What should the answer look like? At first glance it appears that this is the standard catenary problem (Prelim_J00_Mech1). However, there is a subtle but important difference -- here the weight is not distributed along $\vec{dl}$ but dx. This changes the result, but it makes calculations much simpler.

The tensile force is directed along the cable. The horizontal forces are balanced, so parameterize everything in terms of F_H (since it is constant). The tensile force has magnitude $F_H^2 + F_H^2 \tan^2\phi = F_H \sec\phi$.

The vertical tensile force balances gravity (the span mass length density is $\gamma = \frac{M}{L}$). Working to first order

$$F_H\ tan(\phi + d\ phi) - F_H \tan\phi - \gamma dxg = 0$$
$$\frac{d\tan\phi}{dx} = \frac{\gamma g}{F_H}$$
$$\sec^2\phi \frac{d\phi}{dx} = \frac{\gamma g}{F_H}$$

Pleasingly, $\phi = \tan^- 1(\frac{dy}{dx})$ when $dx > 0$, and so

$$\frac{d\phi}{dx} = \frac{1}{\sec^2\phi}\frac{d^2y}{dx^2}$$

By the rule for the Differentiation of Inverse Functions . Thus

$$\sec^2\phi\frac{d\phi}{dx} = \sec^2\phi \sec^{-2}\phi \frac{d^2y}{dx^2} = \frac{\gamma g}{F_H}$$
$$\frac{d^2y}{dx^2} = \frac{\gamma g}{F_H}$$

Yes indeed, suspension cables are more closely parabolic than catenaries.

The equation for y gives

$$y = \frac{\gamma g}{2F_H}x^2 + C_1 x + C_2$$

Let he towers be placed at $x = x_{tower}$ and $x = -x_{tower}$, leaving the origin for the center of the parabola.

Let the height of the towers be $y_{tower} = y(x_{tower}) = y(-x_{tower}) = \frac{\gamma g}{2F_H}x_{tower}^2 + C_2$(where C_1 is eliminated by symmetry).

Then $C_2 = y_{tower} - \frac{\gamma g}{8F_H}L^2$, where L is the length of the span.

We check to see if F_H is specified by this system by equating forces. Twice the vertical force applied at one of the endpoints is equal to gravitational force on the span, Mg.

The angle at the towers is $\phi_{tower} = \tan^{-1}(\frac{dy}{dx}) = \tan^{-1}(\frac{\gamma Lg}{2F_H}) = \tan^{-1}(\frac{Mg}{2F_H})$.

The horizontal and vertical forces are then $F_H = F_{tot}\cos\varphi_{tower}$ and $F_H = \frac{Mg}{2}\cot\phi_{tower}$.

By the formula $\cot \tan^{-1} x = \frac{1}{x}$

$$F_H = \frac{Mg}{2}\frac{2F_H}{Mg} = F_H$$

So we discover that F_H is not specified, any number may be chosen to achieve the desired shape (well, so long as it leads to a cable that's higher than the roadbed).

So, finally, for any reasonable choice of F_H,

$$y(x) = \frac{Mg}{2F_H L}x^2 + y_{tower} - \frac{Mg}{8F_H}L$$