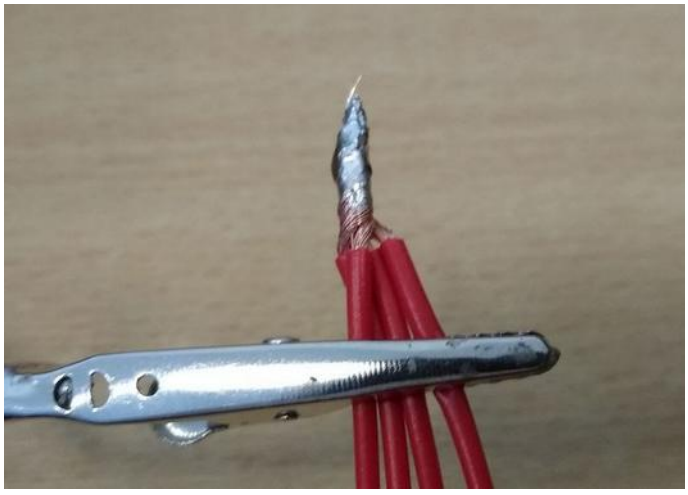
- Wire stripper. (Pliers or side-cutters can be used.)
- Crimping tool.
- Solder.
- Soldering-iron with 3mm or larger tip. At least 25W recommended.
- Heat-gun or other heat-source for heat-shrink tubing.
- Lengths of 1.5mm^2 stranded thinwall automotive red and black wire.
- Heat-shrink.
- Fully-insulated crimp-on female 6mm spade connectors, type with anti-vibration inserts, suitable for the wire size.

Assemble Red Harness

Cutting

Cut the RED wire into the following lengths:

- 1qty 1000mm length
- 4qty 400mm length
- 1qty 2250mm length



First Joint

Take the 1000mm wire, the 2250mm wire, and **2qty** of the 400mm wires.

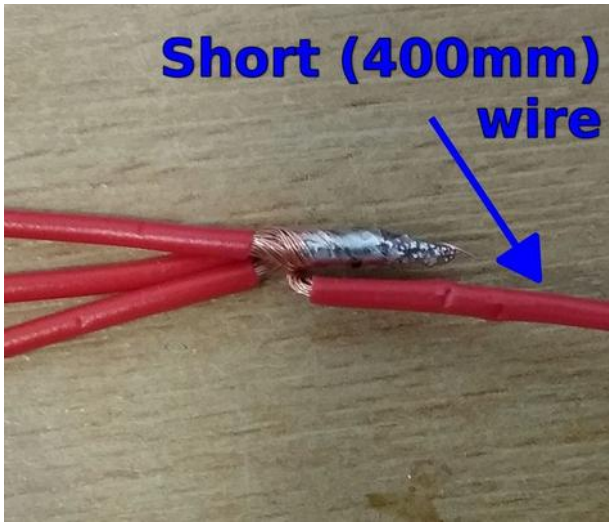
Strip 15mm of insulation from **one** end of each of those four wires.

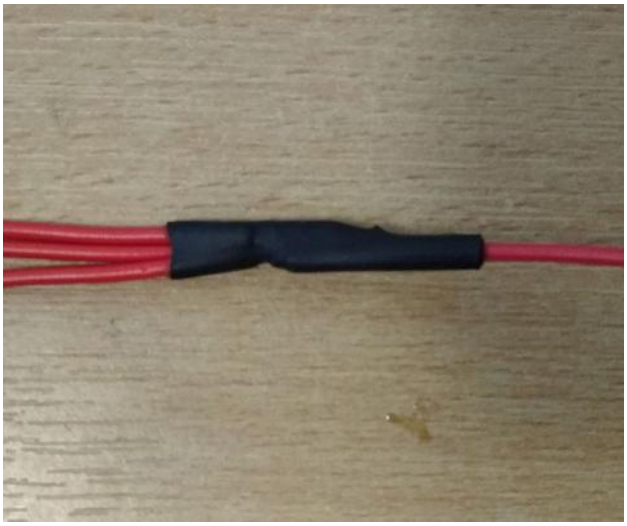
Twist all four stripped ends together into a bundle.

Solder the twisted wires from the tip to just over half-way towards the still-insulated part. (Image.)

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Arrange the joint as shown, with **one** of the 400mm wires separated out, and with the joint laid flat against that same 400mm wire. (Image.)

