A $t$-$(v, k, \lambda)$ covering design, denoted $(\mathcal{V}, \mathcal{B})$, where $v = |\mathcal{V}|$, is a finite family $\mathcal{B}$ of $k$-subsets of $\mathcal{V}$, called blocks, such that each $t$-subset of $\mathcal{V}$ occurs in at least $\lambda$ blocks. The covering number $C_{\lambda}(v, k, t)$ is $\min |\mathcal{B}|$, where the minimum is taken over all $t$-$(v, k, \lambda)$ covering designs. My talk is based on a recent joint work (with Abel, Greig and de Heer) on the covering number $C_1(v, 6, 2)$. This number meets the Schönheim bound:

$$C_1(v, k, 2) \geq \left\lceil \frac{v}{k} \left\lfloor \frac{v - 1}{k - 1} \right\rfloor \right\rceil.$$ 

We show that $C_1(v, 6, 2)$ attains the Schönheim bound for all $v \equiv 2 \pmod{5}$. I will discuss direct combinatorial constructions and computer assisted searches related to this result.