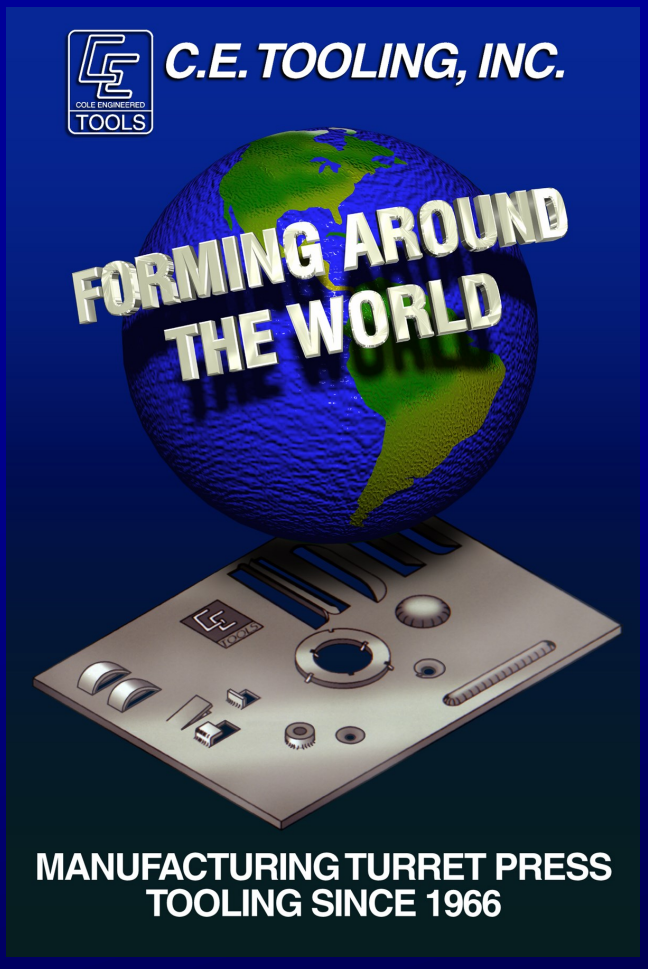
C.E. TOOLING

Section 1

COLE ENGINEERED TOOLS

Technical Reference



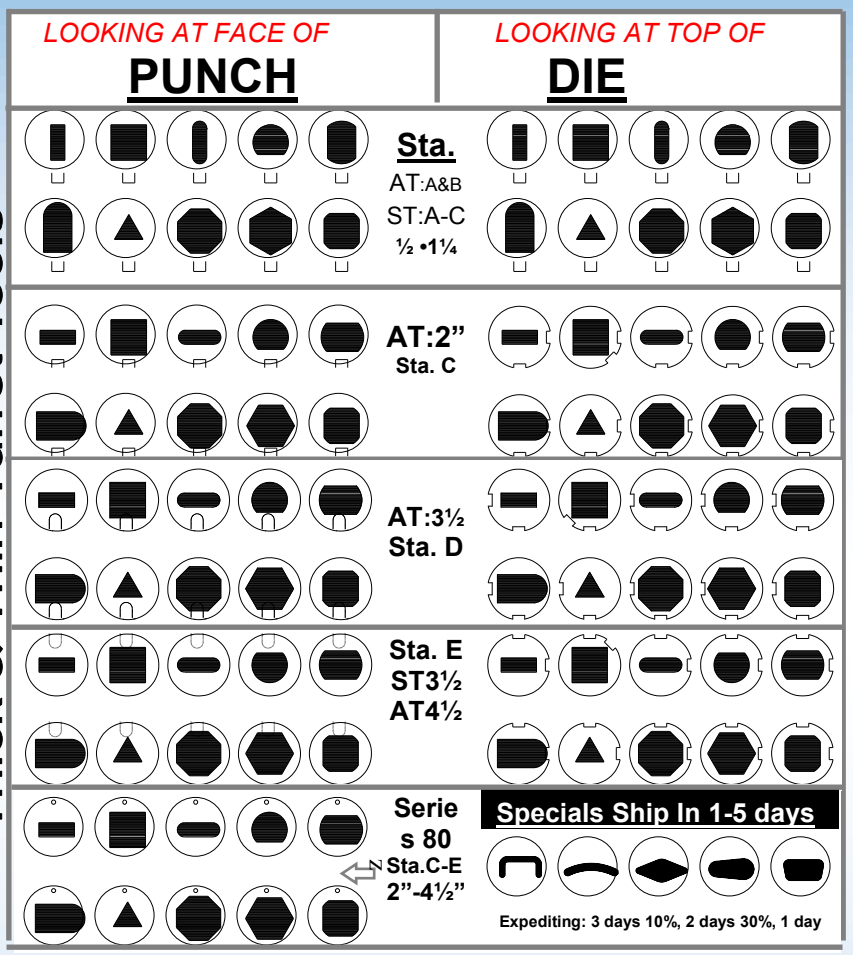
CETooling, started out in 1966 in Chicago as a tool & die shop. In the late 70's we directed our energies exclusively to the manufacturing of punch tools. In 2004, CE Tooling moved into a new 22,000 sq. foot facility, designed specifically for the manufacturing and servicing of fabricator tools. Through our use of quality materials and manufacturing processes and procedures developed from over 50 years of producing punches and dies, our quality and value is unbeatable!

CET now supplies all Fabrication: PUNCH, BEND & SHEAR tooling. This is done through our own manufacturing capabilities and relationships we have with other fab tool manufactures.

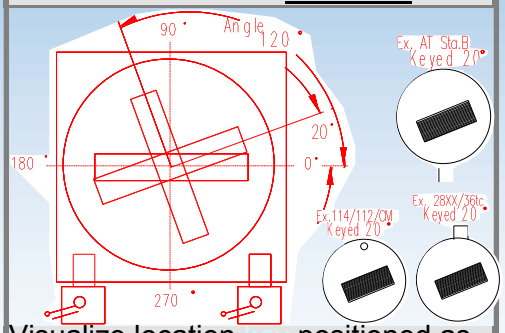
STANDARD KEYING

10 Standard Shapes plus Rounds.

Thick & Thin Turret Tools



Shapes on Angles or Extra Key Locations. *Die View*



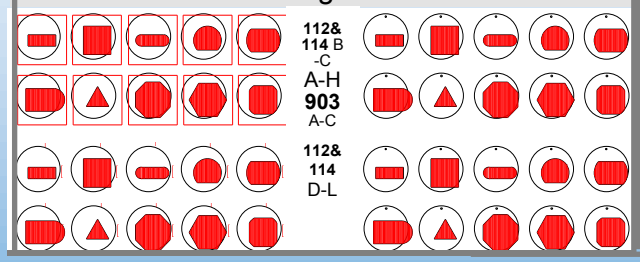
Visualize location key positioned as tool would load into turret. Start with length of shape horizontal. (Length points to 0º)
Next Rotate shape, not location key.
A sketch accompanying your order ensures keying as required! *Note: **Other Manufactures ordering diagrams may differ from C.E.'s!***

10 STANDARD SHAPES
Ships in 1 - 4 work days.

RECTANGLE • SQUARE • OBROUND • SINGLE-D
DOUBLE-D • QUAD-D • HEXAGON • OCTAGON
+ $10 PER SET FOR: LONG-D & EQUILATERAL

Expediting FDS=Firm Delivery Service
• **Order by 1pm,**
Tool Styles: AT, AS, ST:
1 day FDS=25% 2 day FDS=10%
Tool Styles 36tc, 28st, 92/93
1 day FDS=50% 2 day FDS=25%

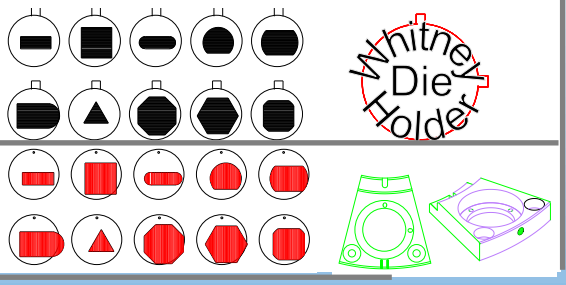
114, 112, 212, 906 & 903 **Wiedemann** /Di-Acro
Looking Down On
Face of Punch Looking Down on Face of Die



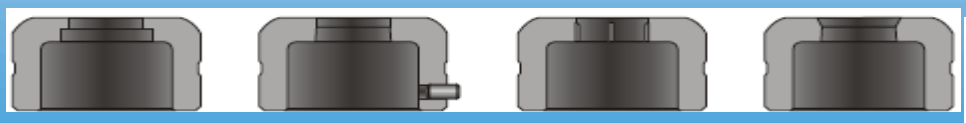
Looking Down Ot Top of **DIE**
Holder is keyed 2plc allowing 0 & 90º Indexing

28XX & 36/37tc

Chassis Maker A, B 1,2,3

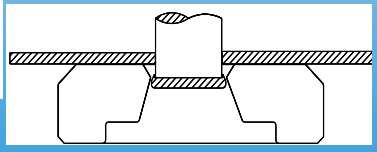


Dies Types: To allow the slug to fall through die land, a taper relief is given to allow slug to pass though with little drag.



STEP Standard Round | Straight + Positive Standard | S/O Z-Hugger Z-Hugger | S/F Slug Trap™ = Slug

S/F Slug Trap™



Choosing Proper Die CLEARANCE

In order to receive optimum performance from a punch and die, it is necessary that the proper clearance be provided in the die in accordance with the material to be punched (pierced). Hole quality (edge roll, and burr), tool life, and slug pulling are results from die clearance.

•Excessive clearance, although achieves longer tool life, will leave more burr, and leads to slug pulling problems.

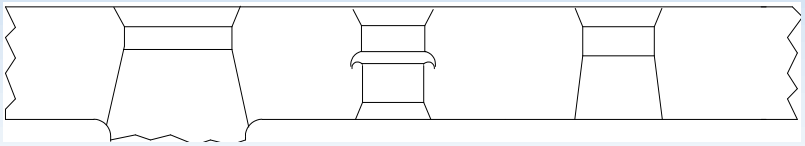
• Insufficient clearance will leave little to no burr, but lessen tool life, and can cause a secondary break .

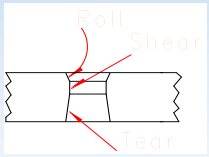
Note: Increasing die clearance when holes are close to edge of sheet will minimize distortion of sheet edge.

