PT-30491

CINCINNATI®

SHEAR CAPACITIES

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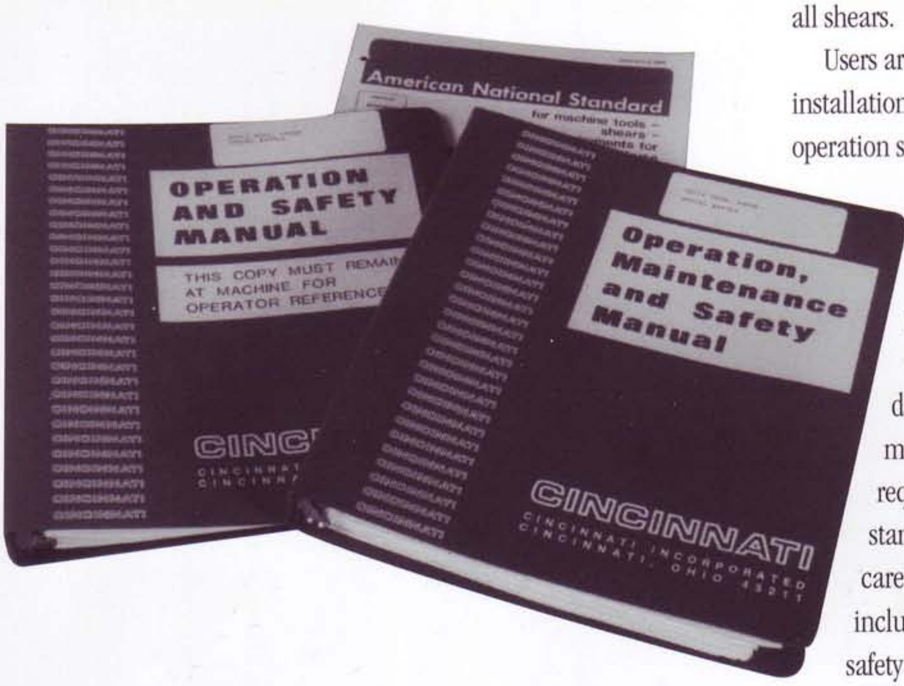

Safety

Good safety practices and proper training of each shear operator are mandatory. Comprehensive operator, maintenance and safety manuals provide instruction on proper procedures and safety methods and should be with the shear at all times. Warning signs and a checklist of operator safety guidelines should be placed at strategic locations on all shears.

Users are responsible for proper installation and continued use of point-of-operation safeguarding and other machine guards. This helps assure operator safety and compliance with OSHA requirements.

Each new CINCINNATI shear displays a tag showing that it meets ANSI B11.4 construction requirements. A copy of this safety standard, which covers the proper care and use of power shears, is included to help users with their safety programs.

Shear Capacities

Shear Rating

All CINCINNATI Shears are rated for maximum thickness mild steel at a specific rake. Mild steel is defined by these mechanical properties:

Maximum shear strength - 50,000 p.s.i.
Ultimate tensile strength - 55,000 to 70,000 p.s.i.
Yield strength - 35,000 to 50,000 p.s.i.
Elongation (% in 2") - 20 to 35%

The thickness rating includes an allowance for normal thickness over tolerance. Sheet thicknesses expressed in gauges have published tolerances. Plate thickness of .250" (6.35 mm) and heavier can vary by as much as .030" (.76 mm) and be within the shear capacity.

CINCINNATI Mechanical Shears and some Hydraulic Shears have a fixed (non-adjustable) rake. Most CINCINNATI Hydraulic Shears have an adjustable rake and are rated for maximum thickness mild steel at the maximum rake setting.

The "Shear Capacity Chart" (pages 10 -13) compares other carbon steel, stainless steel, aluminum and other metals to mild steel. The chart is based on an equivalent shearing force. An explanation of the factors affecting shear capacity will help you understand this chart and the performance of your shear.

If the Ultimate Tensile Strength (U.T.S.) and the Yield Strength (Y.S.) are greater than the values noted above, the thickness of the metal the shear can cut is reduced below its nominal mild steel rating. This is also true if the U.T.S. and Y.S. are below the nominal mild steel rating values and/or the elongation is above 35%. This type of steel is defined as *soft mild steel*. The reason for the reduction in shear capacity is explained in Material Ductility on page 5.

Steels that fall within the *soft mild steel* category are 1006 and 1008. However, due to variations in chemistry or processing, steels higher in carbon or alloy content can occasionally fall into the *soft mild steel* category. Steels like 1010 and 1012 can easily drop into this category. Finally, if the elongation of some ASTM steels (A283 Grade A, A285 Grade A, A570 Grade 30) is higher than normal, greater than 35%, they could drop into the *soft mild steel* category.

Shearing Force

The thickness capacity of all shears is limited by the shearing force required. The shear must produce more force than that needed to cut the thickest material. Shearing force is roughly the product of material shear strength and the area under shear. Area under shear is established by the shear rake angle, the material thickness and the material ductility. Shear knife clearance, shear knife condition, back piece depth and material work hardening characteristics, also have a significant effect on shearing force.

Rake

Rake angle is the included angle between the cutting surface of the upper and lower knives (see Figures 1 and 2).

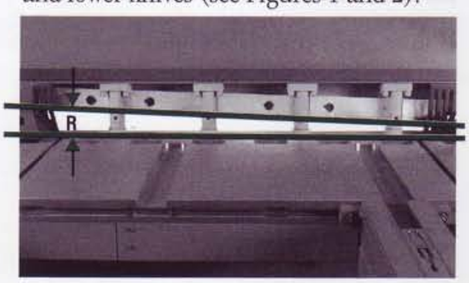

Figure 1—Typical rake angle on a hydraulic shear.
(Fixed guard removed for illustration purposes only.)

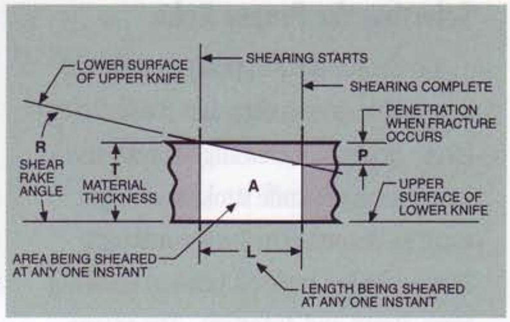

Figure 2—Rake Angle

Rake is normally expressed in "inches per foot" or degrees and minutes.

The effect of rake is to limit the length (and thus the area) being sheared at any one time to a very small portion of the total length. Because of rake, the shearing load is not affected by the length of the piece being sheared. For example, shearing force for a one foot long cut is the same as the shearing force for a twelve foot long cut.

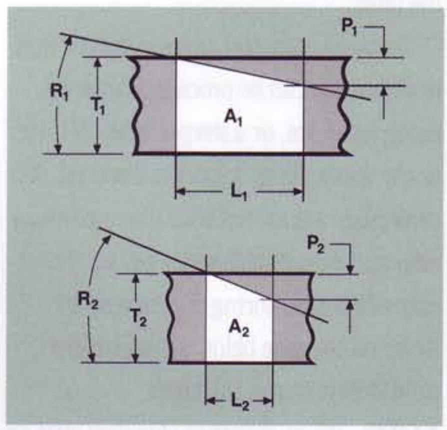

Figure 3—Effect of Rake

Figure 3 shows that doubling the rake (with no change in material physical properties and no change in thickness) decreases the area under shear by two, thus reducing force by one half.

$T_2 = T_1$ Then $L_2 = \frac{1}{2} L_1$
$P_2 = P_1$ And $A_2 = \frac{1}{2} A_1$
$R_2 = 2R_1$ Therefore $\text{Force}_2 = \frac{1}{2}\,\text{Force}_1$

Selecting the Proper Rake

On the surface it appears a large rake is desirable since it decreases the shearing force. However, increasing the rake also increases upper knife stroke and might increase distortion in the sheared part. Thus, rake is a trade off between shearing force, stroke and distortion. The proper rake setting on a CINCINNATI Hydraulic Shear for a specific material and thickness is normally the minimum rake that will produce a blank with the least amount of distortion and not exceed the machine capacity. Reducing the rake, increases the knife force and, on some lighter gauge material, will result in an increase of camber or an objectionable knife imprint along the sheared edge. It also increases the possibility that the holddown force will not be sufficient to hold the workpiece to the table.

Stainless steel and other materials that work harden can be processed better by using less force, or a steeper rake. If there is any doubt about a specific material, it is recommended to start with the maximum rake and then progressively reduce the rake while monitoring the cut results. Never set the rake below an equivalent mild steel material thickness.

NOTE: *When shearing stainless steel or superalloys, knife life can be increased by using the maximum rake angle setting for acceptable back piece distortion.*

Material Shear Strength

An increase in material shear strength will increase the shearing force. Shearing force is directly proportional to the material shear strength, which for most materials, is equal to 75-80% of the material's ultimate tensile strength. If the other factors which affect shearing force are not changed, a material with twice the ultimate tensile strength of mild steel will require twice the shearing force required for mild steel. The "Shear Capacity Chart" (pages 10-13) allows for some variation in the shear strength of the listed materials. Note that most of the ASTM steels specify a *minimum* value for ultimate tensile strength and yield strength, but do not specify a *maximum* value. For these steels the chart is based on tensile and/or yield strengths no greater than 15,000 p.s.i. above the specified minimum values.

Allowable thickness on ASTM steel, with actual ultimate tensile or yield strength exceeding the listed minimum value by more than 15,000 p.s.i., is less than the thickness shown in the chart. Occasionally steel is supplied to meet the requirements of more than one ASTM specification or grade within a specification. The capacity for the specification and/or grade with the highest physical properties must then be used.

