Making Spheres
Duane Hill

Tools required:
Roughing Gouge
Parting Tool
1" Spindle Gouge or 1" Skew
½" Spindle Gouge or ½" Skew
Small dividers
Calipers
Tape measure or steel rule
Faceplate or 4 jaw chuck

Optional Tools Required:
Sphere tangent chart or table
Sphere angle guide
Hole saw tool
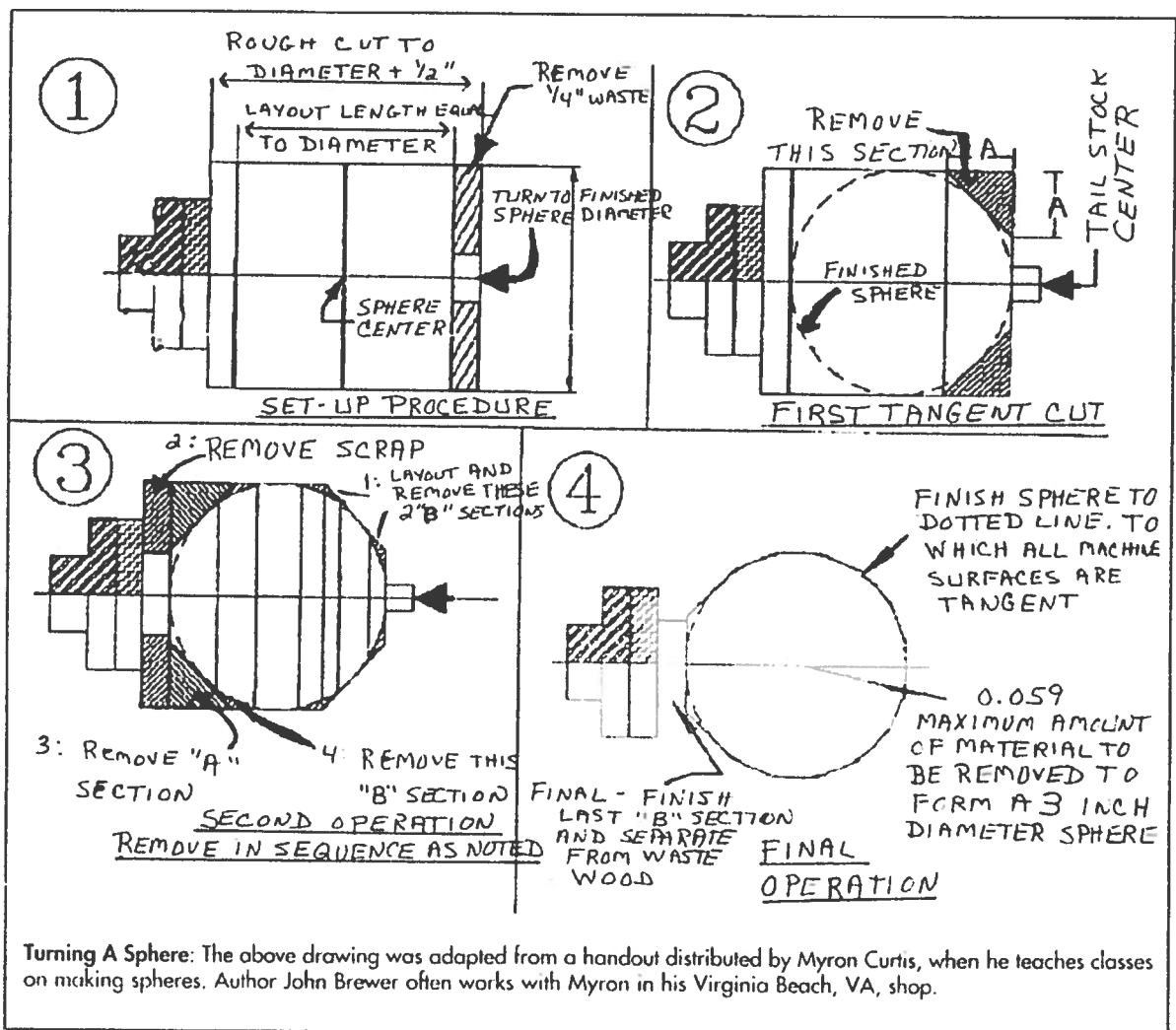Sphere auxiliary mounting chuck inserts

