

# SPHERE IN A CUBE

Made by Paul Howard



An interesting project to turn which finishes with something that will baffle people, how do you get a sphere in a cube?

Almost any cube of hardwood, for this project we will use sycamore, it needs to be approx. 75mm x 75mm (3" x 3") and all sides must be exactly equal, square and smooth.

You will also need a secure method of holding the cube on the lathe allowing access to the end face. Paul uses a modified set of bowl jaws with wooden plates fitted that hold the cube exactly true.

Later you require some means of holding the cube secure when the sphere is turned between dished cup chucks, a clamping box fitted to the lathe bed is ideal. Plus a means to hold the special ground cutting tool at a constant angle.

## **Step 1**

Mark a line on all four edges of each side approx. 12-13 mm in from the edge. A piece of straight timber 12-13mm thick laid on the bench against the cube gives the best results, allowing you to draw each line and keep rotating the cube.

## **Step 2**

Fit the cube onto the jaws, rotate by hand and check it is central and even. Number the corner (1) of the face against a mark on the jaws.

Set the tool rest and create a circle with a pencil which touches the original drawn lines on all edges, this will also show if the cube is central.

## **Step 3**

Using a beading tool cut two beads on the outside of the line, only use the points first before pushing in to form the actual bead, do not go too deep or you may feather the top of the bead.

#### **Step 4**

Using a thin parting tool, cut a 7-8mm deep groove on the inside of the line, allowing a couple of millimetres so stop any chipping of the inner bead.

#### **Step 5**

Using a small pointed bowl gouge, form the first part of the sphere in between the parting tool cut. The top of the curve needs to be about 6-7mm in from the face edge. Do not go any deeper in the corners against the bead edge at this stage. Once you are happy with the sphere remove the excess around the inner edge of the bead. Draw a few rings with a pencil to help the alignment of the cup chuck in step 9.

#### **Step 6**

Now remove the cube from the chuck and repeat the operation for the other 5 sides, numbering each side as before as you proceed. The numbers will correspond to a datum mark on the chuck

#### **Step 7**

With the cube set in the chuck so you can work on the 1<sup>st</sup> face, and using a jig that will allow the tool to be presented at the same angle each time at 45°, using a specially ground cutting tool, (see sketch) gradually cut into the side of the sphere inside the cube. This should go in until you just see daylight through the cut.

#### **Step 8**

Now repeat the operation for each face taking care on the last face as the sphere will obviously come loose. If small pieces are still holding the sphere in each corner a small saw (junior hacksaw blade) can be used to release the sphere.

#### **Step 9**

It is now time to complete the round shape of the sphere inside the cube. Using a pair of dished cup chucks to grip the sphere through opposite sides of the cube, support and clamp the cube in place with the lathe clamping box attachment. The sphere should be able to rotate freely inside the cube although there may be some slight knocking when first starting. Start the lathe slowly to check the sphere is free and then using a small gouge gently turn the sphere into a round form. The actual shape can be seen and checked through the top hole of the cube.

#### **Step 10**

Once you are happy with the shape, release the tailstock slightly and rotate the sphere so the remainder of the sphere can be turned to a perfect round. Do not over cut or the sphere may fall out of the cube.

#### **Step 11**

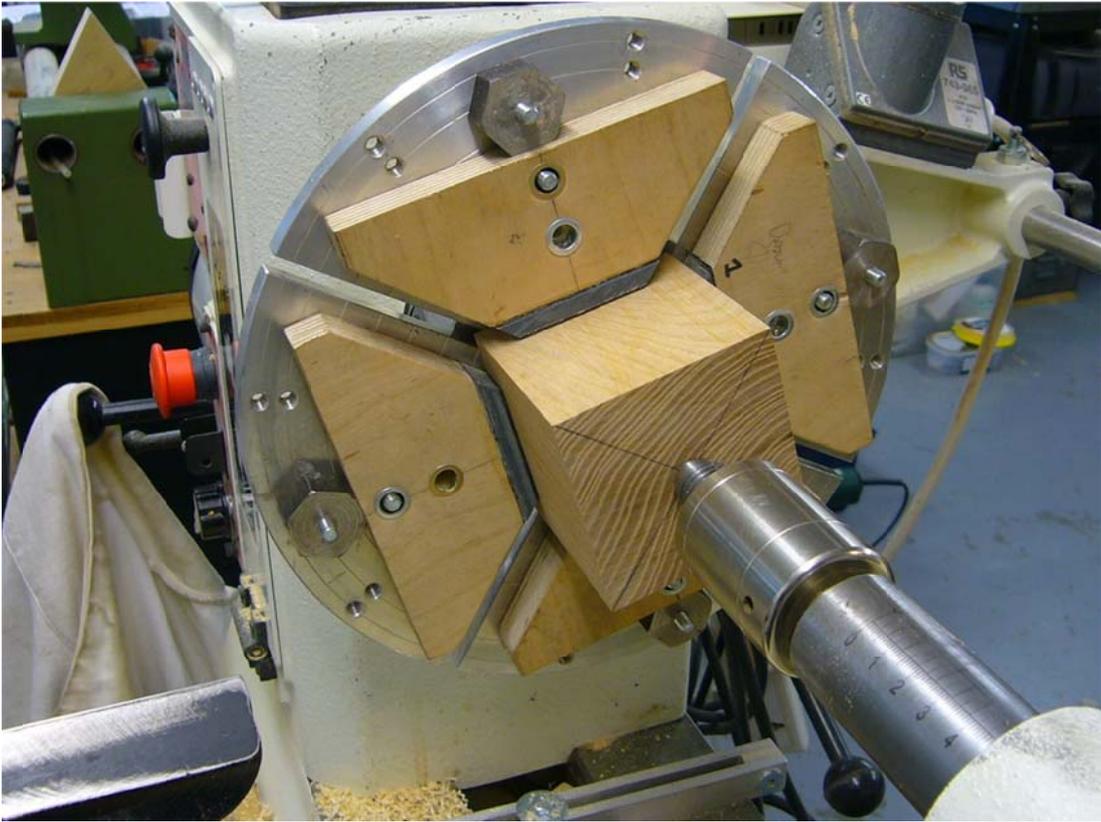
The sphere can now be sanded by threading strip of abrasive through the top and bottom hole in the cube work through the grits until perfect.

#### **Step 12**

The outside of the cube can now be sanded either on the lathe, by disc sander or by hand but be careful not to sand out the beads.

#### **Step 13**

Finish with preferred method, finishing oil is probably best applied by brush and left to dry completely, the first coat may take a couple of days depending on the air temperature.





### **Parting tool.**

The tool is flat on the opposite side.



### **Tool Rest.**

The tool rest step is 45 degrees and can be made from plywood, when the tool rest is set up for the first cut do not move the banjo but remove the tool rest to rotate the cube then replace the rest in the same position. Cut in about half way on each face until the sphere is free.

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