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FOOTBRIDE DESIGN AS AN ACT OF INEXPERIENCE

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Summary

There are many challenges in the field of structural engineering that young graduates have to deal with at the start of their careers. Those are usually associated with the gap between academic courses and current industrial practices, stressful environment, lack of creativity or ability to work effectively in a team, using advanced computer software and so on. From personal experience and by talking to other young engineers, I have noticed that there is a great need for discussing these potential issues. This paper aims to sparkle a debate about inexperience. It presents young engineers who are taking their first steps into practical engineering, their concerns and challenges. The second part gives an example of a footbridge design which I had to make coming straight from college.

Keywords: young structural engineers; inexperience; footbridge design; vibrations; steel; aesthetics

1. Introduction

Young engineers, who are slowly going through the roughness of our profession, have felt personal growth when those periods of deep work have produced success. High interest and striving for perfection, listening to others, seeking education, overcoming and improving upon personal limitations and defects are essential to perform at such a level. Those virtues are highly desirable in engineering today.

2. Challenges facing young structural engineers

At the earliest stage of a career, a young engineer [1] has an excellent technical education, but does not know to use it properly. He is confident and optimistic, but slightly worried. He is committed to continue learning, but has very little experience and unclear professional interests. Growing up, he has been trained to expect guidance and assistance when he needs it. He wants to be useful, productive and wants assignments which will develop his skills and knowledge. Problems can occur if the work does not provide him a certain satisfaction. A young engineer may then start to compare himself with others, which is usually subjective and irrational, and to feel that he does not belong. Young engineers cannot be the judges of themselves. An objective assessment of their talents, needs and abilities is necessary before they can begin to make the most of their work.

Computer programs and access to the Internet have enabled rapid education of quality young engineers. Prior to the Internet, the resources available to teach young structural engineers were primarily written materials. Now, the amount of available information is massive and difficult to navigate. Young engineers need to be skilled in modelling and know how to extract results from the software, which requires strong technical fundamentals and knowledge of design. They have to be creative, think outside the box and adapt to work in interdisciplinary teams. Young engineers sometimes rely on computers without making reasoned judgements or common sense. The most important thing in an engineer's development should always be the

basics- laws of maths and physics, material properties and so on. Things like codes, standards or various software can sometimes be difficult to understand and catch up with all the changes, therefore should be left aside and taught on the job. A career in engineering requires an intensive commitment to lifelong learning. Mentorship is needed to encourage young engineers to successfully develop their skills and gain confidence.

3. Personal experience and footbridge design

Being a young and inexperienced structural engineer myself, I too have to deal with mentioned issues. Since graduating in 2015, I have been working as a bridge designer apprentice in an infrastructure engineering company. The first project I have participated in was a main design of a cable-stayed steel footbridge. The construction of this footbridge aims to solve the problem of pedestrian communication between two districts in the city of Split, Croatia. The total street transverse profile is 16 m wide. Preliminary design of the footbridge was made by an architectural office as a cable-stayed structure with rectangular frame and cables supporting the 24 m long deck. The deck has a pin connection with the reinforced concrete stairway on the south end, while on the north end truss girders are connected to steel columns, which are dilated from the demountable steel stairway. My knowledge of bridge design, especially footbridge, and its issues in general was not excellent at that time. Although I am by far the youngest in the office, my colleagues offered great support and were a precious source of knowledge. Properly assisted by experienced engineers, I was able to learn and perform calculations at the same time.

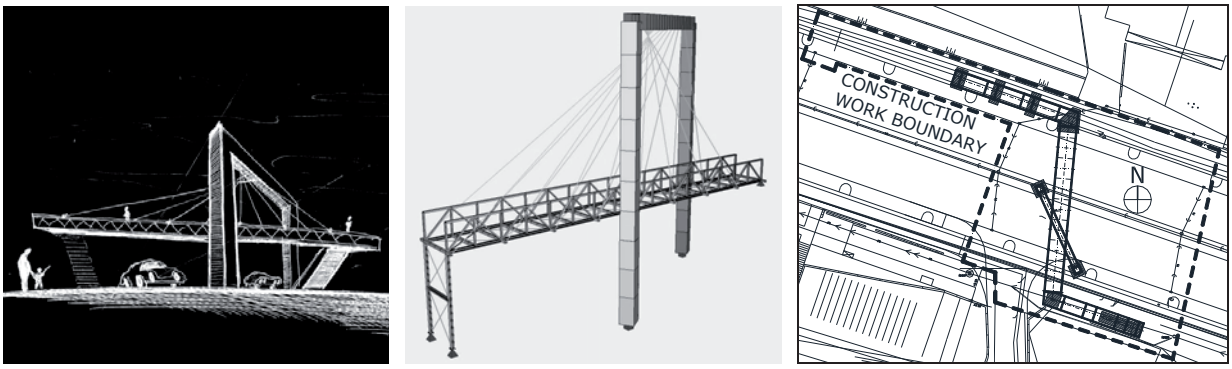

Fig. 1. Cable-stayed footbridge "Mejasi" a) Preliminary sketch by Ivan Radeljak, b) Structural model by Ivan Filkovic, c) Area plan

Looking at preliminary drawings and calculations, it was quite obvious that this structural design does not make much sense. I came to the conclusion that the frame is subjected to small loads from the deck. Out of curiosity, I made a structural model with slightly stronger truss elements without the frame and the cables, which passed all verifications. However, it would not be a particularly aesthetic solution without the excessive frame and scattered cables.

4. Discussion and conclusion

This paper presents young structural engineers who have started their careers to become successful engineers of the future. The first part focuses on their issues and concerns during the stressful process of learning and adaptation into practical engineering. Moreover, this paper raises important and actual questions about the gap between academic courses and the current engineering practice, the importance of having strong technical fundamentals while working with advanced computer software, how to guide young engineers and so on. The second part gives an example of a footbridge design which was made by an inexperienced young structural engineer. Questions about the presented footbridge design are primarily regarding the structural system. What would be a better structural system for a footbridge? Would a different solution, such as an underpass, be preferable considering the narrow footways and short span? Although the proposed idea was not innovative or well conceived, it provided a valuable experience for my career as a bridge designer and got me interested in footbridges.

5. References

[1] WRIGHT W. J., *The Engineer as an Individual*, APL Technical Digest, Vol. 7, No. 6, July-August 1968, pp. 1-6