Figure A

Type of Material	% of Material		
	Min	Best	Max
Aluminum, Soft	5	10	15
Brass, 1/2 Hard	6	11	16
Copper, 1/2 Hard	8	12	16
Mild Steel Galvanize	10	15	20
Steel D.50C	12	18	24
Stainless Steel	15	22	30
Matt. Thickness X % = Clearance			

EXCESSIVE CLEARANCE **INSUFFICIENT CLEARANCE** **PROPER CLEARANCE**



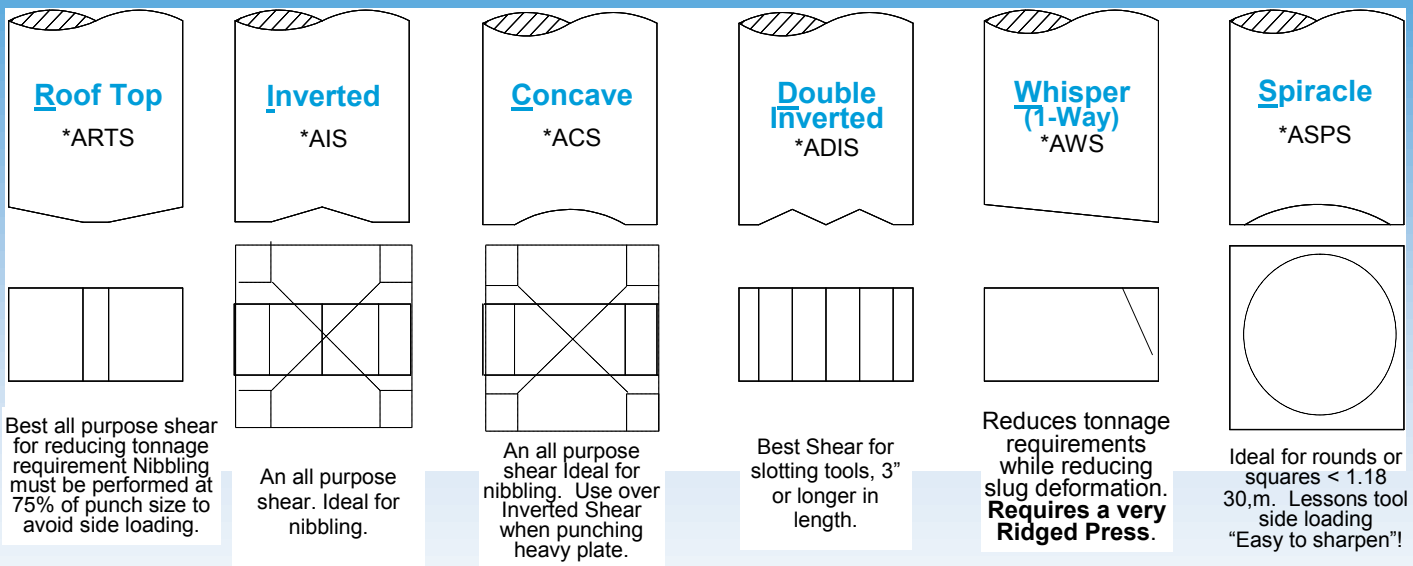


There are many factors that may change the optimum clearance value.
RIGIDITY OF PRESS, MATERIAL GRADE, SPEED OF STROKE

MATERIAL —>			Mild STEEL		ALUMINUM		STAINLES		BRASS		COPPER		STEEL d.50C	
INCH	MM	GAU	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH”	MM
.010	.25	32	.0015	..03	.0015	.03	.002	.05	.0015	.03	.0015	.03	.002	.05
.015	.38	28	.0025	.06	.0015	.03	.003	.08	.002	.05	.002	.05	.003	.08
.018	.45	26	.003	.08	.002	..05	.004	.09	.002	.05	.0025	.06	.004	.09
.024	.60	24	.004	10	.003	.06	.005	.13	.003	.08	.003	.08	.003	.03
.030	.76	22	.005	.11	.003	.08	.007	.17	.0035	.09	.004	.10	.006	.14
.036	.91	20	.006	.14	.004	.10	.008	.20	.004	.10	.005	.11	.007	.17
.048	1.2	18	.007	.18	.005	.13	.010	.27	.006	.14	.006	15	.009	.22
.054	1.4	17	.008	.20	.006	.14	.012	.30	.006	.15	.007	.17	.010	.25
.062	1.6	16	.009	.23	.006	.15	.014	.35	.007	.18	.008	.20	.011	.30
.067	1.7	15	.010	.25	.007	.18	.015	.37	.008	.19	.008	.20	.012	.30
.075	1.9	14	.011	.28	.008	.19	.017	.42	.008	.22	.009	.23	.014	.35
.090	2.3	13	.014	.34	.009	.23	.020	.50	.010	.,25	.011	.30	.015	.40
.105	2.7	12	.016	.40	.011	.27	.023	.60	.012	.30	.015	.38	.029	.56
.120	3.1	11	.018	.46	.012	.30	.026	.70	.013	.33	.016	.40	.024	.62
.135	3.4	10	.020	.51	.014	.34	.030	.75	.015	.38	.018	.46	.027	.70
.150	3.8	9	.023	.57	.015	,38	.033	.85	.017	.42	.020	.50	.025	.60
.164	4.2	8	.025	.60	.017	.42	.036	.90	.018	.46	.021	.55	.032	.80
.179	4.6	7	.027	.68	.018	.46	.039	1.0	.020	.50	.023	.60	.035	.90
.194	5.0	6	.029	.70	.020	.50	.043	1.1	.021	.54	.025	.65	.038	.95
.209	5.3	5	.031	.80	.021	.55	.046	1.2	.023	.58	.027	.70	.040	1.0
.239	6.1	3	.036	.91	.024	.60	.053	1.4	.026	.70	.029	.75	.043	1.1
.250	6.4	1/4	.038	.95	.025	.60	.055	1.4	.028	.70	.030	.76	.045	1.2
.312	8.0	5/16	.048	1.2	.031	.79	.070	1.8	.035	.89	.038	1.0	.056	1.5
.375	9.5	3/8	.056	1.4	.037	1.0	.082	2.1	.041	1.1	.045	1.2	.068	1.8
.500	12.7	1/2	.075	1.9	.050	1.3	.120	2.8	.055	1.4	.060	1.5	.090	2.3

OPTIONAL PUNCH SHEARS

SHEARS Should be Considered for All DIAGONAL DIMENSIONS Over 2"/50.8mm And a Minimum Width of .375(9.53MM)



Best all purpose shear for reducing tonnage requirement Nibbling must be performed at 75% of punch size to avoid side loading.

An all purpose shear. Ideal for nibbling.

An all purpose shear Ideal for nibbling. Use over Inverted Shear when punching heavy plate.

Best Shear for slotting tools, 3" or longer in length.

Reduces tonnage requirements while reducing slug deformation. **Requires a very Ridged Press**.

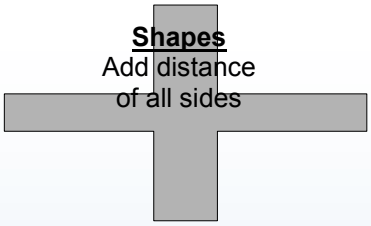
Ideal for rounds or squares < 1.18 30,m. Lessons tool side loading "Easy to sharpen"!

FINDING TONNAGE REQUIRED

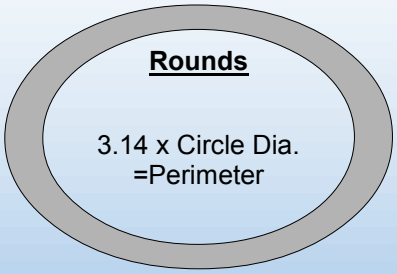
Does your press have the tonnage to pierce thick or tough material?
Use this formula, and below Shear Tonnage Reduction chart to find out.

Perimeter Distance

Shapes
Add distance of all sides



Rectangle = .5"+.5"+ 2"+2"



TONS PER SQUARE INCH

Now, by using the below chart, find the Tons per square inch for the material you will be punching.

Type of Material	Tons per Sq. inch"	Shear Strength per sq. in.
Aluminum (1/2 hard sheet)	9.5	19,000 PSI
Brass (1/2 hard sheet)	17.5	35,000 PSI
Copper (rolled)	14.0	20,000 PSI
Steel, mild	25.0	50,000 PSI
Steel, ASTM-A#6	30.0	60,000 PSI
Steel, 50 carbon	35.0	70,000 PSI
Steel, cold drawn	30.0	60,000 PSI
Steel, stainless (18-8)	35.0	70,000 PSI

FORMULA

Multiply
Perimeter=Cut Distances
X Tons Per
x Material Thickness

The answer to this formula is the required Tonnage needed.

Tonnage Reduction Chart When Shear is Used.

Use above Formula to find the tonnage required with no shear. Next, multiply that by the value found in this chart.

Shear Depth	16 Gage .060" 1,5mm	14 Gage .075" 1,9mm	12 Gage .105" 2,7mm	10 Gage .135" 3,4mm	8 Gage .165" 4,2mm	3/16 Gage .187" 4,8mm	1/4 Gage .250" 6,4mm	5/16 Gage .312" 7,9mm	3/8 Gage .375" 9,5mm
1/16	.5	.58	.72	.78	.83	.86	.90		
3/32		.50	.56	.67	.73	.78	.83	.87	.90
1/8		.46	.51	.56	.62	.63	.74	.85	.95
1/4				.40	.46	.49	.54	.62	.70
7/16				.25	.28	.31	.36	.41	.48

Slug Pulling: *Techniques and Tool Options*

Slug Pulling is when the slug pulls up out of die. This slug can then drop on top of the sheet. If a punch has the misfortune of striking this slug on a future hit, two types of damage to the punch can occur. If the punch hits squarely on the pulled slug, it may merely cause the punch to have to pierce through two material thickness into a die with clearance meant for only one material thickness. The result is heavy edge wear and gauling. The more damaging occurrence is when only a portion of the face of the punch hits the pulled slug. This can cause side load pressure in which the side of punch tip makes contact with die which can cause roll over to edge of punch and dies, or punch breakage.

Common Causes of Slug Pulling	Suggested Solutions
Excessive Die Clearance	Check the die clearance (reference page 4). To large of clearance, although increases punch life, can greatly increase the likelihood of slug pulling.
Slug is attaching itself to Punch Face.	If punch is equipped, add Slug Ejectors.
Punch Face is Magnetized, attracting Slugs.	Have Tools Demagnetized
Lubricant on light gage material causes suction between the punch face & slug.	Remove lubricant on the top of material. lubricate the bottom of sheet instead.
	Add Shear (Inverted, Roof Top or Spherical) to punch. This will kink the slug preventing it from suctioning to face of punch.
Slug not Adhering to Die Land	Try Slug Trap™ or Slug Hugger™ die. (See Page 6)
	Add Shear (Inverted, Roof Top, or Spherical) to punch. This will kink the slug, making the shape hug tightly to the sides of the die wall(refer to page 7).
	Using a sharp edge of a diamond file, add some notches to the edge of the die wall. (.02-.03 deep, & 30-40° to the die land.) No burr will be left in the hole of the sheet but it will cause a slight burr to the slug that will help grab onto the die land.
Punch is not Penetrating a Proper Depth into the Die	Reference page 12 for minimum suggested tool sharpening lengths.

Sheet Lubricant *CLM-50 oil base* or *Poly-Form water based*

Reduce galling, increase tool edge life and improve stripping. To use, simply spray or wipe this premixed lubricant on every 3-6 sheets placed in press. **CLM-50™ is an oil base** so it may be mixed with kerosene to conserve or for easier sheet cleaning when plating is to be performed. This is the best lube for reducing galling on sides of tools and extending edge life.

If your trying to keep away from an oil base, our **Poly-Form™ is a water base**, soluable polymer lubricant for CNC turret and high-speed punch presses. It is an excellent lubricant for soft non-ferrous metals such as aluminum, copper & brass and will protect your non-ferrous metals from oxidation, including galvanized and tin-plate. Clean to work with and doesn't stain skin or clothing or cause dermatitis.

Description	CLM-50	Poly-Form
12oz.spray bottle	*ACLM50-12	*Apoly-12
1 Gallon bottle	*ACLM50-64	*Apoly-64
4 Gallon case	*ACLM50-4G	*Apoly-4g
5 Gallon Bucket	N/A	*Apoly-5g
55 Gallon Drum	N/A	*Apoly-55

Application	Pre-coating	Blanking & Forming	Drawing while flood-ing Die	Punching
Dilution	1:1	4:1	4:1	10:1

Diamond Needle File

Use to notch dies for better slug retention. .1+ sq. file 200/240 grit.
Cat No. *A-FTN-121420 $32.50

Slug Ejectors *By default holes are placed in punch tip sizes >.270"/6.86mm*

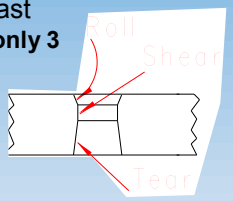
EJECTOR For Hole Size	Clover	Square AT,AS,ST	Round 4W,2W,2B
.078/2mm		N/A	*AEJ-R2 *50pc* $22.50
.109/3mm	*AEJ-C3 $1.25	*AEJ-S3 *24pc* $15.00	
6mm-.25"	*AEJ-C6 $1.25	*AEJ-S6 *24pc* $15.00	*AEJ-R7 *50pc* $20.90
.394/10mm	*AEJC10 $1.25	*AEJ-S10 *24pc* $15.00	
.594/15mm		*AEJ-S6 *24pc* $15.00	

NIBBLING: *Techniques and Tool Options*

To Nibble means to take repeated bites (to not punch with all edges of a punch).