The thicknesses shown on the chart for the other listed materials are based on typical mechanical properties plus an allowance for normal variation.

Material Thickness

Shearing force increases very rapidly with an increase in thickness. Specifically, the shearing force is proportional to the material thickness squared (T x T). If the other factors which affect shearing force are not changed, doubling the thickness will increase the shearing load by four times. This is true because both the height and length of the area being sheared at any one time is doubled as shown in Figure 4.

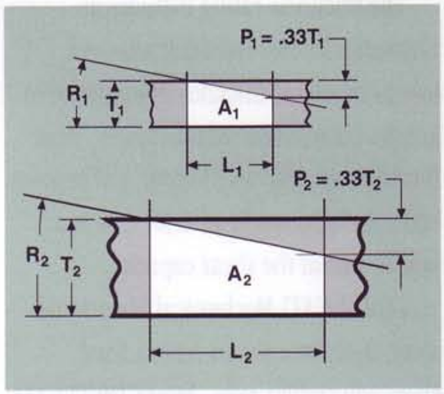

Figure 4—Effect of Thickness

$R_2 = R_1$	Then $A_2 = .833\ T_2 \times L_2$
$T_2 = 2T_1$	And $A_1 = .833\ T_1 \times L_1$
Then $P_2 = 2P_1$	Then $A_2 = 4A_1$
	Therefore
And $L_2 = 2L_1$	$Force_2 = 4\ Force_1$

Minimum Thickness

The minimum thickness that can be processed effectively is primarily a function of close knife clearance and knife sharpness. The ability to set close clearance between the knives depends on knife seat geometry, lengthwise ram adjustment capability and the ability to hold the ram tightly against the guide surfaces. In normal practice, 26 gauge (.018" or .45 mm) material is a realistic minimum on shears having 3/8" (9.5 mm) or lighter capacity mild steel. Larger hydraulic plate shears have a minimum thickness of :

375 HS - 26 GA. (.018" or .45mm)
500 HS - 22 GA. (.030" or .76mm)
750 HS - 20 GA. (.036" or .91mm)
SE series - 16 GA. (.060" or 1.52mm)

Material Ductility

Ductility is the property of material which allows it to deform without fracture. Ductility establishes the amount of knife penetration that will occur before fracture. More ductile materials require more penetration before fracture.

As shown before in Figure 2, shearing starts when the upper knife contacts the material and is complete when the knives have penetrated enough to cause fracture. The area being sheared and hence the shearing load, are approximately proportional to the penetration. The material requiring twice the penetration will require approximately twice the shearing force (see Figure 5).

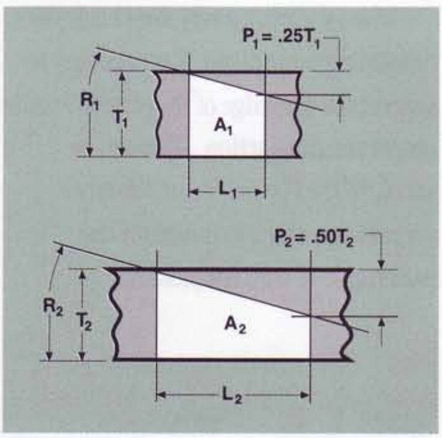

Figure 5—Effect of Ductility

$R_2 = R_1$ Then $A_2 = .75\ T_2 \times L_2$
$T_2 = T_1$ And $A_1 = .875\ T_1 \times L_1$
$P_2 = 2P_1$ Then $A_2 = 1.71\ A_1$
Therefore
Then $L_2 = 2L_1$ $\text{Force}_2 \geq 2 \times \text{Force}_1$

"High strength" and "hard" materials have low ductility. "Soft" materials have high ductility. Minimum elongation listed in the fifth column on the "Shear Capacity Chart" (pages 10-11) is a measure of ductility. Higher elongation corresponds to higher ductility.

The actual knife penetration before start of fracture can be determined by a visual examination of a sheared edge. The depth of knife penetration is the portion of the edge with a bright polished appearance. It is on the top edge of the table piece (portion of material on table) and the bottom edge of the back piece (portion of material beyond lower knife).

Material Strain (work) Hardening Characteristics

Strain hardening is a property of some metals which causes an increase in hardness and strength of the material as the metal is worked. The amount of strain hardening occurring in the shearing process depends on the properties of the material being sheared. Since strain hardening increases the physical properties of the material, therefore shearing force is increased.

Shear Knife Clearance

Knife clearance has an effect on shearing to the extent that improper clearance may increase the force required to shear and will result in an unsatisfactory edge condition.

Too close of a knife clearance will result in "double shear" characterized by a second area with a bright polished surface (see Figure 6). Excessive knife clearance will result in increased out-of-squareness of the sheared edge. If knife clearance becomes too great, the metal may not shear but fold between the knives.

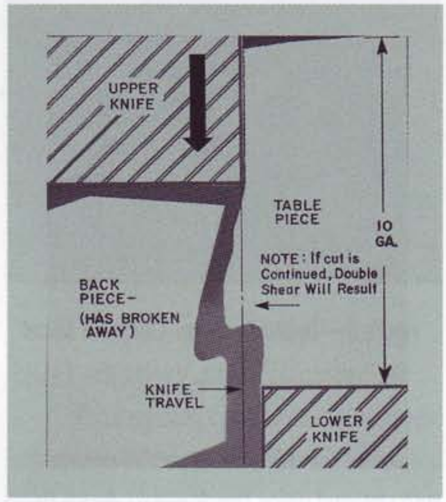

Figure 6—"Double Shear"

Knife clearance on CINCINNATI Mechanical Shears should be set at 7% of the thickness of the thinnest material to be sheared (see Figure 7). This clearance should be used for all thicknesses up to and including the capacity of the shear. This clearance setting will produce satisfactory edge condition without "double shear" in practically all applications.

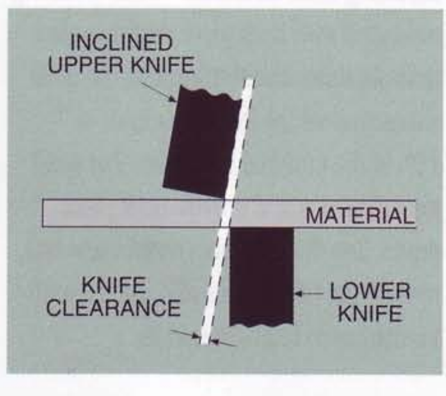

Figure 7—Knife Clearance Setting

NOTE: *Maintaining minimum knife clearance when shearing stainless steel or superalloys on a Hydraulic Shear reduces the edge burr condition and work hardening.*

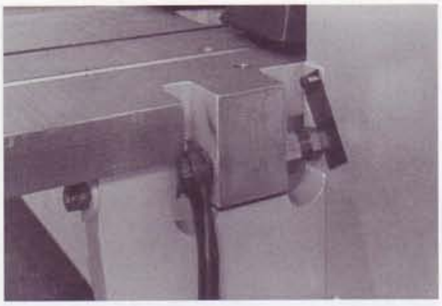

Figure 8—Hydraulic Shear Clearance Shims

On Hydraulic Shears, except the 135HS series, it is necessary to change knife clearance for different material thickness and sheared piece (back piece) depth to obtain an edge free of "double shear". Several predetermined clearances are available for positioning the lower knife in relation to the upper knife. The inner position of the table (minimum knife clearance) is controlled by the table adjusting screws which are preset at the factory.

CINCINNATI standard Hydraulic Shears are equipped with captive table shims for adjusting knife clearance. When shearing mild steel with back piece depths greater than six times metal thickness, use table shims that set the knife clearance at 7-15% of the material thickness. For mild steel trim cuts and narrow back piece depths (less than six times metal thickness), remove the table shims and use the built-in minimum knife clearance.

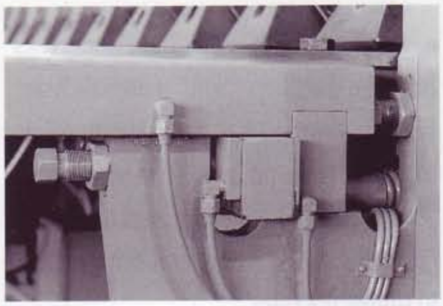

Figure 9— Power Knife Clearance (optional)

Hydraulic Shears, with the Power Knife Clearance option, can select four different knife clearances. This provides a rapid setup on a wide variety of material types and thicknesses.

Knife clearance is based on the thickness of the material being sheared. It does not vary with the type of material being sheared, the exception being stainless steel and similar alloys. Knife rake angle, however, should vary with both the type of metal and the thickness of the metal being sheared. The rake angle is always based on the equivalent mild steel thickness of the material being sheared except for the following exceptions. When shearing stainless steel and superalloys, always use the maximum rake setting.

Shear Knife Condition

All CINCINNATI Shears have adequate reserve capacity for shearing rated thickness after the knife edge has worn a reasonable amount. Dull knives can increase the shearing force enough to overload and perhaps damage the shear. Dull knives also cause unsatisfactory edge condition. A regularly scheduled knife maintenance program will help you avoid overload and edge condition problems.

Consult Cincinnati Incorporated for information on the Total Knife Service Program.

Back Piece Depth

The back piece depth is the dimension from the lower knife edge to the back end of the material being sheared. Shearing force increases as the back piece depth increases. The increase in shearing force as back piece depth increases is more pronounced at high rake angles and close knife clearances. It is also more pronounced on thicker materials and those with higher yield strengths.

