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CONTOUR MARKER INSTRUCTIONS

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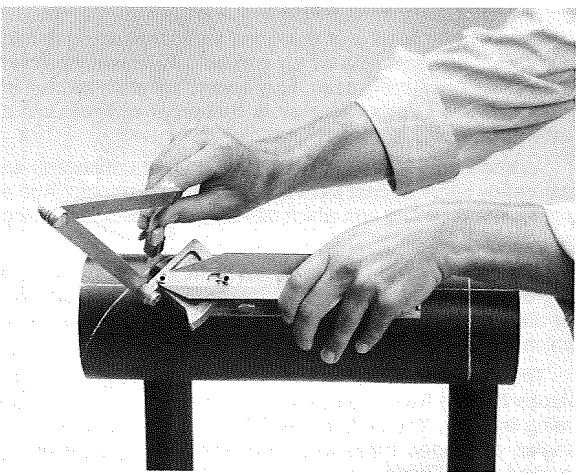
CONTOUR®

CURV-O-MARK®

CONTOUR MARKER
INSTRUCTIONS



NO. 1 STANDARD MARKER **0721-0000**

HOW TO USE YOUR STANDARD OR JUMBO CONTOUR MARKER TO LAY OUT PIPE AND STRUCTURAL STEEL JOINTS.

CONTOUR SALES
A DIVISION OF
JACKSON PRODUCTS, INC.

THE CONTOUR MARKER

The Curv-O-Mark® Contour Marker is a compact, time-saving tool used to lay out pipe and structural steel joints. Laterals at any angle, tees, wyes, crosses, elbows—any type or size of joint can be quickly and precisely laid out. No more complicated mathematical formulas. No more cut and try. No more needless material waste.

The Contour Marker is designed and constructed to fold into a neat compact unit which can be conveniently carried in a pocket or carrying case. Engineered to retain its built-in accuracy, the Contour Marker is rust-proof and will last a lifetime with only an occasional oiling.

As shown in Figure 1, the Contour Marker consists of an accurately aligned, cast frame, a calibrated protractor and a triple-jointed marking arm which carries the soapstone marking point.

The protractor is graduated on both sides; one side in degrees and the other side in inches to the foot. The protractor dial is divided into two sectors marked A and B, both of which are numbered.

The sector marked A is used when marking angles or slopes figured from a perpendicular to the axis of the pipe being marked. The sector marked B is used when marking angles or slopes measured from the axis of pipe being marked. See Figure 10.

The X-shaped frame of the Contour Marker is cast aluminum. Either side of the frame may be used, depending upon the direction of the line to be scribed.

To assure accurate visual alignment of the Contour Marker frame on a predetermined center line on the pipe, an arrow is cast in at the end of the frame. The protractor reading aperture also features an indicator arrow as another aid to easy visual alignment on the reference line. (See Figure 1.)

The marking arm joints are precision-aligned, with special spring tension washers maintaining close tolerance fit. Occasional oiling will prevent joint wear.

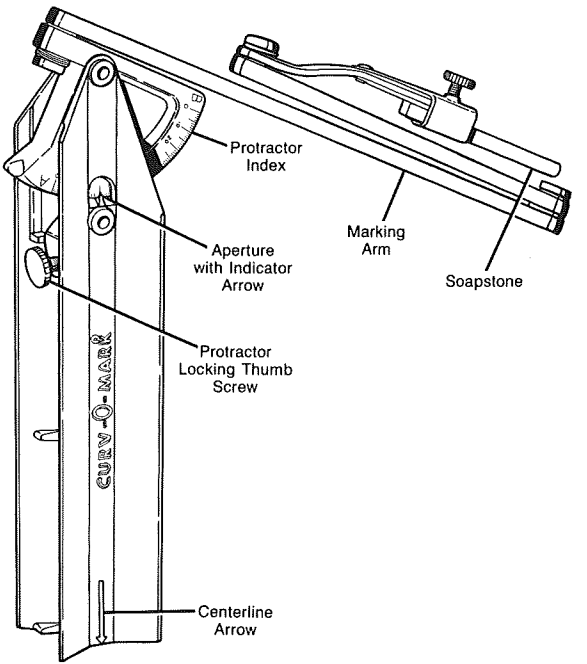

Protractor
Index
Marking
Arm
Soapstone
Aperture
with Indicator
Arrow
Protractor
Locking Thumb
Screw
CURV-O-MARK
Centerline
Arrow

FIGURE 1

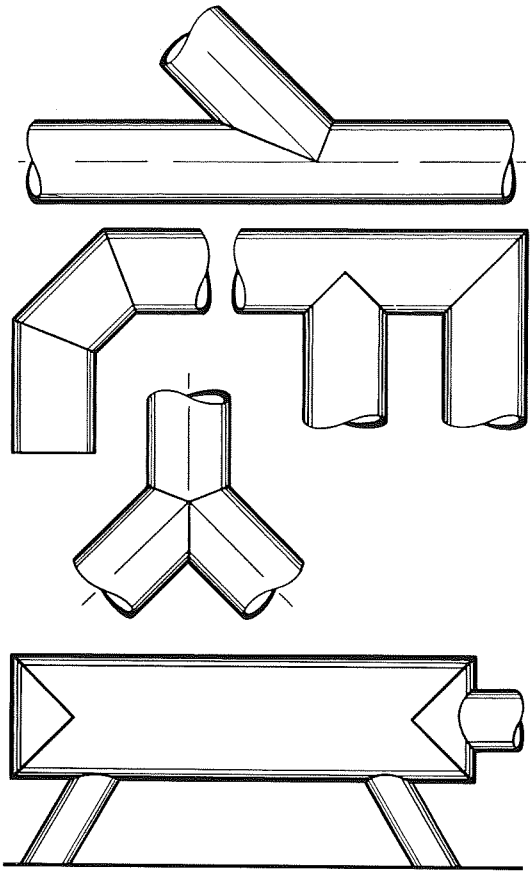


FIGURE 2

Any of the angles shown in Figure 2 can be accurately marked off (or laid out) in a few minutes with the Contour Marker. In addition, all figuring of cut-backs is eliminated. The Contour Marker will mark all the way around the pipe.