Edge life on tools used for nibbling will wear more quickly than tools used for piercing. This due to the tendency of a punch used for nibbling to side load which can cause the punch to shear against the die's cutting edge. When you pierce a hole, the punch tip follows into the center of the mating die as it takes the easiest path to pierce through the sheet. When you nibble, the punch can float side ways to an extent allowed by play inherent of all turret punch presses.

Explanation :The 1st 25% of penetration of punch tip into a sheet merely stretches the material(no cutting). This is the section of the stroke were much of the side pressure onto the punch tip comes from as the path of least resistance is sought. **(Ex. a .200X1" punch taking a bite (suggest 75% of punch surface) which cuts on only 3 sides will be pushed sideways towards the edge of punch which is not cutting.)** The next roughly 35% penetration does in fact cut(shear), but if side pressure has started, the side of punch not cutting, may continue it's side pressure causing the punch to shear on the cutting edge of the die. The remaining 40% penetration through the sheet actually tears. *(These percentages are rough estimates as material type and clearance plays an important factor.)*



Depending on your companies specific requirements and fabrication goals, their are **techniques and tool options to extend greater tool life when nibbling.**

Read through the below and keep in mind their will often be a pro and a con to each option or technique.

Standard punches and dies (ref. page 4 for clearances) can be used for nibbling and extend good edge life. **Best for punch width to be 2-1/2 times material thickness.**

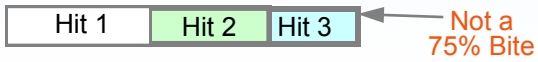
Guided punches **were tip is supported by close clearance metal stripper plate will extend life.**

1st and most important, carefully program hits to prevent tools from side loading! Program bridge hits, or take nibble bites of *no less than 75% of punch area*. Not following these rules even for 1 or 2 hits, can cause side load pressure to the punch in which the cutting edge may make contact with die causing instant edge break down!

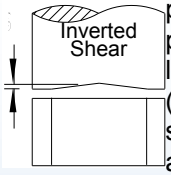
Example of **Bridge Hits**

Example of **75% Nibble Hits**

Example of I**ncorrect Nibble Hit**



2nd Punches can be ordered with Inverted Shears(1/32-1/8 deep depending on tooling style). A shear on a punch does a few things. We initially suggest inverted shears for nibbling as the heel on the punch centers the tool when performing a Bridge hit, and when taking a nibble bite with only a portion of the punch face, the rectangle pad on the side of the punch shear imbeds itself into the material helping to prevent the punch from side loading and shearing on the die. Another feature of the shear is to reduce the tonnage required (reference page 6). Lastly, **the shear on the punch helps prevent slug pulling**. A shear prevents the slug from suctioning on the face of a punch. This a result created when a flat faced punch presses tightly against the sheet, squeezing all the air out between itself, and the pending slug. Further, the slug is kinked from the punch shear, making the slugs shape hug tightly to the sides of the die land.

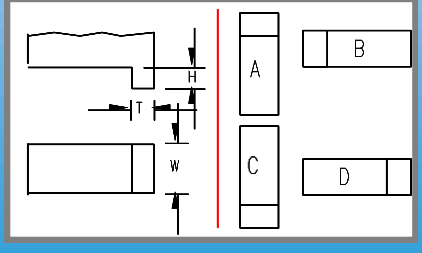


3rd For nibbling, **extend die clearance** by up to 50%. Example, if our chart on Page 4 calls out .008, move up to .012 clearance. This extra clearance allows more room for the punch to flex side ways before it can shear on the side of the die. The negative to increasing the die clearance, is it opens up more possibilities to slug pulling. Tighter clearances extends reduces slug pulling and higher hole quality. Opening up clearances, greatly extend tool edge life, but can cause slug pulling problems, and larger hole burr.

4th Punches can be ordered with heels. A Heel on a punch will extend past the standard length of punch by 3/16-1/4". The heel enters into the die prior to punching which prevent punch tip, extending ridged support and alignment. (Prevents punch from shearing on to die edge.)

HEEL PUNCH DIAGRAM

FACING MACHINE LOOKING DOWN AT DIE, CHOOSE HEEL POSITION



TOOL MAINTENANCE

Tool Edge Life: There are many factors which determine the actual useable life of a punch & die between sharpening. Such factors are and not inclusive of rigidity of press, condition of turret, wear tolerances of holders and variations of material thickness and type (stainless, aluminum, mild steel, etc...)

Tool Cleaning and Lubrication should be part of any maintenance program. Regardless of what type of oiling system or grease you use, it is important to visually inspect the tooling from time to time. Certain materials, such as hot roll or galvanized steel, have a tendency to flake or scale. This foreign matter can work its way into the guide assembly and have a galling effect causing the tools to seize up inside the guide assembly or turret bore. Fully disassemble the tools wiping out all old oils or greases. It is **not** recommended to use: 1)Sulfur-based grease/acid-based lubricants, 2) Lightweight oils or 3)An air hose to clean turret or tool as particles of dirt can contaminate and possibly lodge slivers in die bases or turret bores.

Polishing Stone
A hard structured stone perfect for removing galling from punch tip.

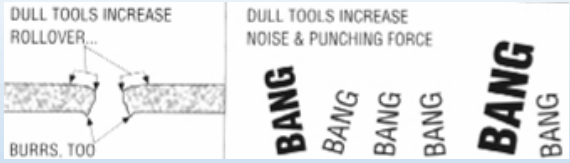
Part#
*AGCS-32180K

Limit Tool and Turret Wear: Lubricate wear surfaces of punch, guide, and turret by applying a quality bearing grease such as **"ADS-71 Extreme Pressure Grease"** . Other choices are graphite or molly based grease or a light coat of machine oil such as a 20-30 weight oil. Some tool systems like CE's *SL*™ and competitors S80 holders allow 80-90wt oil to seap from a built in resevoir. Further, tooling systems like CE's *LS*™ and competitors 90abs, S90wls and Ultra units are designed for machines equiped with ABS (Air Blow System) or ATL (Automatic Tool Lubrication) lubrication on every cycle of press.

CLM L2-71 Extreme Pressure	
*A-ADS71-14	14 Oz. Tube
*A-ADS71-4LB	One 4 LB Tub
*A-ADS71-5GL	One 5 Gal Tub

Tool Sharpening: The actual physical process of grinding (sharpening) can greatly effect the tools continued performance! ***Improper tool sharpening can cause premature tool edge failure.*** If you heat up the tool, you may be annealing the steel, bringing down its hardness thus causing lower wear resistance. Further, if the steel discolors during a grinding pass, even if on a following pass, these burn marks can be hidden. The stee'ls surface may later form surface cracks (buckling of the outer most skin surface). If facilities aren't available to properly care for your tooling, CE offers a tool sharpening service.

Sharpen tools when edge shows .010-.015 of breakdown: Punches often require sharpening 2-3 times more often than dies. If the tools are not sharpened at proper intervals, edge breakdown becomes more rapid, hole quality deteriorates and a tool will require much more metal removal to achieve a sharp edge. The result is reduced tool life.



Grinding Wheel Selection: Use an open coarse wheel such as a 46-60 grit, H-J hardness. CE sells common surface grinder wheels: 7-8" diameter. 1¼ID X ½" Width 46H grade. Call for current pricing!

Dressing of Grinding Wheel: Move diamond across wheel at a fast steady pass of (4 IPM). Take multiple passes at depths of .001-.002". A good way to think of dressing is that your using the diamond to rip out the dull stone particles to expose fresh jagged edged stones.

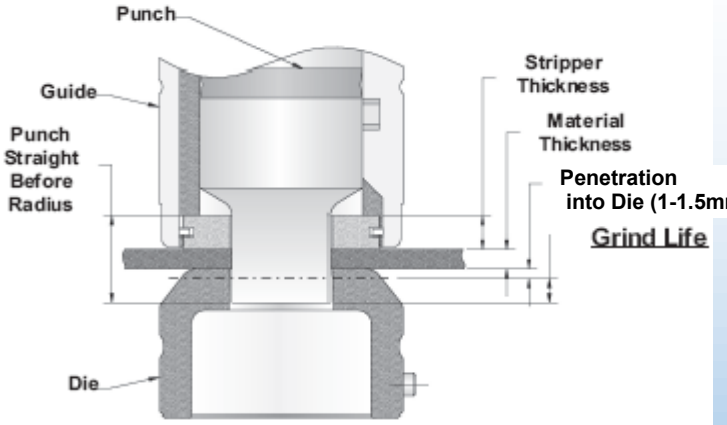
Grinding Tool: Take frequent light passes of no more than .0005 to .001 inch. Removal of more than this may cause the tool steel to burn resulting in the edge becoming brittle and chipping on the edges or corners. **Keep Constant Flood Coolant on tool** to prevent steel from heating up. Removal of .005 to .010" should return the tool to the proper sharpness. By hand, **rub a medium oil/india stone on newly harpened edges** to reduce strengthen and reduce edge wear during punching. Lastly, **Demagnetize tools** to prevent punched slugs and slivers from adhering to them.

Grind Life *New & Suggested Min. Lengths*

TOOL STYLE		PUNCH +/-.02"		DIE +.01/-.01	
Style	**Sta.**	**New**	**O.E.M. Min.**	**New** +.005	**Minimum**
Thin Turret	A,B, C &U	5.48"	5.2"	1.187	1.06
	AS- D 3½	2.77"	2.65"	1.187	1.06
Fab Style (Strippit®)	Fab E 3½ bottom of flange to tip	1"	7/8"	.85	.75"
Thick Turret Metric or Inch (S80) S80 or S90 Holders	A-B 1/2-	8.15	7.9"	1.187 1.06	
	C 2"m or i	3.78	3 5/8		
	D 3½"	3.307	3.18		
	E 4½"	3.346	3.220		
	C-E wt	1.575	1.32		
TR Trumpf	Size 0 a&b	2.362	2.24	.706" 18mm	.646" 16,5mm
	Size I	2.91	2.79		
	Size II	3.03	2.91	.787	.727 /18,5

TOOL STYLE		PUNCH +/-.02"		DIE +.01/-.01	
Style	**Sta.**	**New** +/-.02	**O.E.M. Min.**	**New** +.005	**O.E.M. Min.**
112	**B**	2.81	2.63	.594	.468
	C	3.16	2.97		
	D-H	2.06	1.875	.750	.625
212	**B**	2.81	2.63	.594	.468
	C	3.16	2.97		
	D-H	3.59	3.40	.750	.625
114	**A**	2.72	2.53	1.125	1.00
	B	4.00	3.75		
	C	4.07	3.02		
	D-H	3.54+	3.28		
Whitney	A 1.25O.D.	3 1/8	2 7/8	5/8	1/2
28XX Roper	**B** 2.125O.D.	3 1/8	2 7/8	7/8	3/4
	C - E 2.75-5.75	3 1/8	2 7/8	1 5/32	1.03

With most tool style, Grind Life of Punches often has little to do with their overall length. Length adjustment can often be easily adjusted in the tool holder or by machine stroke control. In most cases, what determines **the usable life of a punch is its ability to pass through its stripper & material it is to pierce along with and penetration into die.** A **punches SBR or "Straight Before Radius" is the real measure of life.** SBR is determined by CE by taking in account the unique strengths of tool style, rigidly of the press and range of material thickness tool may be used for. A simple method of determining when a punch is no longer usable is for the user to: **Find distance a punch tip penetrates through stripper, subtract material thickness that will be punched then subtract the penetration into die.**



Punch Grind Life

=

Straight Before Radius
- Stripper Thickness
- Material thickness
- Die Penetration

Suggestions for Longer Life Between Sharpening

Tool Alignment • **Maximum die clearance without causing to great of burrs or slug pulling** **Sheet Lubrication.** (WD40 may stop slug pulling and keep equipment from rusting but does little to reduce cut edge wear).

