STATIC & ROTATIONAL EQUILIBRIUM Unit 15 Dr. John P. Cise, Professor of Physics, Austin Com. College, 1212 Rio Grande St., Austin Tx. 78701 & NYTimes ,April 28,2017 by David Dunlap

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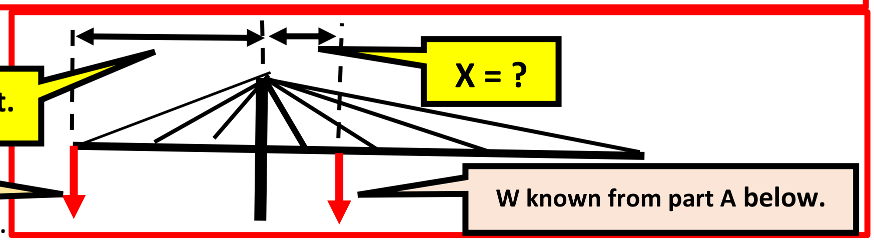
New Bridges Rise in New York, With Looks That Could Stop Traffic

INTRODUCTION B: Do part A below first to find W of entire bridge. **QUESTION:** (B) Knowing weight of bridge W from part A below, now find where center of mass is located X? Use Σ T = 0 . **ANSWER:** X = 123.6 ft., **COMMENT:** As expected, center of mass X is in middle of this 1000 ft long bridge.

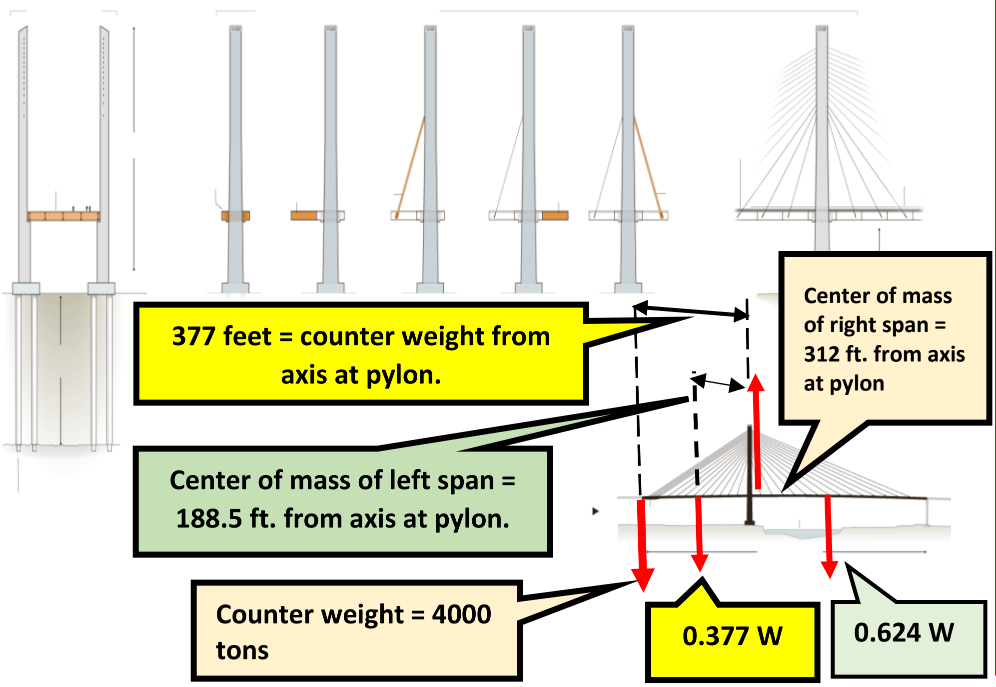


Kosciuszko Bridge in New York. At right is the old bridge.

New York, the city of perpetual arrival, is getting three new gateways: diaphanous cable-stayed bridges that look almost too ethereal to bear the load of thousands of vehicles and people each day. They were relatively easy and economical to build. And they almost couldn't help but look beautiful, with their slender pylons and radiating cables.

The Cable-Stayed Bridge Makes a New York Debut

Construction of the replacement Kosciuszko Bridge on the Brooklyn-Queens Expressway employs a cable-stayed design that permits it to be built outward from the load-bearing main pylons without the need for complex interim structural supports. The upper pylons are hollow, permitting maintenance of the cable anchorages.



INTRODUCTION A: Purpose of this first application is to find the weight (W) of this new NYC bridge. To put this bridge into rotational equilibrium a 4000 Ton counter weight is attached at the end of the left shorter span as seen in graphic at left. What is not known is the weight W of the bridge. But, we do know that each side has a fraction of bridge weight: left side 0.377 W , right side 0.624 W.

QUESTION: Find W using condition for rotational equilibrium: Σ T = o

ANSWER: W = 12,197 tons

A deck section and cables are added on the opposite side of the pylons. This sequence is followed until the span is complete. **1** Once the foundations and pylons are built, a steel and concrete element called a pier table connects the pylons. **2** The pier table is strong enough to hold the first deck section, which is bolted on.

3 Stay cables are strung between the deck and the pylons and pulled into tension. The load is now on one side. Because the overall structure is asymmetrical, a 4,000-ton **counterweight** is installed under the west end to counteract the heavier east end. Then, an inherent imbalance had to be corrected, since the **main span is 624 feet long, while the back span, on the other side of the pylons, is only 377 feet long. To compensate, a 4,000-ton counterweight of concrete and steel plates was added under the shorter section. "Kosciuszko" — has an uninterrupted 1,001-foot span. "**