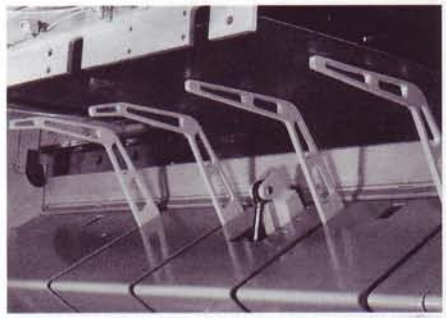

Figure 10—Pneumatic Sheet Supports (optional)

Other concerns with back peice depth are proper gaging and handling. Two options that aid in the shearing of deep back pieces are Pneumatic Sheet Supports and Conveyors.

When shearing a very deep back piece or splitting large plates, it is necessary to support the rear edge of the plate to ensure proper shearing action. This can be accomplished by using a stationary support or a crane to maintain the material level with the passline.

Rear Corner Support

The angle of fracture can vary as the shearing process approaches the end of the material. The last several inches of the cut can be affected by the weight of the entire back piece. The remaining unsheared section does not have enough rigidity to resist the shearing forces which can distort the end of the back piece. These conditions are more prevalent on ductile material and thicknesses of .250" (6.35 mm) and heavier.

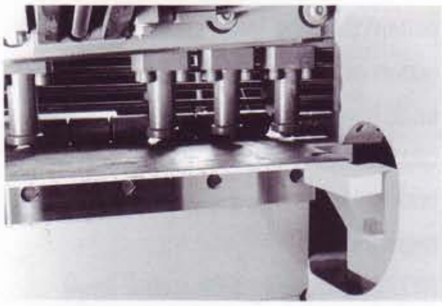

Figure 11—Rear Corner Support (optional)
(Awareness Barrier removed for illustration purposes only.)

An optional rear corner support will minimize these distortions by holding the back piece in position until shearing is complete (see Figure 11). This device can only be used in a fixed position normally at the left end of the shear.

Combinations of Factors

The factors discussed above have been treated separately and reasonable allowance for each variable is included in the capacity chart. However, these factors usually appear in combinations that can affect cut quality and knife life in many ways.

Capacity must be determined, but cut quality, deformation of the sheared piece and knife life also influence the selection of a shear. The ability to adjust rake and knife clearance allows the user to optimize for features most desired.

For example, steels such as stainless and superalloys which work harden require a close knife clearance and may require a larger shear if deep back pieces are to be cut. Other combinations such as a low rake, deep back pieces and close knife clearances should be referred to Cincinnati Incorporated.

The knife clearance will vary depending on the strength and hardness of the sheared material. Recommended settings will appear in the instruction manual and on the capacity nameplate on the front of the shear.

Shear Knife Selection

The selection of the proper knives for each shear is based on a review of a shearing list containing all the materials which will be processed on the shear and their corresponding thicknesses. This permits the selection of the one knife material and heat treatment which is the best combination of wear and shock resistance for the applications. Unfortunately, wear and shock resistance do not go hand-in-hand. Rather, as one increases the other decreases. For this reason, knife selection is always a compromise between these two factors.

It is important to remember that shear capacity and knife capacity are not the same thing. CINCINNATI Shears are rated for a nominal thickness of mild steel. Actual metal thickness may exceed nominal thickness. Normal gauge tolerances for sheet thickness are within the shear capacity.

For .250" (6.35 mm) plate and heavier, the thickness can vary up to 0.030" (0.76 mm) over the nominal and still be within shear capacity.

The "Shear Capacity Chart" (pages 10-13) lists equivalent capacity thickness for other materials. These equivalent capacities are subject to the same over nominal limits as mild steel. This chart applies to the shear only, not the knives.

- The determining factor for shear capacity is the total shearing load which is proportional to material thickness squared, material shear strength, the amount of knife penetration before fracture and inversely proportional to the rake.
- The determining factor for knives is the unit loading on the knife (pounds per inch of knife length), which is proportional to material thickness and material shear strength. It is independent of penetration and rake.

It is also well to note that hydraulic shears have inherent overload protection. Material beyond the capacity of the shear will not damage the machine, but will cause stalling. Stalling during the shear cut can lead to accelerated knife wear, even chipping of the affected edges. Stalling can occur by attempting to shear over capacity material using incorrect rake or trim cuts on materials too thin for the knife clearance.

Shearing material thinner than the shear rating or with too much knife clearance can result in wiping the material between the knives.
In severe cases, wiping thin material between the knives can cause damage to shear components.

Material beyond the knife capacity will probably cause knife problems. This makes it important to know and to avoid exceeding the knife capacity.

The "Knife Selection Chart" (pages 16 -17) was developed by Cincinnati Incorporated to identify the capacity of the different types of CINCINNATI Knives in terms of various material and thicknesses. The basic knife types are:

Type A Highest wear resistance, lowest shock resistance.

Type B High wear resistance, low shock resistance.

Type C Medium wear resistance, medium shock resistance.

Type D Low wear resistance, high shock resistance.

Type E Lowest wear resistance, highest shock resistance.

Type S Special grade of shock resisting knives, developed for predominantly stainless steel applications.

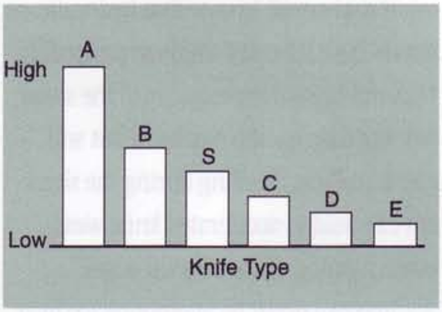

Figure 12—Relative Wear Resistance

Note that increasing letters correspond to decreasing wear resistance and greater shock resistance, except for the "S" knife. Figure 12 indicates the relative wear resistance of the six knife types.

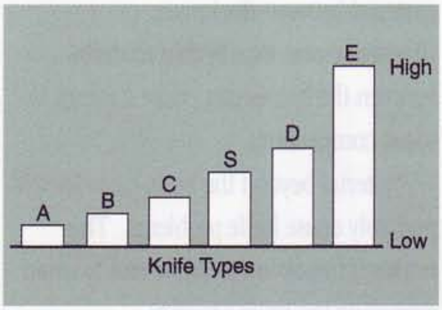

Figure 13—Relative Shock Resistance

Figure 13 indicates relative shock resistance. The required knife for each material and thickness is determined by the shock resistance required of the knife for that material and thickness. The corresponding wear resistance must be accepted. Be aware that a knife with higher wear resistance, but insufficient shock resistance, may chip or fracture. The proper knife type for each application is the highest letter which results from using the "Knife Selection Chart" (pages16-17) for each material and thickness which will be processed.

Recently more and more stainless steel and similar alloys (high strength with high ductility) are being used. Due to this, a special type of knife is being specified for those applications cutting stainless steel and similar alloys more than 50% of the time. These are the Type "S" special knives designed to cut stainless steel and similar alloys with the following characteristics:

1. Increased tensile strength.
2. High ductility—i.e. high elongation.
3. Severe work hardening of area during shearing.

Most nickel based alloys, such as the Hastalloys and Inconels, fall within this category.

The Type "S" knives will last longer in these applications because of their increased toughness and greater resistance to chipping. In many cases a Type "A" or Type "B" knife may have better wear resistance but will have to be rotated frequently because they chip long before they get dull enough to warrant rotation. Chipping generally is not a problem with the thinner gauges. For 10 gauge (.135" 3 mm) and lighter stainless steel it is better to stay with a Type "A" knife.

Be sure CINCINNATI is aware of all the materials and thicknesses you will shear so the proper grade of knife can be provided.

Shear Knife Wear

The greatest knife wear normally occurs on the squaring arm side where most shearing takes place. When inspecting the knives for wear, it is very important to check both the upper and lower knife. Generally the upper knife wears much faster and with a different pattern than the lower knife. "Cupping" occurs on the bottom surface of the upper knife just beyond the front edge. If you can feel this "cupping" it is time to rotate both knives to a new edge or have them reground.

NOTE: *Shearing with a dull knife causes a deterioration in the sheared edge condition and increases the force required to shear. This could lead to knife chipping and possible breakage.*

Shearing a variety of metals will accelerate knife wear. Hardened or high tensile steel result in more frequent knife turns. Generally the harder the material the faster the knives will wear. Material with a hardness of 300 Brinell (BHN) or above and/or those with abrasives included can present severe knife problems. A partial listing of hard materials includes abrasion resistant steels, heat treated alloys, stainless steels, titanium, nickel base and iron base superalloys.

NOTE: *It is recommended that AR (Abrasion Resistant) plate and/or quenched and tempered steel above 360 BHN not be sheared. Shearing this material will lead to rapid knife wear and can cause chipping at any time.*

Knife life depends on many factors but the main ones are:

- Number of cuts.
- Condition of the shear.
- Material being cut.

Conditions that accelerate knife wear are:

- Very scaly metal of any type.
- Flame cut edges.
- Work hardened edges – previously sheared stainless steel edges or superalloy edges are good examples of this.
- Hard spots found on hot rolled medium carbon steels and medium carbon alloy steels. Annealing generally eliminates hard spots.
- Floor tread plate or any plate with a raised pattern on it.
- Expanded metals of all types.
- Improper knife clearance-either too close (knives can rub or cause double shear) or too large (causing bad edge condition or metal folded between the knives).
- Shallow angle cutting (see Figure 14).

Damage to Shear and/or Knives can be Minimized by Avoiding these Shearing Practices

Trim Cuts—Never take trim cuts less than .125" (3 mm) or one metal thickness, whichever is greater. A backpiece that is too narrow will increase the load required to make the cut and it can fold metal between the shear knives.

Cutting Thin Materials—Shearing material thinner than the material rating must be avoided. There is a good chance that thin metal will wipe or fold between the knives rather than shearing. This is true even at close knife clearances.

