

Final Report on the project

**Annual seismic design competition:  
innovation in teaching of structural  
engineering courses**

Funded by Kennslumálasjóður

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# 1.0 Introduction

This report describes the work done and results of the project “Annual seismic design competition: innovation in teaching of structural engineering courses” conducted at the Faculty of Civil and Environmental Engineering of University of Iceland. The project was financially supported by grants from the Teaching Affairs Fund of University of Iceland in the year 2017 and 2018.

## 2.0 Main activities carried out in the project

The fund was used to support part of the work related to the following activities.

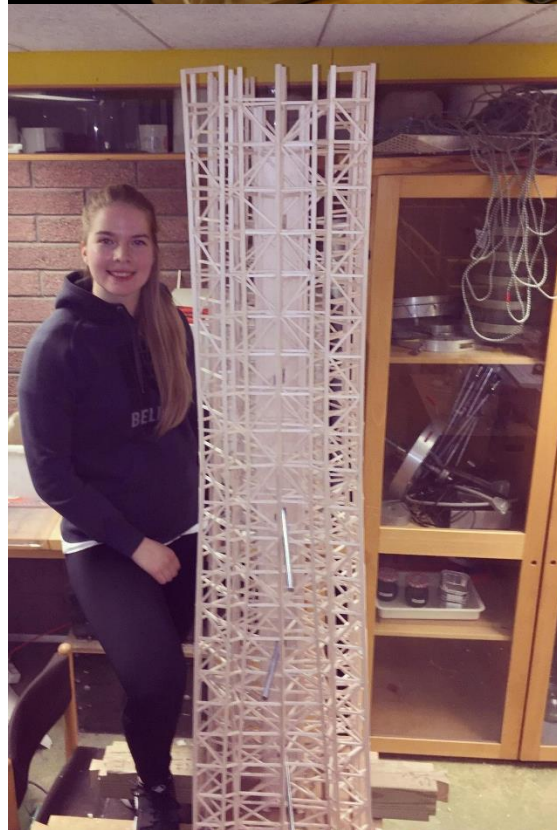
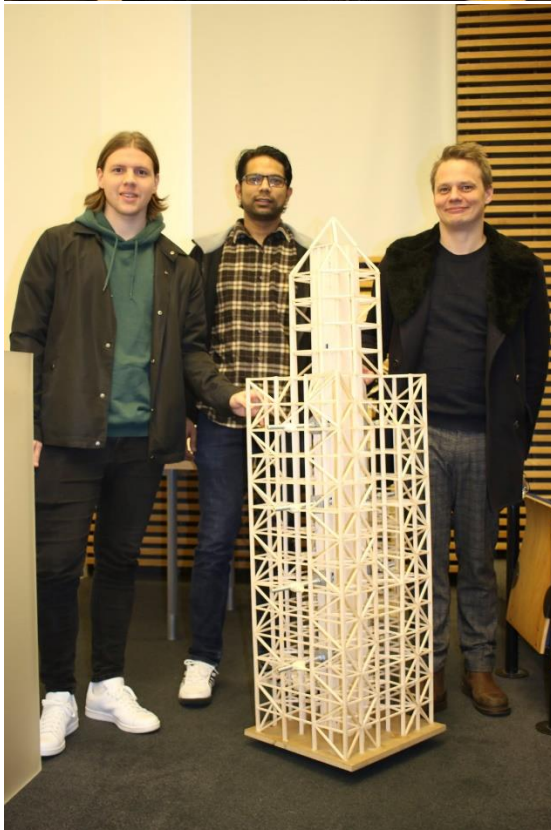
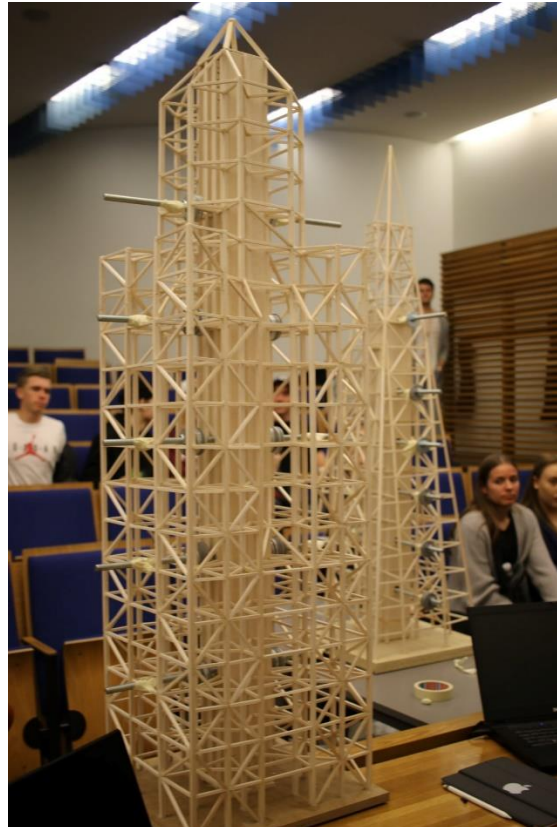
### 2.1 Creation of specification and rules for seismic design competition