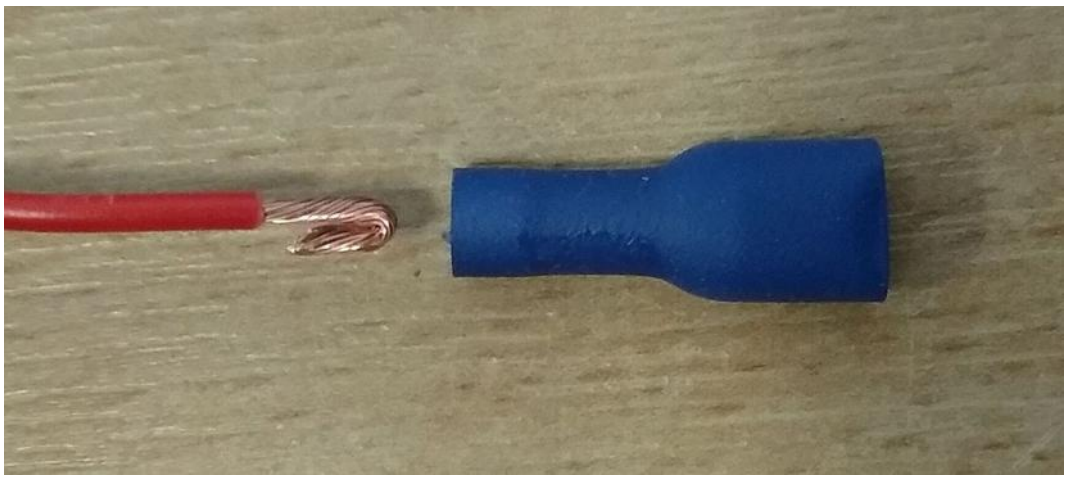




Slide a 35mm length of heat-shrink up the single 400mm wire until it covers the joint and overlaps each end equally. Heat it until it shrinks and a little adhesive oozes out. (Image.)

Crimp Connections

Identify the two 400mm wires in this part-built harness. Strip 12mm from the end of one of them.



Twist the strands together. Optionally fold double, depending on the connector capacity. (Image.)

Insert into a crimp connector. Check that the bare part of the wire has *just* touched the stop inside the connector. (If pushed too hard, the wire will come past the stop and - when crimped - will fail to make good connection.) Check that no bare wire is exposed outside the connector.

Crimp tightly in at least two places in the ‘neck’ of the connector. Tip: professional ‘ratchet’-type tools automatically crimp twice. Cheaper tools crimp only once… and often not very well.

Pull **hard** on the wire. If it comes out of the connector, then it was not crimped properly so re-do it using a new connector.

Repeat for the other 400mm wire.

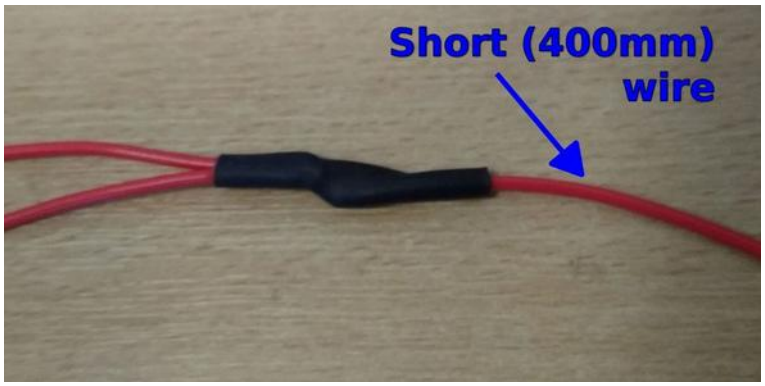
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Second Joint

Identify the remaining unjointed end of the **1000mm** wire in the part-built harness. Strip 15mm from its end.

Strip 15mm from one end of each of the two remaining unused 400mm wires.

Twist all three wires together, and solder as above.



Arrange the joint with **one** of the 400mm wires separated out, and with the joint laid flat against that same 400mm wire.

Insulate with heat-shrink, in the same way as before. (Image.) No crimp connectors are required.



This completes the RED harness.

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Assemble Black Harness

Repeat exactly as above, but with the BLACK wire, to make an identical black harness.

