

DOMINO INFLATABLES LIMITED

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INSTRUCTIONS FOR DOMINO KITS

Do not be in too much of a hurry to start building the boat before you have had time to study the instructions, and before you have read them from start to finish at least once. Also, make sure that every single person who works **on** the boat reads the instructions as well.

There are many silly and expensive mistakes that can trap the unwary, and the instructions are designed to help **you** avoid them.

necking the Parts

Iso before you start on the kit, check through the list of parts which is provided with the kit and tick each **one** off to make sure **it is** there.

There are two reasons for this. First, it will give you an idea of what the various parts look like so the instructions **will** mean more when you read them. Secondly, if we have by any chance made a mistake and left a part out, there **will be** time to send it to you and you will not be without it when you need **it**.

General Procedure

There are three basic stages to the construction of a Domino boat. These **are**:

- A the construction and testing of an air-tight U-tube and **keel**
- B the attachment of the rubber floor, transom, fittings, **etc**. C the construction of the floorboards

It is obvious that the success, and in particular the safety, of the finished boat will depend **to** a very large extent upon . the standard of the workmanship which is put into the basic U-tube. We most strongly recommend that one **person** alone does all the actual gluing and assembly for this stage, and accepts help only for surface preparation, and for supporting panels while he puts them together. In this way, he will gain experience as he goes along and be able to cope **with** the more difficult jobs involved in constructing the front section and joining it onto the side tubes, which is the **final** part of this stage.

Stages B and C are less critical and more time-consuming, and sensible helpers can usually be employed with advantage, **art-made kits**

These are supplied with Section A completed, but you still have to learn the basic techniques of surface preparation and gluing.

These are covered in the first part of the instructions for Section A, and we include with the kit some test seams on which you can practise. Do not be in too much of a hurry to start on the boat until you are really confident you can make a good job of the test seams.

Working Conditions

Good working conditions are essential if you are to maintain the standard of workmanship which making a good inflatable demands. They must be clean and dry, and about normal room temperature, and to complete stage B you must have enough room to work round the boat when it is inflated.

You need some form of smooth working surface, but a sheet of hardboard on the floor is as good as anything.

If you have a large enough room in the house which you can take over you should grab it, but do be warned that glue and carpets are not easy to separate once they have got together. Roll the carpet up, or protect it with several layers of newspapers, because a few spots of glue are bound to go astray at some stage.

Above all, avoid working in a damp atmosphere. If you are not lucky enough to have a well heated and ventilated **room**, this will mean not working on rainy days.

Storage of Glue

You will note from the instructions on the side of each tin of glue that it must be stored between 10° C and 25° C, and each tin is also marked with a date by which it must be used. Observe these instructions, particularly making sure that the glue is never allowed to freeze, and also keep the hardener out of the sun, or the glue may not cure properly. If in doubt, buy some more.

Making the U-Tube and Keel

This stage may itself be split into the following sections:-

- 1 Learning to use the glue and achieving satisfactory test seams
- 2 Making the keel, testing for leaks, and testing at pressure
- 3 Making and testing both side tubes
- 4 Making and testing the front section

1 Gluing

All the seams in the boat are made in the same way: the glue is first mixed, and a thin coat applied to 'prime' both the prepared surfaces. When the priming coat is dry, but before it has had time to cure, a second coat is applied to both surfaces, and allowed to dry until 'touch dry'. The two parts are then put together, pressed firmly down with the scraper and allowed to cure. The resultant joint should be at least as strong as the adhesion of the rubber to the nylon weave, and with a 1" overlap one would expect the seams to be very much stronger than the material itself.

Such a joint should be also airtight, but it is most important to realise that strength and airtightness are not the same, and that strength is much the more important of the two. To prove this, take a look at the actual stresses imposed on the seams you are about to make.

The seam which is subjected to the greatest stress in the boat is the one down the length of the side tube. Each inch of this seam takes a strain which can be calculated by multiplying the pressure (in lbs/sq. in) by the radius (in inches). For the Double Seven, at a working pressure of 2 lbs/sq. in and with a tube radius of about 10", the strain will be 20 lbs. per inch of seam: the figure will be lower for the smaller boats. The strain on the circular seams is exactly half the figure for the longitudinal seams.

A well made seam will have a sheer strength of around 200 lbs/inch, so there is a huge safety margin. However, it is possible to make a seam badly, and if a weak seam does come apart, that section of the boat will deflate instantly. For this reason, all sections are tested at a higher pressure to guarantee a wide margin of safety.

Another important effect of the pressure test is that the fabric is permanently stretched and the tube diameter is increased by nearly ten per cent. This has obviously been allowed for in the design of the boat, but it is equally obviously essential that the pressure test is carried out correctly so that the boat ends up the right size.

In contrast to the very considerable stress tearing seams apart, consider the force behind an air leak: this is calculated by multiplying the pressure by the area of the hole. Take a really bad leak coming through a hole 1/16" across: the area of the hole is $1/16^2$ sq. inches, and at a working pressure of 2 p.s.i. the force behind the leak is $2 \times 1/16^2 = 1/128$ lbs = 0.008 lbs. This could probably be held in by the viscosity of a good thick coat of glue, but in any case the boat would deflate relatively slowly, and there is very little tendency for the hole to enlarge quickly, unless it is also in a weak part of a seam.

Achieving a good strong joint depends upon the following factors:

- i Correct preparation of both surfaces
- ii Mixing the additives to the glue correctly
- iii Applying the right thickness of glue
- iv Allowing the glue to dry to the right stage (touch dry) before putting the two sides together
- v 'Scraping' the joint sufficiently to press the two sides together
- vi Allowing sufficient curing time before straining the joints in any way

Of these, the two points which really do need to be learnt are the thickness of the coats of glue, and the stage at which the joint should be put together: all the other points are simply a question of obeying the rules.

❖ Preparing the surfaces

The darker side of the fabric is plain neoprene, and this can be prepared simply by thoroughly cleaning with a rag dipped in solvent. Use enough solvent to completely wet the surface, and make sure that the rag itself is completely clean before you start.

On the lighter outer surface of the fabric, however, there is a coat of hypalon on top of the neoprene. This hypalon gives the finished boat much improved resistance to abrasion and weathering, but unfortunately has to be completely removed by buffing with sandpaper to allow the glue to make a strong bond onto the neoprene underneath. Use the black sandpaper without a block, and rub with a good firm pressure with a hard smooth surface underneath the material.

With the first one or two strokes the colour appears to get slightly lighter as the finish of the hypalon is scuffed, but after a few more strokes you should start to see the slightly darker neoprene showing through. Carry on until all streaks of the hypalon are removed, and it should end up a completely even colour, just a shade darker than the unbuffed hypalon.

At first you will have to look quite hard for this colour change, but with more experience you should come to recognise it quite easily. Do not be confused by the very dark layer which is sometimes present next to the nylon: if you reach this, or if you reach the nylon, you have gone too far. If in doubt, look at the edge of the area you have buffed, and you should be able to see the colour changing from the unbuffed hypalon, to the lighter colour of the hypalon that has been scuffed, to the slightly streaky area where the hypalon is partly removed, to the more even colour of the slightly darker neoprene. Wiping the whole area with solvent will highlight the colour differences.

All the seams are made with an overlap of 1", and the outside of the seam is finished with a tape 1 1/4" wide. Therefore you must buff a strip at least 1" wide, and no more than 1 5/8" (i.e. the overlap plus half the width of the tape). Aim at 1 1/4", and do not bother to try and buff the full 15/8" in one go.

To demonstrate to yourself the importance of removing the hypalon, on one of the test seams buff half the length properly, and on the other half just roughen the surface, but do not remove the hypalon. When you tear the seam apart again, you will find that the half with the hypalon comes apart with very much less force, and that although the glue appears to have adhered to the top layer of hypalon, it is this which has separated from the layer underneath. In other words, it is the hypalon itself which is weak, rather than the bond onto it.

