At a construction site a pipe wrench struck the ground with a speed of 27 m/s. (a) From what height was it inadvertently dropped?

Solution.
From the energy conservation law we have that at the ground level all potential energy is transformed to kinetic energy:

$$mv^2/2 = mgh \quad ,$$

$$h = \frac{v^2}{2g} = (27\,m/s)^2/(2 * 9.8\,m/s^2) = 37.19\,m$$

Answer.

$$h = 37.2m$$

(b) How long was it falling?

Solution.
We right the second Newton's law:

$$m\,d^2/dt^2\,x = -mg,$$

solving it we obtain

$$x = -g\,t^2/2 + v_0 t + x_0 \quad .$$

Initial coordinate is

$$x_0 = h \quad ,$$

and initial speed is zero

$$v_0 = 0 \quad .$$

At the ground level $x = 0$,

$$0 = -g\,t^2/2 + h$$

$$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 * 37.2\,m}{9.8\,m/s^2}} = 2.76\,s$$

Answer.

$$t = 2.8\,s$$