

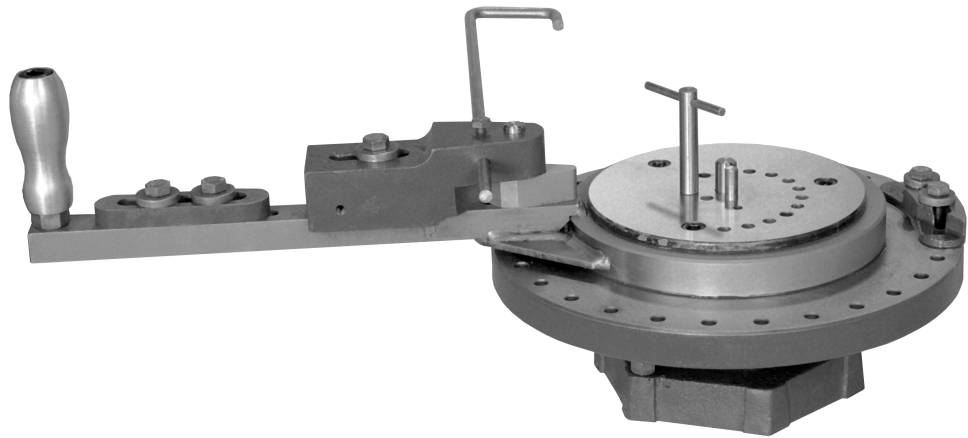
Di-Acro®

OPERATOR'S MANUAL & INSTRUCTIONS

NUMBER 1A

Di-Acro

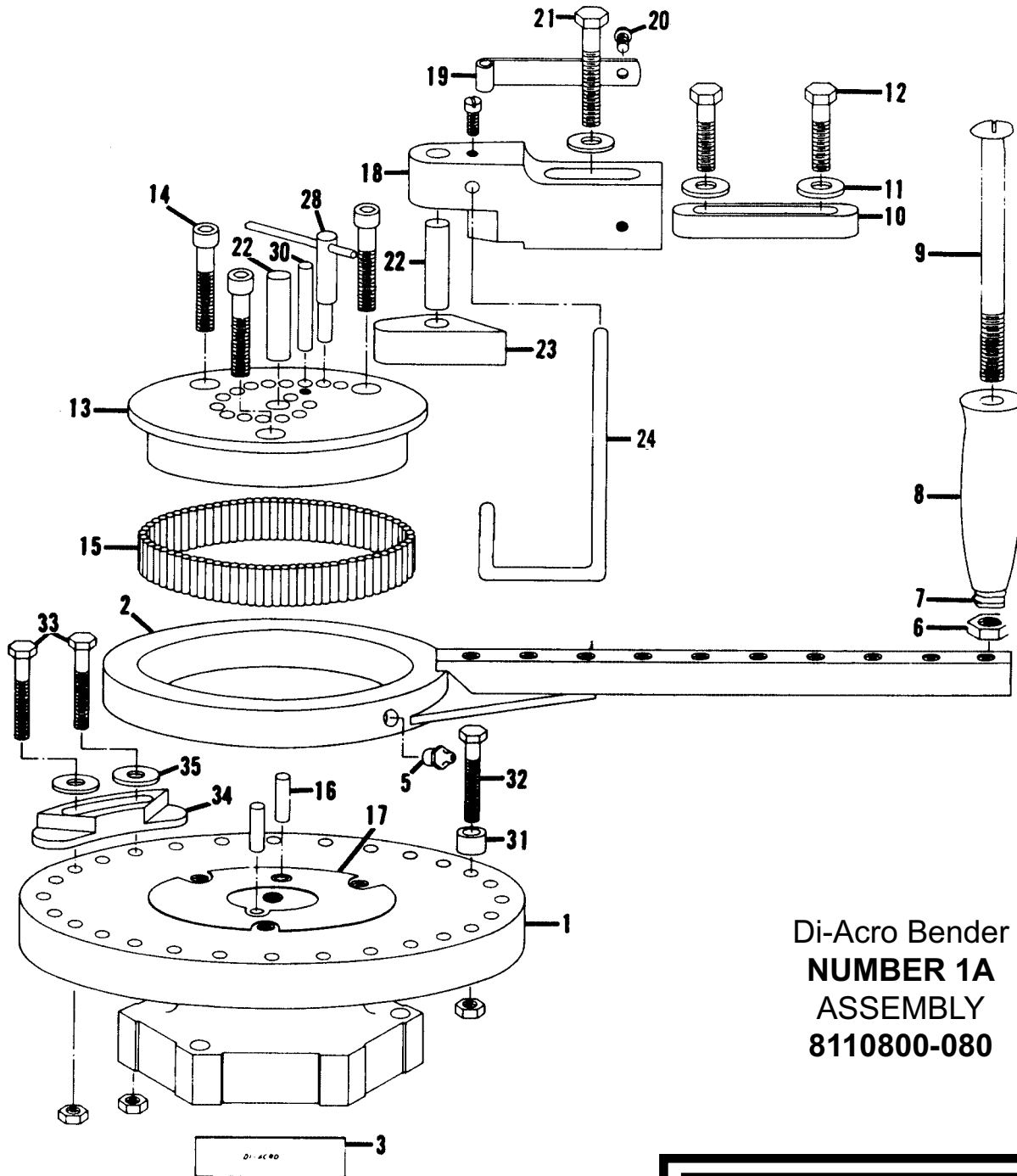
Hand Bender



Di-Acro, Incorporated

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330-455-0220 (fax)
Revised 01/02

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Di-Acro Bender
NUMBER 1A
ASSEMBLY
8110800-080