Buffing is much the dirtiest, most boring, and most time-consuming job in the whole boat, and the one which requires most hard work. You can take most of the slog out of it with a coarse sanding disc on an electric drill, but you will find that you will always have to touch up by hand afterwards. Do not be greedy and try to do too much with the drill or you will find that you will go through the neoprene and damage the nylon weave underneath. If you do damage a piece in this or any other way, send it back and ask us to replace it. We will charge you for the material, but no single panel in the boat is very expensive, especially compared with the risk of affecting the whole boat.

Once a surface has been prepared, and the dust removed with a clean duster or brush, it is ready for gluing. It is important not to contaminate the surface in any way, even by fingering it, before the glue goes on, and for this reason the buffing should be done as you go, rather than all at the beginning. If you are worried that you may have got a surface dirty, then clean it up with a solvent dipped rag.

The edges of each panel are marked on the dark side of the material, with either a continuous or broken line, to tell you which side to prepare.

A continuous line means that the hypalon side must be prepared. A

broken line means that the dark side must be prepared.

A few of the edges are not marked at all, but you should find that these all need to be prepared on the dark side. Either it will be obvious or specifically mentioned in the instructions when you reach that stage.

Be careful not to clean off the markings on the dark side, and then forget what they were. If they are close to the edge and you clean them off, remark the line 2" - 3" in from the edge as you go. Some of the transom pieces have to be buffed on the hypalon side, and this is easier to do before they are cut out. Again, be careful not to lose the markings, and remark as you go. If you do lose the markings, you will find that each piece has at least one pair, so you can copy that.. For cutting out, use a pair of sharp scissors, or a Stanley knife onto a smooth surface such as hardboard.

For the seams, the final job is to mark the overlap line, always on the hypalon side, which you have buffed. Use the compass and a ball point pen, and take great care to mark the line clearly, exactly 1" from the edge. It is very important that this line is drawn accurately, and followed accurately when the seam is assembled.

ii Mixing the Glue

A curing agent is added to the glue to improve the adhesion, the resistance to water and chemicals, and above **all** the resistance to heat. Unfortunately, once mixed, the glue has a pot life of only 6 - 8 hours before it turns thick and stringy and it is then unusable.,

Each small bottle contains the correct amount of curing agent for each tin of glue. Always mix a whole tin at **a** time, and make sure that the curing agent is really thoroughly stirred in. You should have enough glue to waste a certain amount **as** a result of having to mix a full tin, which will happen when you are doing the test seams.

However, if you have some glue left at night and will be working the next day, you will probably be able to use it if you keep it cool in the refrigerator overnight. Use your common sense as to whether it is usable the next day: if it looks like freshly mixed glue, and is the right consistency, it can be used, but if in doubt mix some more. Providing it does not freeze, **a** low temperature for such a short period will not harm it.

THE IMPORTANCE OF CORRECT MIXING CANNOT BE OVERSTATED: if you use badly mixed glue, or if you do not add the curing agent, then all the seams will appear to be perfect, and the boat will pass the pressure test, but **all** the seams will gently slide apart the first time you use the boat in hot sunshine.

The glue gives off a heavy inflammable and somewhat toxic vapour, so make sure that you use it only in a well ventilated room, and keep it from naked flames. Also, the curing agent is a poisonous isocyanate so take care to keep it away from the eyes and skin. If you do get it in your eyes, wash well with water and seek medical help: if you get it on your skin, wash off with soap and water.

iii Applying the right thickness of glue

The thickness of the coats of glue dictate how long it will take to dry to the right stage for the seam to be put together.

Above all, the coats must be even and not too thick. If the coats are not even, the seams will be patchy, with some parts right, and other parts either too dry or too wet to make a good joint.

If you put on too much glue, you will have to wait ages for it to dry, and when you do come to put the seam together, you will feel it 'float' as you scrape it, in contrast to the solid feel of **a** good joint.

As a general guide, then, the coats of glue should be quite thin and as even as possible, but obviously thick enough to completely 'wet' the surface of the rubber. This applies to both first and second coats.

The second coat can be applied as soon as the first is dry, but in any case before the first has started to cure. In practice this means anything from 10 minutes to 10 hours, although the longer you leave it, the greater the risk of contaminating it with dust or greasy fingers. If you are worried that the glue may be dirty or dusty, give it a wipe with the solvent rag.

When you are not using the glue brush, leave it propped in the glue tin with the bristles immersed in glue to prevent it drying out. Then at the end of the day use the scraper to squeeze all the glue out of the bristles (you can quickly wipe the scraper clean again) and then wash the brush thoroughly in solvent. If it goes hard before you use it again you can soften it in the solvent, but take care to try to remove all excess solvent before using it again for glue.

iv The Right Stage to Put the Joint Together

The best way to test this is with the tips of your fingers: for about 5 -10 minutes after application the glue will be wet, and if you touch it, will coat your finger tips and pull out in little strings when you pull them away.

Then it will dry to the stage when it does not transfer itself to your finger tips, but will stick to them firmly enough to start to lift the fabric as you take them away. This stage is described as 'touch dry', and when both sides are touch dry, the seam is ready to put together.

If you leave the glue too long, then you can touch it with your finger tips, but it shows very little tendency to stick to them. It is now too dry, and will not make a strong seam if put together: you must start again with another application of glue if this happens.

You must use the test seams to learn the right stage at which to put the seams together, and then make sure that you do every seam on the boat at this stage. Always test with your finger tips and never try to time it, because the time will always vary with the thickness of the coat of glue and the temperature.

The main danger is that you will put a seam together when it is too dry, due to trying to do too much of a seam at a time. If you do this the section will fail the pressure test, and although you can stick it back together again, it is better to do it right first time.

If you put a seam together when it is too wet you will know when you scrape it by the feel. Pull it apart again or this too will make a weak patch in the seam.

Apart front testing when it is touch dry, try to keep your fingers off the glue as much as possible, or you may contaminate it.

v Scraping

Once the seam has been put together lightly, with finger pressure, it must be squeezed down firmly with the scraper. Always use the scraper with a hard surface such as a block of wood underneath the seam you are scraping, and use it by pushing it away from you with a good hard downwards pressure. Use short strokes across the seam, not along it, or you will make wrinkles.

The reason a scraper is used, rather than a roller or squeegee, is that it is possible to achieve a much higher point pressure. It is essential that every single glued joint is fully scraped down, all over, immediately after it is put together. If not, you will have trouble both with air leaks and weak seams.

It should be possible to hold the scraper at an angle of about 45°, and push it away from you across a piece of material with very firm downward pressure without the surface of the rubber being damaged. Test it, and if it does show signs of ripping the surface, smooth off the end a bit more with a piece of emery cloth. It is no good trying to build a boat with a scraper which cannot be used properly.

vi Curing Time

The glue takes at least 48 hours before it is properly cured, and although they may appear to be strong before this time, joints will gently slide apart if subjected to a continuous pressure, even if it is quite slight. Do not inflate a section at ANY pressure before the glue has had time to cure completely.

TEST SEAMS

The test seams are designed to give you practice at putting seams together, and to test whether you really have learnt to do this job well. We feel that it is most important not to proceed with the construction of the boat itself until you have allowed the test seams to cure, and torn them apart to check their strength.

Test Seam Number 1 (pieces marked T.S.1)

This is a simple straight seam. Prepare the surfaces, mix up a tin of glue, and then try brushing the glue. This is the time to experiment: try to decide what is too thick, then too thin, and by this time you will probably have a fair idea of what is about right.

Having decided what is about the right thickness, try to brush the glue out as evenly as possible at this thickness over the whole seam and leave it to dry. After about ten minutes it should be dry and you can put on a second coat.

When this is touch dry start putting the seam together. Lay the side marked with the overlap line down on a flat surface with the glued edge facing you and present the other to it, holding it in both hands with your thumbs together on the centre line of the seam, palms face downwards, and your fingers curled down over the glued edge away from you. Start by touching just the edge down in the middle, making sure that the centre lines coincide, and that the edge goes down exactly on the line marked. Then transfer your attentions to one side and work down the seam about an inch at a time, pressing just the edge down with your thumbs as you go, and keeping the edge on the line. If you make a mistake, pull it apart-again immediately, and try again. Try not to stretch the edge as you touch it down.