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Appendix: External Lighting Wires

This appendix explains how to extend wires on light units, ready to use on a PhieldBug.

Purpose

As supplied, the cables fitted to commercial vehicle lamps are too short for wiring into PhieldBug. Extensions will be soldered onto each wire in each lamp's cable, to overcome this.

The colours of the extension wires are chosen to make the final wiring - after fitting to PhieldBug - as simple and intuitive as possible. Therefore, many of the extension wires deliberately do not match the colour of the wires on the lamps.

Essential Tools and Materials

Required:

- Wire stripper.
- Solder.
- Soldering-iron with 2mm or larger tip.
- A few metres of various colours of 0.5mm^2 stranded thinwall automotive single-core wire. See text for details and quantities.
- A small quantity of small-diameter **adhesive-lined** heat-shrink insulation.

Do Not

- Do **not** use wires larger than 0.5mm^2. There is not room within the wiring runs for larger cable.
- Do **not** bind extension wires into a sleeve or cover after fitting. Do **not** plait them.
- Do **not** cover the individual small heat-shrinks with any outer layer such as larger heat-shrink.
- Do **not** strip the ends of the extension wires until after fitting to the trailer.

Rear Fog-Lamp

The fog-lamp is a rectangular red lamp with a black base.

Fog-Lamp's BLUE Wire

Strip **15mm** of insulation from the end of the fog-lamp's BLUE wire.

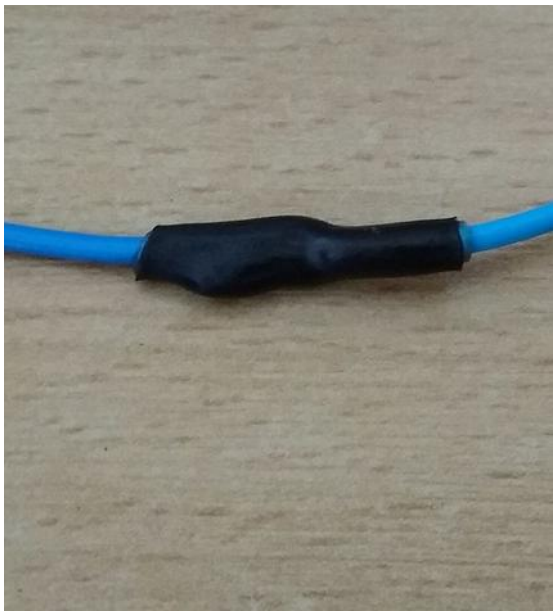
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Strip **15mm** of insulation from one end of the reel of BLUE wire.





Twist the extension BLUE wire together with the fog-lamp's BLUE wire. Solder the tip of the twisted joint - but not *quite* all the way to the base of the twist. (Images.)

Bend the joint over so that the twisted part lies against the extension wire (i.e. pointing away from the lamp.) (Image.)

Measure **670mm** from the **base of the fog-light** along the BLUE extension wire. Cut the wire at this point.

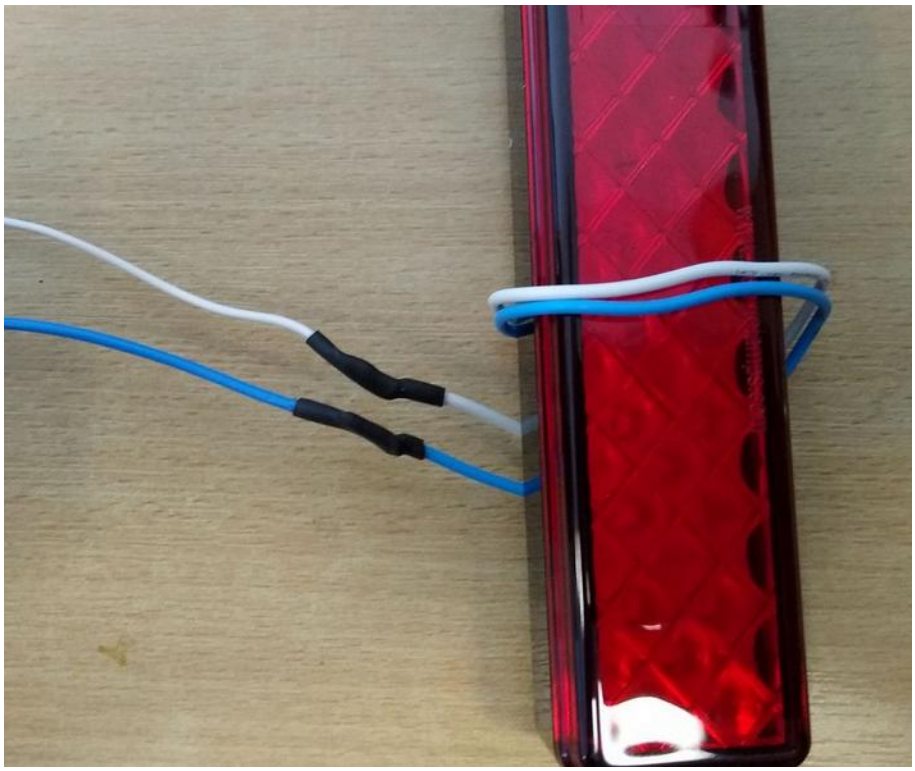
Cut a short length of small heat-shrink. Slide it onto BLUE wire so that it covers the joint with a little excess heat-shrink each side. Heat the heat-shrink until it shrinks tight and a little adhesive oozes from its ends. (Image.)