The Standard Model (pocket size) is designed for use on pipe sizes from 1½" to 18" diameter. The Jumbo Model is used on larger pipe sizes from 8" to 48" diameter.

OPERATION OF THE CONTOUR MARKER

When using the Contour Marker, always mark from the bottom of the pipe to the top. This eliminates accidentally "forcing" or "springing" the arm out of alignment with the protractor setting, and permits accurate marking in one free, easy movement.

To illustrate how layout work can be simplified, typical examples will be examined. In the following descriptions, the term "Angle of Cut" is used to denote the angle at which the pipes are cut to form a joint of a given angle.

ELBOWS

When laying out elbows, use only the "A" sector in setting the protractor on the Contour Marker. To find the angle of cut for any elbow, divide the total number of degrees in the elbow by twice the number of angles specified. For example, look at the two angle 90° shown in Figure 3.

The total angle of the elbow is 90° and it is to be made in two angles. Therefore, using the above rule, twice 2 is 4 and 90° divided by 4 is 22½°.

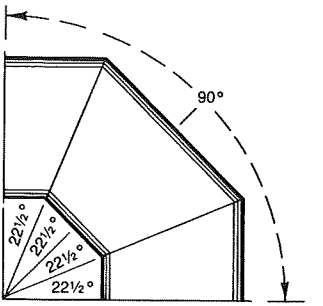
To use the Contour Marker for this cut, first scribe a center or reference line on the pipe.* Set the protractor scale at 22½° on the A sector. (Always use the A sector for all elbows.) Tighten thumb screw securely.

Hold the Contour Marker firmly in position shown in Step 1, Figure 4. Line up with the center line by using the arrows in the aperture and the marker frame. Scribe a line all the way around the pipe, beginning at the bottom and marking up. Do not "force" the arm — let it travel in its own accurate direction. Without changing the protractor setting, turn the Contour Marker over, place in position shown in Step 2 and repeat the scribe.

After making the cuts following these lines, the pieces will fit perfectly to form the two angle 90°.

The same procedures permit accurate marking of any elbow. See Figures 5 and 6.

*(The most easy and convenient way to find an accurate center is with one of Contour's Centering Heads described on page 30 of this booklet.)



Two Angle 90° El
FIGURE 3

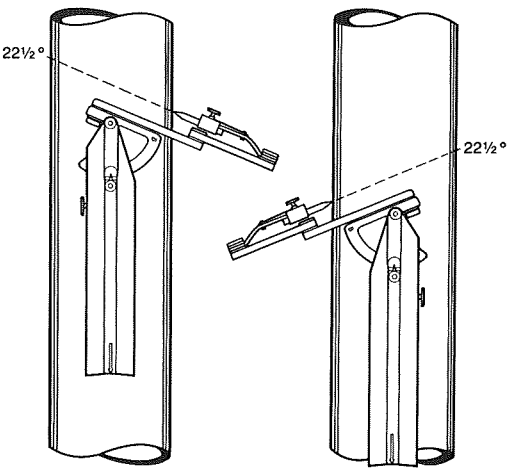
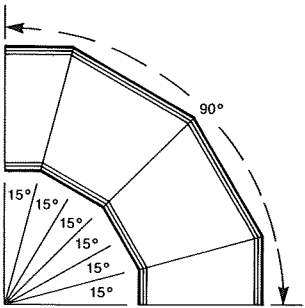
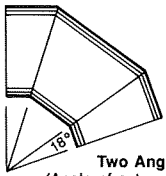


FIGURE 4



Three Angle 90° El
(Angle of cut = 90° ÷ 6 = 15°)

FIGURE 5



Two Angle 72° El
(Angle of cut = 72° ÷ 4 = 18°)

FIGURE 6

LENGTH OF PIECES

The length of the pieces making up an elbow is an important factor in accurate layout work. Using the following simple rule, together with the Table of Tangents on page 10, measurements will be right every time.

To find the length of each piece of an elbow, multiply the length of the bend radius (measured from the center line of the pipe) by the tangent of the cut angle. (See Table of Tangents.) This is the length of each end segment. The piece or pieces in between are always twice the length of the end segment. See Figure 7.

The radius of the bend, measured from the pipe center line, is 12 inches. The angle of cut is 22½°. The tangent of 22½° (see Table) is .414. Multiplying .414 by 12 equals 4.968 which is almost 5 inches. This is the center line length of the end segment and, since the middle piece is always twice the length of the end segment, the middle piece is 10 inches long on the center line.

The same rule also applies when figuring an elbow such as shown in Figure 5. Both middle pieces will each measure twice the length of the end segment.

