We consider an infinite, homogenous linearly elastic beam resting on a system of linearly elastic supports, as an idealized model for a paper web in the middle of a cylinder-based dryer section. We obtain closed-form analytical expressions for the eigenfrequencies and the eigenmodes. The frequencies increase as the support rigidity is increased. Each frequency is bounded from above by the solution with absolutely rigid supports, and from below by the solution in the limit of vanishing support rigidity. Thus in a real system, the natural frequencies will be lower than predicted by commonly used models with rigid supports.