It is easy to believe that if you get few thousand more hits with a tool you will get more value. When tool cutting edges show .010" radius, they need to be sharpened. If this is not done, tool edge wear will increase rapidly requiring a greater amount to be sharpened off the tool, thus reducing overall life.

Punch and Die Shimming:

The reason for shimming is to compensate for the material that has been removed by sharpening, thus maintaining overall penetration depth which helps prevent slug pulling. To determine the thickness of shim to be added, measure the sharpened tools length and subtract the difference to that of a new tool height (ref. chart on the following page).

On self-stripping style guide assemblies, this usually just means adjusting the punch tip to sit 1/32-1/16 below a stripper face. To add a shim in a punch holder usually means disassembly of the punch from its holder, insert the shim, then re-assemble the punch. Some new style tooling can be adjusted with out use of shims. **Don't over shim tools or damage to holder may result.** Assure that punch tip length (straight before radius) is adequate to penetrate through the metal stripper plate (if used), the thickness of material to be punched and enter into the die 1/8-3/16".

Punch Tip Breakage: 2 common causes

1st when a slug is pulled up onto top of sheet, and the small punch tip hits on top of it. The punch tip hits this slug left on the sheet, causing more side load pressure to the tip than what it can withstand. **Solutions to slug pulling** page 8.

2nd material build up(gauling) on the sides of the punch tip. The material being punched grabs on more tightly to the galling on the punch tip adding much stress as it strips. Breakage may eventually occur during the upward stripping motion. **Solutions** Lesson gualing build up by clean off any material that builds up(galling) on the sides of the punch tip before it becomes excessive. Further to lesson gualing, order punches with extra back taper. (Punches come standard with 1/8º, ask for 1/2º, No Extra Cost. Also, TiCn (Gold) coating is best for preventing gualing. Last, use a sheet lubricant to reduce gauling build up.

Steels used for tool style

CE Tooling strives to produce tooling to the highest standards. The steels used to manufacture our punch tools are of the best quality grades available to produce high quality tooling capable of standing up under various punching conditions. Our heat treating facilities utilize the most advanced equipment to assure consistentcy to assured hardening, tempering and cryogenics of steels are to their optimum state. Design and Development of C.E. Tooling products are aimed to extend to our customers the **very best in Tool Value!** **Longevity of tool edge life, realistic balance of Tool Life and Cost!**

Tool Style	Punch	Dies
Di-Acro 906	A2	A2
Di-Acro 901, 902, 903	S7 / A2	A2
Marathon™ Nova™	**HSS-M2**	A2
Salvagnini SA	HSS-M2	D2
Thick Turret AT	**HSS-M2 & M3**	D2
Thin Turret ST & AS	D2 & HSS-M2	D2
Trumpf TR	**M2, M3 HSS**	A2 or D2
Wiedemann 4W 2W 2B	A2 or Semi-HSS=Cru-Wear® or Lesco-Wear®, H.D.only= S7-Shock proof	A2 or S7
Whitney RP, 28XX, 36tc	S7 - A2 - HSS M2	A2 & S7

Below is a Data Analysis for AISI Steel Grades commonly used throughout the industry.

Choosing the tool steel type to produce punch tooling with depends on many determining factors. Some considerations: Design of the machine tools will be used in, rigidity of press, wear tolerances, variations of materials & thickness to be punched.

AISI -Name	Type	Comparison	Typical Analysis
A2	Air Hardening 5%chrome	Wear Resistance Red Hardness Toughness	C1.00; Mn.60; Cr5.25: Mo1.10; V.25
A8	Air Hardening 5%chrome	Wear Resistance Red Hardness Toughness	
D2	Air hardening 11¾%chrome	Wear Resistance Red Hardness Toughness	C1.55; Cr11.5; V.90; Mo.80
M2,M3,M4,	High Speed Steel	Wear Resistance Red Hardness Toughness	C.83; Cr4.15; W6.35; Mo5.0; V1.9
S5	Shock Resisting	Wear Resistance Red Hardness Toughness	C.60; Mn.70; Si1.85; Mo.45; V.20
S7	Shock Resisting 3½% chrome	Wear Resistance Red Hardness Toughness	C.50; Mn.70; Si.25; Cr3.25; Mo1.4
Semi-HSS	Tougher High Speed Steel	Wear Resistance Red Hardness Toughness	

Properties of Tool Steels

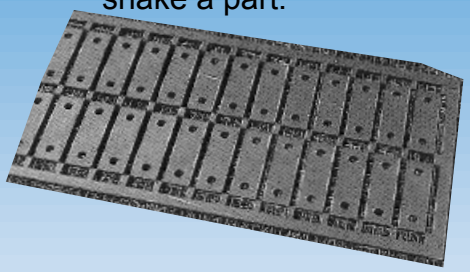
Wear Resistance • Red Hardness • Toughness

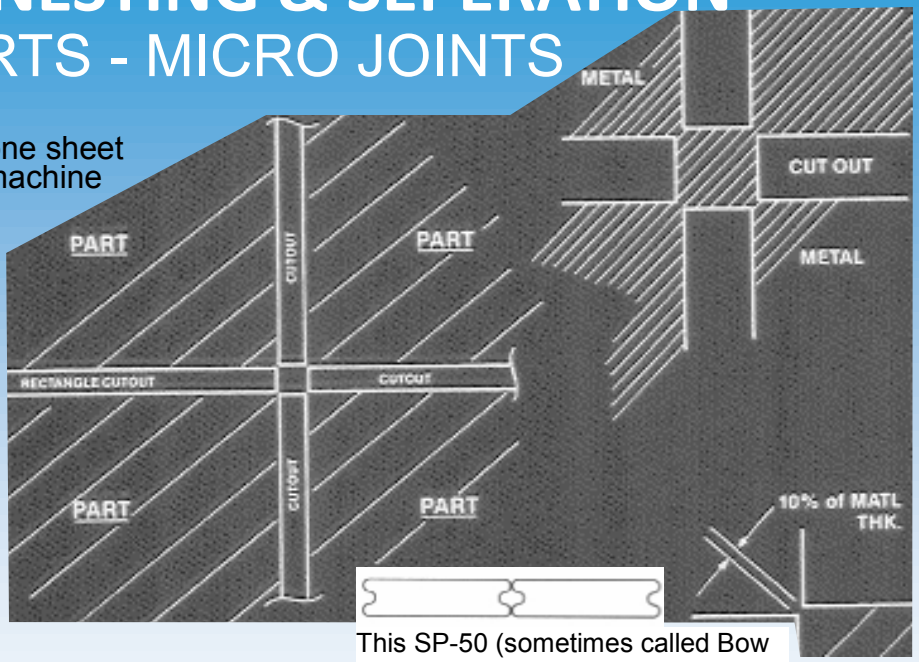
All properties are important in achieving a steel that will stand up to various punching conditions and materials. for punches, wear resistance and steel toughness are most relevant. Wear resistance stands out to be the most dramatic property which effects the life of the punch. In achieving high wear resistance in most cases steel toughness diminishes. With out this toughness, steels tend to flake more easily in adverse conditions causing dramatic tool breakdown. Red hardness is most important to the punch. This is the measurement of temperature in which the punch can be taken to in such applications as nibbling where heat from friction plays am important part of tool break down. Further, as often tools are softened by improper sharpening, the greater the Red hardness, the grater abuse the steel can withstand during grinding. For dies, steel toughness is by for the most essential property which effects the tools performance.

PART NESTING & SEPERATION

SHAKE-A-PARTS - MICRO JOINTS

Small tabs hold multiple parts as one sheet while punched, then when out of machine shake a part.

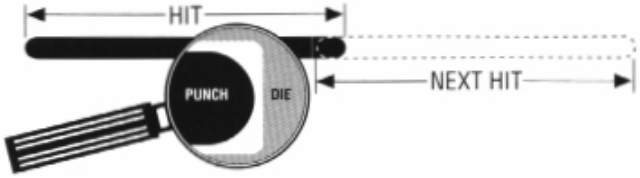




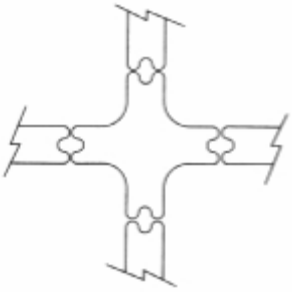
This SP-50 (sometimes called Bow Tie, Shaker, or Bone shape) are excellent for shake–a-parts.

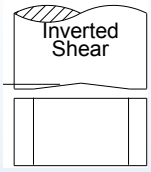
Eliminate scallop (saw tooth marks) **sometimes left from rectangle slitting tools**
Try using Obround Punch with Rectangle Die, or SP-50 =Bow Tie, Shaker, Bone Shaped

Program hit spacing on center of radius ends.



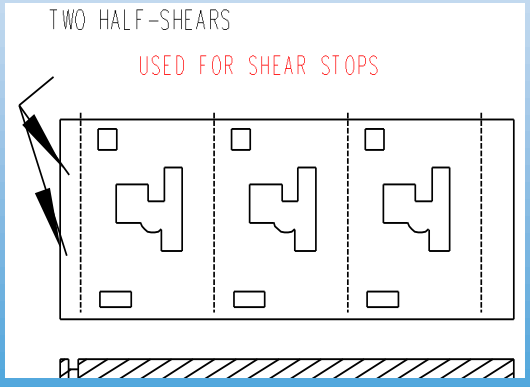
CORNERS



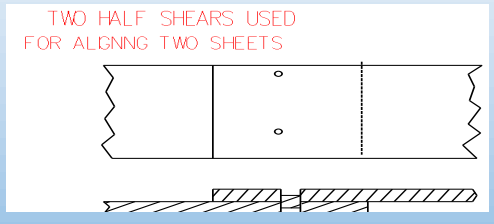


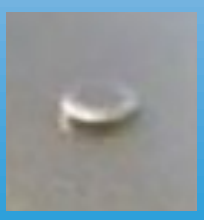
A shear on a punch does a few things. We initially suggest inverted shears for nibbling as the heel on the punch centers the tool when performing a Bridge hit, and when taking a nibble bite with only a portion of the punch face, the rectangle pad on the side of the punch shear imbeds itself into the material helping to prevent the punch from side loading and shearing on the die. Another feature of the shear is to

COMBINE USE OF PUNCH PRESS AND SHEAR TO ACHIEVE FAST QUALITY EDGES



1st • Using slitting tool (example .200 X 3.4") to punch slots down Y axis leaving 10% of material thickness spacing between hits to hold material together





SPECIAL APPLICATION FORMING TOOLS

HIGHER PRODUCTIVITY THROUGH SUPERIOR ENGINEERING

Forming Overview: Use and Set Up

When setting up a form tool in a punch press, close attention must be made in setting the exact depth the punch comes down forming and literally spanking the material tightly between the form punch and die. For positive stop forms, you will need to get the precise Shut Height of your machine.

SET UP INSTRUCTIONS:

1. Inspect the material thickness to be punched. To prevent poor form quality or damage to the form tool, only use a tool for the sheet thickness which the tool was designed for. If critical to the tools design, "Mat-(material thickness)" will be engraved on tool. If only a clearance is etched, tool most probably can be used for a range of thickness and has no positive stop.