When you have got the edge down satisfactorily all along, turn the seam over and touch down the rest of the overlap.

Then scrape it. Push the scraper across the seam, not along it, and make sure that you are absolutely thorough in pressing down the whole seam.

Having finished the seam, pull apart about $1\frac{1}{2}$ " at one end: this is to give you a start when you come to tear it apart to test how good a job you have made, but first it must be left 48 hours for the glue to cure.

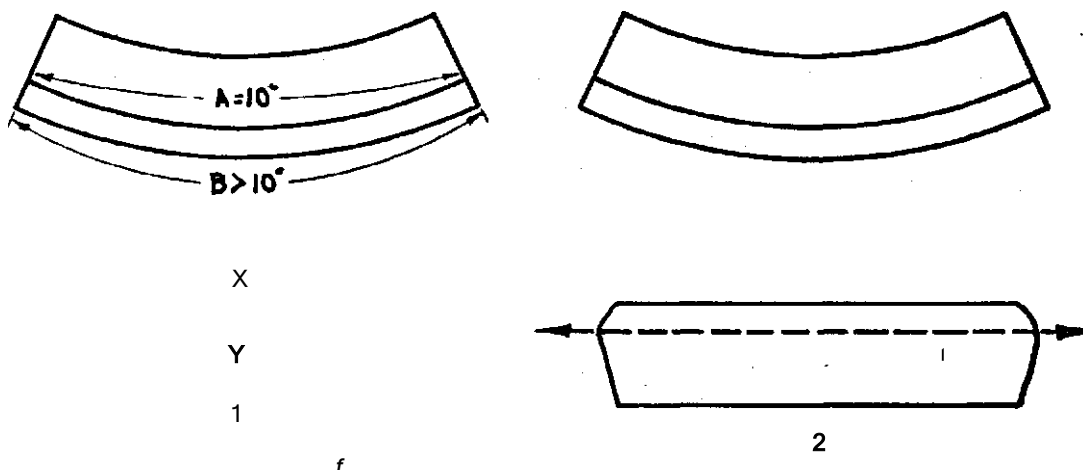
Test Seam Number 2 (T.S.2) - Theory

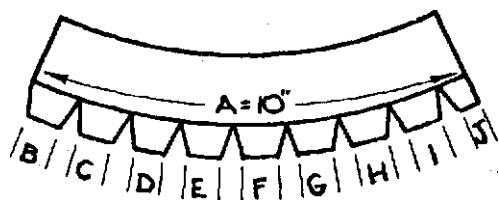
The second test seam involves putting a straight edge onto a curve. This is where it begins to get more difficult.

You will start to see the problem if you try putting the seam together without glue. You can put the edges of the material together to form a curved joint, but any attempt to make an overlapped seam will fail, because the fabric does not have the required stretch.

Look at diagram 1: A is the overlap line and B is the edge of the material. If A is 10" long, then B must be more than 10", because it is the outside of the curve. However, you are trying to glue it to a straight piece of material, and it is clear that to succeed, B must be the same as Y. Since B is longer than A but X and Y are the same, this is clearly impossible.

The first solution would be to stretch Y to the same length as B (Fig. 2), but the fabric just will not stretch this much, so you cannot do it.





$$B * C * D * E * F - \gg G * H * I * C T = 10$$



The second solution would be to shorten B by cutting pieces out (Fig. 3). This works, although you might have problems with air leaks at the top of each cut.

The third solution, and the one used for the seams of Domino, is to stick just the edge X to the line A (which is the same length), and then allow B to lose its length by a series of wrinkles, which can then be flattened out as much as possible with the scraper.

The idea of putting wrinkles into a seam intentionally may sound a little odd: in fact you will find that the system works very well, and a close examination of most professionally made boats will show that they have wrinkles too. Wrinkles **do**, of course, always occur on only one side of the seam, and the boat is designed so that they always occur inside rather than outside.

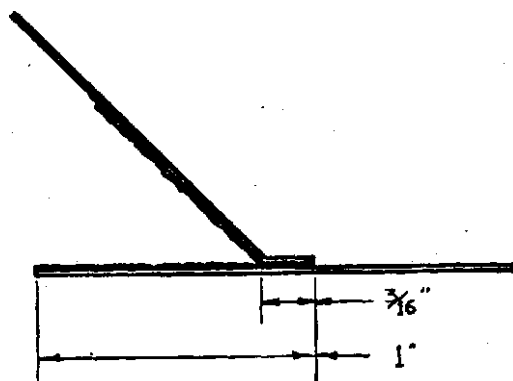
Small wrinkles do not weaken the seam appreciably, provided that they run across, and not along it: this is no problem **to** achieve, but it does emphasise the point that you must make wrinkles how you want them, rather than allow them **to** happen in an uncontrolled fashion.

To make the seam airtight, you must have a perfect seal where the edge X goes down onto the line A, and in practice **the** slight stretch that the material does have should enable you to get a 3/16" band of the seam down without any wrinkles at all.

Once you have accepted the idea that wrinkles do occur, and are a necessary part of making a curved seam, and must **be** made rather than allowed to happen, you are in a position to learn how to reduce them to a minimum. You will find that the fabric can be compressed a great deal more than it can be stretched, and if you make a great many small wrinkles, rather than **a** few large ones, they can almost all be scraped down completely flat.

Test Seam Number 2 • Assembly

The seam is put together in three stages. First, just the edge and a narrow strip is touched down all along the seam:



Second, the seam is turned over, and the rest of the seam is touched down in a series of wrinkles.

Finally the whole seam is scraped down, and the wrinkles removed as far as possible.

Before you start preparing the surfaces, practice putting the edge of the straight piece down on the line of the curved piece. You will find that by holding it up at an angle, and working along an inch or less at a time, you can get a 3/16" strip down onto the line. Hold the piece that you are working with as before: in both hands with your thumbs together, on top with the edge to be glued away from you and underneath.

When you have gained some confidence at putting the seam together without glue, prepare the surfaces, apply glue, **and** when it is touch dry you can start putting it together. Remember to start exactly on the centre line, and keep the **edge** exactly on the overlap line as you go. Aim at getting a strip only 3/16" wide stuck down all along the seam, and **keep** the rest up at an angle towards you. The length that you have put together will tend to curl up as you go: encourage it to do so, rather than try to keep it down flat, and you will find that it makes the job easier.

You will find that on a curved seam there is quite a temptation to stretch the edge which you are putting down, and you must try to resist this. You will run into trouble later on if you get into bad habits at this stage.

When you have got the initial strip down all along the seam, turn the seam over, touch down the whole width in wrinkles, and then try to scrape them out as far as possible.

Start by touching down every two inches, then touch down in between these points, then in between again, then **again** and again, until the whole seam is a mass of little wrinkles. Then start **scraping**.

When scraping, try to take one wrinkle at a time, starting at the top and squeezing the air **out** of the open end. You **will** find that most wrinkles disappear completely, and it is important that none goes right across the seam and forms **a** tunnel for an air leak.

When you have fully scraped the seam and you are satisfied that you have reduced all wrinkles as far as possible, **pull** apart *1/4"* as before, and leave to cure. You will find that a few of the wrinkles, which you thought had gone, start to reappear. This is because the glue is still very weak and cannot stand the stresses, but it is no cause for worry unless **the** wrinkle is right across the seam.

Number 3 Test Seams

Outside curve onto straight

Number 4 Test Seams

Inside curve onto straight

Number 5 Test Seams

Outside curve onto outside curve

These test seams are for practising the techniques learnt on Test Seam No. 2, but, instead of starting on a centre line, **start** at one end and try to learn not to stretch the edge as you put it **down**.

When you start at the end, line up the end of the edge which you are putting down with the end of the overlap **line**. Ignore any projecting corners which can be trimmed off, and you should find that the point of the angle between **the side** edges is on the line of the outside edge of the seam.

Do not be tempted to not bother with all the test seams. Each one is different, and each one is similar to a seam you will **have** to do on the boat.