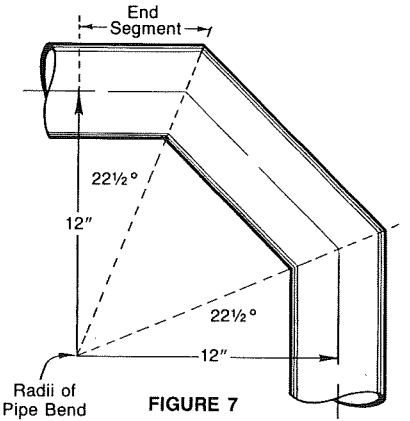


FIGURE 7

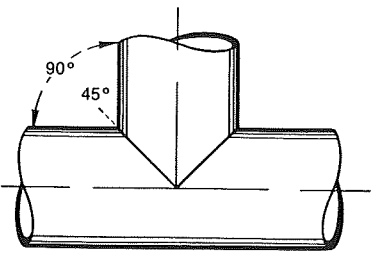
TABLE OF TANGENTS

Deg.	Tan.	Deg.	Tan.	Deg.	Tan.	Deg.	Tan.
5	.087	15	.268	25	.466	35	.7
	.096		.277		.477		.713
6	.105	16	.287	26	.488	36	.727
	.114		.296		.5		.74
7	.123	17	.31	27	.51	37	.754
	.13		.315		.52		.767
8	.14	18	.325	28	.532	38	.78
	.15		.335		.543		.795
9	.158	19	.344	29	.554	39	.81
	.167		.354		.566		.824
10	.176	20	.364	30	.577	40	.84
	.185		.374		.59		.854
11	.194	21	.384	31	.6	41	.869
	.2		.394		.613		.885
12	.21	22	.404	32	.625	42	.9
	.22		.414		.637		.916
13	.23	23	.424	33	.65	43	.933
	.24		.435		.66		.95
14	.25	24	.445	34	.675	44	.966
	.258		.456		.688		.983
						45	1.

Tangent numbers shown in between degrees are for half-degrees, i.e. the tangent .13 between degrees 7 and 8 is the tangent of 7½°.

LATERALS

The Angle of Cut on any lateral is always equal to one-half the crotch angle. Simple examples are the "T" and the "Cross" as shown in Figures 8 and 9. To lay out Tees and Crosses, set the protractor on 45° and use the Contour Marker as described on page 6.



The angle of cut for the "T" and the Cross is 45°

FIGURE 8

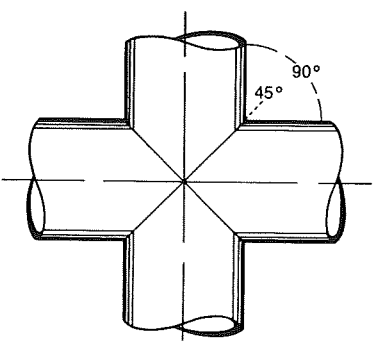


FIGURE 9

Laterals such as that shown in Figure 10 require the use of another factor. As stated previously, the angle of cut is equal to one-half the crotch angle. In Figure 10 the crotch angle is 45°. Therefore, each angle of cut will be 22½°.

To mark the A line for this cut, first set the protractor on 22½° in the A sector. Align the Contour Marker with the center line on the pipe and mark half way around the pipe as shown in Step 1, Figure 11.

Without changing the protractor setting, place the Contour Marker near the end of the mating pipe and repeat the mark.

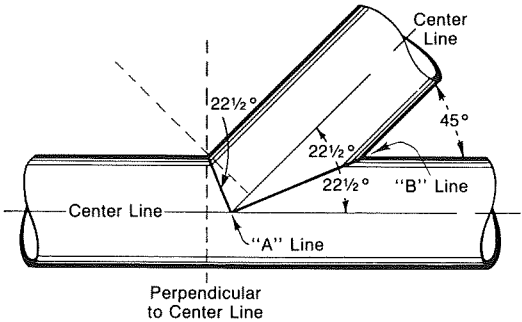


FIGURE 10

To mark the B line, loosen the thumb screw and set protractor on 22½° in the B sector. Place the Contour Marker on the pipe as shown in Step 2, move until the soapstone pointer will intersect with your previous mark at the pipe center line and scribe the line. Without changing the protractor, place the marker on the mating pipe and repeat the mark.

When the cuts are made following these lines, the pieces will fit perfectly to form the desired lateral.

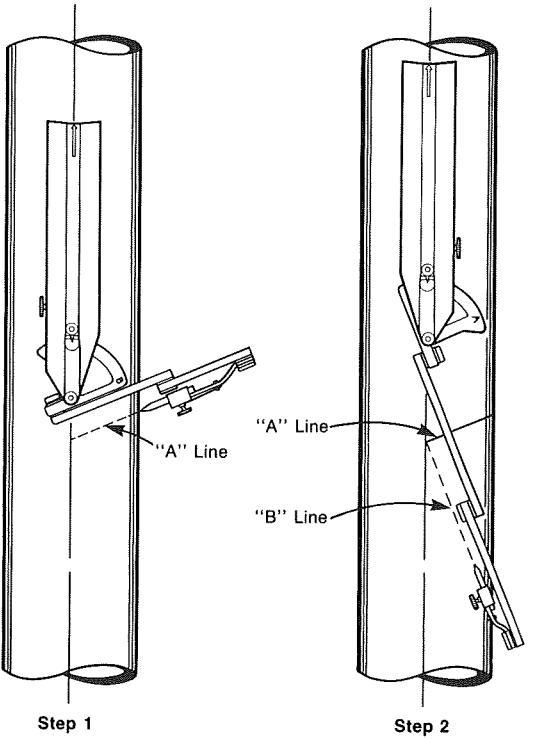


FIGURE 11

LAYING OUT THE TRUE "Y"

For the true "Y", the angle of cut for B is one-half the angle of the Y. The A cuts are equal to one-half the B cuts. For the Y shown in Figure 12, the B cuts would be 45° and the A cuts would be 22½°. Use sector B for the B cuts and sector A for the A cuts.

When one pipe branches from a larger pipe as in Figure 13, the line formed at the intersection is a curved line which cannot be completely marked off with the Contour Marker. The most difficult part can be marked off using the Marker and the remaining part can be easily drawn freehand or with a Radius Marker. (See page 33.) A connection of this kind is commonly referred to as a saddle.

