

Making Moulds for Castings

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This article also appears in the Tutorials section at Model Ship World*

Introduction

How many times have you been put off building or modifying a model because of the logistics of the task ahead? It's so easy not to try to adapt a model, or to become restrained by what you think are your own limitations. That project you have wanted to build could become a step closer with the knowledge, which will enable you to mass-produce specific items. Quite a lot of items on ship models are required in significant numbers, for example, bollards, cannon, belaying pins, hatches and doors etc. To guarantee uniformity between each item, a moulding process can easily be employed to produce white metal or filled resin fittings. For the purposes of this tutorial, we have selected a bollard in order to illustrate this process.

Creating a Master

The first step is to produce a master of the item to be moulded. This master is known as the 'plug'. It can be made from any suitable material such as wood, plastic or metal. It can be an individual turned piece, such as a cannon, or a composite plug, made from several different materials. For the bollard, the main parts such as the upright pieces forming the column can be cut from plastic tube, or turned to diameter from metal stock. The top 'lip' of the column could be formed from a circular disc of wood or plasticard. Again, the base could be made from thicker plasticard sheet, or wood of the correct thickness. Remember that if you use wood, you may need to fill any grain to ensure a smooth finish, as what you are now creating, including any imperfections, will be replicated on every cast part you eventually make. Take your time getting your plug right, and it will pay dividends in the end.

Try using cellulose sanding sealer, such as the product which Humbrol manufacture, and also H. Marcel Guest, in the UK. This is basically cellulose dope with a quantity of talcum powder added. You can actually add a little shop bought talc to your cellulose dope, and this will do the same job.

Try your local model shop for plasticard and brass in different sections also.

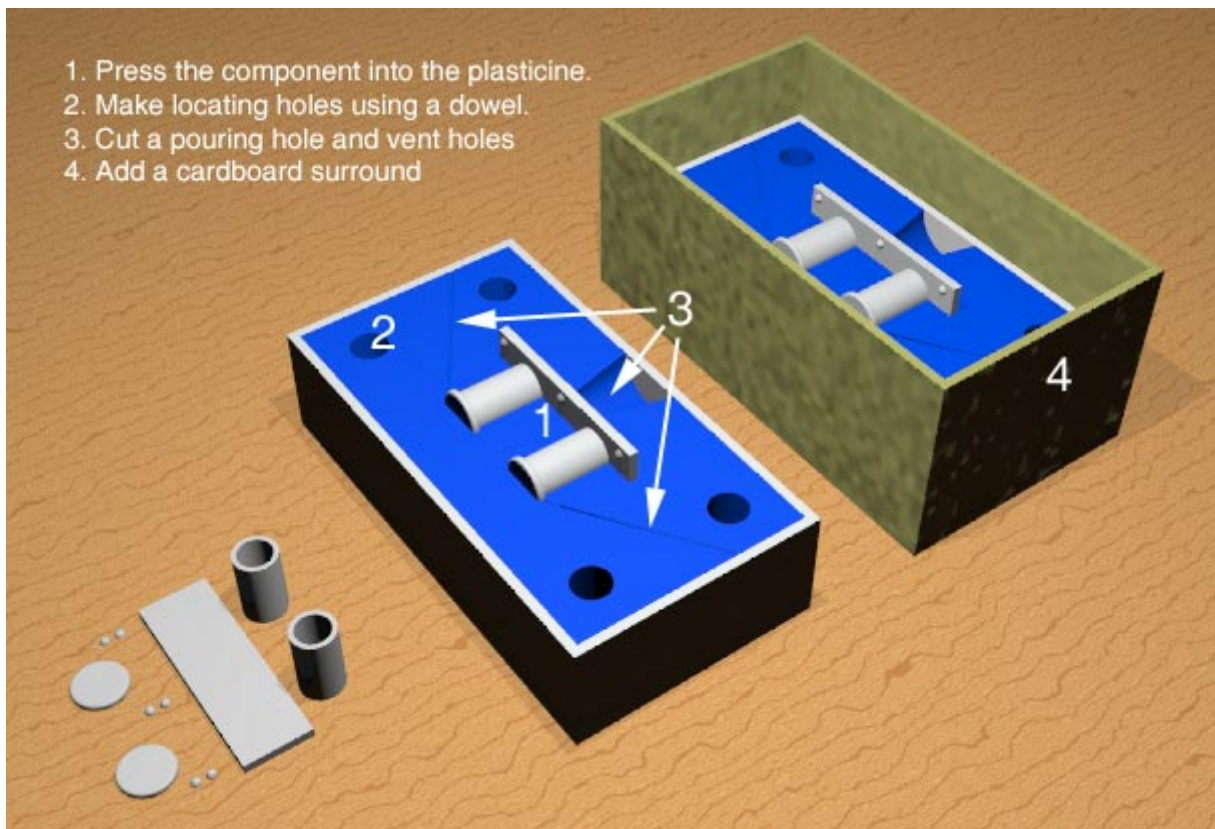
Other detail, such as the simulated bolt heads on these bollards, could be made from small rivet heads which are glued into place on the plug.

