

Hyatt Regency Hotel

In the summer of 1981, the Hyatt Regency Hotel in Kansas City, Missouri, hosted a large party in the multi-story atrium area. During the event, suspended walkways on the second and fourth floors collapsed, killing over 100 people and injuring over 200 more. At the time, the accident was the worst structural failure in US history. In the wake of the disaster, investigators discovered a change to the original design of the walkways that was proposed by the fabricator and mistakenly approved by the structural engineer. What, at first glance, seemed like a subtle adjustment to the design, turned out to be the root cause of the failure.

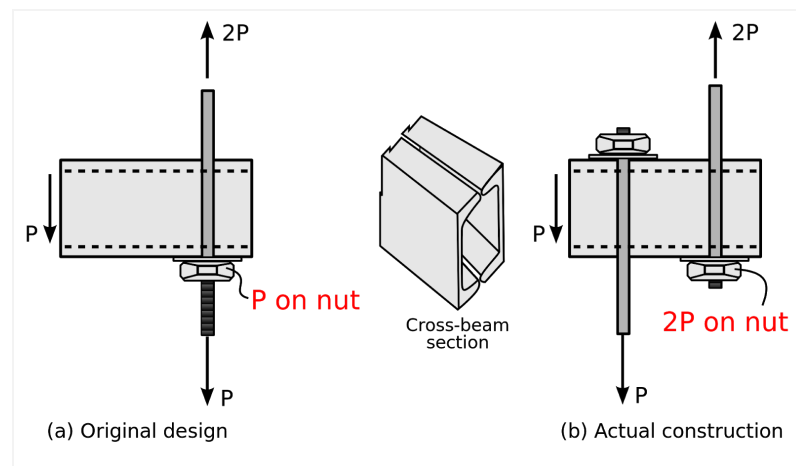


Figure 1. A diagram showing the difference between the design and construction of the walkway support system. Notice in the actual construction, there is double the force on the nut, and the nuts are located on a welded joint.

Two suspended walkways spanned the atrium in the Hyatt Regency with the second-floor walkway directly below the fourth-floor walkway. Each was supported by a series of box girders suspended by hanger rods and retained by nuts and washers. The original design called for a single pair

of hanger rods, which would pass through each fourth-floor girder to the second-floor girder below (fig. 1a). The fabricator responsible for constructing the walkways objected to this plan because it would require screw threads for the entire length of the hanger rods, which could easily be damaged during construction. So, they proposed to split the hanger rods into two sets. One to connect the fourth-floor walkway to the roof and one to connect the second-floor walkway up to the fourth-floor girders (fig. 1b). It was approved by the engineer without a detailed review or calculations, which would have revealed its inherent flaw. This simple change effectively doubled the load on those bolted connections, and was ultimately identified by investigators as the primary cause of failure. With so many people on the walkways that evening, the load on the connections was too great. The box girders split open, slipping past the washers and nuts leading to the collapse of both walkways.

Who is responsible for the final safety check of a design? If one considers the engineering process from beginning to end, It is evident that the engineer must assume responsibility for all design changes. When an architect/contractor hires an engineering firm to design a solution for a construction, it is at that point that the engineering firm holds the responsibility for the safety of the construction. All engineers are taught the concept of a “Factor of Safety” or “Safety Factor”; a number which multiplies the load requirements of a given design. For example, if a bridge is expected to have 50 people on it at a time with a load of 50kPa, a safety factor of 1 would require the engineer to make sure the design can handle 50kPa. A safety factor of 2 would require the engineer to make sure the design can handle 100kPa. So when an engineer approves a design, they are approving the design’s safety factor along with it, therefore It is the engineer that holds responsibility for the safety of the construction.

What would cause an engineer to approve an unchecked design? As with all ethical issues, there is a decision that gets made as a result of weighing the pros and cons of a dilemma. Some of the possible reasons could have been to save time, to save money, or to simplify the engineering/installation process. All of the reasons listed sound tempting, but neglect the safety of the people who will ultimately be using the construction. Usually, It’s not just one of the listed reasons, but a combination of them. Simplifying the

engineering/installation process has the effect of saving time, as well as saving money. If an engineer falls into the trap of making these impulse decisions, the effects can be extreme.

The Kansas City Hyatt Regency walkways collapse is a perfect example of the importance of attention to detail in engineering, and more importantly the consequences of negligence as a result of design change approval. There is an implicit handshake between a society and its engineers. We hardly have a choice but to trust that the constructed environment that we live in is safe and sound. As engineers test designs for ever increasing load capacities, they must always remember the social contract they have with society; they are obligated to protect the welfare of the public.

References

- [1] "Negligence, Risk, and the Professional Debate over Responsibility for Designs." *Civil Engineering Ethics Site*, ethics.tamu.edu/essays
- [2] ENGINEERING.com. "Hyatt Regency Walkway Collapse." *Engineering.com*, www.engineering.com/Library/ArticlesPage/tabid/85/ArticleID/175/Hyatt-Regency-Walkway-Collapse.aspx