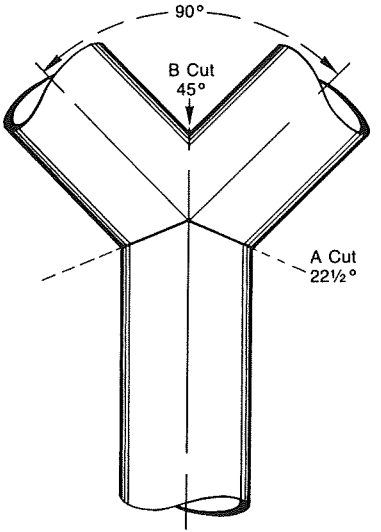


FIGURE 12

SADDLES

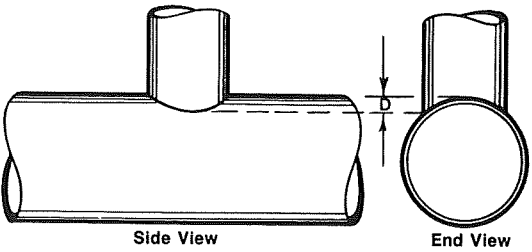


FIGURE 13

To lay out a saddle, first find the saddle depth as shown at D in Figure 13. This is easily done with a steel square and a rule as shown in Figure 14.

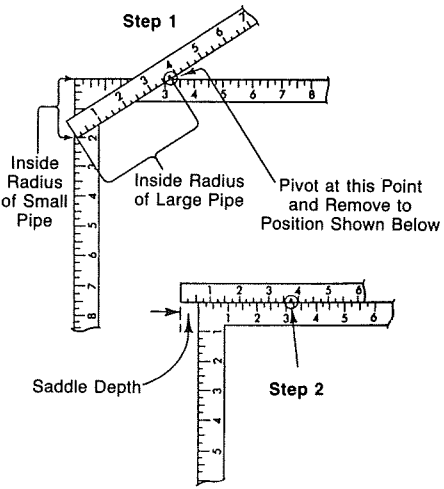


FIGURE 14

After finding the saddle depth, lay off a distance from the end of the small pipe equal to 1½ times the saddle depth. With the protractor set on 0, scribe a line around the pipe as shown in Figure 15, Step 1. To mark the line H-O and F-O as shown in Step 2, loosen the thumb screw so that the protractor is free to move. Maneuver the Marker body and the protractor until the soapstone point will contact both points H and O. Tighten the thumb screw and scribe the line half way around the pipe.

Again loosen the thumb screw and repeat the maneuver to scribe line F-O.

Then lay off the saddle depth and round off the points as shown in Step 3.

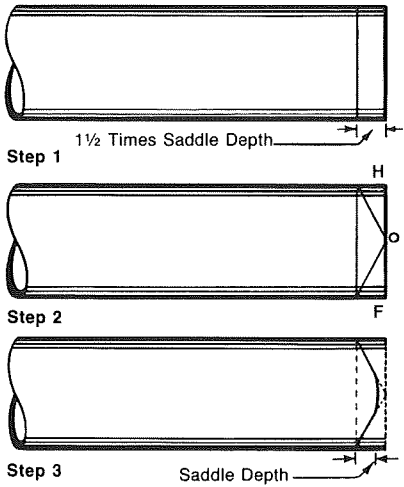


FIGURE 15

For the opening in the large pipe, use the saddle of the small pipe as a template. If the small pipe is long and hard to handle, place a piece of cardboard or thin sheet of metal in the saddle, mark it off and use the pattern as a template.

BRANCH COMING OFF AT AN ANGLE

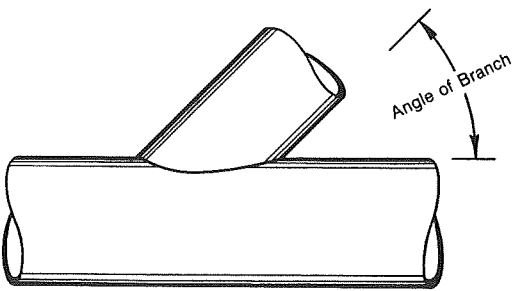


FIGURE 16

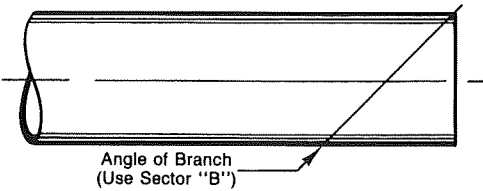
To lay out a branch coming off at an angle, as shown in Figure 16, use the following method:

Set the protractor to the angle of the branch, using the B sector. Scribe a line around the pipe as shown in Figure 17, Step 1. At a right angle to this line, lay off a point equal to 1½ times the saddle depth. This point must be on the pipe center line as shown in Step 2. Mark the lines H-O and F-O.

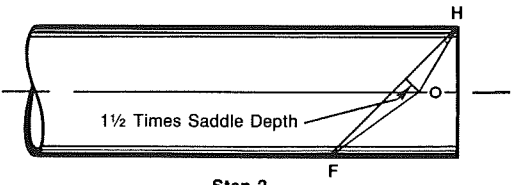
Lay off the saddle depth and round off the points as shown in Step 3.

To mark the opening in the larger pipe, use the same method described on page 14.

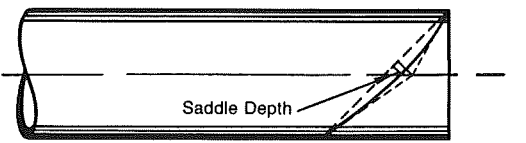
If the angle is greater than 45°, deduct it from 90° and use sector A. For example, assume angle is 60°. Then 90° − 60° = 30° on sector A.



Step 1



Step 2



Finish by rounding off point

Step 3

FIGURE 17

CORRECTION FOR ANGLE OF CUT ON HEAVY WALL PIPE

When thick pipe is cut on an angle and the cut is made parallel with the plane of the angle, the thickness of the pipe can be disregarded. But if the cut is made perpendicular to the axis, then a correction must be made for the angle of cut. Joints made with and without correction for the angle of cut are illustrated in Figure 18.