These pieces should now all be glued together to produce the highest standard plug that you can achieve, as stated earlier. If it doesn't look right, the chances are it's not. Throw it away, and remake the part until you are satisfied with its appearance. Check it against the finished model in order to determine it's scale and to satisfy yourself it's correct.

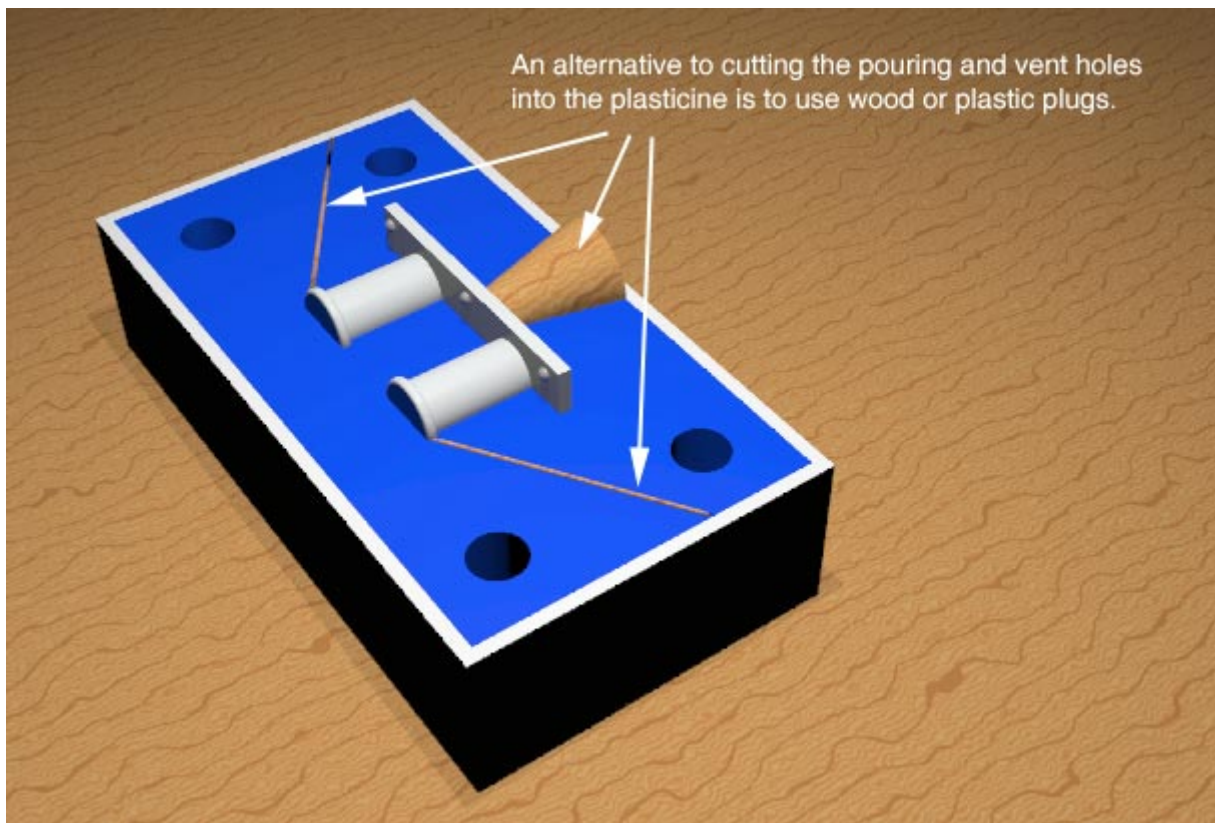
One of the attractive features of the moulding process is that fine detail can be reproduced such as emblems, bolt heads and decor, but as I keep saying, remember that the process will also faithfully reproduce any errors!

