Structural Integrity: Silver Bridge
The Three Sisters Bridges

Tom Vena
The Three Sister Bridges were built in 1928, and they were expected to last 100 years, and at the rate that they're going now, I'd expect them to last 125 years.
The major difference between the designers of the past and the designers you have today, the members that were designed on…on steel structures were over designed where the steel members only needed to be an inch today, well back then they would make them an inch-and-a-half, so you had a…that half inch of material that could actually deteriorate before it even impacted the structural capacity of the bridge.

Narrator
With each eyebar weighing several tons, assembling them into suspension chains was no easy undertaking. But clustering them together had become a time honoured technique because, that way, a degree of redundancy comes from the way that multiple eyebar assemblies provide multiple load-paths.
Photographs from the time of construction, along with the engineering plans, are still preserved in the local county archive….

Bill Connery
This is a plan view of the Sixth Street Bridge, it's approximately 995 feet long and 77 feet high, and it gives general notes to the contractor or the erector on the assembly of the plan in giving the manufacturer's name of the American Bridge Company.

Narrator
The Pittsburgh- based American Bridge Company was able to employ the practice of building from either bank using a cantilever principle. It was necessary to stabilise the eyebars in each arm with additional diagonal braces – until, that is, the two arms met and the whole structure became independently stable. Each eyebar cluster was of course clearly specified in the engineering plans…

Bill Connery
This sheet here shows you the assembly of the eyebar and the number of bars that are in the assembly which the pin goes through.

Narrator
The pinning, or 'threading', was itself a difficult undertaking because of the tight tolerance between the pin and the eyebar holes. The material used was standard annealed mild steel which is susceptible to corrosion; like many steels.
Also, each eyebar contained high levels of tensile residual stress from the manufacturing process and that residual stress could be significant at the points where the eyeholes were drilled out.
A combination of tensile stress, a material like mild steel, and the corrosive environment of a bridge exposed to the elements (and industrial pollution), can lead to stress-corrosion cracking.
Incorporating more material in the form of multiple eyebars makes the overall design of the bridge safer against factors such as these.