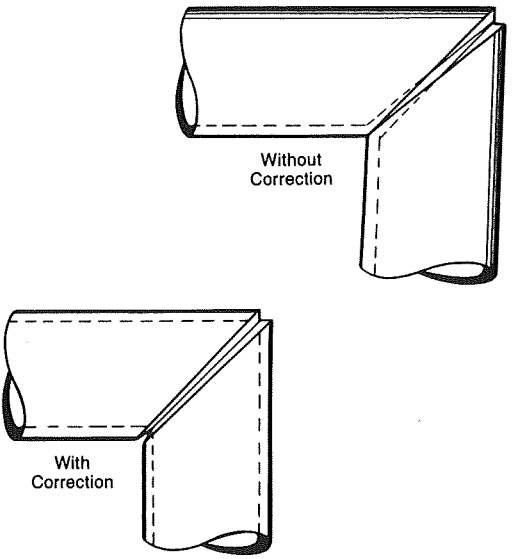


FIGURE 18

The method to correct for angle of cut is as follows: Set the protractor on the desired angle of cut and scribe a line around one-quarter of the pipe as shown by the solid line in Figure 19. From point A, measure off a distance equal to the thickness of the pipe times the tangent of the cut angle. From that point through point O will be the correct angle of cut. For example, assume the angle of cut to be 31° and the pipe ½" thick. The tangent of 31 is .6 and .6x½ equals .3.

To convert tenths to sixteenths, which is the usual measure scale, multiply the three-tenths by 16. 16x.3 equals 4.8 sixteenths. Round to nearest sixteenth, which would be 5/16 in this case. Therefore, the distance from A to B on Figure 19 would be 5/16".

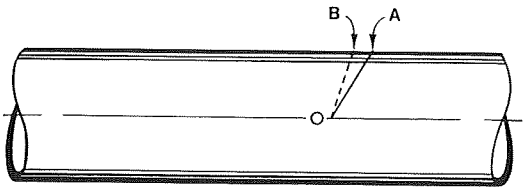


FIGURE 19

BONNET HEAD PRESSURE CYLINDERS

First — Lay off line A, as shown in Figure 20. Then lay off the inside measurement of the pipe as shown. Through those points will be the angle of cut. Make the cuts perpendicular to the wall of the pipe and it will fit as shown in Figure 21.

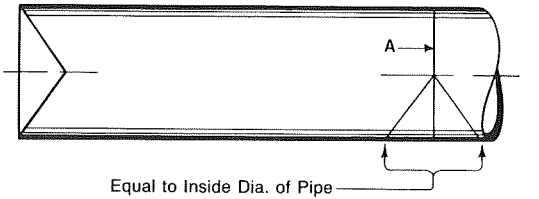


FIGURE 20

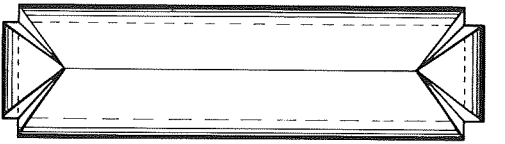


FIGURE 21

CONNECTING TWO PIPE LINES

When two pipes are to be connected, the Contour Marker can be used for taking the angle, as shown in Figure 22. Stretch a line over the two pipes as shown at A. Then the reference lines B and C are layed off from the point where the line A first strikes the pipes. Place the Contour Marker over the line B or C, as shown at B, and shift the protractor until the bar lines up with the line A. Lock the dial in that position and take the reading in degrees. If the reading is on sector B, than 1/2 of that will be the angle of cut. Use sector A for the angle of cut.

If the angle is greater than 45°, it will read on sector A. Deduct that reading from 90°. For example, assume 38° on

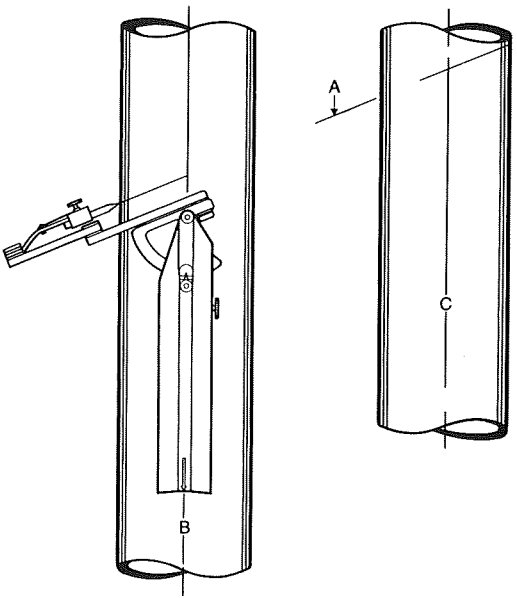


FIGURE 22

sector A. Then 90° – 38° = 52°. The angle of cut would be one-half of 52° or 26°. Use sector A for the angle cut.

When angles are given as slope or pitch of a certain number of inches to the foot, use the dial marked in inches to the foot.

Figure 23 shows a brace having a slope of 6½ inches to the foot.

Set the dial on 6½". Use sector A for the floor cut. Use sector B for the wall cut.

A simple rule for selecting the correct sector is as follows: If the angle O is greater than 45°, use sector A. If less than 45°, use sector B.

