Solutions

2.1

- $t = 0.707h = 0.707 \times 8 = \mathbf{5.66}$ mm.

2.2

- $F = 0.707hL\tau_{allow} = 0.707 \times 8 \times 160 \times 145 = \mathbf{131.2}$ kN.

2.3

- $H = \eta VI/v = 0.8 \times 28 \times 220/4 = \mathbf{1232}$ J/mm.
- Higher: a wider, slower-cooling heat-affected zone, with more grain growth and distortion.

3.1

- $L = F/(0.707h\tau_{allow}) = 90\,000/(0.707 \times 6 \times 145) = 146.3$ mm in total.
- Per weld $146.3/2 = 73.2$, so **75** mm each.
- Bond: $F = \tau A = 20 \times 30 \times 20 = \mathbf{12.0}$ kN on average, just enough.
- The load transfers near the overlap ends, where the stress peaks; the middle carries little, so a longer overlap adds less than its area.

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