The points to make sure you have mastered are as follows:

- 1 Correct preparation.
- 2 Brushing on an even and correct amount of glue
- 3 Keeping the edge exactly on the overlap line, not stretching the edge, and making sure you can do it right first time
- 4 Achieving a good airtight seal with the first **3/16"** strip of each seam
- 5 Scraping out wrinkles to a minimum

Pulling the seams **apart**

After a wait of at least **48** hours for the glue to cure, pull the seams apart, examine them closely, and try and learn **as** much as you can from them.

Try first to decide which layer of the seam has parted:

- (a) The bond of the neoprene onto the nylon weave
- (b) The layer of neoprene itself
- (c) The bond of the glue onto the neoprene
- (d) The bond between the glue on one side and the glue on the other side

You should have a mixture between (a) and (b), with perhaps a small amount of (c), and so if this is the case, you can be confident about proceeding with the construction of the boat itself.

If the glue bond itself seems to be solid, but all the glue has stayed together on one side and peeled cleanly off the other taking a very few traces of the surface of the neoprene with it, then you should suspect that you are not buffing sufficiently, or you may not have removed all the hypalon. However, if hypalon is the problem you should see a distinctive thin grey film sticking to the surface of the glue - look at the part which you deliberately did not buff and compare them.

Most serious, you may have areas where there is a layer of glue firmly sticking to both sides, but the two glue layers have not bonded to one another. If the surface of the glue has a shiny glazed appearance, and has obviously not been completely in contact with the other half, then you have almost certainly waited too long for the glue to dry-before assembling the seam. This is much the most common error that you are likely to make, and although the likelihood of it occurring whilst you are working on the boat will be reduced as you gain the confidence to work faster, it will increase if you become too greedy **and** try to do too much of a seam at one time. Alternatively, you may possibly have waited too long before scraping down fully, or possibly you have not scraped it hard enough.

If the surface of the glue is not glazed, but is still covering both sides of the joint, it is possible that you have put the seam together too wet. If so, you will almost certainly have felt the joint slide when you tried to scrape it, and even when **you** pull the seam apart it will give the impression of being slightly gooey - which it is because the solvents have not had a chance to evaporate from the centre of the seam.

Do not let this little chapter of horrors make you too keen to assume you are doing something wrong - if you have followed the instructions carefully there is no reason at all why you should have done. One would expect instead that the exercise will serve more to boost your confidence to go on and tackle the boat.

However, if you really are uncertain about the quality of your test seams we should be only too happy to comment if **you** would like to return them to us, or we would be happy to send you more if you feel more practice is required.

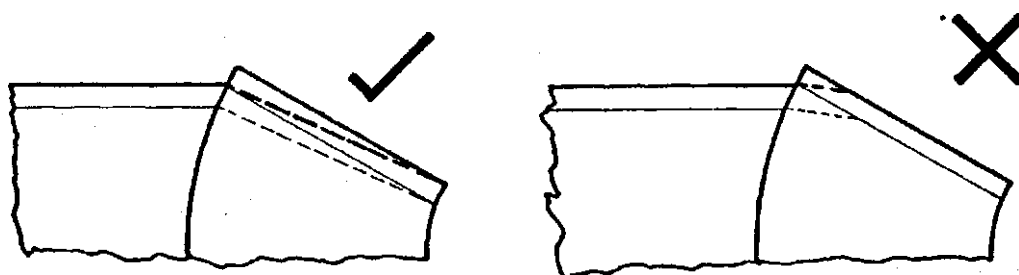
THE KEEL

Start by gluing **K1** to **K2**, starting at the end with the continuous line on the long seam.

When you reach the end of the seam you will probably find that one of the panels projects slightly as a result of stretching, and you will need to trim it off. Although virtually any amount of stretching is acceptable on the keel, you can use this seam to judge how good you are. If the corner projects more than **1/4"** you should certainly make a considerable effort on subsequent seams to improve your technique to reduce stretching, because it will be a serious problem on the U tube.

When trimming, always use a long straight edge to mark a straight line from the end of the panel to the end of the outside edge of the seam. When you have trimmed it, the end of the seam should look like one of the diagrams on page A 6.

Do not just trim off a few inches.

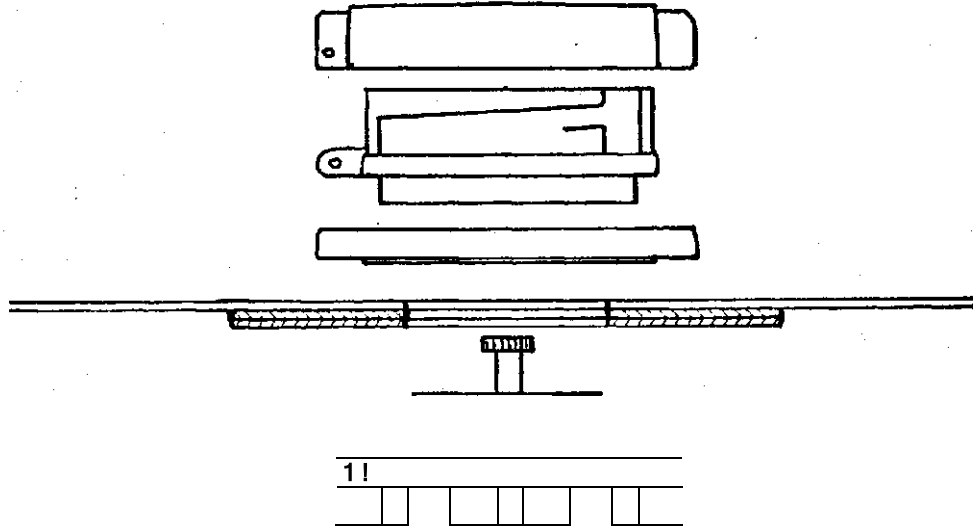


The Valve

First of all cut out the reinforcing patches and the hole marked on the keel, and then glue two patches on the inside of the fabric. The patch on the inside, of course, can be glued on with the hypalon side facing in, so you do not give yourself the extra work of buffing off more hypalon than is necessary, but the middle one needs to be buffed on the hypalon side.

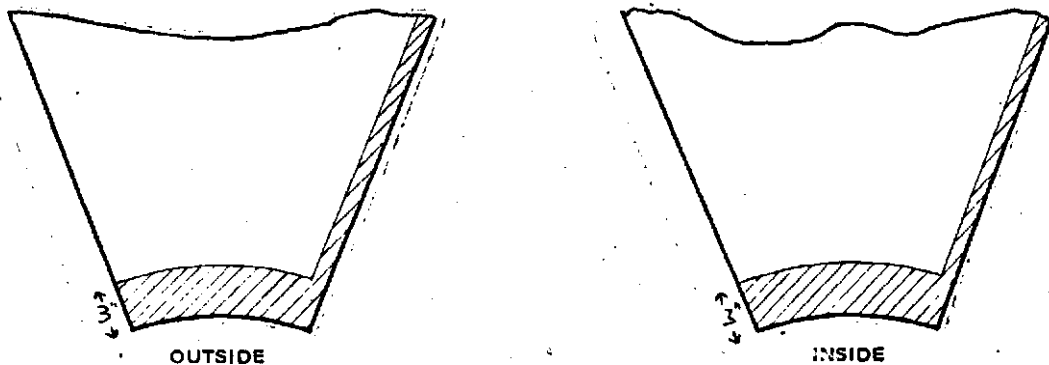
You must brush glue all round the outside edge of the patches after you have glued them on to seal it and prevent air wicking through the nylon weave. Seal the edges of the hole in the same way to prevent any air wicking out through the weave of the main fabric.

Finally, screw on the valve. Put the cap on the top to give a better grip, and then do it up as tight as you can by hand. Do not try to use any tools to give you more leverage because it is unnecessary and you will probably break it.