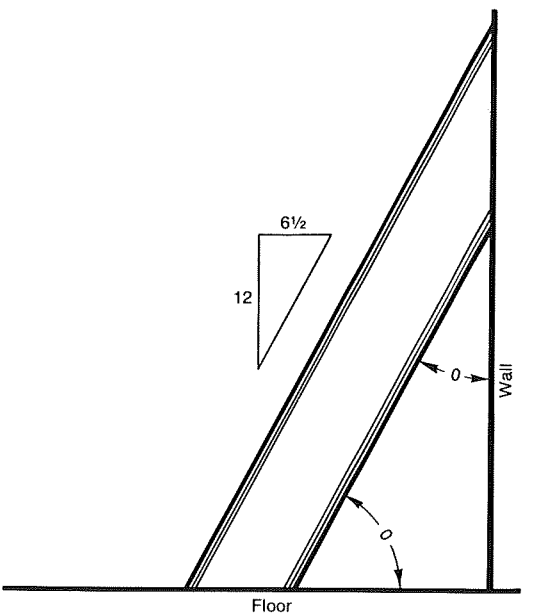


FIGURE 23

FINDING ANGLES USING THE SQUARE

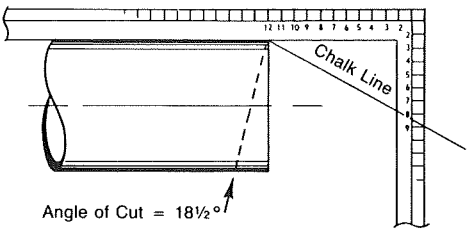


FIGURE 24

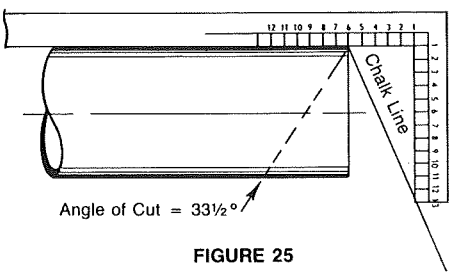


FIGURE 25

If the angle is less than 45° as in Figure 24 as 9 and 12, set the dial on 9, sector B. On the opposite side read the number of degrees. Half of that will be cut on the end of each pipe in order to make the turn of 9 and 12.

If the angle turned is greater than 45° then sector A is used and the reading must be deducted from 90. See Figure 25. Set the dial on 5 on sector A. On the opposite side take the reading in degrees and deduct that from 90. 90 – 23 equals 67. Half of that, or 33½°, would be the angle of cut to make on the end of each pipe.

MARKING PRE-FORMED ELBOWS

Lay the Elbow on a flat surface. Block it so it cannot move and square ends with the flat surface. Lay off lines M and P parallel with the respective ends as shown in Figure 26. Where the lines intersect will be the radius center.

Set the protractor on the angle required and place the Contour Marker so that the scribing point passes through the center as shown. Be sure to align the frame of the Contour Marker parallel with line M. Scribe the line as far around as the scribing point will reach. It is usually not practical to try to scribe completely around the elbow unless marking a large pipe.

A large Elbow can be marked as far as possible and finished by turning the Elbow over and coupled up by using the same method. In so doing, either shift the protractor to sector B, or align the frame with line P.

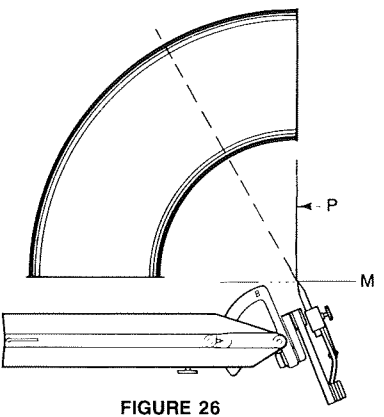
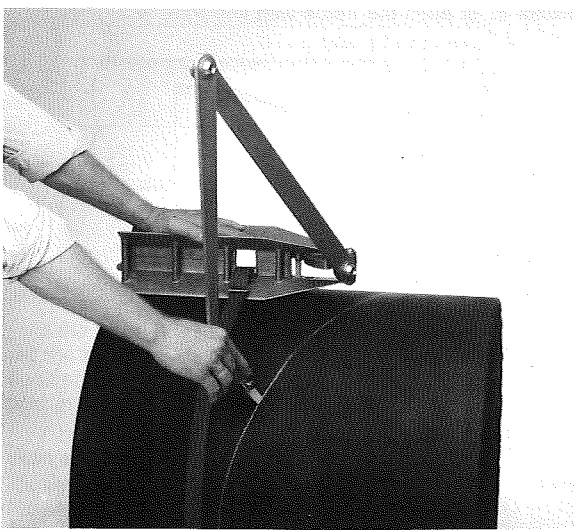


FIGURE 26

MARKING LARGE PIPE

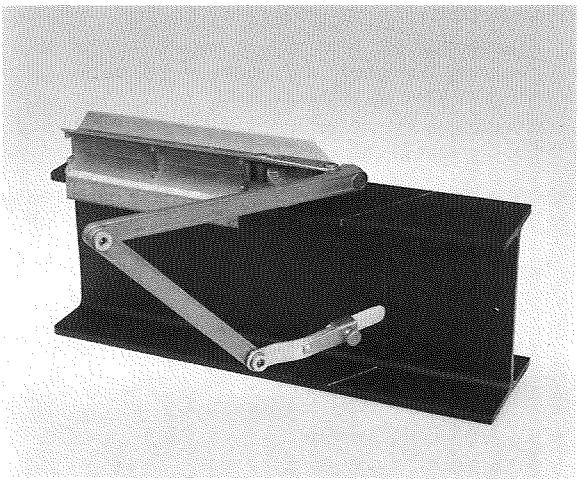
On small pipe up to 8 inches in diameter, the Contour Marker is self-aligning. On large pipe, the tool should be centered over a reference line laid off parallel with the axis of the pipe. In marking around large pipe where the Contour Marker will not scribe completely around, it becomes necessary to scribe from opposite sides of the pipe. First, lay off two lines running lengthwise of the pipe and opposite to each other, dividing the circumference into two equal parts. From one reference line scribe around the remaining half. In this manner pipe as large as 18" can be marked off. When a great deal of larger pipe is to be laid out, the Jumbo Contour Marker should be used. The Jumbo size Contour Marker has been developed specifically for use in the layout of large diameter pipe, from 8 to 48 inches.