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Fog-Lamp's White Wire

In the same way, attach an extension WHITE wire to the fog-lamp's WHITE wire.

Cut it off at **670mm** from the base of the lamp.



Insulate with heat-shrink.

Rear Cluster - Left

The left rear cluster is either of the two lamps with a red/orange lens and a black base.

!!The soldering method for these cluster lamps is different!! Do not use the twist/solder/fold technique: it would create a joint which would be too bulky to fit into PhieldBug's wiring channels.

Re-Tin

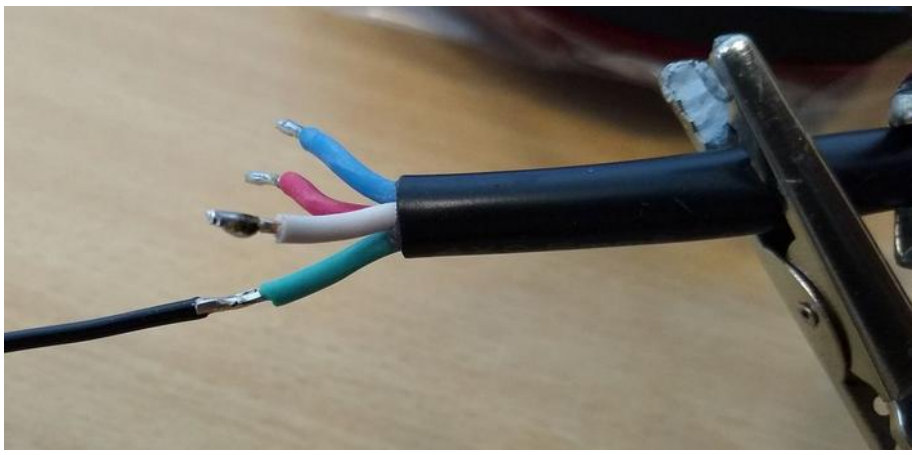
Melt and refresh the tinning in turn on each of the ready-soldered wire tips on the lamp.

Rear Cluster GREEN Wire - Left

Strip just **5mm** of insulation from the end of the reel of BLACK wire.

Solder this BLACK wire to the lamp's GREEN wire. Do this by overlapping the two wires side-by-side and soldering. (Image.)

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Cut the BLACK extension wire at **770mm** from the base of the lamp.

Rear Cluster BLUE Wire - Left

In the same way, attach an extension YELLOW wire to the lamp's BLUE wire.

Cut at **720mm** from the base of the lamp.

