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EDUCATION OF EXPERIMENTAL STRESS ANALYSIS METHODS AT VŠB-TU OSTRAVA

VÝUKA METOD EXPERIMENTÁLNÍ ANALÝZY NAPĚTÍ NA VŠB-TU OSTRAVA

Abstract

The contribution is devoted to the problems and range of education of experimental stress analysis methods at VŠB-TU Ostrava. In compliance with Bologna declaration the fully structured study system is realized at school from academic year 2001/2002. The experimental stress analysis methods are instructed both at Bachelor's and Master's degrees courses. At Bachelor's degree courses the education includes the bases of photoelasticity and strain-gauge method. At Master's degree courses the education is extended on next experimental methods such as brittle lacquer method, visioplastic method, photoplasticity, moiré method and other.

Abstrakt

Příspěvek je věnován problematice a rozsahu výuky metod experimentální analýzy napětí na VŠB-TU Ostrava. V návaznosti na Boloňskou deklaraci je na škole realizován plně strukturovaný systém studia od akademického roku 2001/2002. Metody experimentální analýzy napětí se vyučují jak v bakalářském, tak i magisterském studijním programu. V bakalářském studiu výuka zahrnuje základy fotoelasticimetrické a tenzometrické metody experimentální analýzy napětí. Ve studiu magisterském je výuka rozšířená o další experimentální metody jako např. metodu křehkých laků, moiré, vizioplastickou metodu, fotoplasticitu aj.

1 INTRODUCTION

The problems at engineering practice are generally very complex and complicated. The calculation or experimental methods we can use for the solving of these problems. The analytical solving in closed form is possible only by simple problems often with the use of oversimplifying assumptions. The more exacting problems in consequence of complex shape and loading they are possible to solve for example by means of finite elements method, indeed providing of precise edge condition knowledge. The precise edge conditions we don't know often, especially at the contact problems. The experimental results are very valuable contribution in this case and the experimental methods come more and more into use. The paper has for object the presentation and range of education of experimental stress analysis methods at VŠB-TU Ostrava.

2 EDUCATION AT BACHELOR'S DEGREE COURSES

The field of study Applied mechanics is accredited at the Faculty of Mechanical Engineering VŠB-TU Ostrava and the learning Experimental methods in mechanics is instructed here. The education takes place in the sixth half to the extent of 2 hours of colleges and 3 hours of exercises in the form of practical measurements. The goal of learning is to introduce even to the students for bachelor's degree courses only, with the elementary knowledge of the most used experimental

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methods. Department of mechanics teaches at the first half of semester and Department of mechanics of material keeps teaching at the second half of semester. The paper discuses about the learning only, provided by the Department of Mechanics of Materials.

The learning contents are only the bases of photoelasticity and strain gauge method. The plane photoelasticity is taught just with the range of understanding the principle of method, isoclinic and isochromatic lines definition and analysis, isostatic lines design and the stress measurements on the unloaded model surface. The measurements by means of strain gauge method and their evaluation are focused mainly on the electrical resistance strain gauges including strain gauge rosettes and T-rosettes. The attention is also paid to the design and calibration of certain single strain gauge transducers for the force and mass measurements.

3 EDUCATION AT MASTER'S DEGREE COURSES

The education of Experimental methods in mechanics takes place in the third half in the same range like the bachelor's degree courses. The range of photoelasticity education is extended by the plane photoelasticity about the stress separation by means of shear stress differences method. The methods of photostress and three – dimensional photoelasticity is taught too. The residual stress measurements mainly by means of hole-drilling strain-gauge method are taught. The students are informed about the design and construction, calculation and calibration of next strain-gauge transducer patterns.

In addition to the photoelasticity and strain-gauge method the next methods of experimental stress analysis are taught - brittle lacquer method, moiré method, visioplastic method, photoplasticity methos and others. The excursion at the rolling mill plant is the part of education. The students can see some transducers by the measurements and control of technological processes.