Creating the Mould

Once the master/plug is complete, a mould now has to be prepared. The method which we will illustrate will show the creation of a split mould which is dowelled together when the moulding material is poured. A plastic box of suitable dimensions is required. This is filled with pliable non-setting modelling clay such as 'Plasticine' which is sold in the UK. Use this clay to fill the box, taking care that no air pockets are introduced. Now level this off with a straight edge such as a steel rule, or even a thin length of wire acting like a cheese cutter. Our master part, the bollard is now pressed into the centre of the clay with slow, even pressure until exactly half of it is submerged. This process is easier if the clay has been 'worked' by hand for a little while first.



'Dowelling' holes should now be drilled into the clay in four places towards the corners of the box, to roughly half the depth of the clay. The diameter of these holes is not critical, but should not be less than 5mm (just over 3/16"). A funnel shaped pouring channel now has to be cut into the clay with a craft knife, and in the same way, a number of air vent channels must be cut from those parts in the mould which will be at the bottom when pouring. Angle these vents upwards from the bottom of the mould so that molten material will simply not flow out of it when it is poured into the finished mould. An alternative way to produce both the air vents and pouring funnel is to use an appropriately shaped plastic or wooden plug, which again are pushed into the clay halfway. You may find this an easier alternative, and this is the method that Bernard Frolich advocates in the book "The Art Of Shipmodelling" (Ancre)



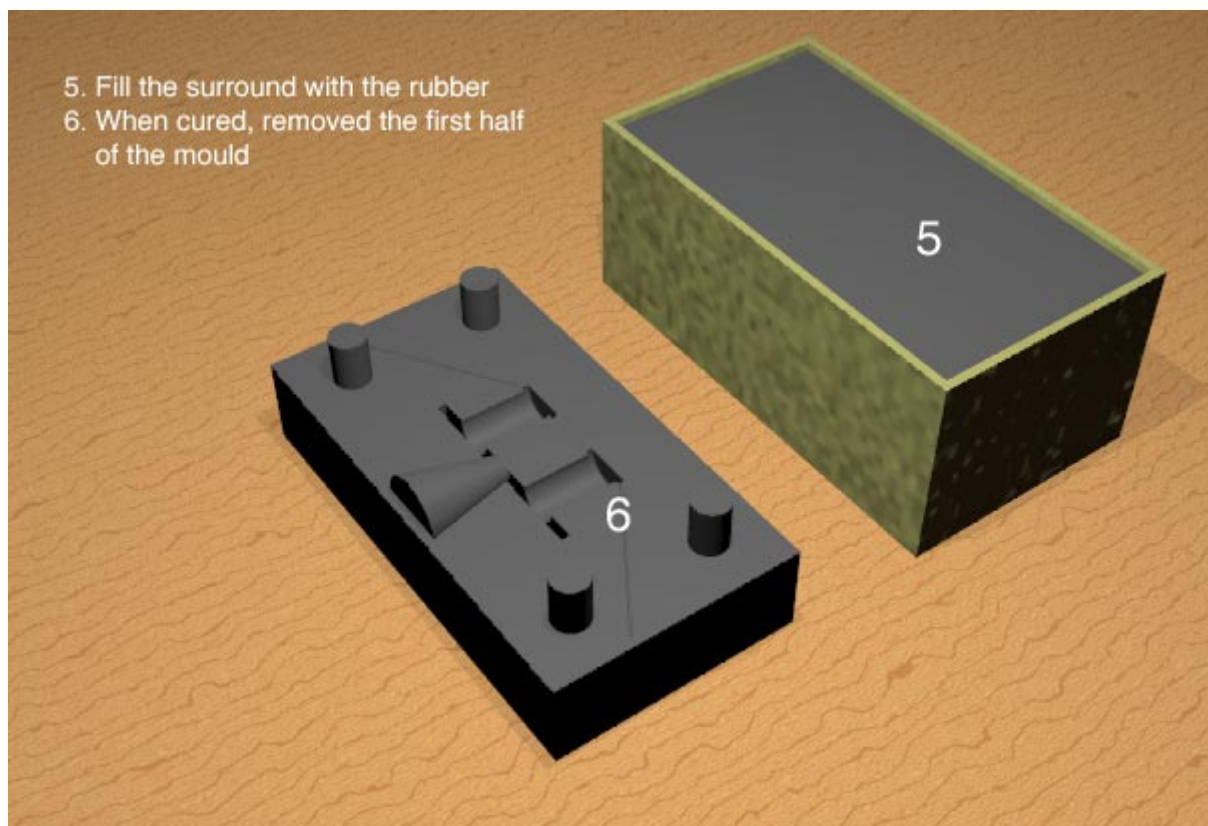
At this point, the box now has to be extended upwards using pieces of rigid cardboard or plasticard and masking/insulation tape as a fixative. Ensure all the corners of this extension and the area where the extension meets the original box are well sealed with the tape to stop leakages. Extend the box to twice its original depth. Our bollard, modelling clay, and inside surfaces of the extended box must now be sprayed with a release agent and allowed to dry.

