

## BENDING, ROLLING, FORMING, SHEARING AND PUNCHING BISPLATE®

### FORMING

#### COLD FORMING

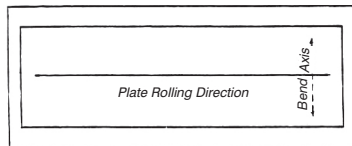
All of the BISPLATE® quenched and tempered steel grades can be cold formed, using brake press bending or plate rolling techniques.

However, with an increase in both hardness and yield stress compared to plain carbon steel grades, suitable consideration of sufficient machine power, plate bending direction and former radii must be made.

In addition, springback allowances should be greater than for plain carbon steel and will depend on the type of forming. Plate edges should be ground smooth, and for thick plates and high hardness grades, the plate edges should be rounded prior to forming.

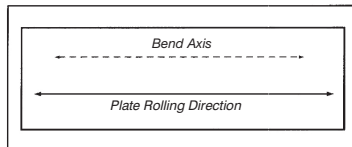
It is recommended for the high hardness grades that where possible the bend axis be at right angles to the plate rolling direction (transverse bending). For plate 16mm and above in BISPLATE® 500 grade, it is suggested bending be done in the transverse direction only (refer to figure 1a).

Figure 1a:



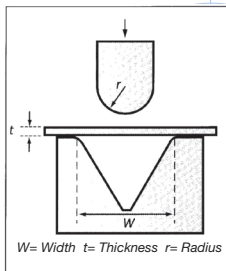
*Schematic of transverse bend direction.*

Figure 1b:



*Schematic of longitudinal bend direction.*

Figure 2:



*W= Width t= Thickness r= Radius*

*Schematic diagram of brake press bending.*

## MINIMUM FORMER RADII (R) IN MM FOR COLD FORMING

Table 1 following gives the minimum former radii for cold forming of the BISPLATE® grades (where possible a larger former radii should be used).

Table 1:

BISPLATE® GRADE	60		70		80		320, 400		450		500	
Bend Direction	T	L	T	L	T	L	T	L	T	L	T	L
Plate Thickness (t) (mm)												
5	12	12	12	12	12	12	15	20	-	-	-	-
6	12	15	12	15	15	15	20	25	25	30	-	-
8	12	16	12	16	20	20	25	35	32	40	40	70
10	15	20	15	20	25	25	30	45	40	50	50	90
12	18	24	18	24	30	30	35	55	48	60	60	110
16	24	32	24	32	45	45	50	75	64	80	85	-
20	40	50	40	50	65	65	70	100	80	100	100	-
25	50	62	50	62	75	75	80	125	100	130	150	-
32	64	80	80	95	100	110	110	175	130	160	250	-
40	100	120	110	130	125	140	170	250	160	200	-	-
50	140	190	150	200	150	200	300	-	200	250	-	-

T: Transverse Bending Direction (refer to figure 1a).

L: Longitudinal Bending Direction (refer to figure 1b).

Notes re: Table 1

- Above values were determined for plate at a temperature of 30°C. If minimum former radii values are to be used, plate temperature should be at least 30°C, maximum 100°C. If forming at a temperature less than 30°C, an increase in former radii of minimum 50% must be made.
- When pressing is being done in a single pass operation, an increase in former radii of minimum 50% must be made.
- When forming using these minimum former radii, flame cut hardened edge (heat affected zone of 1-2mm) should be removed.
- The use of smaller former radii than in the table is not recommended.
- For best cold forming results, ensure adequate lubrication between the plate, die and former.
- Die openings: refer to Table 3.

## CAPACITY OF PRESS

All BISPLATE® grades have yield and tensile strengths higher than for plain carbon steel.

It is important that the capacity of the machine is suitable, bending press manufacturers provide information on bending loads in relation to V-block opening, plate thickness and steel strength.

Table 2 gives an indication of the approximate bending force required when forming BISPLATE® grades, compared to plain carbon steel (e.g. AS3678-Grade 250).

Approximate Bending Force (P) Required for BISPLATE® Grades, Compared to Plain Carbon Steel, for a Given Forming Geometry (refer figure 2).

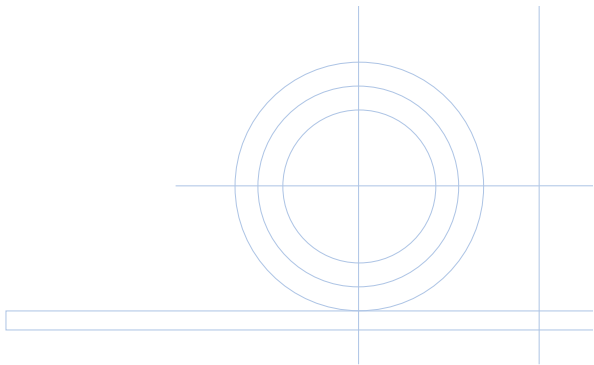


Table 2:

STEEL GRADE		BENDING FORCE (P)
AS3678 - Grade 250		P
BISPLATE®	60	2.0P
	70	2.4P
	80	2.8P
	320	4.0P
	400	5.0P
	450	5.2P
	500	6.4P

Approximate Die Openings  
(refer fig 2)

Table 3:

BISPLATE® GRADE	W/t TRANSVERSE BENDING	W/t LONGITUDINAL BENDING
60	6.0	7.5
70	6.0	7.5
80	7.0	8.5
320	8.5	10.0
400	8.5	10.0
450	10.0	12.0
500	10.0	12.0

## HOT FORMING

The operation of hot forming is not recommended for the BISPLATE® grades, as hot forming is generally done at a high temperature (900-1000°C) which exceeds the tempering temperature.

As a result, the mechanical properties of quenched and tempered steels will be reduced considerably.

However, if hot forming is unavoidable, it is essential that the component be requenched and tempered to restore original mechanical properties.

## SHEARING AND PUNCHING

Shearing and punching of the lower hardness BISPLATE® grades can be done successfully, provided a machine of sufficient power and stability is used.

BISPLATE® 60, 70 and 80 grades can normally be cold sheared up to 25mm thickness. However, the necessary shearing force is in the order of 2-3 times that required for plain carbon steel grades. The grades of BISPLATE® 400, 450 and 500 should not be considered for shearing.

The guillotine blades should be very sharp and set with a clearance of 0.25 to 0.40mm. Note, the maximum limiting thickness for cold punching are approximately half the cold shearing values.

## MAXIMUM THICKNESS FOR COLD SHEARING AND PUNCHING

Table 4:

BISPLATE® GRADE	COLD SHEARING	COLD PUNCHING
60	25mm	12mm
70	25mm	12mm
80	25mm	12mm
320	10mm	6mm
400	Not Recommended	Not Recommended
450	Not Recommended	Not Recommended
500	Not Recommended	Not Recommended