4 CONCLUSIONS

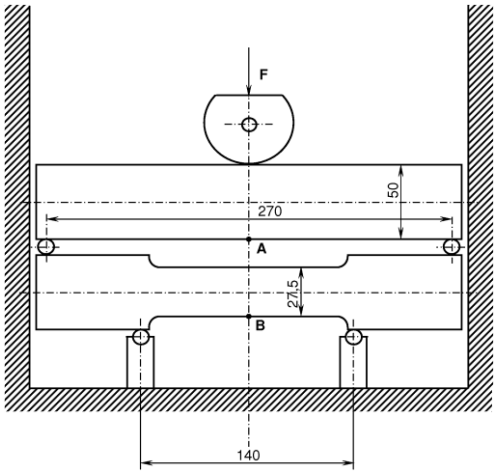
The education range of experimental stress analysis methods at VŠB-TU Ostrava is shortly described in submitted paper. The lectured subject matter is published in lecture notes [1]. The practical measurements are provided in exercises on the examples generally, on which the results of measurements and theoretical solving is possible. The students are in a position to consider the accuracy and precision of measurements. Some examples of measurements are demonstrated at the paper. The measured subject matter is published in lecture notes [2].

REFERENCES

[1] MACURA, P. *Experimentální metody v pružnosti a plasticitě [Experimental methods in elasticity and plasticity]*. 1st ed. Ostrava : Editační středisko VŠB-TU, 2001, 107 pp. ISBN 80-7078-934-4.

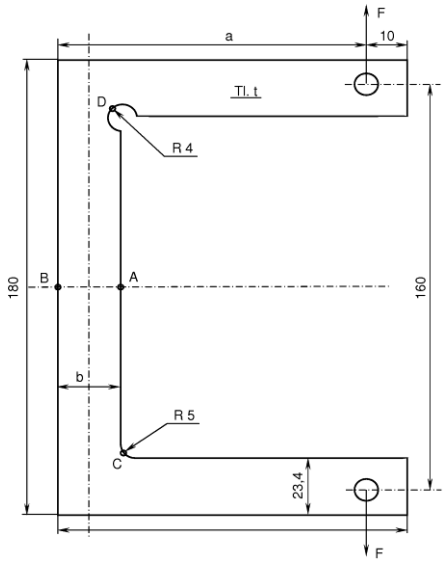
[2] MACURA, P. *Sbírka úloh z experimentální pružnosti [Task collection from experimental elasticity]*. V tisku.

Exercise F12



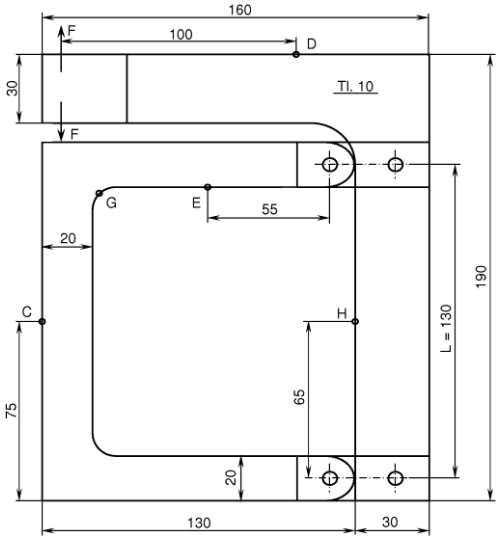
Photoelasticity measurement and stress analysis at the three – and four point bending

Exercise F14



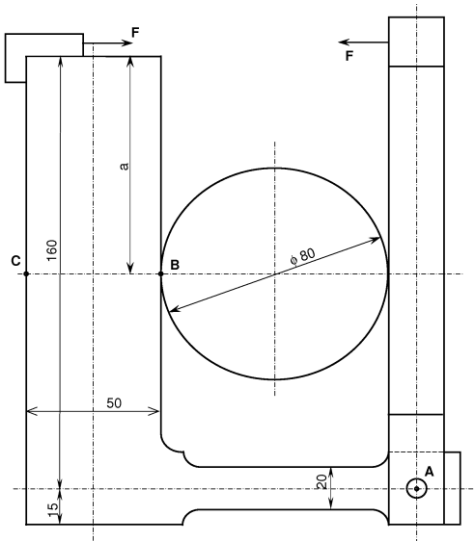
Computational and experimental analysis of beam with broken axis