2. Prepare upper punch unit to be loaded into turret. **Set the overall length of tool** to the **SHUT HEIGHT of Press -minus Sheet Thickness**. (unless your certain of machines shut height it is safe to subtract an extra .04/1mm in length.

Forms requiring large movement will move sheet below standard die height. For this, no dies should be in stations to left & right of form dies. Ideally Lifter dies should be installed either side of form. **See Page 19**

3. Load Die into turret making sure it is aligned to punch. Don't place shims under die unless their is a notation engraved requesting shims etched on die. .

4. Perform a single stroke of the press and check the results. Increase tools length accordingly. Don't over adjust length! Better to move small increments to prevent bottoming out tools. Repeat this step until desired form height is achieved.

Note: Never attempt to exceed the forming height which the tool was designed for. If critical to the tools design, "F.H.=(form height)",for which the tool was designed to perform under is etched on the tool.

PROGRAMMING SUGGESTIONS

- Form tools should be the last operation punched.
- As a form die is higher than a standard die. On deep stroke forms, no die should try not to program the use of either station adjacent to the form.
- When available, always program reduced striker speed, and + pause or dwell after each hit from a form tool. Metal stretches best at slower speeds. Pauses & Dwells gives extra time for the sheet to be stripped off tool.
- For Progressive Tools, see page 22 & 24

TOOL MAINTENANCE

•*CE Tooling offers sharpening/re-conditioning of form tools at very reasonable rates and turn around of usually 1-2 day turn around. Unless user has full understanding of form tools design.*

Common regular maintenance of a form tool is simply to clean and rub off any gualing build up. Insist that operators use a sheet lubricant such as CLM50 (page __) to help lessen galling and improve cutting edge life.

If there is a cutting edge, study tool, and determine the different heights of tool which must be maintained.

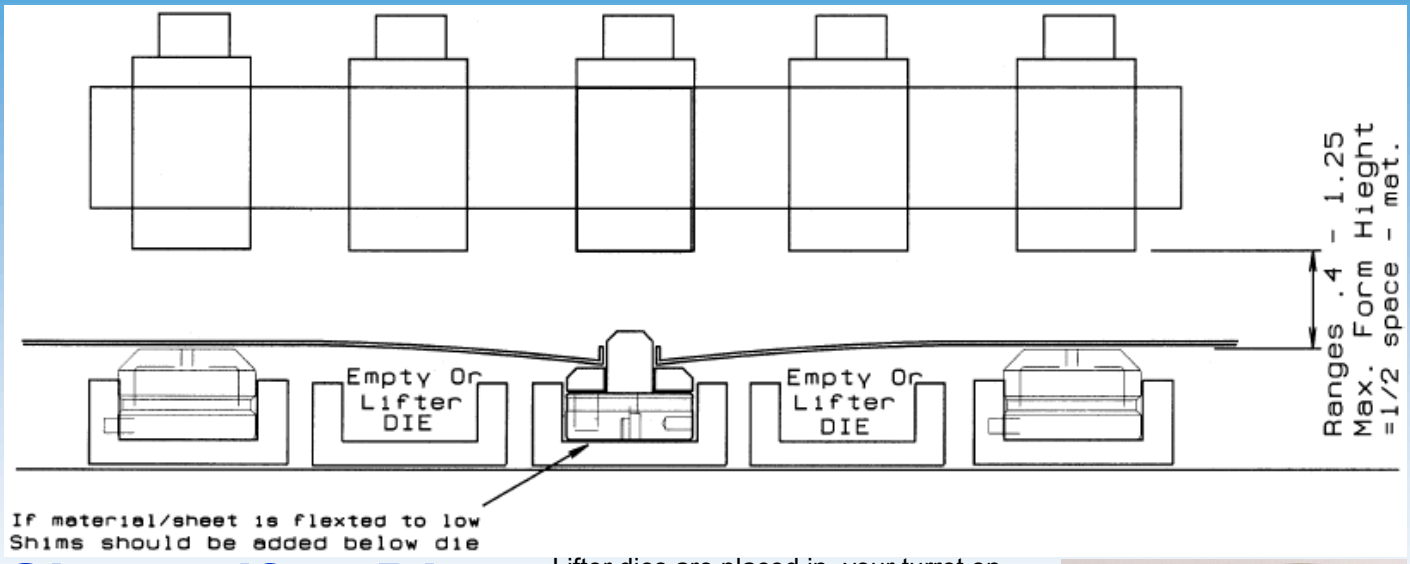
Example, when sharpening an electrical knock out style form, equal amounts must be sharpened off cutting edge as positive stop (ejector ring) .

If you have any questions about maintaining/sharpening a particular cutting edge of a form, **call our engineering department (702) 736-2958 or eng@cetooling.com for guidance. All specials have a S-#### etched on the tools.** Giving this number to our tool engineers ill allow them to retrieve detailed information about your tool.

FORM REQUIRING LARGE STROKE (Deep Stroke)

Diagram shows **sheet movement below standard die height.**

Form requiring deep stroke will require sheet to be moved below standard die height. No dies should be left installed in stations to left & right of such form dies. Ideally lifter dies should be installed either side of form.



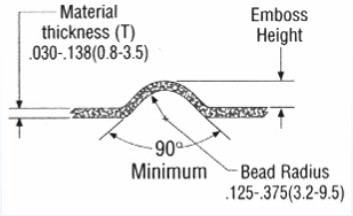
Sheet Lifter Dies

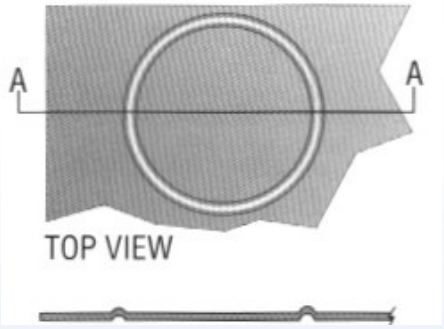
Lifter dies are placed in your turret on each side of a special forming tool. When the sheet passes through this section of the turret, these lifter dies will lift the sheet up above that of a standard die. This will help guide sheet to the height of a tall forming die preventing an abrupt jerking action when sheet meets form die which at times causes the sheet to break the grip of the work holder clamps.

PROGRESSIVE "Continuous" Form Tools

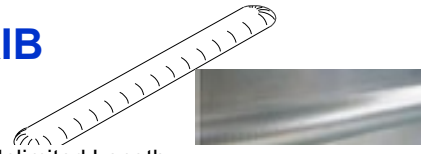
PROGRESSIVE BEADING

Program any shape, of a raised emboss, from circular to straight lines. Form up to .25"/6,4mm height, in material up to 14 gauge. Nibble moves of .03"/,8mm



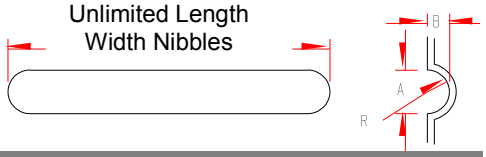


STIFFENING RIB



Punch is made for a specific material thickness

Unlimited Length
Width Nibbles



Standard Size	"A"	"B"	"R"
	3/8	3/16	3/16

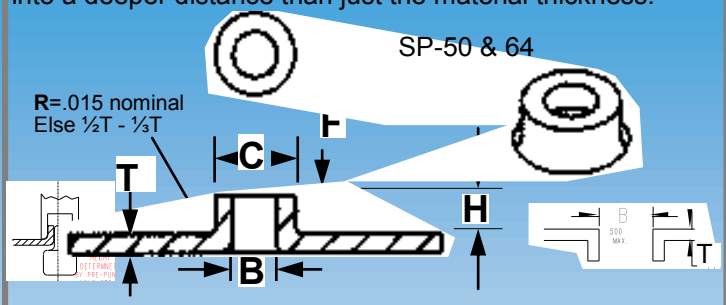
Other sizes available

Programming Progressive-Continues Forms such as Louvers, Card Guides, Stiffening Ribs

Start in center, nibbling to one side in .8mm/.03" increments. Next move back to center and nibble back to other side. If needed, make last single hit in center.

Extrusion

commonly used to accept sheet metal screws or permit tapping into a deeper distance than just the material thickness.



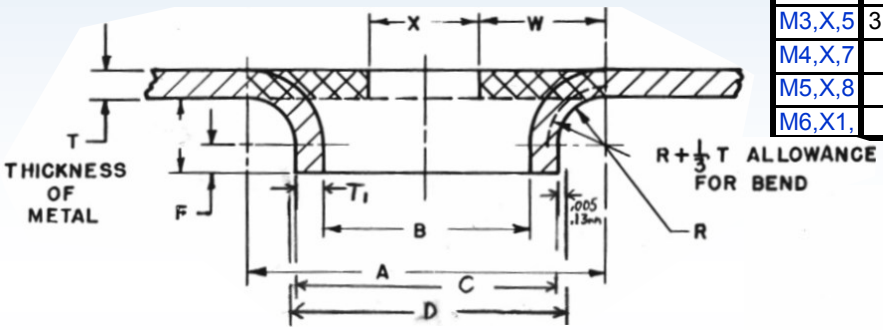
A pre-pierce hole is commonly required as a one hit pierce and extrude gives poor hole quality, and has limited adjustment on the machine. The diameter of the pre-punched hole ultimately determines the height of the extrusion. **Max. height (H) is the metal's limit of being drawn (stretched), and form dies max. height above + .1" below standard die.**

If distortion, apply forming sheet lubrication to help material slide over tool surfaces. This to reduce galling & distortion in formed wall.

Small size such as below, to achieve enough H length for adequate threads, X would have to be to small. We instead, make C smaller and extrude wall of material.

INCH Tapping Extrusion & Pre-Pierce Ø								
Material T →	#22 .03"	#20 .036	#18 .048	#16 .06	#14 .075	#13 .09	Extrusion B Ø cut Thread	Recommended ↓ Pre-Pierce
↓screw	↓ Female Bore Dimension ↓							
#4-40	.127	.136					.090	.045
#5-40	.139	.148	.165	.180			.102	.051
#6-32	.144	.153	.171	.185			.107	.053
#8-32		.182	.199	.214	.233		.136	.064
#10-24			.213	.228	.247	.267	.150	.069
#10-32			.222	.237	.256	.276	.159	.074
1/4-20			.268	.283	.302	.322	.205	.100
1/4-28								

METRIC Tapping Extrusion & Pre-Pierce Ø								
Material: T →	#22 .03"	#20 .036	#18 .048	#16 .06	#14 .075	#13 .09	Extrusion B Ø Cut Thread	Recommended ↓ Pre-Pierce
↓screw	↓ Female Bore Dimension ↓							
M2,X,4	2,74	3,0	3,26	3,78			1,7	0,8
2,5x4,5	3,14	3,4	3,66	4,18			2,1	1,0
M3,X,5	3,64	3,9	4,16	4,68			2,6	1,3
M4,X,7		4,7	4,96	5,48	6,0	6,39	3,4	1,6
M5,X,8			5,86	6,38	6,9	7,29	4,3	2,0
M6,X1,			6,66	7,18	7,7	8,09	5,1	2,5

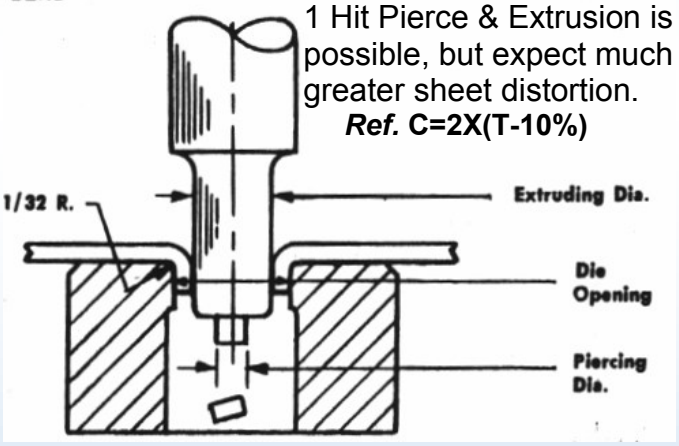


Reference Info: **X**=Pierce Ø **B**=Max. ExtrusionØ
C= B + 2(T_1) **D**= C + .010" **T**=Mat'l Thickness
H-Nominal Extrusion Hgt. **T_1**=Min. Mat'l Thk –.002"