Rear Cluster RED Wire - Left

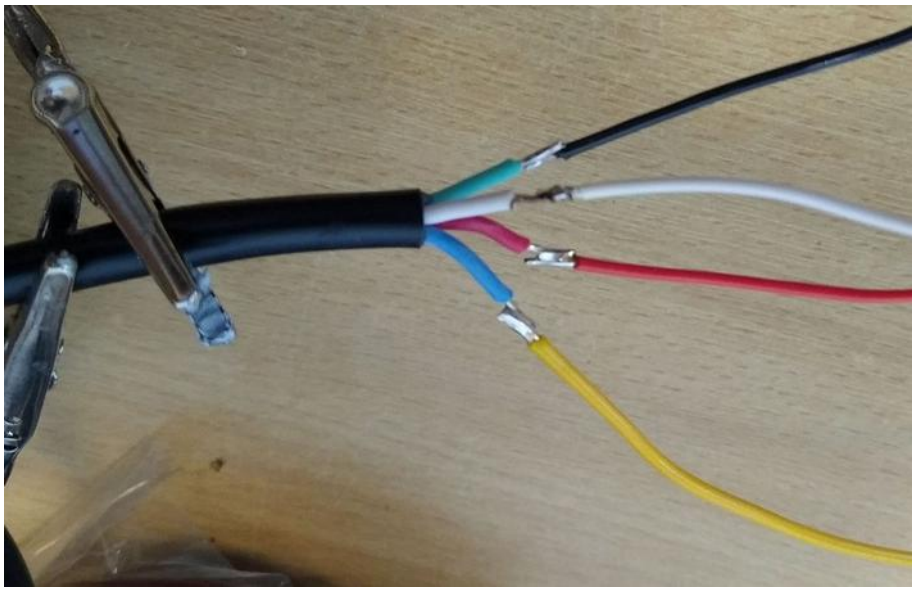
Attach an extension RED wire to the lamp's RED wire.

Cut at **1120mm** from the base of the lamp.

Rear Cluster WHITE Wire - Left

Attach an extension WHITE wire to the lamp's WHITE wire.

Cut at **1120mm** from the base of the lamp.



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Insulate



Insulate each of the 4qty wires with short (**20mm max)** lengths of heat-shrink. (Image.)

Label

Label or mark the back of this lamp (or the box that it is in) to identify it is the left-hand one. A useful mnemonic is that all (L)eft lamps have a b(L)ack extension wire on them.

Rear Cluster - Right

The right rear cluster is the remaining lamp with a red/orange lens and a black base.

Re-Tin

Refresh the tinning on the lamp's wire ends.

Rear Cluster GREEN Wire - Right

Attach an extension BROWN wire to the lamp's GREEN wire.

Cut at **770mm** from the base of the lamp.

Rear Cluster BLUE Wire - Right

Attach an extension GREEN wire to the lamp's BLUE wire.

Cut at **720mm** from the base of the lamp.

Rear Cluster RED Wire - Right

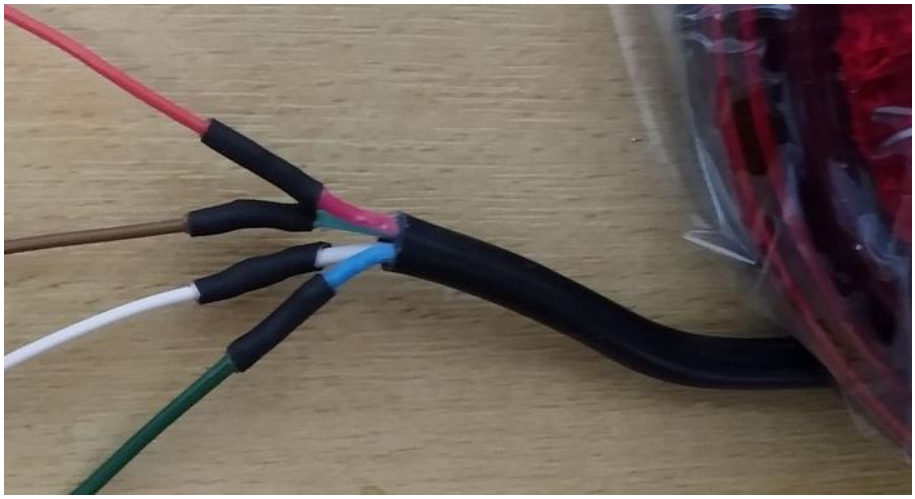
Attach an extension RED wire to the lamp's RED wire.

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Cut at **1120mm** from the base of the lamp.

Rear Cluster WHITE Wire - Right

Attach an extension WHITE wire to the lamp's WHITE wire.



Cut at **1120mm** from the base of the lamp.

Insulate

Insulate each of the 4qty wires with short (**20mm max)** lengths of heat-shrink. (Image.)

Label

Label or mark the back of this lamp (or the box that it is in) to identify it is the right-hand one. A useful mnemonic is that all (R)ight lamps have a b(R)own extension wire on them.