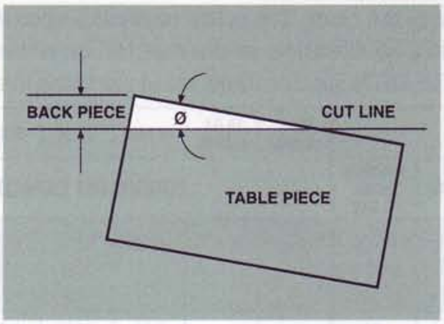

Figure 14—Angle Cutting

Angle Cutting—When Ø (see Figure 14) is less than 20 degrees and the back piece runs out to less than .125" (3 mm) or one metal thickness—whichever is greater—problems may result. Shallow angles such as this may result in slivers which can cause rapid knife wear.

Multiple Layer Cutting—Never cut more than a single layer of any material. The lower layer will be shielded from the upper knife (the upper layer from the lower knife) and the chances of bending one or both edges between the knives are high. In addition, the sheared edge condition will be very low quality.

Shear Capacity Chart

The "Shear Capacity Chart" (pages 10-13) is a listing of mild steel equivalent thicknesses for other materials. Mild steel capacities for all CINCINNATI Shears are listed across the top of the chart and other materials down the left hand column of the chart. The intersection of a row and column indicates the thickness of the material in that row equivalent to the mild steel thickness at the top of the column. The chart can be used (1) to find the thickness capacity for all listed materials for a given shear, and (2) to select the proper size shear for a specific material and thickness. The "Steel Cross Reference Chart" (pages 14-15) should be used to identify the proper "ASTM" classification for a manufacturer's trade name. Consult Cincinnati Incorporated for materials not listed.

How to Use the Chart (example)

1. Determine the maximum thickness of T-1 steel that can be sheared on a shear with a mild steel capacity of .750" (19 mm).

Step 1: Refer to pages 10-13 to find the proper ASTM number for T-1. Select ASTM A514.

Step 2: Locate .750" mild steel shear capacity in the top row on page 10.

Step 3: Follow the .750" column down to the intersection of the ASTM A514 row. Read .625" maximum thickness.

2. Determine the proper shear for .250" (6.35 mm) thick ASTM A572 Grade 65.

Step 1: Refer to page 10 and locate ASTM A572 in the first column.

Step 2: Locate Grade 65 in the second column.

Step 3: Determine the smallest shear that can be used by moving horizontally to the right in the row selected in Step 2 until .250" is reached or exceeded. Read .312". Move vertically to read mild steel shear capacity of .375" in the top row.

The tensile and/or yield strength of many ASTM steels are specified as minimum values with no limit on the maximum. This chart is based on the actual tensile strength and/or yield strengths 15,000 PSI above the specified minimum values. Steel exceeding this value must be limited to thinner material than shown in the chart. The actual physical properties and chemical analysis of a steel may meet more than one specification and/or grade within a specification. In this case the capacities for the specification and/or grade with the highest mechanical properties must be used. The ASTM specifications listed are those in effect on January 1, 2000.

MILD STEEL SHEAR CAPACITY (INCHES)					12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
ASTM STEELS		TENSILE STRENGTH K.S.I.	YIELD STRENGTH K.S.I.	MINIMUM ELONG. %-2 IN.	EQUIVALENT CAPACITY THICKNESS - NOMINAL (INCHES)*										
NO.	GRADE														
A-36	-	58-80	36-51	23	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
	-	58-80	36-51	OVER 35	-	-	-	5 GA.	0.344	0.438	0.562	0.688	0.875	1.125	1.375
	-	58-80	OVER 51	23	-	-	-	5 GA.	0.344	0.438	0.562	0.688	0.875	1.125	1.375
A-131	A to DS	58-71	34 MIN.	24	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
	AH32 to EH32	68-85	46 MIN.	22	-	-	-	5 GA.	0.344	0.438	0.562	0.688	0.875	1.125	1.375
	AH36 to EH36	71-90	51 MIN.	22	-	-	-	7 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
	AH40 to EH40	74-94	57 MIN.	22	-	-	-	7 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
A-242	-	70 MIN.	50 MIN.	21	-	-	-	5 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
A-283	A	45-55	24 MIN.	30	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
	B	50-60	27 MIN.	28	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
	C	55-75	30 MIN.	25	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
	D	60-80	33 MIN.	23	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
A-285	A	45-65	24 MIN.	30	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
	B	50-70	27 MIN.	28	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
	C	55-75	30 MIN.	27	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
A-299	-	75-95	42 MIN.	19	-	-	-	7 GA.	0.281	0.375	0.500	0.625	0.812	1.000	1.250
A-514	-	110-130	100 MIN.	18	-	-	-	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125
A-515	60	60-80	32 MIN.	25	-	-	-	7 GA.	0.344	0.438	0.562	0.688	0.875	1.125	1.375
	65	65-85	35 MIN.	23	-	-	-	7 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
	70	70-90	38 MIN.	21	-	-	-	7 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
A-516	55	55-70	30 MIN.	27	-	-	-	7 GA.	0.344	0.469	0.562	0.688	0.938	1.125	1.375
	60	60-80	32 MIN.	25	-	-	-	7 GA.	0.344	0.438	0.562	0.688	0.875	1.125	1.375
	65	65-85	35 MIN.	23	-	-	-	7 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
	70	70-90	38 MIN.	21	-	-	-	7 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
A-517	-	115-135	100 MIN.	16	-	-	-	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125
A-537	1	70-90	50 MIN.	22	-	-	-	5 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
	2	80-100	60 MIN.	22	-	-	-	7 GA.	0.281	0.406	0.500	0.625	0.812	1.000	1.125
	3	80-100	55 MIN.	22	-	-	-	7 GA.	0.281	0.406	0.500	0.625	0.812	1.000	1.125
A-572	42	60 MIN.	42 MIN.	24	-	-	-	5 GA.	0.344	0.469	0.562	0.688	0.938	1.125	1.375
	50	65 MIN.	50 MIN.	21	-	-	-	5 GA.	0.344	0.438	0.562	0.688	0.875	1.125	1.375
	60	75 MIN.	60 MIN.	18	-	-	-	5 GA.	0.312	0.406	0.500	0.625	0.812	1.000	1.250
	65	80 MIN.	65 MIN.	17	-	-	-	7 GA.	0.312	0.406	0.500	0.625	0.812	1.000	1.250
A-588	ALL	70 MIN.	50 MIN.	21	-	-	-	5 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
A-606	H.R.	70 MIN.	50 MIN.	22	13 GA.	11 GA.	8 GA.	5 GA.	0.312	0.438	0.500	-	-	-	-
	C.R.	65 MIN.	45 MIN.	22	13 GA.	11 GA.	8 GA.	5 GA.	0.250	-	-	-	-	-	-
A-612	TO .500	83-105	50 MIN.	22	-	-	-	7 GA.	0.281	0.375	0.500	-	-	-	-
	OVER .500	81-101	50 MIN.	22	-	-	-	-	-	-	-	0.562	0.750	1.000	1.125
A-619	-	N.S.	N.S.	N.S.	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
A-621	-	N.S.	N.S.	N.S.	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	-	-	-	-	-
A-633	A	63-83	42 MIN.	23	-	-	-	5 GA.	0.312	0.438	0.562	0.625	0.875	1.125	1.250
	C	70-90	50 MIN.	23	-	-	-	7 GA.	0.312	0.438	0.500	0.625	0.812	1.000	1.250
	D	70-90	50 MIN.	23	-	-	-	7 GA.	0.312	0.438	0.500	0.625	0.812	1.000	1.250
	E	80-100	60 MIN.	23	-	-	-	7 GA.	0.281	0.406	0.500	0.562	0.812	1.000	1.125
A-635	-	N.S.	N.S.	N.S.	-	-	7 GA.	0.250	0.375	0.500	-	-	-	-	-
A-656	50	60 MIN.	50 MIN.	23	-	-	-	5 GA.	0.344	0.469	0.562	0.688	0.938	1.125	1.375
	60	70 MIN.	60 MIN.	20	-	-	-	5 GA.	0.312	0.438	0.500	0.625	0.875	1.000	1.250
	70	80 MIN.	70 MIN.	17	-	-	-	7 GA.	0.312	0.406	0.500	0.625	0.812	1.000	1.250
	80	90 MIN.	80 MIN.	15	-	-	-	7 GA.	0.281	0.406	0.500	0.625	0.812	1.000	1.125

*Actual metal thickness may exceed nominal thickness listed in this chart. For sheet thickness normal gauge tolerances apply.
For 0.250" (6.35 mm) plate and heavier the thickness may vary by a maximum of 0.030" (0.76 mm) and still be within shear capacity.