Nominal H is 2 to 2½ of T

Formula for determining X if specific H is required

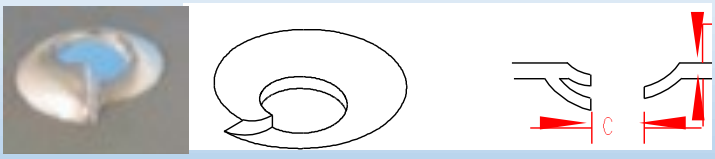
X=D- 3.14(.005+.25T)-2(H-.005)



1 Hit Pierce & Extrusion is possible, but expect much greater sheet distortion.
***Ref.* C=2X(T-10%)**

THREAD FORM **DOWN Shown**

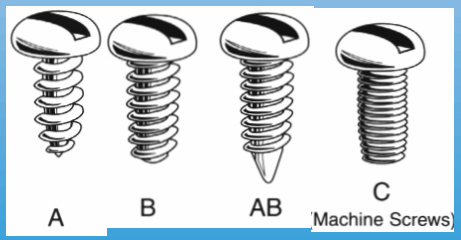
Replaceable Top Inserts *FIP81 Bottom *FID81

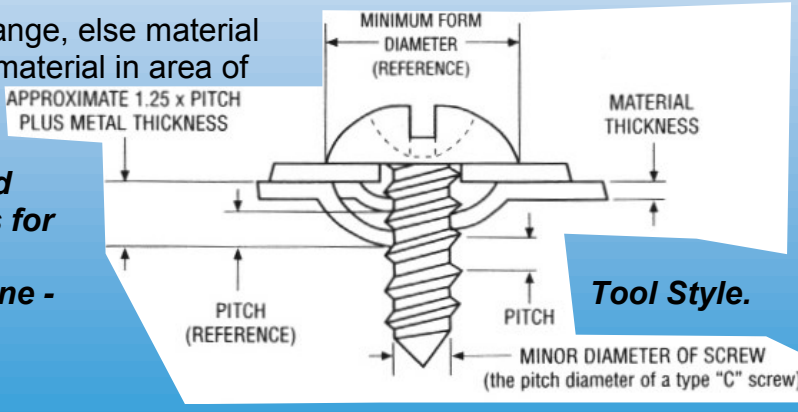


Ordering Notes:
Order by Screw & Thread size

Limitations Thread Pitch must chart range, else material may require a pre-pierce & coin to thin material in area of thread form. < than material thickness.

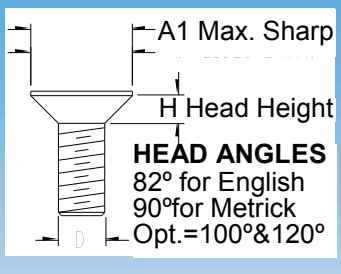
Request Detailed Quote Sheet on Thread Forms for your machine -





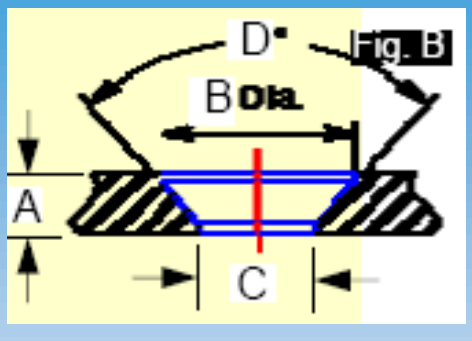
Tool Style.

COIN FORMS Technical Reference



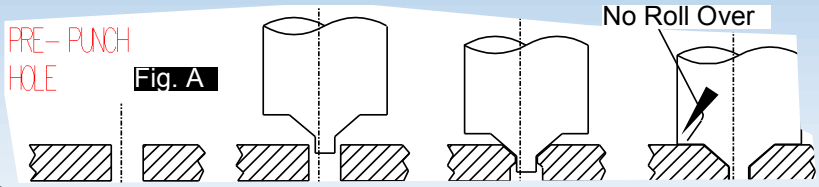
SAE Flat Head			
Size	D	A1	H
#4	.112	.255	.057
#5	.125	.281	.09
#6	.138	.307	.097
#8	.184	.359	.112
#10	.190	.411	.127
1/4	.250	.531	.161
5/16	.313	.656	.198
3/8	.375	.781	.234
1/2	.500	.938	.251

METRIC Flat Head Screw DIN 7991		
Size D	A1 Max.	H Max
M3	6,0	1,7
M4	8,0	2.3
M5	10,	2.8
M6	12,	3.3
M8	16,	4.4
M10	20,	5,5
M12	24,	6.5
M14	27	7



COINING

Pre-Pierce hole hole is required.



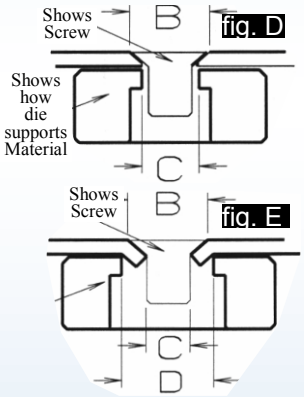
Lets call material thickness "A"

Best quality: use "A"= only 90% of mat. thickness.

1st Step is to determine if material thickness "A"=material can accommodate screws "**H**" head height with sheet staying flat. **If "A" is > "H", "C" can= Screw thread size**

PrePierce=((B-C) / 2)+C) Formula estimate larger for safety. *After tests, pre-pierce size may be reduced to achieve best cosmetic results on your material type. Note: To small a pre-punch hole causes material to coined tightly around the pilot of the form insert. The result can be problems with stripping, heavy burrs, bulging of material, and excessive tool gauling.*

If "A" < "H" you will have to choose between having a larger "C" thru hole size were material can be kept flat shown in **fig. D** (screw will be centered on head and not thread) **PrePierce=((B-C) / 2)+C)** Must use **Die Size=*B-(((D=Angle/2)TAN X A) X 2)***

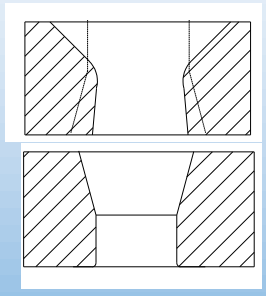


Else you will need to allow the material to be bent shown in **fig. E** Use a die that has an opening **=> B+(1.2 X Mat.)** die edges not sharp to help lift of material.

To determine J=((B-C)/2) K= J /(D/2)COS C-((K-J)X2) Pre-Pierce =__

Find Material thickness on left most column then follow across to Screw Size.
If screw size is not found, use formula.

Mat.	#4	#5	#6	#8	#10	1/4	5/16	3/6	1/7	M3	M4	M5	M6	M7	M8	M10
.048	**.187**	**.213**	**.238**													
.060	.177	.204	.228	.281	.332											
.075	**.149**	**.191**	**.219**	**.206**	**.323**	**.437**										
.090	.144	.180	.205	.257	.302	.422										
.105		**.161**	**.196**	**.242**	**.295**	**.422**	**.546**									
.120			.177	.234	.281	.406	.531									
.135				**.209**	**.272**	**.390**	**.515**	**.656**	**.765**							
.150					.261	.386	.500	.640	.750							
.164					**.242**	**.375**	**.500**	**.626**	**.734**							
.180						.359	.494	.625	.718							
.250						**.316**	**.397**	**.547**	**.672**							



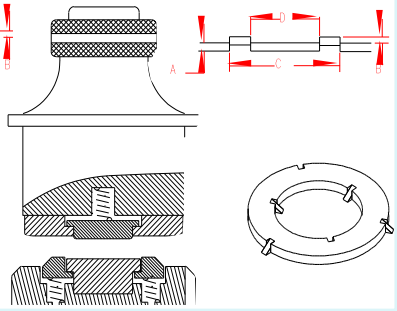
If a Single Hit Pierced and Form is Chosen, be advised that the hole quality and tool life will be greatly reduced.

Reason: The metal being coined has no were to go but to bulge on the top of sheet (roll over), against the pilot tip and pushes below the sheet leaving a large burr. This binding of the pilot tip by the material causes rapid galling which if not constantly cleaned off can cause the pilot tip to be snapped off during the stripping cycle of the stroke.

ELECTRICAL KNOCK OUT TOOLS

ELECTRICAL KNOCK OUTS

SINGLE Sp-60 DOUBLE Sp-61



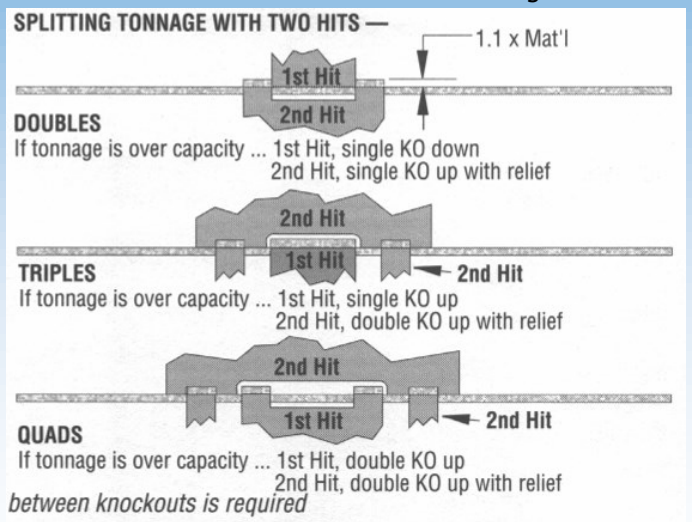
Con-duit	Actual Size	Con-duit	Actual Size
1/2	.875	1½	2.000
3/4	1.125	2"	2.500
1"	1.375	2½	3.000
1¼	1.750	3"	3.625

Tonnage Requirements: Up to 3/4 of press capacity may be safely used. Use the below to calculate tonnage required for your knockout size and material.
(ref. Page 7 for Ton-Per Sq. Inch)

Perimeter or 3.14XØ X Mat'l thickness X Mat'l Ton-Per-Sq.Inch

MS=25(22.5mm) AL=9.5-14(8-12,6mm) SST=50(45mm)

Example: 1" Pipe=1.375 actual size, in 12ga. Galvanized/ mild steel 3.14 X 1.375 X .105 X 25=11.33 English tons.



E.K.O. TAB LOCATION "Common Use Chart"

Actual Size Diameter	SINGLE E.K.O.		DOUBLE E.K.O.	
	Lower	Upper	Lower	Upper
0-.249 * (0-6,3mm *)				
.250-.313 (6,4-8,0mm)				
.3140-1.374 (8,0-34,9mm)				
1.374 –Max. (34,9mm–Max.)				

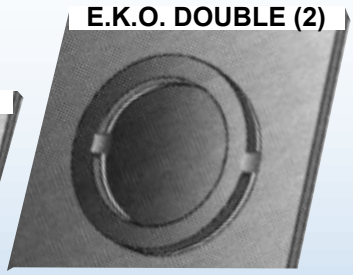
* Must have tab on lower & Upper if thicker than 16 gauge. Thinner materials only need tab on Upper.