Number-Plate Illuminator - Left

The left number-plate illuminator is either one of the small black lamps with a white lens.

Either soldering technique above can be used, as preferred.

Number Plate Illuminator Red Wire - Left

Attach an extension BLACK wire to the number-plate illuminator's RED wire. (This is counter-intuitive now, but will later match the standard trailer-cable colour-coding.)

Cut off the extension BLACK wire at **700mm** from the base of the lamp.

Insulate with heat-shrink.

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Number Plate Illuminator Black Wire - Left

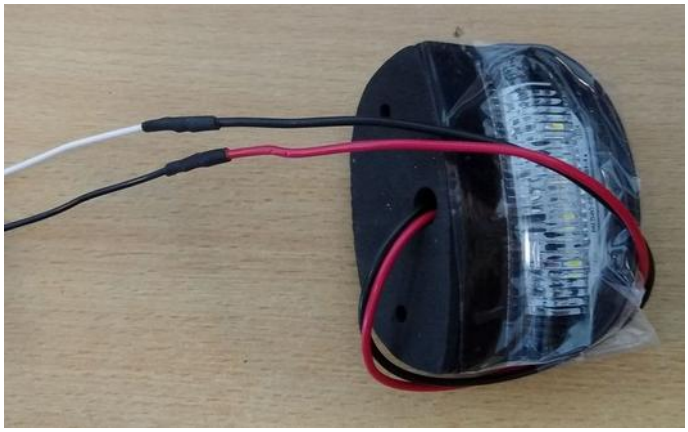
Attach an extension WHITE wire to the number-plate illuminator's BLACK wire.

Cut off the extension WHITE wire at **750mm** (NB: this is longer than the other wire) from the base of the lamp.

Insulate with heat-shrink.

Label

Label or mark the back of this lamp (or the box that it is in) to identify it is the left-hand one.





Number-Plate Illuminator - Right

The right number-plate illuminator is the remaining small black lamp with a white lens.

Number Plate Illuminator Red Wire - Right

Attach an extension BROWN wire to the number-plate illuminator's RED wire.

Cut off the extension BROWN wire at **700mm** from the base of the lamp.

Insulate with heat-shrink.

Number Plate Illuminator Black Wire - Right

Attach an extension WHITE wire to the number-plate illuminator's BLACK wire.

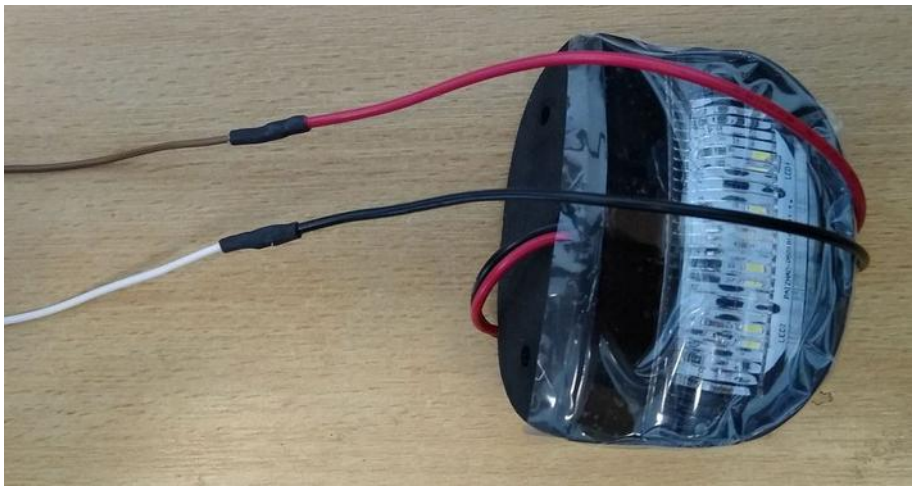
Cut off the extension WHITE wire at **750mm** from the base of the lamp.

Insulate with heat-shrink.

Label

Label or mark the back of this lamp (or the box that it is in) to identify it is the right-hand one.

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Appendix: Licence

All documents and information - including the design, assembly instructions, images, templates, and any subsequent advice which may be obtained from PhieldBug.co.uk - are released under the CERN Open Hardware Licence Version 2 - Strongly Reciprocal .

The licence can be found at https://ohwr.org/cern_ohl_s_v2.txt . The text of the licence is copied below.

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