Structural Integrity: Silver Bridge
The Silver Bridge Disaster

It's 1928 and suspension bridges are being built all across America. New designs and new materials make for rapid construction….. This is the Silver Bridge, crossing the Ohio River at Point Pleasant, West Virginia on its opening day.

Walter Carpenter
My father was Vice-President of the corporation that built the Silver Bridge,
It was a wonderful time to be a young American boy. The Roaring Twenties, they called it, and America had…had never been as prosperous, they just thought nothing but the best in the future and a wonderful time for America
The St Mary's Citizens Band marched at the opening of the Silver Bridge, , and my father and mother went to that opening, and it was supposed to be a very gala event, but unfortunately right in the middle of the parade, to have rain and everybody was running and trying to get out of the rain, it dampened the fervor of the thing and the historic impact of it.

Francesca
Shortly after work commenced on the Silver Bridge another bridge, almost identical in design, was constructed at St Marys, about 70 miles up stream from Point Pleasant. The bridge was formally named the 'Hi Carpenter' bridge…..
Walter Carpenter
It was really ready for a big thing to happen at St Mary's, and people were just rousing to welcome this new thing called a bridge crossing the river at St Mary's. …

Narrator
In a suspension bridge, the uppermost supporting chains, strung from tower to tower, are members in tension and they exert a downwards force on the towers. The deck is supported from the cabling system using a series of vertical hangers. These hangers are also in tension.
The bridge should be designed so that the degradation of any one tension element of the structure doesn't immediately lead to collapse.
Nowadays, suspension bridges use cables spun from many individual wires but, in fact, the suspension chains in the Hi Carpenter and Silver bridges were formed out of long lengths of steel, with holes drilled out at either end. These 'eyebars' were put together in much the same way as the links in a bicycle chain…..
A bolt is used to join the eyebars together. The resulting joints in the suspension chain can then move in response to the forces placed on them…..

Walter Carpenter
The bridges were both painted with an aluminum colour, and described as a beautiful silver colour, although the St Mary's Bridge never lost the name, the Hi Carpenter Bridge It always had that, never alluding to the paint at all. But the Silver Bridge was very proud of that silver sheen that they got from their aluminum coat, and when the bridge was even repainted, every time, so far as I know, always silver, or aluminum, but always referred to as a silver bridge, But the word aluminum and the fact that the Silver Bridge will be painted aluminum, I think, had more of an impact on the psyche of the public than did the fact that it was steel.
Narrator
But after barely 40 years, the design and materials used came to haunt them. On December the 15th, 1967, the bridge fell in less than 1 minute, with the loss of 46 lives….. A 20 year old eyewitness at the time, was Charlene Wood…..

Charlene Wood
I was actually on the bridge when it fell that night. I was going home from work, and a trembling an…of the bridge and a…a noise that you couldn't…I couldn't even describe what

the noise was like, but I realised that maybe something had hit the bridge, and I decided I wasn't going to cross it, so I threw the car in reverse, and as I was backing, the car stalled on me, but my…it was on an incline that it kept going, and when I was able to get it stopped, the bridge had fell in front of me, and my wheels were on the ledge here.

Narrator
What was the cause? Was it an accident, carelessness, or inadequacy in the design?
The problem couldn't just be that this bridge was a suspension bridge using eyebars because that was a known technology with many contemporary examples.
The city of Pittsburgh has three suspension bridges spanning the Allegheny River. Known collectively as the Three Sister bridges, all employ eyebars in their suspension chains. They were constructed at much the same time as the silver bridge and are clearly still standing. They do, however, have a marked difference in their design.
This one is the 6th street bridge. The eyebars are configured together in clusters; meaning that several eyebars are used to form each chain and so the failure of any one eyebar won't precipitate a collapse of the structure. In fact, the steel used here is of a lower strength than that used in the silver bridge but these bridges are said to have a safety factor of at least 2; that means that they're designed to support more twice the greatest expected load.