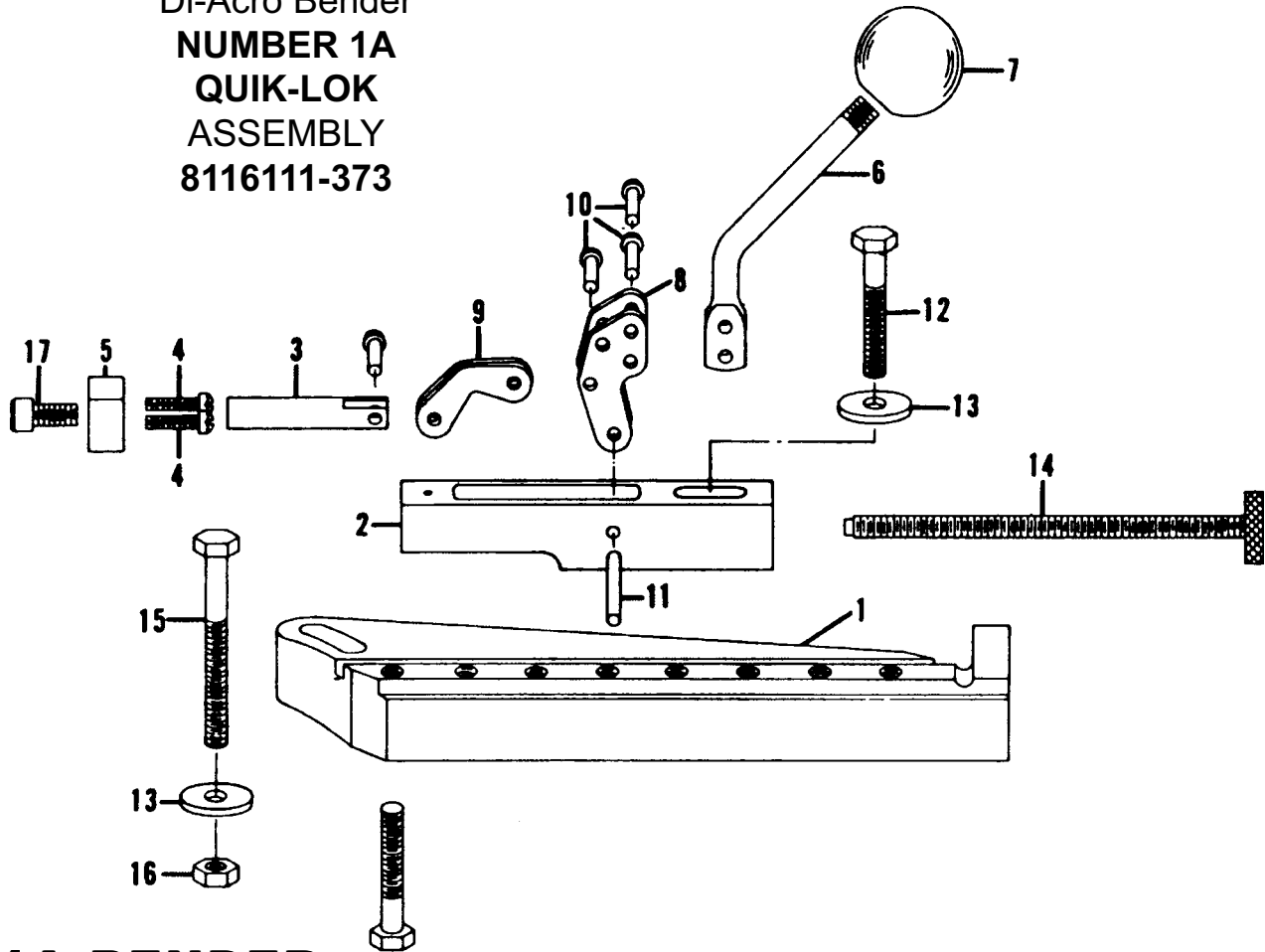
CAUTION

TO PREVENT SERIOUS BODILY
INJURY AND DAMAGE TO THE MACHINE

BOLT THE MACHINE TO THE STAND
AND THE STAND TO THE FLOOR

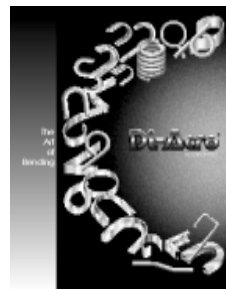
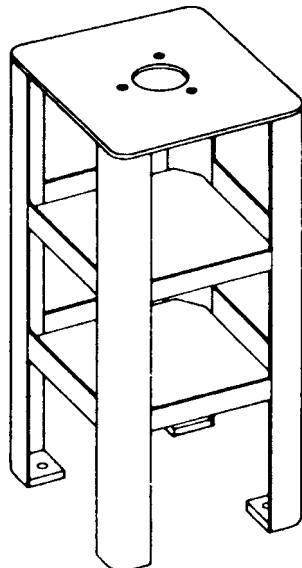
ITEM	DESCRIPTION	PART NUMBER	QTY
	BENDER #1 A	8110800-080	
1	BASE-1A	8110110-100	1
2	HANDLE ARM WLDMT	8110120-800	1
3	NAME PLATE	8110650-110	1
5	GREASE FITTINGS	8901004-000	1
6	NUT	31X0102C	1
8	HANDLE - REVOLVING	8410120-803	1
9	SCREW (HANDLE STUD)	20A0102C4000	1
10	NOSE HOLDER SUPPORT	8100121-701	1
11	WASHER	61X0308C1332	3
12	SCREW	21A0308C1104	2
13	MOUNTING PLATE	8110110-501	1
14	SCREW	20A03081102	3
15	NEEDLE ROLLER	8310301-200	97
16	PIN	8110120-301	2
17	SHIMS	8110570-203	7
18	NOSE HOLDER	8000121-701	1
19	NOSE SPRING	8110510-401	1
20	SCREW	21A0104C0102	2
21	SCREW	21A0308C2000	1
22	RADIUS PIN	8110008-970	2
23	FORMING NOSE	8110121-701	1
24	BEND LOCATING GAUGE	0114352-100	1
28	LOCKING PIN ASSEMBLY	8110120-370	1
30	HOLDING PIN	8110120-303	1
31	RETURN STOP	8000142-001	1
32	SCREW	21A0516C2000	1
33	SCREW	21A0308C2104	2
34	ANGLE GAUGE	8110142-001	1
35	WASHER	61X0516	2