Some preliminary guidelines for model building and their grading were prepared in the year 2017. A seismic design competition was organized in Askja during Háskoladagurinn in March 2018. Four groups of students in Computational Mechanics (BYG401G) course built models and competed in the event. Grading of the models relied on a prescribed guideline covering architecture of the models, workmanship in the building process, accuracy in material estimation, and finally their seismic performance to different intensities of ground shaking.

The rules were then modified in 2019. More detailed guidelines were prepared based on the experience from previous years. Four groups of students in BYG401G built models and competed in a seismic design competition organized in Askja during Háskoladagurinn in 2018 and 2019.

Some examples of the models are shown in Figure 1. The models built in the year 2019 were excessively strong could not be tested for damage within the capacity of the small scale shaking table. The shaking table also malfunctioned and had a reduced shaking capacity. To account for these limitations, regulations on the design of models had to be changed drastically. This required building several test models and shaking them until damage initiated. After extensive testing, new regulations were developed which set restrictions on how strong the models could be how much load they had to carry.

Students in BYG401G in the year 2020 built 4 models based on these new set of rules and competed in an event organized during Háskoladagurinn 2020. The competition was very exciting as most of the models performed very well despite damage initiation. The competition was a popular event and attend by many.



*Figure 1. Some examples of the balsa wood buildings models built by students in BYG401G for annual seismic design competitions in 2018 and 2019.*

## 2.2 Maintenance of the hardware and software of the shaking table.

The shaking table malfunctioned during the competition in 2018. Part of the problem was damage to the model platform of the table. This problem was fixed by adjusting and modifying the parts of the platform at the workshop of the Earthquake Engineering Research Centre of University of Iceland. Most of the work was carried out by graduate student Ashim Niraula. The software of the shaking table also had to be renewed to make it compatible with newer versions of operating systems. A lot of effort had to be put into this because the newer version of the software was found to be incompatible with the hardware of the table. This required several online meetings with the engineers of the manufacturing company. During these meetings, several test runs were conducted, and the table was finally updated to the latest software, which had to be adjusted to the older hardware of the table. This was a very time-consuming process, and most of the work was conducted by graduate student Ashim Niraula with the applicant's supervision. Due to the Covid-19 pandemic, the annual competition for the year 2021 had to be cancelled, but it is expected to resume in 2022.

### 3.0 Expenses

The grant was used to pay salary of Ashim Niraula. The Earthquake Engineering Research Centre contributed in purchasing hardware needed for the maintenance of the shaking table, and also bought the new software. Materials required for building the balsa wood models and loads applied on them were bought by funds from other research projects of the applicant.

### 4.0 Summary

The applicant is grateful for the support from the Kennslumálasjóður. The project has been very successful in the following aspects.

1. Annual seismic design competitions held in 2018, 2019, and 2020 was found to be very exciting by the participating students.
2. The event has been very popular among the Háskoladagurinn visitors.
3. Prospective students who attended the competition were very interested in the models and the tests, and this has increased student interest in civil and structural engineering.
4. The hardware and the software of the shaking table have been fully updated, and the competition rules and guidelines have been refined over the years. The competition will resume in 2022.

Further details about the events, including pictures and videos can be provided on request.