Reference Articles
"Making Spheres" by John Brewer, American Woodturner Summer 2001

How to turn an <u>accurate</u> sphere
1. Decide the diameter of the sphere you wish to turn.
2. Select wood. Wood should be at least ¼"-½" more in diameter than finished diameter of sphere. Wood should be straight grained. If using a face plate and waste block, wood should be about 1" longer than diameter of sphere. If using 4 jaw chuck, wood should be 2-3" longer than diameter of sphere.
3. Prepare wood blank. The sides should be parallel and the ends perpendicular to the sides. Mount blank on waste block and then mount waste block faceplate or turn a spigot on one of blank that will fit 4 jaw chuck. Engage tail center and turn blank to desired diameter. Make sure blank is the same diameter for the required sphere length.
4. From the tailstock end, measure in ¼" from the end of the blank and make a pencil mark. Set calipers to diameter of blank/sphere. Set one end of calipers on pencil mark and make another mark at the other end of the calipers. Turn on lathe and enhance pencil marks to make two lines.
5. Set calipers to "A" diameter (from chart, table or calculate). With the parting tool, reduce the diameter of the blank to the right of the first pencil line to "A" diameter. Do the same to the left of the second pencil line. Also, on the left hand side, cut away extra material to allow the gouge or skew to finish the cutting process later. See Figure 1, step 1.
6. Set dividers/calipers to "A" length. From the right shoulder of blank, make a pencil mark the "A" distance to the left of the shoulder. Also check that the distance from the shoulder down to the right side spigot is the same as the "A" length. From the left shoulder, make a pencil mark the "A" distance to the right. Check that the distance from the shoulder down to the left side spigot is the same as the "A" length. Turn on lathe and enhance pencil marks to make two lines. See Figure 1, step 2.
7. With a gouge or skew, remove waste material between the right side pencil line and the right side spigot. Take light cuts when removing material. The angle should be approximately 135°. This may be checked with the sphere angle guide.
8. With a parting tool, reduce the diameter of the right spigot to the "B" diameter.
9. Set the dividers/calipers to the "B" length. Make a mark the "B" length to the left and right of the of the right pencil line/cut line. Make another mark the "B" length left of the right shoulder. Turn on the lathe and enhance the three pencil marks. See Figure 2.
10. With a gouge or skew, remove the waste material between the two "B" lines. Also remove the material between the right most "B" line and the right spigot. See Figure 1, step 3.1 The angle should be approximately 167.5°. This may be checked with the sphere angle guide.

11. With a gouge or skew, remove waste material between the left side "A" pencil lines. The angle should be approximately 135°. This may be checked with the sphere angle guide. See Figure 1, step 3.3.
12. Make a mark the "B" length to the left and right of the of the left "A" pencil line/cut line. Turn on the lathe and enhance the two pencil marks. See Figure 1, step 3.4.
13. Round over all tangent lines to shape the sphere. Remove the tail stock and finish the tail stock end of the sphere. The sphere should now look like Figure 1, step 4. Sand as needed.
14. Finish the last "B" cuts on the headstock side. Part the sphere off.
15. Mount the sphere mounting chuck inserts in the chuck and tail center. Position sphere so theat end point are 90° from their original orientation. Sand as needed.
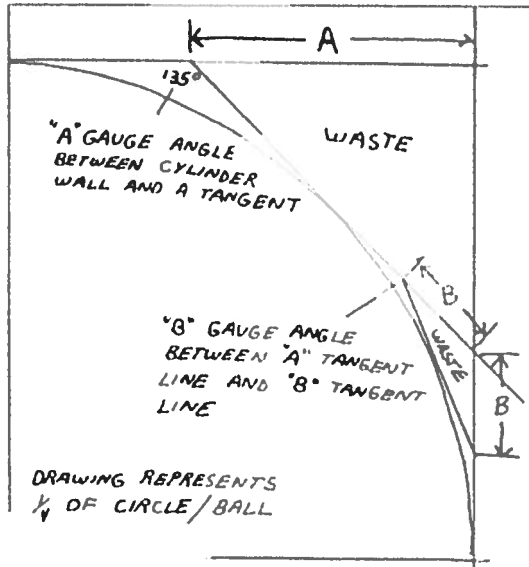

Turning A Sphere: The above drawing was adapted from a handout distributed by Myron Curtis, when he teaches classes on making spheres. Author John Brewer often works with Myron in his Virginia Beach, VA, shop.