Di-Acro Bender
NUMBER 1A
QUIK-LOK
ASSEMBLY
8116111-373



1A BENDER STAND ASSEMBLY

Di-Acro Bender
NUMBER 1A
STAND
ASSEMBLY
8230110-900



THE ART OF BENDING

FOR A COMPLETE DESCRIPTION OF 20 BENDING OPERATIONS WITH CLEAR STEP-BY-STEP ILLUSTRATIONS OF EACH, ORDER THE 20-PAGE DI-ACRO "ART OF BENDING" CATALOG WITH OVER 90 DIAGRAMS AND CHARTS TOGETHER WITH VALUABLE TOOLING SUGGESTIONS.



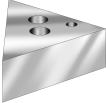
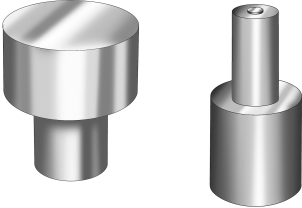
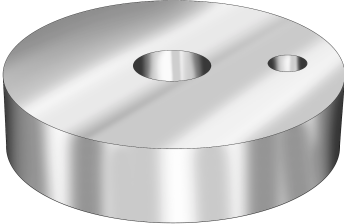





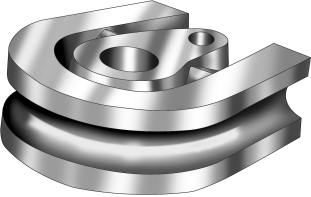




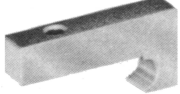
#1A BENDER QUIK-LOK PARTS

ITEM	DESCRIPTION	PART NUMBER	QTY
	QUIK-LOK #1A BENDER	8116111-373	
1	BASE	8116111-300	1
2	HANGER A	8116111-302	1
3	SLIDE ARM	8000111-300	1
4	SCREW	22BXX10F0508	2
5	NOSE	8100111-300	1
6	HANDLE ARM	8200111-300	1
7	PLASTIC KNOB	8120810-600	1
8	HANDLE LINK	8111312-400	2
9	LINK	8111312-500	2
10	RIVET	8470310-100	4
11	PIN	19A0316X1104	1
12	SCREW	21A0516C1304	2
13	WASHER	61X0516	2
14	SUPPORT SCREW WLDMT	8100111-303	1
15	SCREW	21A0516C2102	1
16	NUT	30X0516C	1
17	SCREW	20A0516C0508	1

SPECIFICATIONS

Model	No. 1A		No. 2		No. 3		No. 4	
	in.	mm	in.	mm	in.	mm	in.	mm
Max. Radius Capacity	6	152.4	9	228.6	12	304.8	12	304.8
Height of Standard Forming Nose	3/4	19.1	1	25.4	1-1/2	38.1	1-1/2	38.1
Center Pin Hole—Diameter	1/2	12.7	1	25.4	1	25.4	1	25.4
Operating Leverage	16	406.4	29	736.6	40	1016	40	1016
Material Capacities								
Round Mild Steel Bar	5/16	7.9	1/2	12.7	5/8	15.9	1	25.4
Square Mild Steel Bar	1/4	6.4	3/8	9.5	1/2	12.7	3/4	19.1
Steel Tubing—16 gauge	1/2	12.7	3/4	19.1	1	25.4	1-1/4	31.8
Standard Iron Pipe	—	—	3/8 IPS	9.5	1/2 IPS	12.7	1 IPS	25.4
Flat Steel Bar (easy way)	3/16 x 1,4.8 x 25.4		1/4 x 1-1/2, 6.4 x 38.1		1/4 x 2,6.4 x 50.8		3/8 x 4,9.5 x 101.6	
Flat Steel Bar (hard way)	1/8 x 1/2, 3.2 x 12.7		1/8 x 3/4, 3.2 x 19.1		1/8 x 1,3.2 x 25.4		1/4 x 1,6.4 x 25.4	