MILD STEEL SHEAR CAPACITY (INCHES)					12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
ASTM STEELS		TENSILE STRENGTH K.S.I.	YIELD STRENGTH K.S.I.	MINIMUM ELONG. %-2 IN.	EQUIVALENT CAPACITY THICKNESS - NOMINAL (INCHES)*										
NO.	GRADE														
	CS Type A, B, & C	N.S.	20-40	30	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	DS Type A & B	N.S.	22-35	36	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	DDS	N.S.	17-29	38	14 GA.	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-
	EDDS	N.S.	15-25	40	14 GA.	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-
	SS: Grade 25	42 MIN.	25 MIN.	26	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	SS: Grade 30	45 MIN.	30 MIN.	24	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	SS: Gr 33 Ty 1 & 2	48 MIN.	33 MIN.	22	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	SS: Gr 40 Ty 1 & 2	52 MIN.	40 MIN.	20	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	SS: Grade 80	82 MIN.	80 MIN.	N.S.	14 GA.	12 GA.	9 GA.	7 GA.	0.250	-	-	-	-	-	-
	HSLAS: Grade 45 Class 1	60 MIN.	45 MIN.	22	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
A1008 COLD ROLLED SHEET	HSLAS: Grade 45 Class 2	55 MIN.	45 MIN.	22	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 50 Class 1	65 MIN.	50 MIN.	20	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 50 Class 2	60 MIN.	50 MIN.	20	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 55 Class 1	70 MIN.	55 MIN.	18	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 55 Class 2	65 MIN.	55 MIN.	18	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 60 Class 1	75 MIN.	60 MIN.	16	13 GA.	12 GA.	9 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 60 Class 2	70 MIN.	60 MIN.	16	13 GA.	12 GA.	9 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 65 Class 1	80 MIN.	65 MIN.	15	14 GA.	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 65 Class 2	75 MIN.	65 MIN.	15	14 GA.	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 70 Class 1	85 MIN.	70 MIN.	14	14 GA.	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 70 Class 2	80 MIN.	70 MIN.	14	14 GA.	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
	HSLAS-F: Grade 50	60 MIN.	50 MIN.	22	13 GA.	11 GA.	8 GA.	5 GA.	0.344	0.469	0.500	-	-	-	-
	HSLAS-F: Grade 60	70 MIN.	60 MIN.	18	13 GA.	11 GA.	8 GA.	5 GA.	0.312	0.438	0.500	-	-	-	-
	HSLAS-F: Grade 70	80 MIN.	70 MIN.	16	14 GA.	12 GA.	9 GA.	7 GA.	0.312	0.406	0.500	-	-	-	-
	HSLAS-F: Grade 80	90 MIN.	80 MIN.	14	14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	-	-	-	-
	CS Type A, B, & C	N.S.	30-50	25	12 GA.	10 GA.	7 GA.	-	-	-	-	-	-	-	-
	DS Type A & B	N.S.	30-45	28	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	-	-	-	-	-
	SS: Grade 30	49 MIN.	30 MIN.	25	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	SS: Grade 33	52 MIN.	33 MIN.	23	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	SS: Grade 36 Type 1	53 MIN.	36 MIN.	22	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	SS: Grade 36 Type 2	58-80	36-51	21	12 GA.	10 GA.	7 GA.	0.250	-	-	-	-	-	-	-
	SS: Grade 36 Type 2	58-80	>51	21	13 GA.	11 GA.	7 GA.	5 GA.	-	-	-	-	-	-	-
	SS: Grade 40	55 MIN.	40 MIN.	21	13 GA.	11 GA.	7 GA.	5 GA.	-	-	-	-	-	-	-
	SS: Grade 45	60 MIN.	45 MIN.	19	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	SS: Grade 50	65 MIN.	50 MIN.	17	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	SS: Grade 55	70 MIN.	55 MIN.	15	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
A1011 HOT ROLLED SHEET	HSLAS: Grade 45 Class 1	60 MIN.	45 MIN.	25	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 45 Class 2	55 MIN.	45 MIN.	25	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 50 Class 1	65 MIN.	50 MIN.	22	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 50 Class 2	60 MIN.	50 MIN.	22	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 55 Class 1	70 MIN.	55 MIN.	20	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 55 Class 2	65 MIN.	55 MIN.	20	13 GA.	11 GA.	8 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 60 Class 1	75 MIN.	60 MIN.	18	13 GA.	12 GA.	9 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 60 Class 2	70 MIN.	60 MIN.	18	13 GA.	12 GA.	9 GA.	5 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 65 Class 1	80 MIN.	65 MIN.	16	14 GA.	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 65 Class 2	75 MIN.	65 MIN.	16	14 GA.	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 70 Class 1	85 MIN.	70 MIN.	14	14 GA.	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
	HSLAS: Grade 70 Class 2	80 MIN.	70 MIN.	14	14 GA.	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
	HSLAS-F: Grade 50	60 MIN.	50 MIN.	24	13 GA.	11 GA.	8 GA.	5 GA.	0.344	0.469	0.500	-	-	-	-
	HSLAS-F: Grade 60	70 MIN.	60 MIN.	22	13 GA.	11 GA.	8 GA.	5 GA.	0.312	0.438	0.500	-	-	-	-
	HSLAS-F: Grade 70	80 MIN.	70 MIN.	20	14 GA.	12 GA.	9 GA.	7 GA.	0.312	0.406	0.500	-	-	-	-
	HSLAS-F: Grade 80	90 MIN.	80 MIN.	18	14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	-	-	-	-

*Actual metal thickness may exceed nominal thickness listed in this chart. For sheet thickness normal gauge tolerances apply.
For 0.250" (6.35 mm) plate and heavier the thickness may vary by a maximum of 0.030" (0.76 mm) and still be within shear capacity.

MILD STEEL SHEAR CAPACITY (INCHES)	12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
OTHER STEELS & ALLOYS	**EQUIVALENT CAPACITY THICKNESS - NOMINAL (INCHES)***										
SOFT MILD STEEL (SEE NOTE #1)	14 GA.	12 GA.	10 GA.	7 GA.	0.250	0.375	0.438	0.500	0.750	0.875	1.125
LOW CARBON (.10 - .20 CARBON) HR & CR SHEET	12 GA.	10 GA.	7 GA.	-	-	-	-	-	-	-	-
LOW CARBON PLATE (.10- .20 CARBON)	-	-	7 GA.	0.250	0.375	0.500	0.625	0.750			
LOW CARBON PLATE (.15 - .25 CARBON)	-	-	-	-	-	-	-	-	1.000	1.250	1.500
ANNEALED .40 -.50 CARBON SHEET & PLATE - HOT ROLLED	14GA.	12 GA.	9 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125
A.I.S.I. 4130 H.R. SHEET - ANNEALED	14 GA	12 GA.	9 GA.	7 GA.	-	-	-	-	-	-	-
A.I.S.I. 4140 H.R. PLATE - ANNEALED	-	-	-	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125
A.I.S.I. 6150 H.R. PLATE - ANNEALED	-	-	-	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125
A.I.S.I. 8620 H.R. PLATE - ANNEALED	-	-	-	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125
FLOOR PLATE (THICKNESS INCLUDES LUG HEIGHT)	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
ABRASION RESISTING PLATE (250 BHN MAX)	14GA.	12 GA.	11 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125
ABRASION RESISTING PLATE (320-360 BHN MAX)	CONSULT FACTORY										
ABRASION RESISTING PLATE (HARDER THAN 360 BHN)	NOT RECOMMENDED										
STAINLESS STEELS (SEE NOTE #2)											
ANNEALED STAINLESS STEEL SHEET & PLATE, TYPES 302, 304, 304L, 309, 316, 316L, 410, AND 430	16 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	0.563	0.750	1.000	1.125
QUARTER HARD STAINLESS STEEL	CONSULT FACTORY										
PRECIPITATION HARDENING STAINLESS STEEL TYPES PH 13-8 MO, PH 14-8 MO, PH 15-7 MO, 15-5 PH, 17-4 PH, & 17-7 PH	CONSULT FACTORY										
ALUMINUM ALLOYS (SEE NOTE #3)											
MOST ALUMINUM ALLOYS INCLUDING 1100-0, 1100-H14, 1100-H16, 2024-0, 3003-H14, 5005-H34, 5052-0, 5052-H32, 5052-H34, 5086-H32, 6061-0, 6061-T6	8 GA.	5 GA.	0.281	0.375	0.562	0.750	1.000	1.125	1.500	1.750	2.250
HIGH STRENGTH ALUMINUM ALLOYS INCLUDING 2014-T6, 2024-T3, 2024-T4, 2219-T62, 7050-T7, 7075-T6, 7475-T6, & 7475-T7	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500

COPPER, BRONZE & BRASS ALLOYS (SEE NOTE #4)

ALLOY	UNS NUMBER	CONDITION	12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
COMMERCIAL COPPER	C10100 THRU C10800	M20	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
COMMERCIAL COPPER	C10100 THRU C10800	H02	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
COMMERCIAL BRONZE	C22000	M20	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
COMMERCIAL BRONZE	C22000	H02	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
COMMERCIAL BRASS	C26000	H02	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
YELLOW BRASS	C26800 & C27000	H02	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
LEADED BRASS	C33500 THRU C35600	H02	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
NAVAL BRASS	C46400 THRU C46700	M20	14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.188
NAVAL BRASS	C46400 THRU C46700	H02	12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
ALUMINUM BRONZE	C61400	M20	13 GA.	12 GA.	10 GA.	5 GA.	0.312	0.438	0.563	0.688	0.875	1.063	1.312
ALUMINUM BRONZE	C61400	H02	13 GA.	12 GA.	10 GA.	5 GA.	0.312	0.438	0.563	0.688	0.875	1.063	1.312

NICKEL ALLOYS & SUPERALLOYS (SEE NOTE #4)

ALLOY	UNS NUMBER	CONDITION	12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
COMMERCIAL NICKEL[2]	N02200	ANNEALED	14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.188
HASTALLOY C-276[2]	N10276	SOL. TR.	14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.188
HASTALLOY X[2]	N06002	SOL. TR.	13 GA.	12 GA.	8 GA.	5 GA.	0.312	0.438	0.563	0.688	0.875	1.063	1.312
INCOLOY 800[2]	N08800	ANNEALED	13 GA.	12 GA.	8 GA.	5 GA.	0.312	0.438	0.563	0.688	0.875	1.063	1.312
INCONEL 601[2]	N06601	SOL TR.	13 GA.	12 GA.	8 GA.	5 GA.	0.312	0.438	0.563	0.688	0.875	1.063	1.312
INCONEL 718[2]	N07718	SOL. TR. & AGED	14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.188
MONEL 400[2]	N04400	ANNEALED	14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.188

TITANIUM ALLOYS

ALLOY	ASTM NO.		12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
COMMERCIAL TITANIUM	B265 GR 2		12 GA.	10 GA.	7 GA.	0.250	0.375	0.500	0.625	0.750	1.000	1.250	1.500
TI-5AL 2.5SN	B265 GR 6		14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125
TI-6AL 4V	B265 GR 5		14 GA.	12 GA.	10 GA.	7 GA.	0.281	0.375	0.500	0.625	0.750	1.000	1.125

* Actual metal thickness may exceed nominal thickness listed in this chart. For sheet thickness normal gauge tolerances apply. For 0.250" (6.35 mm) plate and heavier the thickness may vary by a maximum of 0.030"" (0.76 mm) and still be within shear capacity.

