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## **Review of doctoral thesis**

Title of the thesis: ***ENERG EFFICIENCY IN THE URBAN SCALE***  
Student: ***Ernest Shtepani, M.Arch.***  
Study programme: Architecture and Urbanism  
Study branch: Urban Design and Spatial Planning  
Department: Department of Design and Building, Faculty of Architecture, CTU in Prague  
Supervisor: Prof. Ing. arch. Michal Kohout  
Opponent: Prof. Ing. Jiří Hirš, CSc.

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### 1. General description

The submitted thesis corresponds to the principles and requirements for the structure of the scientific work. The current state of the topic solved in the dissertation is described, objectives and scientific methods for solving are defined. Theoretical analyses and simulation studies are presented and at the end of the thesis also conclusions and recommendations. The author studied the relevant bibliographic resources, demonstrated deep theoretical knowledge and also good orientation in the issues discussed in the dissertation thesis.

The language style of work is good. The work fulfils formal requirements at a very good level.

### 2. The topicality of the thesis

The objectives of PhD thesis, defined in chapter 1.3, are concentrated on assembling selected criteria of energy efficiency in the urban scale, creation of methodology for analyse and study the variety of urban patterns.

The objectives of thesis are current and relevant to the trends on research in the theory of urban design and spatial planning.

### 3. Approach and choice of methods for solving the thesis

The doctoral thesis has a very good analysis of the current state of the energy aspect in urban planning, the theoretical part and methodology of research. The analysis of the studied of the generated urban patterns from the point of view of energy efficiency on 60 variants was done systematic with use of simulations. Author chose for solving of research aims the appropriate physical and mathematic methods, analysis of buildings complex in reality for validation, simulation methods and multi-criteria decisional analysis.

Objectives and methods were sufficiently described, author represents the ideas and knowledge with very good theoretical background. Methods used in doctoral thesis are suitable for this type of research from point of view energy efficiency.

#### 4. Results of thesis, new knowledge and their benefit

Conclusion and discussion are presented at the end of doctoral thesis in chapter 7. New knowledge summarized in the conclusions of the work is the original results: of generation of 60 patterns in different variations and typologies and analysis of them based on building density, number of buildings, site coverage, surface-to-volume ratio, building surface irradiation by solar radiation and behaviour of virtual models effected of wind. In addition, the analysis of real patterns used in Prague are beneficial.

The research contribution and the possibilities for future research are summarized in chapters 7.3 and 7.4 of doctoral thesis.

#### 5. Fulfilling of thesis objectives

The results of doctoral thesis benefit the progress for research and for practice application. They are based on theoretical fundamentals, simulations and analysis carried out within the frame of doctoral thesis and they are useable. Partial results of the thesis have been presented at international conferences and one have been published in professional journal. The objectives were met in full.

#### 6. Remarks and questions

- a) What do you think about using 3D building scanning methods and creating regional data models?
- b) The energy efficiency of buildings includes several items (heating, cooling, ventilation, domestic hot water, lighting and auxiliary energy). Which items are included in your concept of energy efficiency of the urban pattern?
- c) Different types of buildings also have a different mode of operation. Are your results applicable primarily to residential buildings or can they be used for other types of buildings? Have you considered the time use of solar radiation or the effects of wind with respect to the operation of the building?

#### 7. Conclusion

Doctoral dissertation has a significant influence on spatial planning and information modelling of urban smart regions in relation to the development of automated designing (BIM, Revolution 4.0).

In my opinion, **the dissertation thesis by Ernest Shtepani fulfils all the conditions for gaining the PhD. degree** in Architecture and Urbanism – Urban Design and Spatial Planning and therefore **I recommend it to defence.**



Prof. Ing. Jiří Hirš, CSc.

Brno, April 11, 2019