TAB DIMENSIONS

Material Thickness	Width
.020–.045(0.5–1.1)	.06(1.5)
.045–.082(1.1–2.1)	.09(2.3)
.082–.097(2.1–2.5)	.12(3.0)
.097–.127(2.5–3,2)	.18(4.6)
.127–.179(3.2–4.5)	.25(6.4)

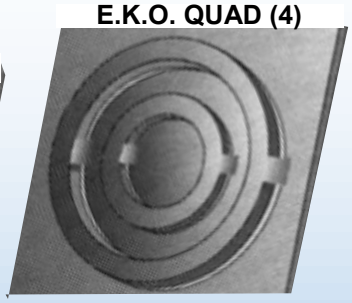
E.K.O. SINGLE (1)

E.K.O. DOUBLE (2)

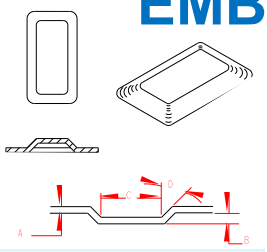


E.K.O TRIPLE (3)

E.K.O. QUAD (4)

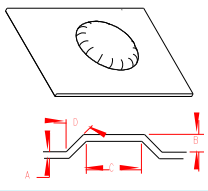


EMBOSS



D >= 45° DIE w/No Stripper SP-74

D < 45° DIE w/Built in Stripper SP-74



D>= 45° DIE w/No Stripper SP-63

D < 45° DIE w/Built in Stripper SP-63

EMBOSS **Notes: Limitations and limited warrantee:**

A) Caution on sheet distortion
B) Max. Form Height = 2 X Material thickness (.25max.)
C) May Require Additional Radius
D) Pre-Punch Thru Hole will distort.
E) Sheet Lubricant should be used. *Ref. Sec.1 page 19*
F) Tools are designed for specific material +/-30%

Trouble Shooting: Desired flat face on top of emboss does not stay flat, but arches into a doomed shape after it is formed. This a combination of material proper ties and emboss proportions. To prevent doomed top, prior to embossing, punch a small hole in the center of were the emboss will be. This gives an area for the material to flow, eliminating stress point.

CHARACTER SHARP FACE MARKING

Dedicated form tools can be produced to *stamp Logo's, Names, Part No., etc..* Contact our tooling engineers to discuss your particular application. Art Work or Cad-.DXF/.IGES files are required for Logo's.

GROUND SYMBOL

SHARP FACE CHARACTER STAMP INSERT HOLDERS

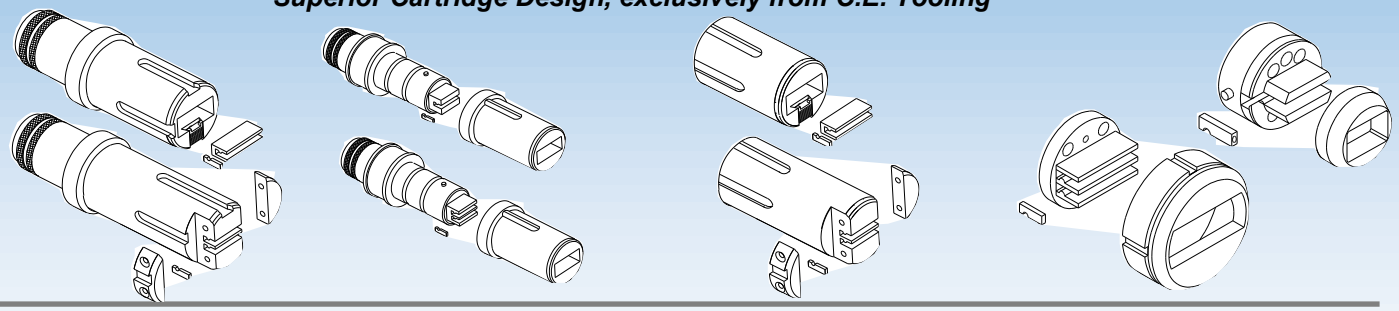
Available 1/16, 3/32, 1/8, & 3/16 width X ¼ height. **1/8 is standard**

blanks/spacers cost = 50% of regular character price

1/8 *ACHAR⅛ stamps .09X.15 **1/16** *ACHAR1/16 stamps .06X.12" • **5/32** *ACHAR5/32 stamps .125"X.19", **3/16** *ACHAR3/16 stamps.156X.23

Spacer Kit I*ASPACER includes widths of: 4 each 1/16, 3/32,⅛, 2pc 3/16 Lengths: CE & Amada Standard

Superior Cartridge Design, exclusively from C.E. Tooling



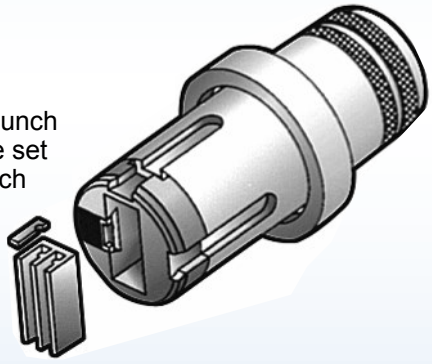
Available for all tooling styles. Units can be ordered as a dedicated, or replaceable insert style.

DEDICATED MARKING UNITS Produced to stamp Logo's, Names, Part No., etc..

Contact our tooling engineers to discuss your particular application. Camera Ready Art Work or .DXF/.IGES files are required for Logo's.

Go to the dedicated pricing booklet (Section 2-9) for the tooling style used in your machines for information of station capacities, character quantities and pricing.

Tool Overview: Use and Set Up



Character Marking Units are classified as a form tool. Unlike a standard piercing punch which punches through the sheet metal and into a mating die, a form tool has to be set to a near exact length to allow the punch to firmly spank the top of the material which lays on top of the bottom die. If the punch length is adjusted to long, the press will drive the punch into the bottom die resulting in probable damage to the tooling and possibly to the machine. *Unless specifically requested and marked on the tool, marking tools are designed to be used in a maximum material thickness of 9 gage (.150" or 3.8mm) if the tool is to be used to punch thicker material, steps must be taken to reduce the length of the upper unit.*

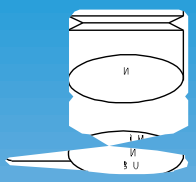
The first step in **setting up any form tool** is to adjust the tool to the **Shut Height for the exact Machine which tool is to be used on - (minus) Materials thickness**. (C.E. offers tools used to check machines shut height). After the tools length is set, load tool into the press, making a single hit, checking the results. Next make SMALL adjustments to the tool's length to set proper penetration. (Usually only .004-.008 on coin style marking tool (sharp faced engraved characters,logo's, or shapes)

The life of the tool will be greatly affected by the depth the tool has to stamp into the material. Although sharp faced replacement character, or a engraved logo, or shape, are produced with approximately 1/32 depth of useful detail, it is recommended to penetrate into the material only .004 to .008 for maximum tool life. If you are punching in C.R.S. this depth will normally give about 10,000 to 12,000 hits before showing signs of break down. An example of how the life of the tool will be affected by the stamping depth: if you were to penetrate .012 to .015 depth in C.R.S. expect approximate 7,000 hits before signs of break down. How much longer the tooling can be used would be at the discretion of the set up person to determine if the quality of the detail is acceptable. Logo and solid type sharp face tools can be sent back to C.E. Tooling to be sharpened. This style of tooling can be made either form-up or form-down style.

There are 2 DIFFERENT TYPES of character marking tools. Shown on this page are the popular **COIN STYLE** marking stamps. A Coin style marking unit has sharp face characters that are pressed very shallow into the one side of the material while a the opposite side of sheet is pressed against a flat no hole die (flat faced punch if forming up), which act's as an anvil to support the material.

The other type of character marketing tool is the "EMBOSSING STYLE" stamp. Just like the sharp face style, the length of the punch is very critical. This style tooling is pressed on the side of the material and embossed out the other side, the cost of this tooling is greater due to the detail had to be on both the punch and die. Most generally the tooling has to be made as form-up. **Use CLM50 Sheet Spray to extend edge life.** (Ref. Page 8)

SHARP FACE MARKING OPTIONS

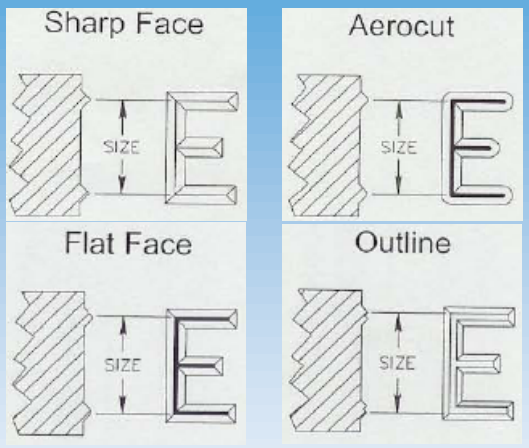


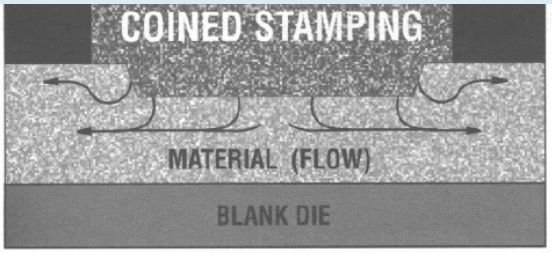
Sharp Face Characters are engraved with a sharp edge where the tool comes in contact with the work. A sharp face tool penetrates more easily than others.

Flat Face Characters are engraved with a flat instead of a sharp edge in order to produce a wider impression. This face is often used on brass or other nonferrous metals or when the impression is to be color-filled. Since more material is displaced, more tonnage is required to make a flat face impression.

Aerocut Engraving produces a specially designed rounded face for marking impressions with minimum stress at the point of marking.

Outline Characters have two sharp face lines to produce the double line impression of an outline character. This style is often used to emphasize tradenames or designs.





COINED STAMPING — moves a great deal of metal with much force to achieve a three dimensional sculptured effect. Creates internal stresses that can deform adjoining features and back of sheet. Size and depth of the image and softness of the metal are critical considerations in observing press punching force limits.

Coined Marking Tonnage Requirements

Common Coin Target Depth is .006" (.004 - .008")
Thicker materials are easier to stamp as there is more room for the material to flow.
Marking is not recomended for material < .06"/1,5mm

Pressure to mark one character (in tons).

Character Size	Soft Mild Steel	Soft Aluminum	Tool Steel	Character Depth
1/16"	.25	.15	.38	.003"
3/32"	.50	.30	.75	.004"
1/8"	.75	.45	1.13	.006"
5/32"	1.00	.60	1.50	.007"
3/16"	1.88	1.13	2.82	.008"
1/4"	2.10	1.26	3.15	.010"
5/16"	3.00	1.80	4.50	.013"
3/8"	4.00	2.40	6.00	.016"
7/16"	4.75	2.85	7.13	.016"
1/2"	5.70	3.42	8.55	.017"
5/8"	7.50	4.50	11.25	.020"
3/4"	9.25	5.55	13.88	.020"
7/8"	11.00	6.60	16.50	.020"
1"	13.00	7.80	19.50	.020"

GROUND SYMBOLS SHARP FACE

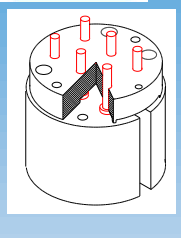
Standard=1/2"Ø +$50 for non standard Longest horizontal line=3/8 length

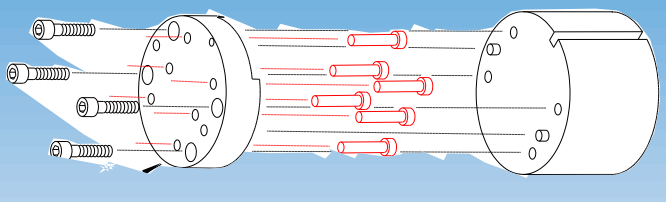
Character Marking

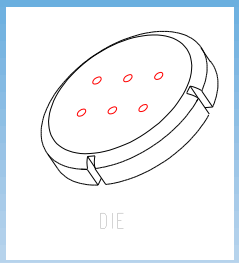
Accepts Replaceable Inserts. Ref. page 14 & 15

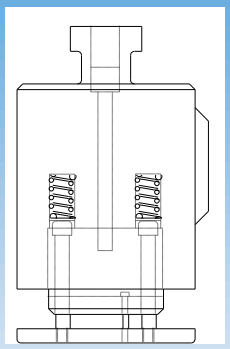
CLUSTER / GANG PUNCHING

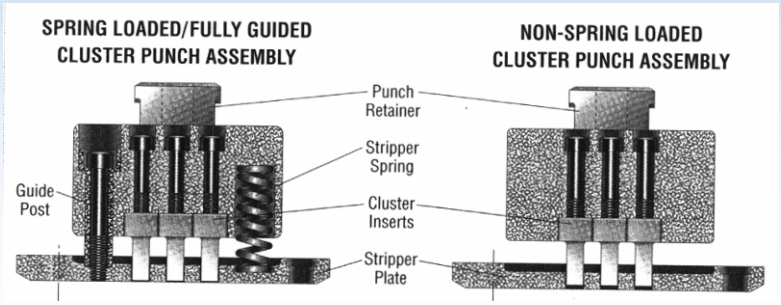
Cluster Tools reduce hits required but most importantly reduce sheet warpage, common problem of multiple single hits in close proximity.