** The Manufacturer's Standard Gauge Table is used whenever a metal thickness is annotated with a gauge number.

1. Soft mild steel is any steel lower in strength and/or higher in ductility than mild steel. For this purpose mild steel is defined as follows: Ultimate Tensile Strength - 55,000 to 70,000 psi. Yield Strength - 35,000 to 50,000 psi. Elongation (% in 2 inches) - 20 to 35%

   Due to the increased penetration when shearing soft mild steel, the thickness the shear is able to cut will be slightly less than the mild steel capacity of the shear. See Other Steels and Alloys on the Shear Capacity Chart for the equivalent thickness of the soft mild steel. (Also see Shear Rating write up on page 3.)
2. Shear with the rake angle set at maximum. (See page 4 - Selecting the Proper Rake)
3. Material thickness greater than mild steel capacity of a shear - i.e. 0.750" (19 mm) aluminum on a 0.500" (13 mm) shear - may require additional clearance under the holddowns and at the low end of the upper knife. The addition of protective cups on the holddowns can further reduce the thickness of the material that can be sheared.
4. Accurate only for the material conditions indicated.

In Jan of 2000 new ASTM Specifications A1008 & A1011 replaced several old ASTM Specifications. The chart shown here is a cross reference between the old and the new specifications.

ASTM SPEC. NO.	ASTM SPEC. GRADE	PREVIOUS SPEC.
A1008 COLD ROLLED SHEET	CS Type A	
	CS Type B	A-366
	CS Type C	
	DS Type A	
	DS Type B	A-620
	DDS	A-963
	EDDS	A-969
	SS: Grade 25	A-611 GR A
	SS: Grade 30	A-611 GR B
	SS: Grade 33 Type 1	A-611 GR C Type 1
	SS: Grade 33 Type 2	A-611 GR C Type 2
	SS: Grade 40 Type 1	A-611 GR D Type 1
	SS: Grade 40 Type 2	A-611 GR D Type 2
	SS: Grade 80	A-611 GR E
	HSLAS: Grade 45 Class 1	A-607 GR 45 Class 1
	HSLAS: Grade 45 Class 2	A-607 GR 45 Class 2
	HSLAS: Grade 50 Class 1	A-607 GR 50 Class 1
	HSLAS: Grade 50 Class 2	A-607 GR 50 Class 2
	HSLAS: Grade 55 Class 1	A-607 GR 55 Class 1
	HSLAS: Grade 55 Class 2	A-607 GR 55 Class 2
	HSLAS: Grade 60 Class 1	A-607 GR 60 Class 1
	HSLAS: Grade 60 Class 2	A-607 GR 60 Class 2
	HSLAS: Grade 65 Class 1	A-607 GR 65 Class 1
	HSLAS: Grade 65 Class 2	A-607 GR 65 Class 2
	HSLAS: Grade 70 Class 1	A-607 GR 70 Class 1
	HSLAS: Grade 70 Class 2	A-607 GR 70 Class 2
	HSLAS-F: Grade 50	A-715 GR 50
	HSLAS-F: Grade 60	A-715 GR 60
	HSLAS-F: Grade 70	A-715 GR 70
	HSLAS-F: Grade 80	A-715 GR 80
A1011 HOT ROLLED SHEET	CS Type A	
	CS Type B	A-569
	CS Type C	
	DS Type A	
	DS Type B	A-622
	SS: Grade 30	A-570 GR 30
	SS: Grade 33	A-570 GR 33
	SS: Grade 36 Type 1	A-570 GR 36
	SS: Grade 36 Type 2	
	SS: Grade 40	A-570 GR 40
	SS: Grade 45	A-570 GR 45
	SS: Grade 50	A-570 GR 50
	SS: Grade 55	A-570 GR 55
	HSLAS: Grade 45 Class 1	A-607 GR 45 Class 1
	HSLAS: Grade 45 Class 2	A-607 GR 45 Class 2
	HSLAS: Grade 50 Class 1	A-607 GR 50 Class 1
	HSLAS: Grade 50 Class 2	A-607 GR 50 Class 2
	HSLAS: Grade 55 Class 1	A-607 GR 55 Class 1
	HSLAS: Grade 55 Class 2	A-607 GR 55 Class 2
	HSLAS: Grade 60 Class 1	A-607 GR 60 Class 1
	HSLAS: Grade 60 Class 2	A-607 GR 60 Class 2
	HSLAS: Grade 65 Class 1	A-607 GR 65 Class 1
	HSLAS: Grade 65 Class 2	A-607 GR 65 Class 2
	HSLAS: Grade 70 Class 1	A-607 GR 70 Class 1
	HSLAS: Grade 70 Class 2	A-607 GR 70 Class 2
	HSLAS-F: Grade 50	A-715 GR 50
	HSLAS-F: Grade 60	A-715 GR 60
	HSLAS-F: Grade 70	A-715 GR 70
	HSLAS-F: Grade 80	A-715 GR 80

CS = COMMERCIAL STEEL
DS = DRAWING STEEL
DDS = DEEP DRAWING STEEL
EDDS = EXTRA DEEP DRAWING STEEL
SS = STRUCTURAL STEEL
HSLAS = HIGH-STRENGTH LOW-ALLOY STEEL
HSLAS-F = HIGH-STRENGTH LOW-ALLOY STEEL WITH IMPROVED FORMABILITY

ASTM SPEC			PRODUCER AND PRODUCT NAME					
NO.	GRADE	TYPE	ACME STEEL CO.	ALGOMA STEEL INC.	AK STEEL CORP.	BETHLEHEM STEEL CORP.	ISPAT INLAND STEEL CORP.	LTV STEEL CORP.
A242		STRUCTUAL	COR-TEN A & B			MAYARI R		
A514		QUENCH & TEMPER		ALGOMA 100		T-1 "T-1A, T-1B" N-A-XTRA		
A517		QUENCH & TEMPER				T-1 "T-1A, T-1B" N-A-XTRA		
A572	42 50 60 65	STRUCTUAL	A42Y0 A50Y0 A60YK A65YK	ALGOMA'S A572-42 ALGOMA'S A572-50 ALGOMA'S A572-60		A-572-42 A-572-50 A-572-60 A-572-65		LTV 42 XK M LTV 50 XK LTV 60 XK LTV 65 XF M
A588		STRUCTUAL	COR-TEN B	ALGOMA'S A588 GR A ALGOMA'S A588 GR B				
A606	SHEET	SHEET	COR-TEN A	ALGOMA'S A606 TYPE4		MAYARI R B45WK		
A633	A C D E	STRUCTUAL		ALGOMA'S A633 GR A ALGOMA'S A633 GR C ALGOMA'S A633 GR D		RQC-60(N)		
A656	50 60 70 80	PLATE		ALGOMA'S A656 GR50 ALGOMA'S A656 GR60		BETHSTAR 50 BETHSTAR 60 BETHSTAR 70 BETHSTAR 80		A656 Gr 50 A656 Gr 60 A656 Gr 70 A656 Gr 80
A1008	HSLAS: Grade 45 Class 1 HSLAS: Grade 45 Class 2	COLD ROLLED SHEET	A45Y0 A45YK	Cb/V 45	FORMABLE 45	B45X0 B45XK	INX-45	LTV 45 XK
	HSLAS: Grade 50 Class 1 HSLAS: Grade 50 Class 2		A50Y0 A50YK	Cb/V 50	FORMABLE 50	B50X0 B50XK	INX-50 HI-FORM 50	LTV 50XK
	HSLAS: Grade 55 Class 1 HSLAS: Grade 55 Class 2		A55Y0 A55YK	Cb/V 55	FORMABLE 55	B55XK	INX-55	
	HSLAS: Grade 60 Class 1 HSLAS: Grade 60 Class 2		A60Y0 A60YK	Cb/V 60	FORMABLE 65	B60XK	INX-60 HI-FORM 60	LTV 60XK
	HSLAS: Grade 65 Class 1 HSLAS: Grade 65 Class 2		A65YK	Cb/V 65				
	HSLAS: Grade 70 Class 1 HSLAS: Grade 70 Class 2		A70YK			B70XK	HI-FORM 70	
	HSLAS-F: Grade 50		A50XF	ALGOFORM 50B ALGOFORM 50F	FORMABLE 50	B50XF	HI-FORM 50	LTV 50 XF
	HSLAS-F: Grade 60		A60XF	ALGOFORM 60B ALGOFORM 60F	FORMABLE 60	B60XF	HI-FORM 60	LTV 60 XF
	HSLAS-F: Grade 70		A70XF			B70XF	HI-FORM 70	LTV 70 XF
	HSLAS-F: Grade 80		A80XF			B80XF		LTV 80 XF
A1011	HSLAS: Grade 45 Class 1 HSLAS: Grade 45 Class 2	HOT ROLLED SHEET	A45Y0 A45YK	Cb/V 45	FORMABLE 45	B45X0 B45XK	INX-45	LTV 45XK
	HSLAS: Grade 50 Class 1 HSLAS: Grade 50 Class 2		A50Y0 A50YK	Cb/V 50	FORMABLE 50	B50X0 B50XK	INX-50 HI-FORM 50	LTV 50XK
	HSLAS: Grade 55 Class 1 HSLAS: Grade 55 Class 2		A55Y0 A55YK	Cb/V 55	FORMABLE 55	B55XK	INX-55	LTV 55XK
	HSLAS: Grade 60 Class 1 HSLAS: Grade 60 Class 2		A60Y0 A60YK	Cb/V 60	FORMABLE 65	B60XK	INX-60 HI-FORM 60	LTV 60XK
	HSLAS: Grade 65 Class 1 HSLAS: Grade 65 Class 2		A65YK	Cb/V 65				
	HSLAS: Grade 70 Class 1 HSLAS: Grade 70 Class 2		A70YK			B70XK	HI-FORM 70	
	HSLAS-F: Grade 50		A50XF	ALGOFORM 50B ALGOFORM 50F	FORMABLE 50	B50XF	HI-FORM 50	LTV 50 XF
	HSLAS-F: Grade 60		A60XF	ALGOFORM 60B ALGOFORM 60F	FORMABLE 60	B60XF	HI-FORM 60	LTV 60 XF
	HSLAS-F: Grade 70		A70XF			B70XF	HI-FORM 70	LTV070 XF
	HSLAS-F: Grade 80		A80XF			B80XF		LTV 80 XF