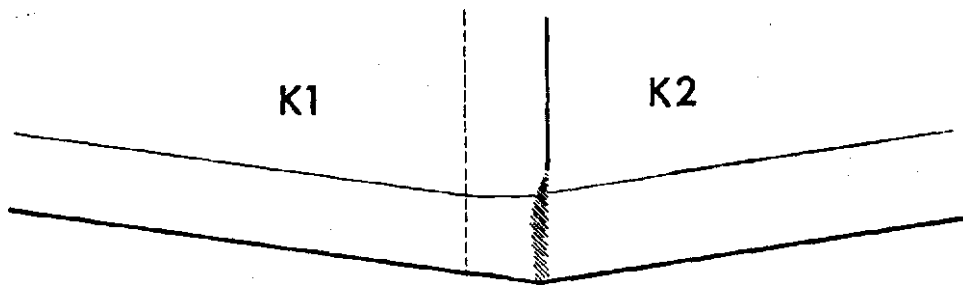


The Long Seam

Next prepare the whole of the long seam, and a band 3" wide at each end, both inside and outside.



Where the circular seam glues down onto itself, the steps of material must be buffed away completely, or you will have trouble with an air leak through the holes.



Before you start gluing, find a piece of wood to place inside the keel, onto which to make up and scrape the long seam: without it, you may not manage to put on enough pressure with the scraper, especially over the valve. Remember **not to** leave it inside)

I Do not try to assemble the whole of the long seam at one time, or you will undoubtedly find that some areas of glue are too dry when you come to them. You can start by applying the priming coat to the whole of the seam but only apply the second coat and assemble and scrape it in sections of about 18" at a time, starting with the 9" either side of the circular seam, which must be lined up onto itself like a centre line.

Be careful not to assemble any of the seam which has not had a second coat, especially if the first coat is still rather fresh and slightly tacky: pull the seam open again slightly after you have scraped it to make sure it is solid. Also, be careful not to get a build-up of glue at the point where you start the next section.

As you progress with the construction of the boat you may find you can do more than 18" at a time: obviously the more you can do the better, but do not be too ambitious in the early stages, and never be tempted to forget the importance of assembling all parts of all seams at exactly the right time. A chain is as strong as its weakest link.

Having completed the long seam, you can seal the ends.

The Ends of the Keel

Each end is flattened down horizontally with the inside surfaces glued together for 3" (Fig. 1). It is then folded up and back on itself for 1 1/2" with the seam round the outside of the fold (Fig. 2). After testing, it is finished off with a 1 1/2" tape, ending 3/4" from the end (Fig. 3).



First of all, put an end together without glue to check that you understand how it all fits.

Then buff off the step on the inside of the seam, apply the usual two coats of glue and flatten it down, making sure that the seam is central. Scrape well, especially at the edges.'

Then fold it back in order to mark where to apply glue, and then glue it down. You should have no trouble providing that you have not given the glue from the first operation a chance to cure, but if the fold shows signs of springing apart again find a heavy weight and leave it on the end while the glue cures. Do the same with the other end in the same **way**.

With the keel still deflated, seal off all the exposed edges of material by brushing on a thin fillet of glue as you did **on** the valve patches. This will not stop any leaks through the seams, but it will stop air wicking out through the **nylon** weave of the fabric.

Then leave the keel for 48 hours for the glue to cure before testing for leaks and then at pressure. When it has passed **the** tests, it is completely finished by taping the seams.

Testing

It is impossible to over-stress the importance of carefully and correctly testing all the inflatable sections both for leaks and at pressure. Although it can be extremely frustrating and apparently time-consuming looking for leaks which **do** not even seem particularly serious, you will find that it is ten times more difficult to do the same job once the boat **is** finished, and much more frustrating to own for years a boat which is constantly slightly soggy than it is to spend **a few** hours with a sponge and soap and water.

Also, do not be tempted to think that the tapes will cure leaks. That is not their function, but what does happen is **that** air travels along under the tape and emerges some way from the actual leak in the seam, and this obviously makes the whole job of finding and repairing leaks very much more complicated.

So, remember the routine, and stick to it: first, look for any obvious leaks and repair them. Secondly, pressure test, **to the** correct pressure and for the correct time. Third, look for leaks again. Fourth, leave it at pressure for 24 hours and check the pressure loss. Only when this is acceptable can you proceed with taping.

Testing for Leaks

Blow it up to 2 lb. per sq.inch, and go over all the seams with **a** soapy wet sponge looking for air leaks. Mark any that you find, and deflate before repairing them.

How to repair a leak depends very much upon what type of leak it is, and why it has been caused. Unless you have **a** bad wrinkle, which you would probably know about anyway, the leaks should be small and curable with a dab of **glue** . forced into the hole, if possible.

Leaks are a danger sign for a weak seam: always try and pull a leaky seam apart, and if you succeed, work out why **it** was weak and reglue it more strongly.

If you have a bad leak in an otherwise strong seam, you may have to patch it with a small piece of tape material, but cut down the width so that when you come to tape the seam, the patch will be covered.

Despite perfect workmanship you may still get trouble with leaks due to air "wicking" through the nylon weave **of the** fabric. The air penetrates the fabric at the exposed cut edges on the inside of the seams, and travels right round **the** circumference of the tube, to leak out at the exposed outer edge of the seam. Deflate the keel completely, and try another coat of glue to seal the edges.

If you do have to mend any leaks you must wait another 24 hours before testing at pressure: this is not because **the** leaks will be blown olt again, but because the solvents in the glue you use to mend the leaks will soften the glue in **the** seams, and weaken **ttjem**.

Testing at Pressure

When all leaks have been repaired and the glue has cured, blow the keel up to the test pressure shown on the gauge, and leave at this pressure for half an hour before deflating to working pressure.

' This pressure is not designed to be achieved by normal pumping with the bellows, but it can be achieved by jumping **on** the bellows with a fair level of enthusiasm; take care to land straight each time, or you will break them!

Better still, cut a short length off the bellow tube (there is enough to spare), and connect it up to a high pressure source such as a garage air line or divers' compressed air bottle. BE VERY CAREFUL not to over-inflate from such a high pressure source.

If a seam does burst open, try and decide why, and reglue better before testing again. The keel is most unlikely **to fail** the test, since the stresses are so small due to the low diameter.

Testing Pressure Retention

After the pressure test go over all the seams again looking for any leaks which might have developed, and cure them. It is quite common for such leaks to develop, but no cause for alarm unless they are large.

When you are convinced that all the leaks have been cured, blow it up to exactly working pressure, put the valve **cap on** securely, and leave for 24 hours before testing the pressure again. Try and keep the temperature reasonably constant for this test since variations do affect the pressure considerably.

If it has lost $\frac{1}{2}$ p.s.i. or more, you can be sure that air is getting out somehow, so go back to the soapy water and try **again**.

Taping.

Taping is designed to improve the appearance and to prevent the seams being subjected to any peeling stresses during **use**, but it does not add ahy appreciable strength to the seams, which should already have a huge safety margin with **the 1"** overlap. Because of this, there is no need to remove all the hypalon before gluing, since the bond onto the hypalon **should** be sufficient for this application. You do need to buff it, but only enough to roughen up the surface finish. Also, **you** need only use one coat of glue on each surface.

The appearance of the finished boat will depend to a large extent upon the neatness of the taping, and upon the amount of stray glue which gets onto the fabric. This glue may not look too bad at first, but after exposure to sunlight, it turns dark brown, and looks messy on the light grey fabric.

However, there are two very easy short cuts to good results. First, by the use of masking tape, which incidentally will withstand a certain amount of buffing as well, you can easily achieve a neat and accurate band of glue on the seam. Secondly, by stretching the tape you can adjust the width to match the width of the band you have prepared, and thus cover it exactly.

The tape is nominally $1\frac{1}{2}$ " wide and stretches down to about $1\frac{1}{4}$ ", and so you want to aim at preparing and applying glue to a band just over $1\frac{1}{4}$ " wide on the seam.

Take one seam at a time, first of all going round making regular marks $\frac{5}{8}$ " from the edge, and wrapping sellotape round to these marks. Then buff up the tube and tape, and glue it on in the normal way, stretching it as much as necessary.