MAINTENANCE: Use sheet lubricants (ref. Page 8) Keep punch quills as sharp or sharper than the die.

SHARPENING: Small quills while still assembled in punch body. Put wax between quills and attach strong rubber bands around pattern to lessen vibration and prevent quill breakage.

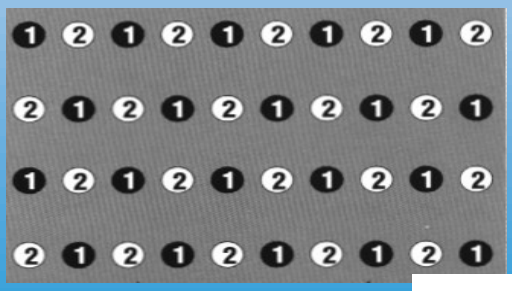
Disassembly: Remove the bolts on location plate and carefully pull location plate off of punch body. Clean off any galling around tip to prevent jamming. Quills should be tapped out of location plate using a piece of brass or aluminum. Carefully clean location plate before installing new or sharpened quills. After new or sharpened quills are tapped back into location plate, you must surface grind back of quills and plate until level to each other. Do this by laying location plate between two magnetic parallels & set on a surface grinder magnet. Place location plate back on punch base being careful to realign dowel holes as marked. Tighten bolts securely using a none permanent type of thread lock, such as Loc-Tite.

Prevent sheet warping & reduced die edge life: If hole patterns are to close, remaining web thickness becomes week and will cause sheet warping. To prevent this, double space to punch every other hole, then come back and punch between holes already punched

.

Programming: Plan your hits so that none of the quills of a cluster tool re-enter a hole previously punched. Clusters are prone to sheet deformation so they are not warranted against this. How much depends on closeness and shape of holes. To lessen deformation, use CLM Sheet Lubricant and program press to punch the Outside of grid pattern and work in towards the middle.

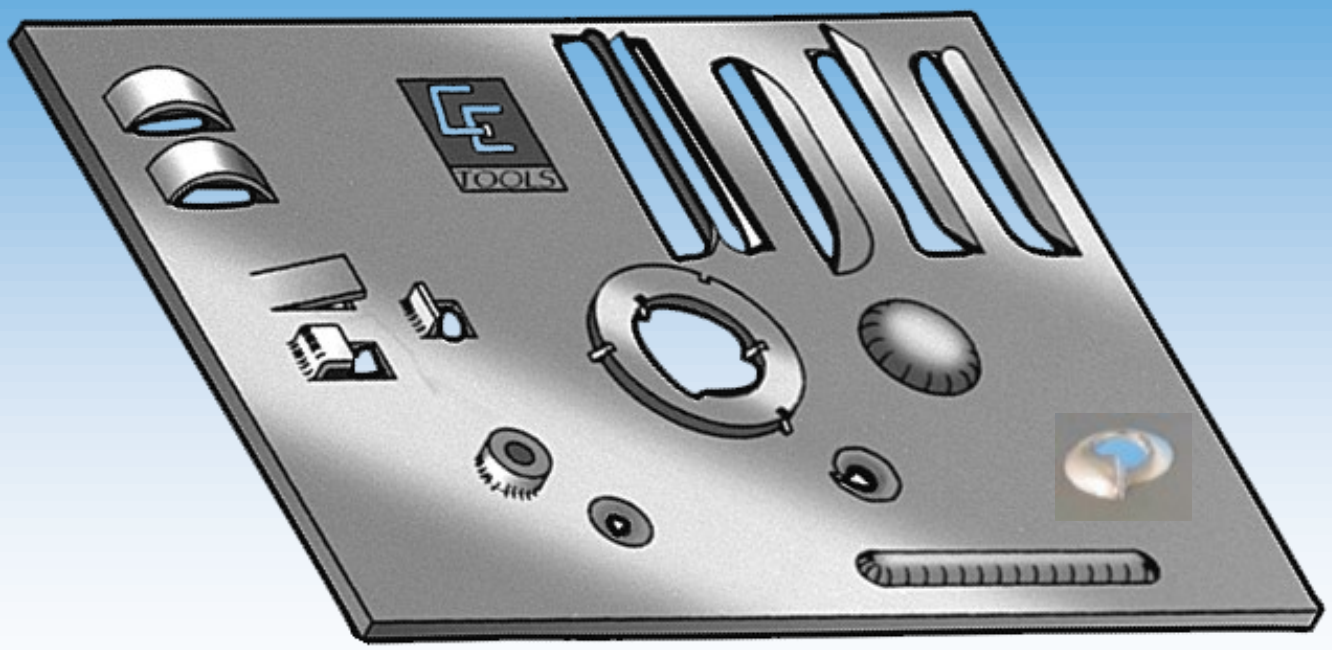
Reduce material warping. Use CLM Sheet Lubricant. Each time a hole is pierced, material surrounding the hole is stretched downward placing stress on the top of the sheet. The more holes pierced close together, the more chance of the sheet warping. Prevent this by punching every other hole ❶, and then come back and punch the remaining holes ❷.
An even greater solution is flip part over to punch ❷ holes.

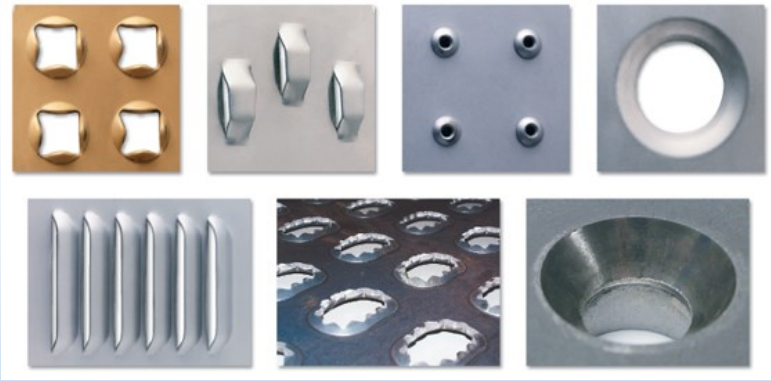


Page 18

CE TOOLING SPECIAL APPLICATION FORMING TOOLS

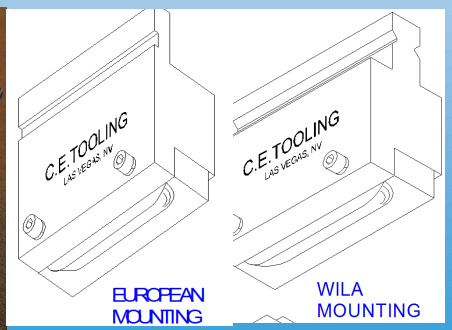
HIGHER PRODUCTIVITY THROUGH SUPERIOR ENGINEERING

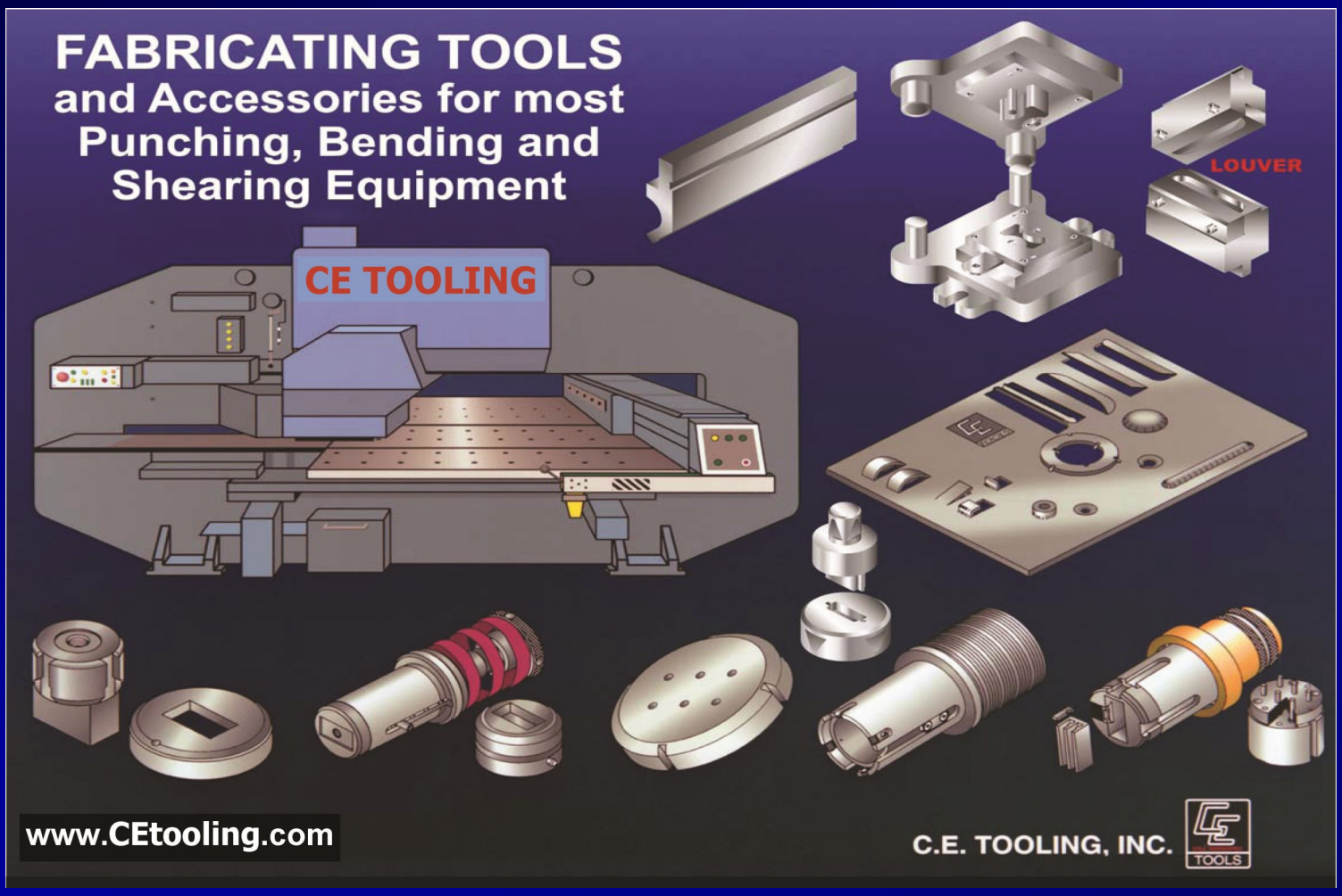




PRESS BRAKE LOUVERS

American, European, Trumpf/Willa 9 Stocked Sizes





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AGENT