Pouring the Silicone Mould

The first half-mould is formed by pouring the moulding solution on top of the bollard and clay. The silicone rubber solution used must be suitable for the resin or metal chosen for the moulded item. For RESIN casts, rubber RTV 3325 should be used, and for METAL casts, rubber RTV 3255 is suitable. These rubbers, which belong to the Polycondensation moulding category can be expensive and are not re-useable, but they are easy to handle, require no heat or pressure, and will reproduce the finest finish. Also, you will usually find that these is enough rubber to produce several moulds. The smallest quantity that I have typically seen for sale is 1Kg (2.2lbs)

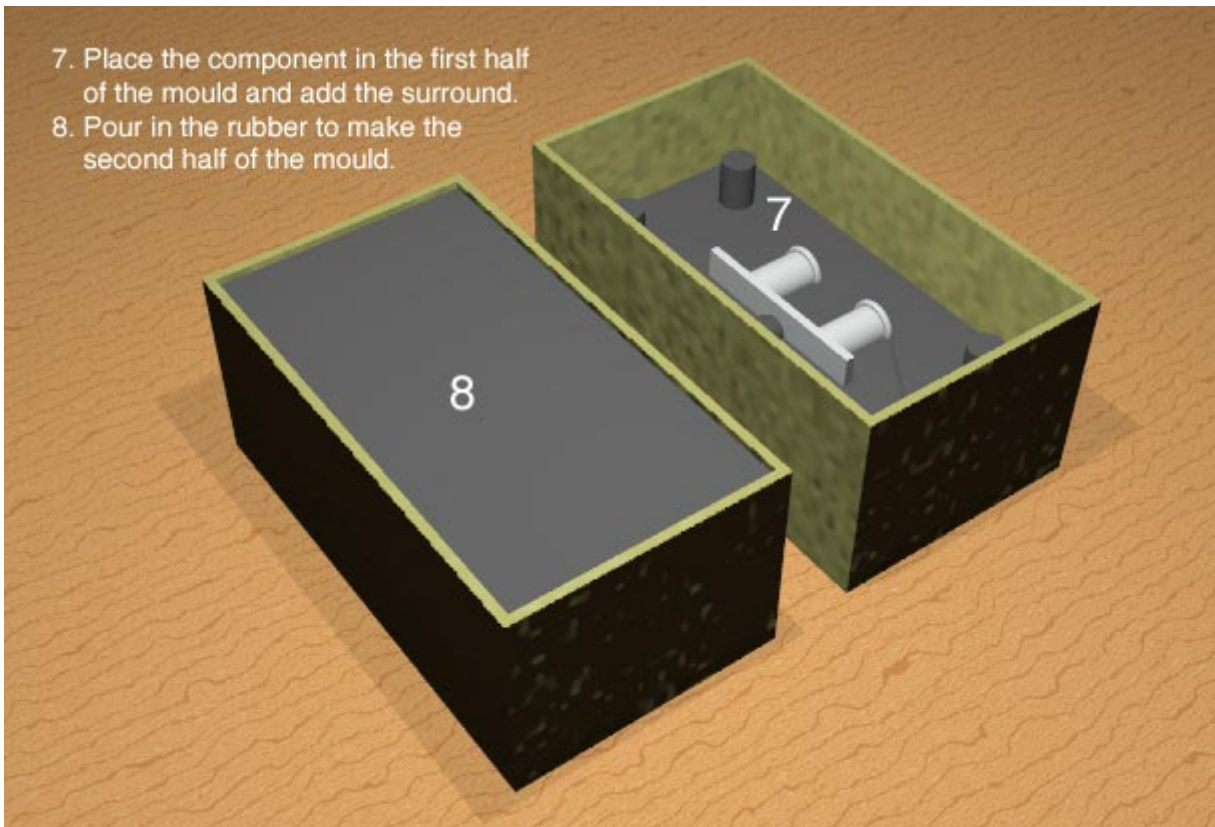
The manufacturer's instructions must be followed for mixing the rubber and catalyst, and care must be taken when mixing as NOT to cause air bubbles, as these can produce defective moulds. When mixed, the rubber must be poured into the extended box SLOWLY from one corner, at the same time making sure that the mould fills without trapping any air around the master. The mould should be filled as near as possible to the same depth as is the clay you are pouring upon. Now the rubber needs to be left for 24 hours to cure. Do not compromise on this time, but please be patient.