DESCRIPTION	PART NUMBER	SIZE
BUILT-UP NOSE 	8110250-000	2" HT.
FORMING ROLLER 	8110690-000	1-1/2" DIA.
RADIUS BLOCK 	8110000-920 8110001-920 8110002-920 8110003-920	O. R. 1/32" R. 1/16" R. 3/32" R.
RADIUS PIN 	8110002-970 8110004-970 8110006-970 8110008-970 8110010-970 8110012-970 8110014-970 8110016-970 8110018-970 8110020-970	1/16" R. 1/8" R. 3/16" R. 1/4" R. 5/16" R. 3/8" R. 7/16" R. 1/2" R. 9/16" R. 5/8" R.
RADIUS COLLAR 	8110022-930 8110024-930 8110026-930 8110028-930 8110030-930 8110100-930 8110102-930 8110104-930 8110106-930 8110108-930 8110110-930 8110112-930 8110114-930 8110116-930 8110118-930 8110120-930 8110122-930 8110124-930 8110126-930 8110128-930 8110130-930 8110200-930	11/16" R. 3/4" R. 13/16" R. 7/8" R. 15/16" R. 1" R. 1-1/16" R. 1-1/8" R. 1-3/16" R. 1-1/4" R. 1-5/16" R. 1-3/8" R. 1-7/16" R. 1-1/2" R. 1-9/16" R. 1-5/8" R. 1-11/16" R. 1-3/4" R. 1-13/16" R. 1-7/8" R. 1-15/16" R. 2" R.
GROOVED ROLLER 	8110008-790 8110010-790 8110012-790 8110014-790 8110016-790	TUBE DIA. 1/4" 5/16" 3/8" 7/16" 1/2"
FOLLOW BLOCK 	8116008-621 8100008-622 8116010-621 8100010-622	LENGTH TUBE DIA. 3" 1/4" 6" 1/4" 3" 5/16" 6" 5/16"

DESCRIPTION	PART NUMBER	SIZE	
		LGTH.	TUBE DIA.
FOLLOW BLOCK CONTINUED 	8116012-622 8116014-622 8116016-622	6" 6" 6"	3/8" 7/16" 1/2"
 RADIUS COLLAR (USE WITH QUIK-LOK CLAMP)	8116020-008 8116100-008 8116116-008 8116024-010 8116100-010 8116116-010 8116100-012 8116200-012 8116300-012 8116108-014 8116200-014 8116300-014 8116108-016 8116200-016 8116300-016	C/L RADIUS 5/8" 1" 1-1/2" 3/4" 1" 1-1/2" 1" 2" 3" 1-1/4" 2" 3" 1-1/4" 2" 3"	TUBE DIA. 1/4" 1/4" 1/4" 5/16" 5/16" 5/16" 3/8" 3/8" 3/8" 7/16" 7/16" 7/16" 1/2" 1/2" 1/2"
 CLAMP BLOCK (USE WITH QUIK-LOK CLAMP)	8116008-320 8116010-320 8116012-320 8116014-320 8116016-320		1/4" 5/16" 3/8" 7/16" 1/2"
 RADIUS COLLAR (USE WITH SWIVEL CLAMP)	8110020-008 8110100-008 8110024-010 8110100-010 8110100-012	C/L RADIUS 5/8" 1" 3/4" 1" 1"	TUBE DIA. 1/4" 1/4" 5/16" 5/16" 3/8"
 SWIVEL CLAMP	8110-008SC 8110-010SC 8110-012SC 8110-014SC 8110-016SC		1/4" 5/16" 3/8" 7/16" 1/2"
 RADIUS COLLAR (USE WITH CLEVIS CLAMP)	8110116-008 8110116-010 8110200-012 8110300-012 8110108-014 8110200-014 8110300-014 8110108-016 8110200-016 8110300-016	1-1/2" 1-1/2" 2" 3" 1-1/4" 2" 3" 1-1/4" 2" 3"	1/4" 5/16" 3/8" 3/8" 7/16" 7/16" 7/16" 1/2" 1/2" 1/2"
 CLEVIS CLAMP	8110008-330 8110010-330 8110012-330 8110014-330 8110016-330		1/4" 5/16" 3/8" 7/16" 1/2"