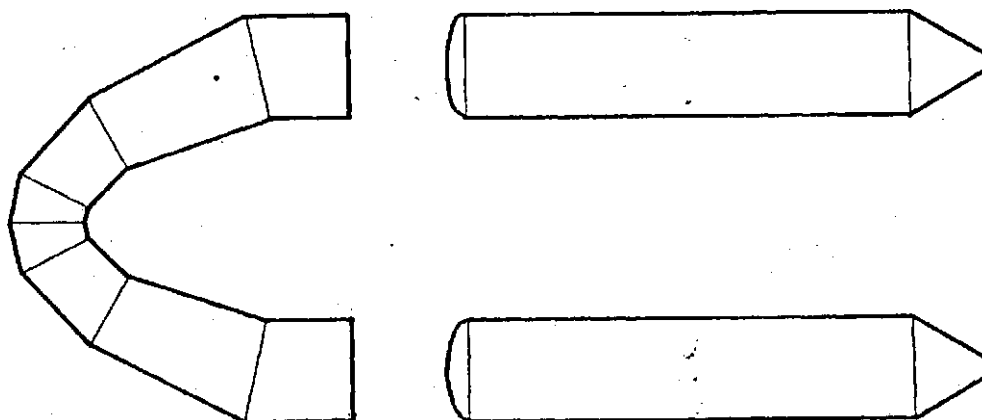
Do the long seam on the keel first, and take it round the end of the keel, and about an inch beyond the end of the seam. Then do the central circular seam, and round each end.

Where the circular seams come round onto themselves, allow/about $\frac{1}{4}$ " overlap, and round off the end and stick it down.

THE U-TUBE

The U-tube consists of two side tubes, and a front section. Each of the three sections is made up completely independently, and the side tubes are tested for leaks and at pressure before the front section is attached.

By making the boat in this way, the front end of each side tube acts as a baffle between it and the front section. Whether the baffle points forwards or backwards in use depends upon which sections are inflated first, but it is adequately strong either way. It is a good idea always to inflate the side sections first so that the baffle does not get prematurely worn out through constantly being turned inside out and back again.



Start by laying out all the panels, inside up, so you can see which edges join onto which. Each panel has an arrow pointing to the front of the boat, and a number and letter to show which panel it is (except no. 5, which is round).

You are advised to assemble and complete one side tube at a time although it does not matter which one you do first. Since the order of assembly of each side is the same, the rest of this section of the instructions will not differentiate between them.

Side Tubes

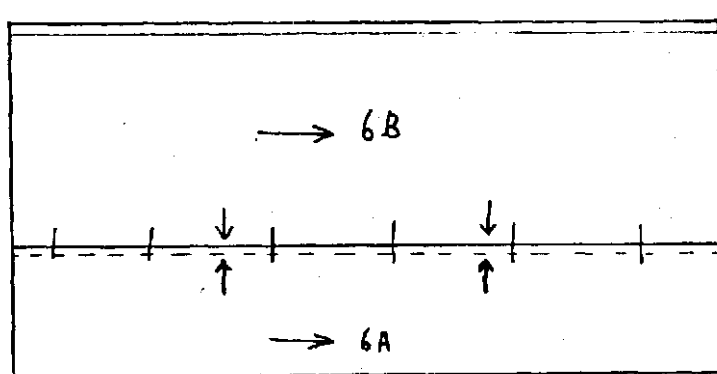
Preparation

The following paragraphs apply to the Double Seven only, since panel 6 is supplied in two pieces. The rest of the section applies to all sportsboat models.

On the Double Seven you must first of all join 6A and 6B along the seam marked with arrows. This is a **simple** enough operation, but it is very important that one side is not stretched more than the other, and so you **should** check the lengths and make some distancing marks before you start gluing.

Prepare the surfaces and draw the overlap line, and then lay the panels out flat, dark side down, with **the one** overlapping the other exactly as it is to be glued, and with the back edges of the panels exactly **level**.

The front edges may be level, but since the fabric distorts after being cut out, there is likely to be **about $\frac{1}{2}$ "** difference in length. Ignore it at this stage, but go up the seam marking across both panels at intervals of approximately 18" with **a** ball-point pen or similar.



(For clarity, the diagram shows all the markings as if they were on the same side of the fabric, but of course the panel numbers, arrows etc. are on the dark side and the distancing marks should be on the hypalon side).

You can then glue the two panels together, starting at the back and making sure that the two halves of each mark line up as you reach them.

(All Models)

Before you actually assemble any more of the side tube seams you must put distancing marks on all the seams so you can control the stretch when putting them together.

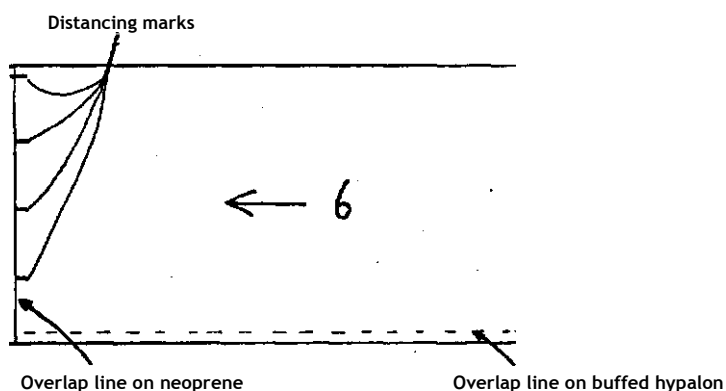
This is simple on the long seam, since you can assemble it without glue and mark across both halves of the seam, but the end panels have to be each individually divided into quarters because we have designed them to allow for a little stretch, which is almost unavoidable. You cannot just put marks every 6" on both sides, because you would find the seam almost impossible to assemble, and if you succeeded in putting the seam together without any stretch at all, you would find that the panels are actually slightly the wrong size.

Prepare and mark overlap lines on panels 6 and 7 including a band 1½" wide round the semicircular cut-out on the inside of 7, but not including the front edge of No. 6.

Then lay panel 6 out with the light side down, fold both sides into the middle, and put the seam together. Check that the back ends line up exactly, and then make a series of distancing marks at least every 18 inches as described for assembling 6A and 6B on the Double Seven. These should be on the hypalon side. At the front end of the seam the edges may not line up exactly as a result of the material having distorted after being cut out, and if so, mark it, and then open the panel ~ out and trim off in a straight line to the other corner. On the Double Seven, at the same time trim off any corner projecting on the seam you have already glued between 6A and 6B.

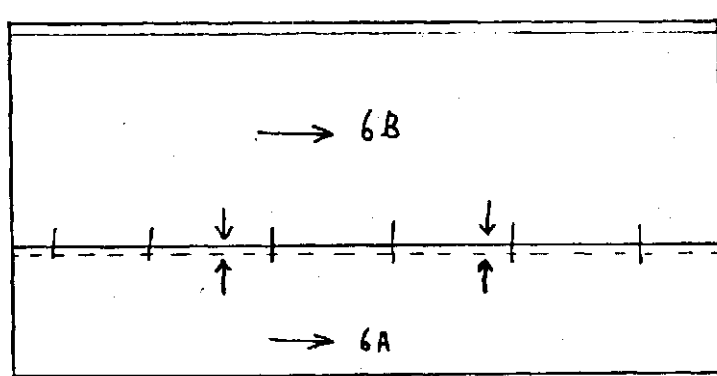
Then prepare the neoprene side of the front edge of panel 6, and draw an overlap line (this is the only overlap line on the whole boat to be drawn on the inside of the material).

Measure accurately the overall length of this line (i.e. the width of the panel), subtract 1" and divide by 4, and mark this distance off four times along the line, starting at the end at which you have buffed the hypalon for the long seam. As a check, the final mark should be 1" from the edge which has been prepared on the neoprene side for the long seam.



Turn the panel over, and do almost the same thing on the other side, at the other end. Only this time do not deduct 1", just divide the whole width into four.

Then take panel 5 and fold it exactly in half, with the hypalon on the inside of the fold. Put a pen into the fold, and mark the line of the crease both sides, with the mark coming right to the edge of the material. Then fold it the other way with the first two marks exactly together, and mark it again.



(For clarity, the diagram shows all the markings as if they were on the same side of the fabric, but of course the panel numbers, arrows etc. are on the dark side and the distancing marks should be on the hypalon side).