After the rubber has cured, the extended walls of the box have to be removed and, with the clay uppermost, the clay section is lifted from the newly formed silicone half mould. Any particles of clay must now be cleaned off the half mould, and the extended box wall rebuilt around it again, adding again the same depth as the mould you have just created.



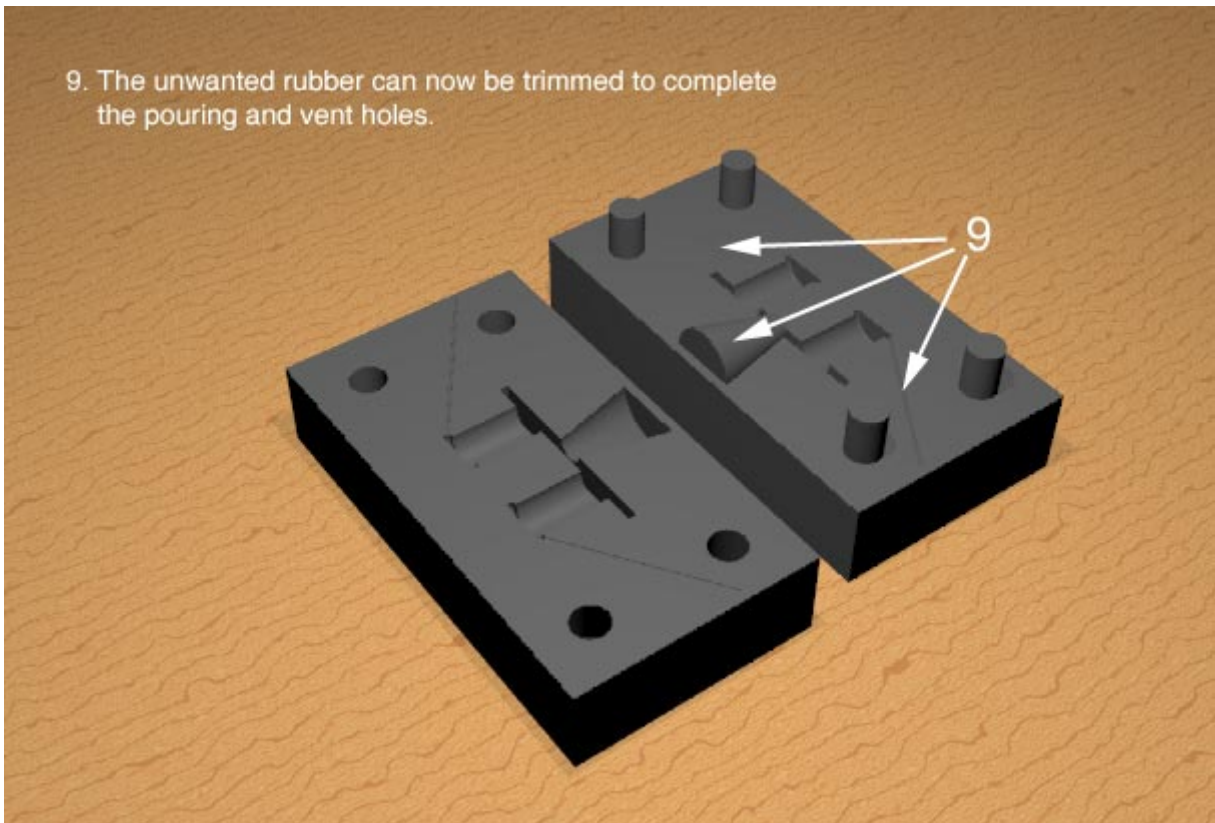
Places the bollard master into the mould along with the wooden pouring funnel and vents if used, and spray well with the release agent and allow to dry. The 2 halves of the mould will stick together if the release coat is not complete, so this operation is vital.

7. Place the component in the first half of the mould and add the surround.
8. Pour in the rubber to make the second half of the mould.



More silicone rubber solution can now be mixed and poured as before, to form the second half of the mould and allowed to cure for another 24 hours. The mould can then be split and the master removed. The filling funnel slot should now be cut out and the air channels chased out, if you have not previously used the funnel and vent plugs. The mould is now ready for use, with the dowels ensuring perfect registration of the 2 mould halves every time.

9. The unwanted rubber can now be trimmed to complete the pouring and vent holes.



If pouring metal, the mould should be lightly dusted with talc each time in order to help disperse any gases. The metal should be heated to the required temperature and poured into the mould, which should be tightly clamped together. With both metal and resin/filler mouldings, sufficient time must be allowed for cooling/curing before splitting the mould to extract the perfect replica of the master part.