



Semi-probabilistic Assessment of Existing Bridges: Findings from Austria and Czech Republic (SAEB: AT-CZ)

Final report

Completed Project Activities:

The main goal of the project No. 93p8 SAEB AT-CZ was to share know-how and recent experiences regarding semi-probabilistic assessment of existing concrete structures. This was successfully achieved by four visits of project partners at their institutions: 2 visits of Czech team at University of Natural Resources and Life Sciences (BOKU), Vienna; and 2 visits of Austrian team at Brno University of Technology (VUT), Brno. Although these visits were originally planned once per month (September-December), it was necessary to adapt the schedule due to health issues of some project participants. Visits of both teams initiated interesting and fruitful discussions among researchers as well as students. Moreover, several faculty members and students outside of project team joined the seminars and gave us great feedback. Final schedule (dates and activities) was thus as follows:

1. Czech team at BOKU on 20-22.10.
 - a. Lectures presented by L. Novák and D. Novák focused on semi-probabilistic approach and numerical examples;
 - b. Discussions with project partners and attending students;
 - c. Presentation of results for existing concrete bridges on the Czech side: statistical analysis, semi-probabilistic approach and surrogate modelling;
 - d. Outline of a conference paper for World Tunnel Congress 2023 in cooperation with prof. Bergmeister (head of IKI, BOKU).
2. Czech team at BOKU on 3.-5.10.
 - a. Lecture presented by D. Lehký focused on surrogate modelling using artificial neural networks;
 - b. Discussions with project partners and attending students;
 - c. Outline of a conference paper for Eurostruct 2023.
 - d. First draft of a conference paper for World Tunnel Congress 2023
3. Austrian team at VUT on 10.-12.11.
 - a. Lecture presented by A. Strauss focused on Life-cycle assessment of concrete structures;
 - b. Discussions with project partners and attending students;
 - c. Presentation of results for existing concrete bridges on the Austrian side: statistical analysis, semi-probabilistic approach;
 - d. First draft of a conference paper for Eurostruct 2023.
4. Austrian team at VUT on 24-26.11.
 - a. Lecture presented by K. Voit focused on Recycling of Tunnel Excavation Material and Recycled Aggregate Concrete;
 - b. Discussions with project partners and attending students;
 - c. Finalizing of a conference paper for World Tunnel Congress 2023;
 - d. Possibilities of further cooperation.



Achieved Project Outcomes:

Besides the series of lectures, discussions and meetings at BOKU and VUT described in previous section (see appendix), two conference papers were prepared and send for publication in conference proceedings. The main findings and conclusions were summarized in joint conference paper [1] indexed by Scopus/Web of Science and will be presented at the international conference Eurostruct 2023 as originally planned. The paper was prepared and submitted to organizing committee, and it is under review of scientific committee at the moment. Moreover, additional conference paper was prepared in cooperation with prof. Bergmeister from BOKU and prof. Spyridis from TU Dortmund University [2], who also attended 4. meeting at VUT in person. The second paper was already accepted for publication in conference proceedings of World Tunnel Congress 2023. The summary of results is as follows:

1. Scientific paper indexed by Scopus/Web of Science (expected 1/ reality 2)

The main results will be presented at two international conferences in 2023. During the project, researchers from both partner institutions prepared two manuscripts: the first manuscript is under review, and it will be presented at Eurostruct 2023 conference; the second manuscript in accepted for publication and it will be presented at World Tunnel Congress 2023. Both publications will be indexed by Scopus/WoS and contain acknowledgment given to this project “Aktion SAEB AT-CZ 93p8“.

- 1) Drahomír Novák, Alfred Strauss, Lukáš Novák, David Lehký, Martina Šomodíková, Martin Lipowczan, Ondřej Slowik, Jiří Doležel, Radomír Pukl, Fabian Sattler, Eftychia Apostolidi. Nonlinear probabilistic structural assessment: Findings from Austrian and Czech bridges. Proceedings of EUROSTRUCT 2023 2nd Conference of the European Association on Quality Control and Structures, Vienna 2023. [UNDER REVIEW]
- 2) Spyridis, P.; Novák, L.; Novák, D.; Bergmeister, K. Advanced semi-probabilistic methods for the design and assessment of concrete tunnel linings. World Tunnel Congress (WTC2023), Athens 2023. [IN PRESS]

2. Series of lectures at the BOKU (expected 2/ reality 2)

Czech researchers presented and discussed their findings.

3. Series of lectures at Brno University of Technology (expected 2/ reality 2)

Austrian researchers presented and discussed their findings.

Summary of cooperation:

The cooperation of both teams was very active and fruitful, all planed outcomes were successfully achieved, and mutual cooperation was extended. Besides in-person meetings at VUT and BOKU, team members also discussed important topics virtually via Teams and Zoom, which accelerated their cooperation, especially in preparation of manuscripts. Moreover, public lectures and discussions initiated new cooperation with researchers outside of team members. This is especially important for graduate students attending seminars. The second paper can be seen as a great success of this project, since it was not planned, and it was created thanks to visits of Czech team at the BOKU and significantly extended planned cooperation.



Besides research cooperation, the project SAEB AT-CZ was also very beneficial for students at both institutes. On the one hand, some students attended lectures and discussions offering a great possibility for learning state-of-the-art techniques, discussing in English language, and networking. On the other hand, professors from both institutes also discussed inclusion of the presented topics into regular seminars for students, since the presented methods supported by real-life examples are becoming very important for industry and civil engineers should be able to employ them for design and assessment of structures.

Further International Cooperation:

Researchers from both institutions are aware of the importance of this research topic and its possible influence on further engineering practice and thus they are willing to cooperate in further research. Therefore, during the meetings, we discussed possibilities for further scientific cooperation including bilateral projects or projects funded by European Union. At this moment, both teams are preparing project proposal for program INTERREG VI-A Austria-Czech Republic 2021-2027 describing selected open questions discussed during meetings. Moreover, motivated by great success of the project SAEB AT-CZ, both partners agreed to write a project proposal again for program AKTION AT-CZ.

Members of Czech team:

Lukáš Novák	30.01.1993	faculty
Drahomír Novák	15.01.1960	faculty
David Lehký	14.09.1976	faculty
Martina Šomodíková	27.12.1986	faculty
Ondřej Slowik	05.12.1988	researcher

Members of Austrian team:

Alfred Strauss	29.12.1968	faculty
Klaus Voit	12.02.1982	faculty
Maximilian Granzner	22.11.1990	faculty
Benjamin Taubling	09.02.1988	Ph.D. student
Fabian Sattler	03.11.1992	Ph.D. student

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Lukáš Novák
Ing., Ph.D.

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Alfred Strauss
Univ. prof., Dipl.-Ing., Dr.habil

Appendix: Selected Photos from Seminars and Discussions