IT'S EASY TO BEND

Increased knowledge of the cold bending of metal and improvements in bending machines during the past decade have opened new horizons in the manufacturing field as many forming operations not considered practical some years ago can now be readily performed.

Technically metal bending is rather involved due to the physical change that occurs within the material during the bending operation and also because the numerous types of alloys available each react differently when formed.

Rather than discuss these technical problems, the purpose of this booklet is to illustrate and describe the multitude of bending operations that can easily be accomplished without special engineering knowledge provided a few elementary principles are observed.

PRODUCT DESIGN

Design of the formed parts in a product generally determines whether or not they can be efficiently and economically produced. Give careful consideration to these suggestions.

Selection of material is of first importance as it must be sufficiently ductile to produce a satisfactory bend of the smallest radius required and still be strong enough to provide the rigidity which the product demands.

It is usually desirable to designate the largest practical radius as this gives wider latitude in choice of material and often assures a better bend in both strength and appearance.

By using the same size material and designating identical radii for each bend whenever possible, the tooling of the bending machine can be simplified and the highest possible production obtained as a number of successive bends can then be progressively made in a part, thereby completing it before it is removed from the machine.

Compound bends or adjacent bends in different planes should be avoided if possible because of conflict that may occur between the bends which might necessitate special tooling. This is especially true in tubing but also holds for solid materials.

Generally the smallest recommended radius for tubing, measured to the exact center of the tube, is 1-1/2 times the outside diameter of the tube provided an inside mandrel is used when bending. This minimum centerline radius should be increased to at least 2-1/2 times the outside diameter of the tube if the bend is to be made without an inside mandrel.

In making a bend near the end of a tube, a straight length equal to at least the diameter of the tube should extend beyond the bend. If a bend is required to the very end of the tube, a straight length should be allowed and trimmed after forming.

SELECTION OF MATERIAL

From the numerous types of material available in tubing, extrusions, mouldings, channel and solid bars, the most suitable material for production of a part can usually be chosen.

In making this selection the ductility of the material should be given prime consideration and before a decision is made a sample should be formed to the smallest required radius or assurance obtained from the supplier that the bend can be satisfactorily made.

Elasticity of the material, which causes it to spring back after it has been bent, must also be considered as it may be impossible to form a closed eye or a complete circle in some alloys.

If tubing is to be bent without an inside mandrel the heaviest practical wall should be used. As a rule, in non-ferrous metals, one quarter to half hard tubing provides best results.

When bending channels, angles, mouldings, and extrusions the centerline radius of the bend should usually be at least three times the width of the flange to be formed edge-wise.

CHOICE OF BENDING MACHINE

A number of bending machines are offered on the market today and your choice of the most suitable bender can largely be determined by the range of your bending requirements.

These machines are available in both small and large manually operated models as well as power driven units; some designed for one specific application and others capable of performing a wide variety of operations.

Should your work consist only of one specialized operation such as the bending of thin wall tubing on a high speed basis, obviously a completely automatic bender is the answer.

If, on the other hand, your jobs are so varied that you are called on to form a variety of materials such as tubing, angle, channel, extrusions, mouldings, and bus bars in addition to solid materials, a universal all-purpose bender will best serve your needs.

Oftentimes small parts can be formed faster and cheaper with manually operated benders provided production quantities do not warrant completely automatic equipment.