You can then glue the two panels together, starting at the back and making sure that the two halves of each mark line up as you reach them.

(All Models)

Before you actually assemble any more of the side tube seams you must put distancing marks on all the seams so you can control the stretch when putting them together.

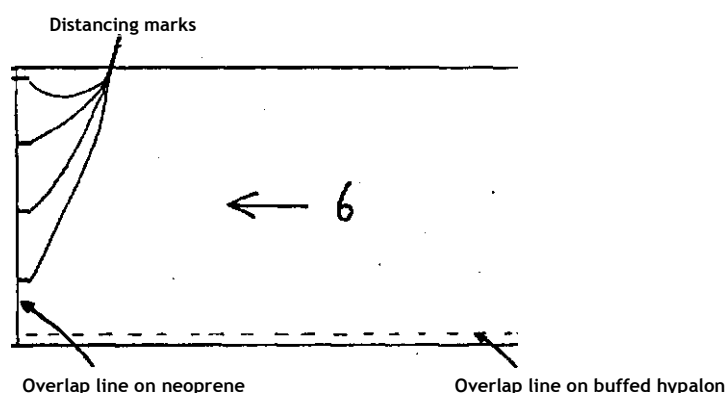
This is simple on the long seam, since you can assemble it without glue and mark across both halves of the seam, but the end panels have to be each individually divided into quarters because we have designed them to allow for a little stretch, which is almost unavoidable. You cannot just put marks every 6" on both sides, because you would find the seam almost impossible to assemble, and if you succeeded in putting the seam together without any stretch at all, you would find that the panels are actually slightly the wrong size.

Prepare and mark overlap lines on panels 6 and 7 including a band 1%" wide round the semicircular cut-out on the inside of 7, but not including the front edge of No. 6.

Then lay panel 6 out with the light side down, fold both sides into the middle, and put the seam together. Check that the back ends line up exactly, and then make a series of distancing marks at least every 18 inches as described for assembling 6A and 6B on the Double Seven. These should be on the hypalon side. At the front end of the seam the edges may not line up exactly as a result of the material having distorted after being cut out, and if so, mark it, and then open the panel ~ out and trim off in a straight line to the other corner. On the Double Seven, at the same time trim off any corner projecting on the seam you have already glued between 6A and 6B.

Then prepare the neoprene side of the front edge of panel 6, and draw an overlap line (this is the only overlap line on the whole boat to be drawn on the inside of the material).

Measure accurately the overall length of this line (i.e. the width of the panel), subtract 1" and divide by 4, and mark this distance off four times along the line, starting at the end at which you have buffed the hypalon for the long seam. As a check, the final mark should be 1" from the edge which has been prepared on the neoprene side for the long seam.



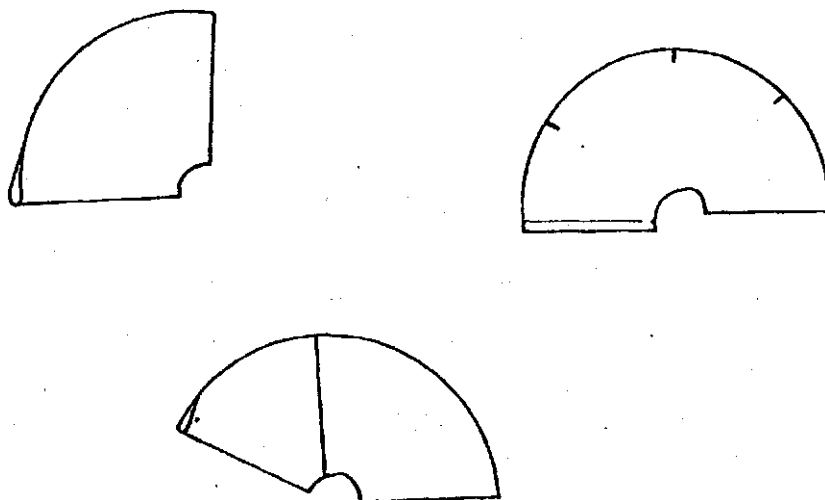
Turn the panel over, and do almost the same thing on the other side, at the other end. Only this time do not deduct 1", just divide the whole width into four.

Then take panel 5 and fold it exactly in half, with the hypalon on the inside of the fold. Put a pen into the fold, and mark the line of the crease both sides, with the mark coming right to the edge of the material. Then fold it the other way with the first two marks exactly together, and mark it again.



To complete preparation of the panel, clean round the edge on the neoprene side.

Mark panel 7 in the same way. Start by folding in half with the corners together, and then fold each corner in turn to the first mark in order to make the quarter marks. Complete by cleaning round the semicircular edge on the neoprene side.



Side Tubes - Assembly

Start by gluing panel 7 onto 6, and then 5 onto 6. This is the seam with the most curvature on the whole boat, and you will probably be unable to avoid a few wrinkles. However, this seam ends up completely out of sight, and so all you are aiming at is to make it strong and airtight.

When you come to the end of this seam between 5 and 6, glue up about 6" of the longitudinal seam. Providing the stretch has worked out right this should be no problem, but you may find that you need to adjust the width of the overlap for the first few inches to compensate for material gained or lost. This is completely acceptable providing there is never less than $\frac{5}{8}$ " overlap, and also providing you can adjust it back to 1" within 2 $\frac{1}{2}$ " of the edge of panel 5, since this part of the seam, and tube, is also out of sight. If the discrepancy is worse than this, rip the last quarter apart and try again, having wiped it with a solvent rag and applied another coat of glue.

•Next fit the valve fn exactly the same way as on the keel.

Thoroughly buff the sides of the rubber cones up to, but not over, the embossed guideline, and then glue the rubber cones in, starting in the middle of the semicircular edge, and wrapping the fabric round with the edge just up to the guideline. When you get to the seam make sure you get the right side down first (i.e. the edge on which the hypalon is buffed).

Start from the cone joining up the longitudinal seam, up to about 12" beyond the seam between 6 and 7. Then turn the whole tube inside out and paint over with glue the inside of all the seams which you have put together so far, to seal the edges of the fabric as you did on the outside of the keel. Be particularly generous at the points where the circular seams overlap onto themselves, and where the inside edge goes onto the cone: these are always trouble spots for leaks.

When this glue is dry, turn the tube the right way out, and close up the final seam. Watch the distancing marks carefully, or you will find yourself with a problem as you come to put the last bit down.

Finally, put a few pumps of air into the tube to lift it up just enough so that it cannot stick to itself inside, and leave it for the glue to cure before testing for leaks, at pressure, and for pressure retention. Do not tape it until the front section has been fitted.

THE FRONT SECTION

Assembly

On the Double Seven only, first join the two halves of panel 4 along the seam indicated with arrows, then proceed as for other models by gluing all the panels together, starting with both No. 1 panels, and then joining the No. 2 panels onto the No. 1 panels, the No. 3 panels onto the No. 2 panels, and finally the No. 4 panels onto the No. 3 panels.

Start each seam at the end at which the hypalon side is buffed for the longitudinal seam, and try to avoid stretching as much as possible. If any corners do project, trim them off afterwards as previously described, so that the edge of each panel is straight, and the angles between the edges of adjacent panels coincide with the outer edges of the circular seams (see page A6).

Buff off the 'steps' where each circular seam glues onto itself, and then join up the longitudinal seam. Start at the centre front circular seam, and work down each side up to 10" from the end, which must be left open until the whole section is joined onto the side tubes.

The outer edge of each circular seam must line up onto itself, and if you have had to do much trimming this will not be easy. Try to stretch one side or the other to make the panels fit, but if necessary you may have to make some wrinkles to 'lose' some of the excess length in one side. Make sure they run across the seam, which may cause leaks but does not weaken it, rather than along the seam, which will weaken it.

The look of the seam does not matter because it will subsequently be covered by the floor gusset, and any leaks through the wrinkles can always be cured. However, if the circular seams are out of line then the boat will end up the wrong shape.