ASTM SPEC			PRODUCER AND PRODUCT NAME				
NO.	GRADE	TYPE	NATIONAL STEEL CORP.	OREGAN STEEL IMILLS	ROUGE STEEL CO.	USX STEEL	WHEELING-PITT. STEEL CORP.
A242		STRUCTUAL	NAX-HIGH TENSILE	OREGON'S A242		COR-TEN A	
A514		QUENCH & TEMPER		OREGON'S A514 B, E, F, & H		T-1 T-1A T-1B	
A517		QUENCH & TEMPER		OREGON'S A517 B, E, F, & H		T-1 T-1A T-1B	
A572	42 50 60 65	STRUCTUAL	GLX-42W GLX-50W GLX-60W GLX-65W		A572-42 A572-50 A572-60 A572-65	EX-TEN 42 EX-TEN 50 EX-TEN 60 EX-TEN 65	PITT-TEN X-42W PITT-TEN X-50W
A588		STRUCTUAL	NAX WEATHERING	OREGON'S A588 A, B		COR-TEN B	
A606	SHEET	SHEET	NAX-HIGH TENSILE NAX WEATHERING			COR-TEN A	
A633	A C D E	STRUCTUAL		OREGON'S A633 A OREGON'S A633 B OREGON'S A633 C OREGON'S A633 D		USS 42N USS 50N USS 60N	
A656	50 60 70 80	PLATE	NAX-50 NAX-60 NAX-70 NAX-80	OREGON'S A656 50 OREGON'S A656 60 OREGON'S A656 70 OREGON'S A656 80		A656-50 A656-60 A656-70 A656-80	
A1008	HSLAS: Grade 45 Class 1	COLD ROLLED SHEET	GLX-45W		RSC HR45XK55	HR45XK60	PITT-TEN X-45K
	HSLAS: Grade 45 Class 2		NAPAC-45		RSC HR45YK60	EX-TEN 45	PITT-TEN X-450
	HSLAS: Grade 50 Class 1		GLX-50W		RSC HR50XK60	HR50XK65	PITT-TEN X-50K
	HSLAS: Grade 50 Class 2		NAPAC-50		RSC HR50YK65	EX-TEN 50	PITT-TEN X-500
	HSLAS: Grade 55 Class 1		GLX-55W		RSC HR55XK65	HR55XK65	PITT-TEN X-55K
	HSLAS: Grade 55 Class 2		NAPAC-55		RSC HR55YK70	EX-TEN 55	PITT-TEN X-550
	HSLAS: Grade 60 Class 1		GLX-60W		RSC HR60XK70	HR50XK75	PITT-TEN X-60K
	HSLAS: Grade 60 Class 2		NAPAC-60		RSC HR60YK75	EX-TEN 60	PITT-TEN X-600
	HSLAS: Grade 65 Class 1 HSLAS: Grade 65 Class 2		GLX-65W NAPAC-665		RSC HR65XK75 RSC HR65YK80	HR65XK80	
	HSLAS: Grade 70 Class 1 HSLAS: Grade 70 Class 2		NAPAC-70		RSC HR70XK80 RSC HR70YK85	HR70XK80	
	HSLAS-F: Grade 50		NAX-50		RSC HR50XF60 RSC HR50YF65	HR50XF60	PITT-TEN X-50F
			NAPAC-F-50		RSC CR50XF60 RSC CR50YF65	EX-TEN F50	
	HSLAS-F: Grade 60		NAX-60 NAPAC-F-60		RSC HR60XF70 RSC HR60YF75	HR60XF70 EX-TEN F60	PITT-TEN X-60F
	HSLAS-F: Grade 70		NAX-70 NAPAC-F-70		RSC HR70XF80 RSC HR70XF85	HR70XF80 EX-TEN F70	PITT-TEN X-70F
	HSLAS-F: Grade 80		NAX-80 NAPAC-F-80		RSC HR80XF90	HR80XF90 EX-TEN F80	PITT-TEN X-80F
A1011	HSLAS: Grade 45 Class 1	HOT ROLLED SHEET	GLX-45W		RSC HR45XK55	HR45XK60	PITT-TEN X-45K
	HSLAS: Grade 45 Class 2		NAPAC-45		RSC HR45YK60	EX-TEN 45	PITT-TEN X-450
	HSLAS: Grade 50 Class 1		GLX-50W		RSC HR50XK60	HR50XK65	PITT-TEN X-50K
	HSLAS: Grade 50 Class 2		NAPAC-50		RSC HR50YK65	EX-TEN 50	PITT-TEN X-500
	HSLAS: Grade 55 Class 1		GLX-55W		RSC HR55XK65	HR55XK65	PITT-TEN X-55K
	HSLAS: Grade 55 Class 2		NAPAC-55		RSC HR55YK70	EX-TEN 55	PITT-TEN X-550
	HSLAS: Grade 60 Class 1		GLX-60W		RSC HR60XK70	HR50XK75	PITT-TEN X-60K
	HSLAS: Grade 60 Class 2		NAPAC-60		RSC HR60YK75	EX-TEN 60	PITT-TEN X-600
	HSLAS: Grade 65 Class 1 HSLAS: Grade 65 Class 2		GLX-65W NAPAC-65		RSC HR65XK75 RSC HR65YK80	HR65XK80	
	HSLAS: Grade 70 Class 1 HSLAS: Grade 70 Class 2		NAPAC-70		RSC HR70XK80 RSC HR70YK85	HR70XK80	
	HSLAS-F: Grade 50		NAX-50		RSC HR50XF60 RSC HR50YF65	HR50XF60	PITT-TEN X-50F
			NAPAC-F-50		RSC CR50XF60 RSC CR50YF65	EX-TEN F50	
	HSLAS-F: Grade 60		NAX-60 NAPAC-F-60		RSC HR60XF70 RSC HR60YF75	HR60XF70 EX-TEN F60	PITT-TEN X-60F
	HSLAS-F: Grade 70		NAX-70 NAPAC-F-70		RSC HR70XF80 RSC HR70XF85	HR70XF80 EX-TEN F70	PITT-TEN X-70F
	HSLAS-F: Grade 80		NAX-80 NAPAC-F-80		RSC HR80XF90	HR80XF90 EX-TEN F80	PITT-TEN X-80F