Careful study of specifications, capacities and working range of the various benders under consideration will enable you to choose the most logical unit for your own operations.

TOOLING THE BENDER

All bending machines merely provide a means of applying power either manually or mechanically to perform the bending operation and supply mountings for the bending tools.

These tools consist of a form or radius collar having the same shape as the desired bend, a clamping block or locking pin that securely grips the material during the bending operation and a forming roller or follow block which moves around the bending form.

When bending materials of open cross section such as tubing, channel, angle and extrusions, the bending form should exactly fit the contour of the material to provide support during their forming operation. This is also true of the clamping block and forming roller, as only by completely confining the material can a perfect bend be obtained.

Since all metals are somewhat elastic, they will spring back more or less after they are formed and for that reason the bending form must usually have a smaller radius than the required bend. The amount of springback is dependent upon the type of material, its size and hardness, as well as the radius of the bend and it is usually necessary to experiment somewhat to determine the exact size of the bending form.

Bending is no different than any machining operation in that the results obtained will be in direct proportion to the care taken in properly tooling the bender for the job to be done.

BENDER TOOLING**SPECIAL TOOLING FOR YOUR SPECIAL BENDING NEEDS**

When you have a bending problem in production or design, Di-Acro can aid you at no obligation. Just send blueprints, dimensioned sketches, or the part you wish to produce to our Applications Engineering Department and your plans will receive prompt attention.

Special tooling? Here is some tooling we have available: Crush-bend tooling, automatic follow-bar return, wiper dies and ball mandrels for thin-walled tight radius tube bending, power clamping for high speed application, pneumatic mandrel extractor.

SPRING BACK - When determining the size of the Radius Pin or Collar, spring-back should be compensated for. A frequent way is by overbending slightly beyond the required angle. After the amount of spring-back has been determined, the Angle Gauge can be set so that all bends will be duplicated. In addition to overbending, it may be necessary, in some cases, to form the material around a Radius Pin or Radius Collar of smaller radius than the desired bend. The actual size of the Radius Pin or Collar can best be determined by experiment for the material and conditions.

FORMING ROLLER - To eliminate work marking and reduce operator effort, it is often desirable to replace the Forming Nose (furnished as standard equipment), with a Forming Roller.

BUILT-UP FORMING NOSE - This is used to increase the material width range of Di-Acro Benders. Must be used with wider or stacked radius collars.

There are two tube bending methods:

1. The "Forming Roller" method is recommended for (a) all large bends where centerline radius is at least 4 times the outside diameter (O.D.) of the tube, (b) pipe and heavy wall tubing, and (c) very small diameter tubing.
2. The "Follow Block" method, which allows forming thin wall tubing to a centerline radius as small as 2-1/2 times the O.D. without using inside mandrels or fillers.

Guard against spring-back (see above). To prevent the tube from slipping during forming, the Quik-Lok Clamp is recommended, used with Type A Radius Collar. For locking smaller size tubing the Clevis and Swivel Clamps with Type B Radius Collars are used on No. 1 and No. 1A Benders.

PARTS REQUIRED FOR "FORMING ROLLER" BENDING METHOD Grooved Radius Collar - one for every radius and tube size. Grooved Forming Roller - one for each tube size only. Clamp Block - for use with Quik-Lok Clamp on all Di-Acro Benders. One for each tube size. Swivel and Clevis Clamps - for No. 1 and No. 1A Benders. One for each tube size.

PARTS REQUIRED FOR "FOLLOW-BLOCK" BENDING METHOD Grooved Radius Collar - one for every radius and tube size. Forming Roller - one covers all "Follow Block" operations. Follow Block - one for each tube size only. Listed length will accommodate a 180 degree bend. Clamp Block - for use with Quik-Lok Clamp on all Di-Acro Benders. One for each tube size. Swivel and Clevis Clamps - for No. 1 and No. 1A Benders. One for each tube size. Style B collars only.