Sphere Dimensions

Sphere Diameter	"A" Length	"B" Length	"A" Diam	"B" Diam	"A" Length	"B" Length	"A" Diam	"B" Diam
1	0.293	0.108	0.415	0.199	5/16	2/16	7/16	3/16
1.25	0.366	0.135	0.518	0.249	6/16	2/16	8/16	4/16
1.5	0.439	0.162	0.622	0.299	7/16	3/16	10/16	5/16
1.75	0.512	0.188	0.725	0.349	8/16	3/16	12/16	6/16
2	0.586	0.215	0.829	0.398	9/16	3/16	13/16	6/16
2.25	0.659	0.242	0.933	0.448	11/16	4/16	15/16	7/16
2.5	0.732	0.269	1.036	0.498	12/16	4/16	1 1/16	8/16
2.75	0.805	0.296	1.140	0.548	13/16	5/16	1 2/16	9/16
3	0.878	0.323	1.244	0.597	14/16	5/16	1 4/16	10/16
3.25	0.951	0.350	1.347	0.647	15/16	6/16	1 6/16	10/16
3.5	1.025	0.377	1.451	0.697	1	6/16	1 7/16	11/16
3.75	1.098	0.404	1.554	0.747	1 2/16	6/16	1 9/16	12/16
4	1.171	0.431	1.658	0.797	1 3/16	7/16	1 11/16	13/16
4.25	1.244	0.458	1.762	0.846	1 4/16	7/16	1 12/16	14/16
4.5	1.317	0.485	1.865	0.896	1 5/16	8/16	1 14/16	14/16
4.75	1.391	0.511	1.969	0.946	1 6/16	8/16	2	15/16
5	1.464	0.538	2.073	0.996	1 7/16	9/16	2 1/16	1
5.25	1.537	0.565	2.176	1.046	1 9/16	9/16	2 3/16	1 1/16
5.5	1.610	0.592	2.280	1.095	1 10/16	9/16	2 4/16	1 2/16
5.75	1.683	0.619	2.383	1.145	1 11/16	10/16	2 6/16	1 2/16
6	1.757	0.646	2.487	1.195	1 12/16	10/16	2 8/16	1 3/16
6.25	1.830	0.673	2.591	1.245	1 13/16	11/16	2 9/16	1 4/16
6.5	1.903	0.700	2.694	1.295	1 14/16	11/16	2 11/16	1 5/16
6.75	1.976	0.727	2.798	1.344	2	12/16	2 13/16	1 6/16
7	2.049	0.754	2.902	1.394	2 1/16	12/16	2 14/16	1 6/16
7.25	2.122	0.781	3.005	1.444	2 2/16	12/16	3	1 7/16
7.5	2.196	0.808	3.109	1.494	2 3/16	13/16	3 2/16	1 8/16
7.75	2.269	0.834	3.212	1.543	2 4/16	13/16	3 3/16	1 9/16
8	2.342	0.861	3.316	1.593	2 5/16	14/16	3 5/16	1 9/16

A = Diam * .29275; 135 Deg
B = Diam * .10767; 167.5 Deg
A Diam = Diam - (2 * A)
B Diam = A Diam - (2 * B)

A

135°

"A" GAUGE ANGLE
BETWEEN CYLINDER
WALL AND A TANGENT

WASTE

"B" GAUGE ANGLE
BETWEEN "A" TANGENT
LINE AND "B" TANGENT
LINE

B

WASTE

B

DRAWING REPRESENTS
¼ OF CIRCLE/BALL

Determining the angles for shop-built gauges

Sphere Construction Info

Chart titled "Sphere Construction Info" plotting Tangent Values (in) on the vertical axis (0.000 to 3.500) against Sphere Diameter (in) on the horizontal axis (0 to 8).

Legend:
- "A" Length
- "B" Length
- "A" Diam
- "B" Diam