NO. 4 JUMBO MARKER **0721-0003**

STRUCTURAL ADAPTOR

Both the Standard and Jumbo Contour Markers come with a structural adaptor designed to simplify the layout of structural joints, including I-beams, angles, channels, T-sections, square tubing and similar shapes.



To use the structural adaptor, slip edges of the Contour Marker onto the channel section of the adaptor. With the adaptor in place, the marker now has a flat bottom with a projecting lip on one side. This lip serves as a stop so that the Contour Marker can be lined up along the edge of the structural member on which it has been placed.

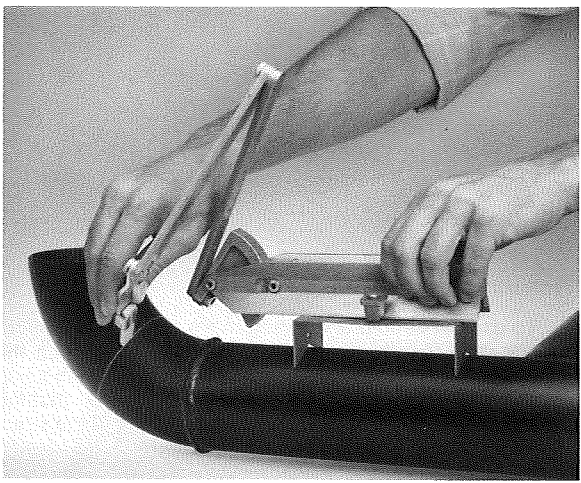
The Contour Marker can now be used to square the end of the member, or mark off any angle in whatever direction desired depending on the placement of the marker. Either the A or B scale of the protractor can be used depending on the direction of the angle.

COMBINATION ADAPTOR ACCESSORY

This tool allows use of all four sides of the Contour Marker in layouts on pipe and structural steel. It also allows work on up to 30″ dia. pipe with the Standard Model and up to 100″ dia. with the Jumbo Model without having to quarter or halve the pipe. Permits marking over nipples, old welds, and on wrapped pipe.

The adaptor can also provide layouts with compound angles using a single setting, or any degree of take-off on elbows and turns up to 90 degrees.

This tool is sold as an accessory to the Standard and Jumbo Contour Markers.

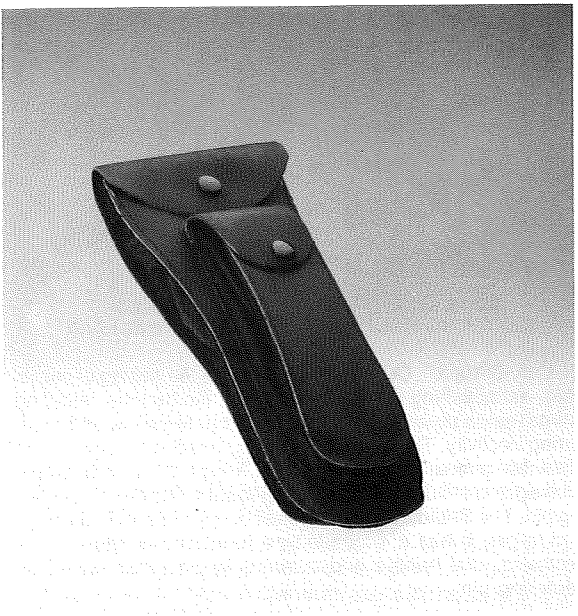


Marking the end cut on a lateral.

NO. 2 STANDARD COMBINATION ADAPTOR	**0721-0001**
NO. 5 JUMBO COMBINATION ADAPTOR	**0721-0004**

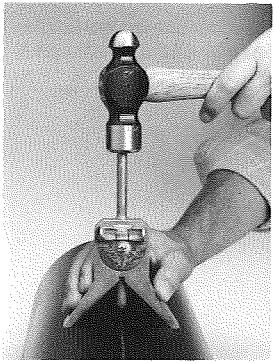
CARRYING CASE

Also available for the Standard Contour Marker is a Leather Carrying Case.

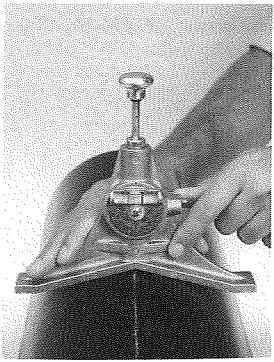


NO. 3 CARRYING CASE **0721-0002**

CENTERING HEADS



STANDARD CENTERING HEAD

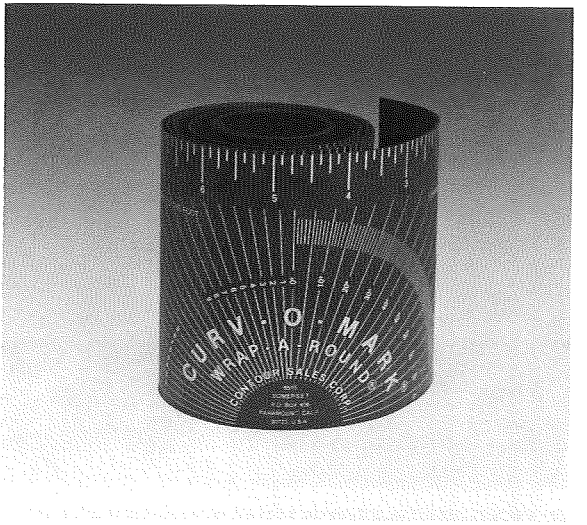


JUMBO CENTERING HEAD

Curv-O-Mark® Centering Heads aid in the setting of center lines, establishing angles and marks for butt-ins, locating points inside pipes and tanks, laying out keyways and measuring declivity. The Jumbo Centering Head is for pipe 1-inch diameter and up. It has an 8-inch Y-type head, adjustable protractor dial bubble and a spring-loaded, hardened centering pin. The Standard model is used on pipe 1/2-inch diameter and larger. It has a 4-inch Y-type head and is fitted with a protractor dial bubble and a manually operated hardened centering pin.