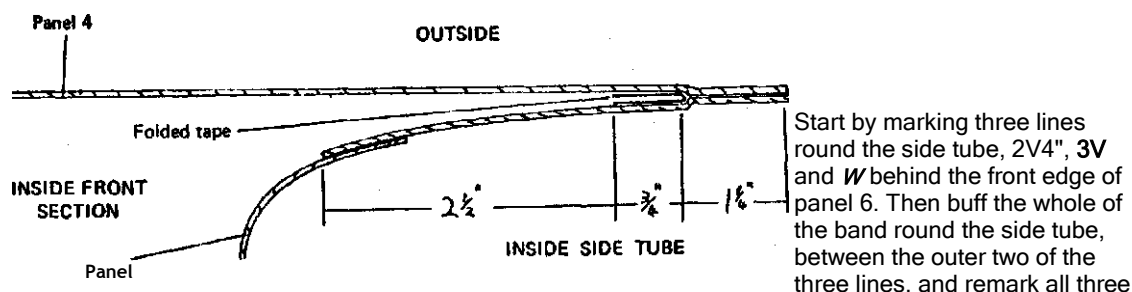
Fit the valve, and then turn the whole tube inside out and paint with glue over all the exposed edges on the inside. **Be** especially generous at the corners where the circular seams join onto themselves - these are classic spots for leaks.

Leave this glue to dry off completely before turning the section the right side out again, and it is then ready to be joined onto the side tubes.

Joining the Front to the Side Tubes

Panel 4 is glued round the outside of panel 6, with a tape folded back on itself to form a gusset to give strength with the baffle reversed, and it is designed so that the stretch of the material when the boat is inflated conceals the-existence of a join or baffle.

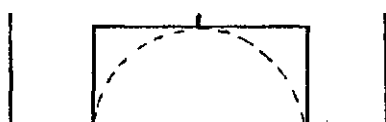
Panel 6



lines if necessary.

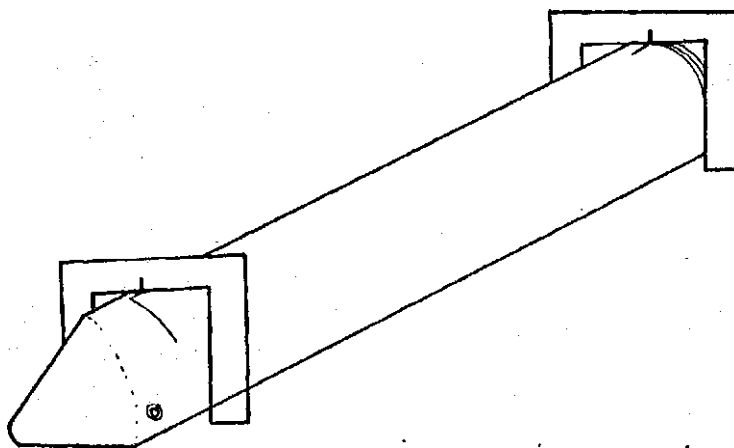
The inside edge of the longitudinal seam on the front section lines up with the bottom of the transom mark on the side tube, not with the longitudinal seam on the side tube, and so the next job is to find the point at the front of the tube which lines up with a point which is marked only at the back. It is not quite as simple as it sounds, since you cannot do it by simply measuring the distance round from the seam at front and back because the tube will have twisted slightly, and the seam itself will be out of line.

To get over the problem you will have to make two jigs, using hardboard, wood, or stiff cardboard. Make the jigs in the form of a square with one side missing, the size of the side tube when it is at working pressure, and mark the exact centre of the top edge.



Then, with the tube at working pressure and on a flat surface, arrange the tube with one jig so that the centre mark lines up with the bottom corner of the "L" shaped transom mark, and use the other jig to mark the same point in line at the front.

This mark at the front is to line up the inside edge of the longitudinal seam of the front section.



Next, you must put distancing marks round the tube and front section. Measure the tube and divide it into four: do not get confused as to which is the starting mark. On the front section you can fold it in half, not including the inch overlap on the edge which will be the outer one. To get the quarter marks you can fold the sides in to the centre mark.

You are now ready to proceed with the actual assembly. Cut a piece of tape to go round the tube and overlap onto itself by at least 1", and buff the hypalon off where it is to be glued down onto itself.

Then place a strip of masking sellotape round the side tube, up to and behind the middle line, leaving a 1/2" wide buffed strip between the front two lines. Apply glue to this strip, and to just over half the width of the tape, remove the sellotape and stick on the tape with the unglued half projecting over where the sellotape was. Glue the end down onto itself.

When you have stuck tape all round the tube and scraped it all as well as you can with the tube inflated (you may wish to do it in two or three sections), deflate the tube and scrape the tape down hard all round.

Inflate the tube again to about 1/2 p.s.i. and fold back the tape on itself: it should fold neatly in half, back to the line to which you put the sellotape.

The final stage is to glue the front section onto the side tube and the folded back tape, but before you do so wrap it round dry to see how much you need to try and stretch it to make it fit.

Then glue it on in four stages, starting at your mark and making sure that the quarter marks line up. Considerable brute force will be required, but it is possible, and it is obviously very important that you get it right.

When you get to within 1"-2" of the end, but not before, deflate the side tube and complete the final 10" of the front section longitudinal seam. With the tube still deflated, then go all round scraping again thoroughly to make sure that the whole joint is really solid.

When both side tubes have been joined on, the glue can be allowed to cure, and the front section tested for leaks and at pressure with the side tubes deflated.

Taping the U-Tube

The longitudinal seams are all covered by other parts and do not need to be taped except for the seam up the cone, to a point about 6" forward of the transom. The edge round the cone itself can be left providing it is reasonably neat, but you can tape it if you wish: you will find it easier if you reduce the width of the tape to about 1".

The circular seams can all be taped with the ends finishing on the longitudinal seam of the front section, and right on the bottom of the tube on the seam round the cone. In this way all ends will be covered, by the floor and gussets, and bottom rubbing strips respectively.

SECTION B - ATTACHING TRANSOM FLOOR AND FITTINGS TO THE U-TUBE

None of section B involves making airtight seams, and one coat of glue on each surface is quite sufficient to achieve the strength required on all joints. Also, standards of scraping can be somewhat relaxed, and whereas some jobs in section A called for the tube to be deflated to enable a joint to be scraped better, this is not necessary for any of the joints in section B.

Standards of buffing can also be relaxed, although common sense should be used as to whether a joint is likely to be subjected to any particular strain. For example, fitting the transom and rope fittings are jobs which require reasonably thorough buffing, whilst you need do little more than scratch the surface when fitting rubbing strips.

One problem which you will encounter when buffing the inflated tube is air leaks through the buffed areas. One answer is to be sure to buff no more than is necessary, but if you run into serious leaks which blow the glue out in bubbles, deflate the tube completely and apply a priming coat of glue to seal them.

The other problem to remember throughout section B is that any stray glue will turn dark brown in the sun and look very unsightly. Take care when brushing, and rub off any excess before it has had a chance to cure.

FITTING THE TRANSOM

Shaping and Preparing the Transom

First of all mark which edge is the top of the transom: the shorter edge is the top on the Double Six, and on the Double Seven and Double Five the top edge is the one which is not straight.

With the U-tube at working pressure, offer the transom up into position to see what shaping is required on the edge which butts onto the side tubes. Mark whichever side you are going to make the front, and then with a surform, rasp, spokeshave or coarse electric



sander chamfer off the top rear section and bottom front section of the edge until the whole width sits flat against the tube.

TOP

TOP

FRONT

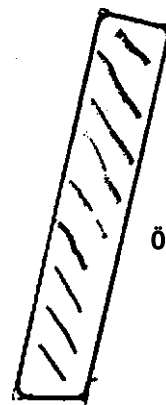
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K

Then plane off the rear bottom edge of the transom until it is parallel to the floor when the transom is held at the correct angle (1), and round off both front and back edge on the top and bottom to a radius of at least 1/8" (2).



FRONT

BACK



FRONT

BACK

Cut back the point at each corner about 3/8" and round it off, and finish the job off by rubbing down well all over with the brown abrasive paper supplied in the kit. Do not varnish the transom until you have glued it onto the boat and fitted the rubber floor.