

## Executive Summary

Engineering disasters are perhaps some of the most publicly scrutinized events in society. Often times, these disasters are critiqued and judged both from a technical, engineering perspective, as well as a social perspective, with blame and judgement often being assigned prematurely and on ill-information. In an attempt to determine how these types of disasters are avoided and handled in different societies, case studies were performed on the Morandi Bridge collapse of 2018 in Genoa, Italy and the Arena Corinthians crane collapse in 2013 in São Paulo, Brazil. These disasters shared many similarities and differences, when compared in terms of several categories:

**Technical Failures:** The Morandi Bridge failed as a result of poor design, whereas the Arena Corinthians crane collapsed due to a combination of engineering negligence and rushed construction; issues that are common and come up often in engineering works.

**Cultural:** Both disasters resulted in outcry from their respective societies, as a result of damages and loss of life. This was escalated in both cases once blame was placed and prevention issues made public.

**Event Aftermaths/Public Opinion:** Much analysis had shown that there were several critical issues with the Morandi Bridge, but these were ignored. Similarly, safety conditions and concerns were known during the construction of Arena Corinthians. When made public in both cases, these added even further to outcry from citizens. Arena Corinthians was completed and as of today plans are in place to replace the Morandi Bridge.

**Regulatory Bodies/Professional Organizations:** The engineering profession is well-regulated in both countries. The Brazilian system consists of both regional and federal organizations, whereas the Italian system consists of a national organization, which in turn is part of a wider, European organization.

**Engineering Profession/Licensure:** Italy offers a unique classification system of engineering designation, titling and merit, which is directly proportional to one's background. On the other hand,

prospective Brazilian engineers can become professional engineers solely based on their academic background.

**Legal/Ethical:** Both Italy and Brazil have relatively weaker statutes for professional negligence liability. In terms of liability, Italian law places liability on both the contracting company and the designer in the event of an accident, with the party causing the damage also being liable for restoration. In Brazil, contractors and designers are liable for up to ten years, similarly with contractors being liable for damages to persons and property.

From the conclusions drawn in each of the categories above, several actions and recommendations are proposed, pertaining to engineering disasters and disaster prevention. The first recommendation involves taking a proactive approach to issue management. As was seen in both disasters, critical issues were known beforehand. Proactive issue management can aid in disaster prevention by addressing known issues. The second recommendation is for engineers to maintain professional integrity even under political pressure. Engineers involved with both disasters ultimately succumbed to pressure that affected their quality of work. Being a professional engineer means being able to adhere to a code of conduct and ethics, which must be maintained at all times.

The third recommendation is to document all external decisions and pressures. As seen in the aftermath of both events, the governments and other parties were apt to assign blame to the engineers in charge of design, maintenance, etc. despite the pressures that they themselves placed to get the projects done. The fourth recommendation is to study the Italian system of professional engineering. The two-tiered approach should be studied by other professional organizations, as their multiple testing appears to promote and ensure competency among engineers. The fifth and sixth recommendations are to investigate the opportunity for infrastructure failure consulting and increase the statute of limitations. In the aftermath of the infrastructure failure events, the government and the contractor are usually in dispute of the causes, therefore a third-party independent disaster consulting organization should be considered for unbiased results. In conclusion, implementation of these recommendations can ultimately aid in the reduction, and ideally, the prevention of engineering disasters.