

PROJECTION WELDING DATA
DESIGN AND WELDING DATA FOR PROJECTION WELDING LOW CARBON STEELS

| Thickness of Thinnest Outside Piece Inches | PROJECTION DESIGN | | ELECTRODE DIAMETERS (d=2 x Projection Diameter) | | Electrode Force Pounds | Weld Time (Cycles) 60 Cycles per Sec. | Hold Time (Cycles) Minimum | Welding Current Amperes (Approx.) | Diameter of Fused Zone | Minimum Shear Strength (Single Projection) Pounds Only (For Steels Having Strength of 100,000 psi and below) | Minimum Contacting Overlap L Inches |
|--|---------------------------------------|-------------------------------|--|------------------|------------------------|---------------------------------------|----------------------------|-----------------------------------|----------------------------|---|---|
| | Base Diameter of Projection Dp Inches | Height of Projection H Inches | Minimum d Inches | Minimum D Inches | | | | | | | |
| | | | | | | | | | | | |
| 0.010 | 0.055 | 0.015 | 0.125 | 1/2 | 50 | 3 | 3 | 2,800 | 0.112 | 150 | 1/8 |
| 0.012 | 0.055 | 0.015 | 0.125 | 1/2 | 80 | 3 | 3 | 3,100 | 0.112 | 200 | 1/8 |
| 0.014 | 0.055 | 0.015 | 0.125 | 1/2 | 100 | 3 | 3 | 3,400 | 0.112 | 250 | 1/8 |
| 0.016 | 0.067 | 0.017 | 0.187 | 1/2 | 115 | 4 | 4 | 3,600 | 0.112 | 285 | 5/32 |
| 0.021 | 0.067 | 0.017 | 0.187 | 1/2 | 150 | 6 | 6 | 4,000 | 0.140 | 380 | 5/32 |
| 0.025 | 0.081 | 0.020 | 0.187 | 1/2 | 200 | 6 | 8 | 4,500 | 0.140 | 525 | 3/16 |
| 0.031 | 0.094 | 0.022 | 0.187 | 1/2 | 300 | 8 | 8 | 5,100 | 0.169 | 740 | 7/32 |
| 0.034 | 0.094 | 0.022 | 0.187 | 1/2 | 350 | 10 | 10 | 5,400 | 0.169 | 900 | 7/32 |
| 0.044 | 0.119 | 0.028 | 0.250 | 5/8 | 480 | 13 | 14 | 6,500 | 0.169 | 1,080 | 9/32 |
| 0.050 | 0.119 | 0.028 | 0.250 | 5/8 | 580 | 16 | 16 | 7,100 | 0.225 | 1,500 | 9/32 |
| 0.062 | 0.156 | 0.035 | 0.312 | 7/8 | 750 | 21 | 20 | 8,400 | 0.225 | 2,100 | 3/8 |
| 0.070 | 0.156 | 0.035 | 0.312 | 7/8 | 900 | 24 | 24 | 9,200 | 0.281 | 2,550 | 3/8 |
| 0.078 | 0.187 | 0.041 | 0.375 | 7/8 | 1,050 | 26 | 30 | 10,500 | 0.281 | 2,950 | 7/16 |
| 0.094 | 0.218 | 0.048 | 0.500 | 7/8 | 1,300 | 32 | 30 | 11,800 | 0.281 | 3,700 | 1/2 |
| 0.109 | 0.250 | 0.054 | 0.500 | 7/8 | 1,650 | 38 | 36 | 13,300 | 0.338 | 4,500 | 5/8 |
| 0.125 | 0.281 | 0.060 | 0.500 | 7/8 | 1,800 | 45 | 40 | 15,000 | 0.338 | 5,200 | 11/16 |
| 0.140 | 0.312 | 0.066 | 0.625 | 1 | 2,300 | 60 | 45 | 15,700 | 0.437 | 6,000 | 3/4 |
| 0.156 | 0.343 | 0.072 | 0.625 | 1 | 2,800 | 80 | 50 | 17,250 | 0.500 | 7,500 | 13/16 |
| 0.171 | 0.375 | 0.078 | 0.750 | 1 | 3,300 | 105 | 50 | 18,600 | 0.562 | 8,500 | 7/8 |
| 0.187 | 0.406 | 0.085 | 0.750 | 1 | 3,800 | 125 | 50 | 20,000 | 0.562 | 10,000 | 15/16 |
| 0.203 | 0.437 | 0.091 | 0.875 | 1-1/4 | 4,500 | 145 | 55 | 21,500 | 0.625 | 12,000 | 1 |
| 0.250 | 0.531 | 0.110 | 1.000 | 1-1/4 | 6,600 | 230 | 60 | 26,000 | 0.687 | 15,000 | 1-1/4 |

NOTES:

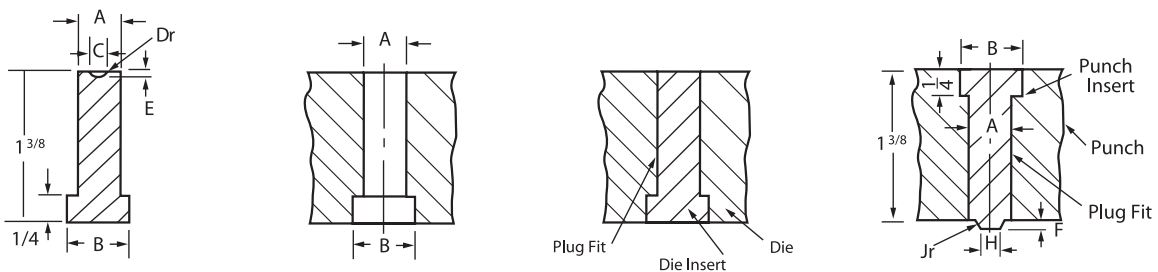
- Type of Steel—Low Carbon SAE 1010—0.15% Carbon Maximum.
- Material free of scale, oxide, paint, dirt, etc.
- Size of projection determined by thickness of thinnest piece and projection should be on thickest piece.
- Data is based on thickness of thinnest sheet for two thicknesses only. Maximum ratio between two thicknesses = 3 to 1.
- See TABLE BELOW for design of punch and die for making projections.
- Contacting overlap does not include any radii from forming.
- Projection should be located in center of overlap.
- Tolerance for Projection Dimensions:

| Dimension | Thickness Up to 0.050" | Thickness Over 0.050" |
|--------------------|------------------------|-----------------------|
| Diameter "D" | ±0.003" | ±0.007" |
| Height "H" | ±0.002" | ±0.005" |

- Electrode Material:
CMW®100 ELKONITE®TC-10 ELKONITE®10W3

From American Welding Society "Recommended Practices for Resistance Welding"

PUNCH AND DIE DESIGN FOR FORMING WELDING PROJECTIONS



| Mat Thickness | Pt. No. | A | B | ±.002 C | Dr | ±.001 E | ±.001 F | ±.001 H | Jr |
|---------------|---------|-----|------|---------|------|---------|---------|---------|------|
| 0.010-0.015 | 1 | 3/8 | 9/16 | .055 | .033 | .015 | .015 | .035 | .005 |
| 0.016-0.021 | 2 | 3/8 | 9/16 | .067 | .042 | .017 | .020 | .039 | .005 |
| .025 | 3 | 3/8 | 9/16 | .081 | .050 | .020 | .025 | .044 | .005 |
| .031 | 4 | 3/8 | 9/16 | .094 | .062 | .022 | .030 | .050 | .005 |
| .034 | 5 | 3/8 | 9/16 | .094 | .062 | .022 | .030 | .050 | .005 |
| .044 | 6 | 3/8 | 9/16 | .119 | .078 | .028 | .035 | .062 | .005 |
| .050 | 7 | 3/8 | 9/16 | .119 | .078 | .028 | .035 | .062 | .005 |
| .062 | 8 | 3/8 | 9/16 | .156 | .105 | .035 | .043 | .081 | .005 |
| .070 | 9 | 3/8 | 9/16 | .156 | .105 | .035 | .043 | .081 | .005 |
| .078 | 10 | 3/8 | 9/16 | .187 | .128 | .041 | .055 | .104 | .010 |

| Mat Thickness | Pt. No. | A | B | ±.002 C | Dr | ±.001 E | ±.001 F | ±.001 H | Jr |
|---------------|---------|-------|-------|---------|------|---------|---------|---------|------|
| .094 | 11 | 1/2 | 11/16 | .218 | .148 | .048 | .065 | .115 | .010 |
| .109 | 12 | 1/2 | 11/16 | .250 | .172 | .054 | .075 | .137 | 1/64 |
| .125 | 13 | 1/2 | 11/16 | .281 | .193 | .060 | .085 | .154 | 1/64 |
| .140 | 14 | 1/2 | 11/16 | .312 | .217 | .066 | .096 | .172 | 1/64 |
| .156 | 15 | 5/8 | 13/16 | .343 | .243 | .072 | .107 | .191 | 1/64 |
| .171 | 16 | 5/8 | 13/16 | .375 | .265 | .078 | .118 | .210 | 1/64 |
| .187 | 17 | 5/8 | 13/16 | .406 | .285 | .085 | .130 | .229 | 1/64 |
| .203 | 18 | 11/16 | 7/8 | .437 | .308 | .091 | .143 | .240 | .020 |
| .250 | 19 | 13/16 | 1 | .531 | .375 | .110 | .175 | .285 | .025 |

Material: Tool Steel. Finish all over and harden to 65-68 Rockwell "C" scale. Note: All working surfaces of die unit must be polished.

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