Exercise F17



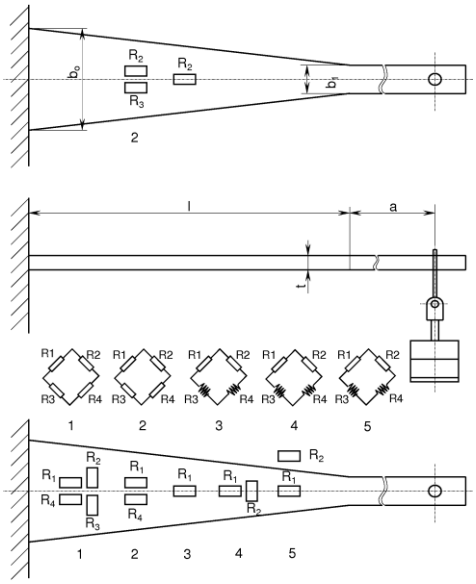
Stress analysis and measurements of beams with broken axis system

Exercise F18



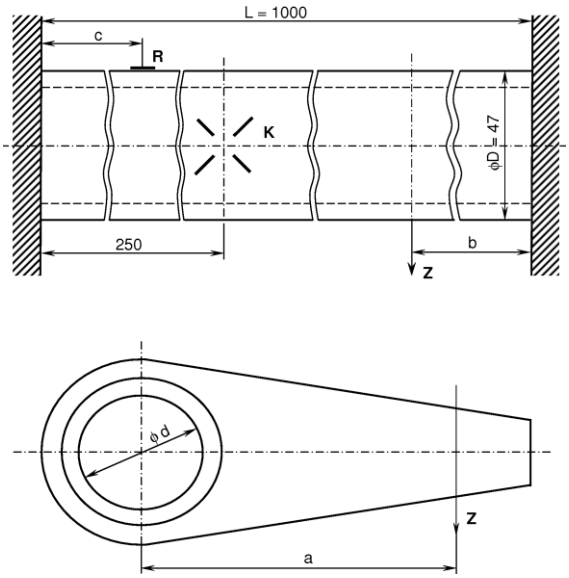
Photoelasticity measurement on the model system

Exercise T5



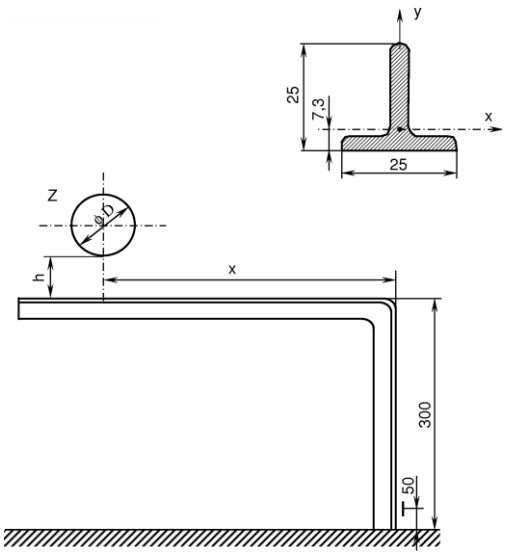
Strain-gauge measurements at the different bridge circuits

Exercise T8



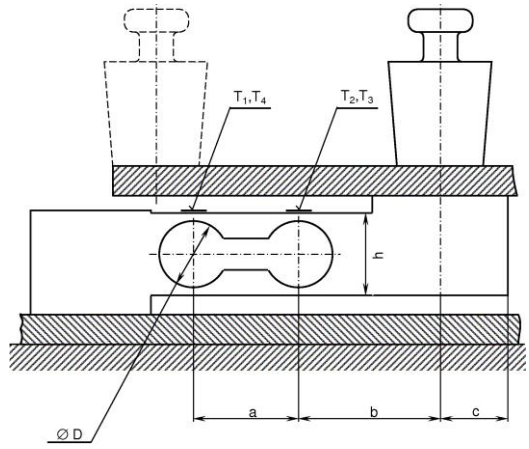
Stress analysis and measurements of hyperstatic beam, subjected to bending and torsion

Exercise T10



Strain – gauge measurement by the impulsive loading

Exercise T19



Stress analysis and calibration of transducer for mass measurement

Reviewer: prof. MSc. Jiří LENERT, CSc., VŠB-TU Ostrava