NO. 6 STANDARD CENTERING HEAD	**0721-0005**
NO. 7 JUMBO CENTERING HEAD	**0721-0006**

WRAP-A-ROUNDS

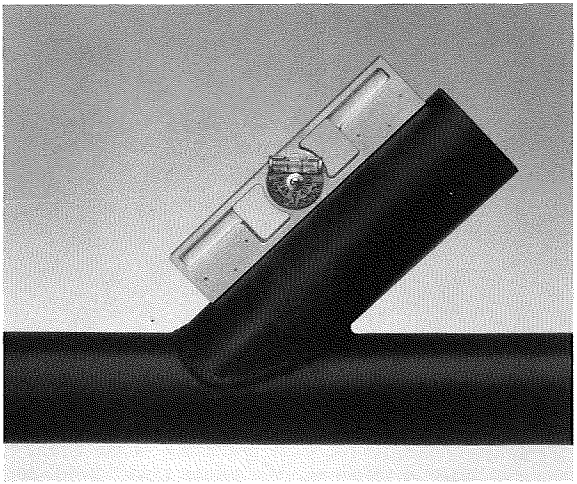


An inexpensive tool for marking straight lines around pipe, or for use as a straight edge. Made out of flexible gasket material, with good resistance to heat and cold.

All Wrap-A-Rounds are available in two colors. These designate material type and service temperature. GG (Gray) material is used for high temperature applications up to 550°F. B (Black) material has a service temperature of up to 350°F. Both material types are asbestos free.

Extra small and special order sizes are unmarked. All other sizes are printed with a scale in inches, pitch chart, tangent chart and other useful markings. Wrap-A-Rounds in 3.88″ and 5.00″ feature a metric scale and pitch chart. See Contour Catalog or Price Sheet for complete list of stock numbers and sizes.

PRO-MAG LEVEL



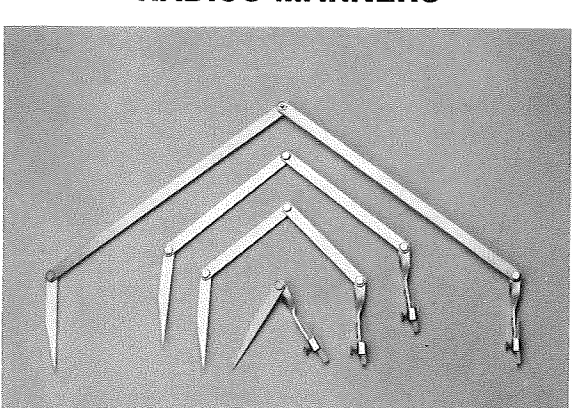
A lightweight, easy to use tool for determining angles, the Pro-Mag Level has two cast-in 25#-pull magnets that hold securely to any steel surface. The unit has a 360-degree adjustable protractor dial bubble with two 90-degree quadrants graduated in 2½-degree increments. Also cast in are tables used to convert degree-of-angle to rise-in-inches-per-foot or millimeters-per-meter. A groove on the bottom edge permits use on a small pipe.

The Pro-Mag Level is 9 inches long, 2 inches high and 3/4 inch thick. It is made from cast aluminum.

The unit is ideal for pipefitter, welder, jig builder or anyone who has to determine angles or do setup work.

NO. 8 PRO-MAG LEVEL **0721-0007**

RADIUS MARKERS



Models are available in four sizes for scribing circles up to 80-inch diameter. All are a folding type design — the three smaller models will fit conveniently into a shirt pocket. All have sturdy friction joints to maintain rigidity and accuracy, and are made from lightweight, rustproof aluminum for long wear. A soapstone crayon is already installed in each radius marker.

In addition, the scribe holder will accept round, square or flat soapstone crayon, pencil or steel point scribe.

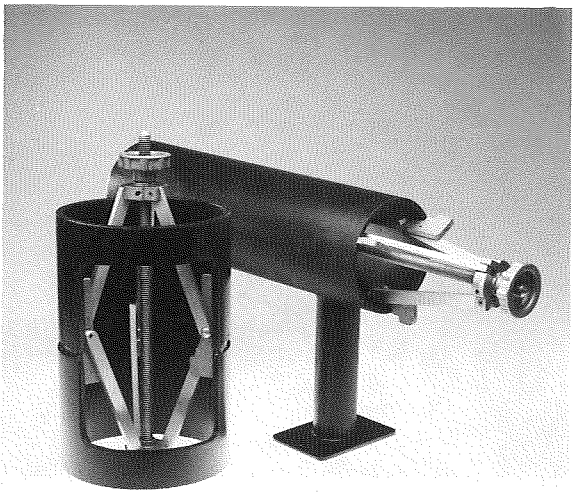
MINI — up to 8-inch radius
STOCK NO. 1208 **0721-0010**

SMALL — up to 20-inch radius
STOCK NO. 1220 **0721-0011**

STANDARD — up to 24-inch radius
STOCK NO. 1224 **0721-0012**

JUMBO — up to 40-inch radius
STOCK NO. 1340 **0721-0013**

PIPE FLANGE ALIGNERS



Fast, accurate pipe construction is possible with this self-determining flange aligning tool. The Aligner inserts easily into pipe, centers snugly against the inside pipe diameter and automatically aligns with the pipe axis.

The Pipe Flange Aligner is quickly adjustable for all types of flanges or pipe sizes ranging from 3 to 12 inch diameter.

NO. 10 PIPE FLANGE ALIGNER **0721-0009**

JACKSON SAFETY

CONTOUR®

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