ASTM STEELS		MATERIAL THICKNESS (INCHES)																
NO.	GRADE	12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.312	0.375	0.438	0.500	0.562	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500
A-36	-	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	E	E
A-131	A to DS	-	-	A	A	B	B	C	C	C	C	C	D	D	D	D	D	E
	AH32 to EH32	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	E	X
	AH36 to EH36	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
	AH40 to EH40	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
A-242	-	-	-	A	B	B	C	C	C	C	C	D	D	D	D	E	X	X
A-283	A	-	-	A	A	A	B	B	C	C	C	C	C	D	D	D	D	D
	B	-	-	A	A	A	B	B	C	C	C	C	C	D	D	D	D	D
	C	-	-	A	A	B	B	C	C	C	C	C	D	D	D	D	D	D
	D	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	D	E
A-285	A	-	-	A	A	B	B	C	C	C	C	C	D	D	D	D	D	D
	B	-	-	A	A	B	B	C	C	C	C	C	D	D	D	D	D	E
	C	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	E	E
A-299	-	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
A-514	-	-	-	B	C	C	C	D	D	D	D	D	E	E	E	X	X	X
A-515	60	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	E	X
	65	-	-	A	B	B	C	C	C	C	C	D	D	D	D	E	X	X
	70	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
A-516	55	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	E	X
	60	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	E	X
	65	-	-	A	B	B	C	C	C	C	C	D	D	D	D	E	X	X
	70	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
A-517	-	-	-	B	C	C	C	D	D	D	D	D	E	E	E	X	X	X
A-537	1	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
	2	-	-	A	B	C	C	C	C	D	D	D	D	D	E	X	X	X
	3	-	-	A	B	C	C	C	C	D	D	D	D	D	E	X	X	X
A-572	42	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	E	X
	50	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	E	X
	60	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
	65	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
A-588	-	-	-	A	B	B	C	C	C	C	C	D	D	D	D	E	X	X
A-606	H.R.	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	C.R.	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
A-612	-	-	-	A	B	C	C	C	C	D	D	D	D	E	E	X	X	X
A-619	-	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
A-621	-	A	A	A	A	B	B	B	C	-	-	-	-	-	-	-	-	-
A-633	A	-	-	A	B	B	C	C	C	C	C	D	D	D	D	E	X	X
	C	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
	D	-	-	A	B	C	C	C	C	C	D	D	D	D	E	E	X	X
	E	-	-	A	B	C	C	C	C	D	D	D	D	D	E	X	X	X
A-635	-	-	-	A	A	B	B	C	C	-	-	-	-	-	-	-	-	-
A-656	50	-	-	A	A	B	C	C	C	C	C	D	D	D	D	D	E	X
	60	-	-	A	B	B	C	C	C	C	C	D	D	D	D	E	X	X
	70	-	-	A	B	C	C	C	C	D	D	D	D	D	E	E	X	X
	80	-	-	A	B	C	C	C	C	D	D	D	D	D	E	X	X	X
A1008 COLD ROLLED SHEET	CS Type A, B, & C	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	DS Type A & B	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	DDS	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	EDDS	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	SS: Gr 25 thru Gr 40	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	SS: Grade 80	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 45 Cl 1 & 2	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 50 Cl 1& 2	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 55 Cl 1 & 2	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 60 Cl 1 & 2	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 65 Cl 1 & 2	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 70 Cl 1 & 2	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS-F: Grade 50	A	A	A	A	B	C	C	C	-	-	-	-	-	-	-	-	-
	HSLAS-F: Grade 60	A	A	A	B	B	C	C	C	-	-	-	-	-	-	-	-	-
	HSLAS-F: Grade 70	A	A	A	B	C	C	C	C	-	-	-	-	-	-	-	-	-
	HSLAS-F: Grade 80	A	A	A	B	C	C	C	C	-	-	-	-	-	-	-	-	-
A1011 HOT ROLLED SHEET	CS Type A, B, & C	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	DS Type A & B	A	A	A	A	B	B	B	C	-	-	-	-	-	-	-	-	-
	SS: Grade 30	A	A	A	A	A	B	C	C	-	-	-	-	-	-	-	-	-
	SS: Grade 33	A	A	A	A	B	B	C	C	-	-	-	-	-	-	-	-	-
	SS: Gr 36 Type 1 & 2	A	A	A	A	B	B	C	C	-	-	-	-	-	-	-	-	-
	SS: Grade 40	A	A	A	A	B	B	C	C	-	-	-	-	-	-	-	-	-
	SS: Grade 45	A	A	A	A	B	C	C	C	-	-	-	-	-	-	-	-	-
	SS: Grade 50	A	A	A	A	B	C	C	C	-	-	-	-	-	-	-	-	-
	SS: Grade 55	A	A	A	B	B	C	C	C	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 45 Cl 1 & 2	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 50 Cl 1 & 2	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 55 Cl 1 & 2	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 60 Cl 1 & 2	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 65 Cl 1 & 2	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS: Gr 70 Cl 1 & 2	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	HSLAS-F: Grade 50	A	A	A	A	B	C	C	C	-	-	-	-	-	-	-	-	-
	HSLAS-F: Grade 60	A	A	A	B	B	C	C	C	-	-	-	-	-	-	-	-	-
	HSLAS-F: Grade 70	A	A	A	B	C	C	C	C	-	-	-	-	-	-	-	-	-
	HSLAS-F: Grade 80	A	A	A	B	C	C	C	C	-	-	-	-	-	-	-	-	-

KNIFE SELECTION CHART

MILD STEEL SHEAR CAPACITY (INCHES)	12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.312	0.375	0.438	0.500	0.562	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500
OTHER STEELS & ALLOYS	**EQUIVALENT CAPACITY THICKNESS - NOMINAL (INCHES)**																
SOFT MILD STEEL	A	A	A	A	A	B	B	C	C	C	C	D	D	D	D	D	D
LOW CARBON (.20 CARBON MAX.) H.R. & C.R. SHEET	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
LOW CARBON PLATE (.10-.20 CARBON)	-	-	A	A	A	B	B	C	C	C	C	D	D	D	D	D	D
LOW CARBON PLATE (.15-.25 CARBON)	-	-	-	-	-	-	-	-	-	-	-	-	D	D	D	D	D
ANNEALED .40-.50 CARBON SHEET & PLATE - HOT ROLLED	A	A	A	B	C	C	C	C	D	D	D	D	D	E	X	X	X
A.I.S.I. 4130 H.R. SHEET & PLATE - ANNEALED	A	A	A	B	-	-	-	-	-	-	-	-	-	-	-	-	-
A.I.S.I. 4140 H.R. PLATE - ANNEALED	-	-	A	B	C	C	C	C	D	D	D	D	E	E	X	X	X
A.I.S.I. 6150 H.R. PLATE - ANNEALED	-	-	A	B	C	C	C	C	D	D	D	D	E	E	X	X	X
A.I.S.I. 8620 H.R. PLATE - ANNEALED	-	-	A	B	C	C	C	C	C	D	D	D	D	E	X	X	X
FLOOR PLATE (THICKNESS INCLUDES LUG HEIGHT)	A	A	A	B	C	C	C	C	C	C	D	D	D	D	D	E	E
ABRASION RESISTING PLATE (250 BHN MAX)	-	-	B	C	C	C	D	D	D	D	D	E	E	E	X	X	X
ABRASION RESISTING PLATE (320-360 BHN MAX)	CONSULT FACTORY																
ABRASION RESISTING PLATE (HARDER THAN 360 BHN)	NOT RECOMMENDED																
STAINLESS STEELS (SEE NOTE #1)																	
ANNEALED STAINLESS STEEL SHEET & PLATE, TYPES 302, 304, 304L, 309, 316, 316L, 410, AND 430	A	A	B	C	C	C	C	D	D	D	E	E	E	E	X	X	X
QUARTER HARD STAINLESS STEEL	CONSULT FACTORY																
PRECIPITATION HARDENING STAINLESS STEEL TYPES PH 13-8 MO, PH 14-8 MO, PH 15-7 MO, 15-5 PH, 17-4 PH, & 17-7 PH	CONSULT FACTORY																
ALUMINUM ALLOYS																	
MOST ALUUMINUM ALLOYS INCLUDING 1100-0, 1100-H14, 1100-H16, 2024-0, 3003-H14, 5005-H34, 5052-0, 5052-H32, 5052-H34, 5086-H32, 6061-0, 6061-T6	A	A	A	A	A	A	A	A	A	A	A	A	B	B	C	C	C
HIGH STRENGTH ALUMINUM ALLOYS INCLUDING 2014-T6, 2024-T3, 2024-T4, 2219-T62, 7050-T7, 7075-T6, 7475-T6, & 7475-T7	A	A	A	A	A	B	B	C	C	C	C	D	D	D	D	D	D

COPPER, BRONZE & BRASS ALLOYS (SEE NOTE #2)

ALLOY	UNS NUMBER	CONDITION	12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.312	0.375	0.438	0.500	0.562	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500
COMMERCIAL COPPER	C10100 THRU C10800	M20	A	A	A	A	A	A	A	A	A	B	B	C	C	C	C	C	C
COMMERCIAL COPPER	C10100 THRU C10800	H02	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
COMMERCIAL BRONZE	C22000	M20	A	A	A	A	A	A	A	B	B	B	C	C	C	C	C	C	D
COMMERCIAL BRONZE	C22000	H02	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
COMMERCIAL BRASS	C26000	H02	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
YELLOW BRASS	C26800 & C27000	H02	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
LEADED BRASS	C33500 THRU C35600	H02	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
NAVAL BRASS	C46400 THRU C46700	M20	A	A	A	A	A	A	B	B	C	C	C	C	C	D	D	D	D
NAVAL BRASS	C46400 THRU C46700	H02	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
ALUMINUM BRONZE	C61400	M20	A	A	A	A	A	B	B	C	C	C	C	C	D	D	D	D	D
ALUMINUM BRONZE	C61400	H02	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-

NICKEL ALLOYS & SUPERALLOYS (SEE NOTE #2)

ALLOY	UNS NUMBER	CONDITION	12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.312	0.375	0.438	0.500	0.562	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500
COMMERCIAL NICKEL	N02200	ANNEALED	A	A	A	A	B	B	C	C	C	C	C	D	-	-	-	-	-
HASTALLOY C-276	N10276	SOL. TR.	A	A	B	C	C	C	C	D	D	D	D	D	-	-	-	-	-
HASTALLOY	XN06002	SOL. TR.	A	A	B	C	C	C	C	D	D	D	D	D	-	-	-	-	-
INCOLOY 800	N08800	ANNEALED	A	A	A	B	B	C	C	C	C	D	D	D	-	-	-	-	-
INCONEL 601	N06601	SOL TR.	A	A	A	B	C	C	C	C	D	D	D	D	-	-	-	-	-
INCONEL 718	N07718	SOL. TR. & AGED	A	B	C	C	C	D	D	D	D	E	E	E	-	-	-	-	-
MONEL 400	N04400	ANNEALED	A	A	A	A	B	C	C	C	C	C	D	D	-	-	-	-	-

TITANIUM ALLOYS

ALLOY	ASTM NO.		12 GA. (0.1046)	10 GA. (0.1345)	0.188	0.250	0.312	0.375	0.438	0.500	0.562	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500
COMMERCIAL TITANIUN	B265 GR 2		A	A	A	A	A	A	B	B	B	C	C	C	C	C	C	C	D
TI-5AL 2.5SN	B265 GR 6		A	A	B	C	C	C	C	D	D	D	D	E	E	E	E	E	E
TI-6AL 4V	B265 GR 5		A	A	B	C	C	C	D	D	D	D	D	E	E	E	E	E	E.

A (-) in the Knife Selection chart indicates the material is not available. An (X) indicates there is no standard CINCINNATI Shear for that material.

1. Shear with the rake angle set at the maximum (see page 4). If shearing stainless steel more than 50% of the time and some of it is thicker than 10 gauge (3 mm) then Type "S" knives are recommended."

2. Accurate only for the material conditions indicated

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