If the single lap joint were replaced by a double strap butt joint with 10 rivets per joint and each carrying the same shear stress as above, what would be the required rivet diameter?

Solution: when replacing these compounds, the shear load is reduced by half. In this case, it is specified in the condition that each of the ten rivets undergoes the same load, so if we can write the value for the load for a single-lapped connection: $F = \frac{\pi \times \tau \times d_1^2}{4}$, where: τ - shearing stress; d_1 - rivet diameter.   When replacing a double butt joint, we can write: $n = \frac{2 \times F}{\pi \times \tau \times d_2^2} = \frac{2 \times \pi \times \tau \times d_1^2}{4 \times \pi \times \tau \times d_2^2} = \frac{d_1^2}{2 \times d_2^2} = 10$. The number 10 appears from the condition that we replaced the 10 rivets with a rivet, and the diameters, respectively, will be different, since more stabilizing force appears, then: $\frac{d_1^2}{d_2^2} = 20$, $\frac{d_1}{d_2} = 2 \times \sqrt{5}$, $d_2 = \frac{\sqrt{5}}{10} \times d_1$.

Answer: the diameter of the rivet will decrease in $2 \times \sqrt{5}$ time.