UNIVERSITATEA TEHNICA DE CONSTRUCTII BUCURESTI

REZUMAT TEZĂ DE ABILITARE

PRODUSE INDUSTRIALE NOVATIVE PREFABRICATE PENTRU LOCUINTE DIN ZONE DEFAVORIZATE

Domeniul de doctorat: Inginerie industrială

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ABSTRACT OF THE ABILITATION THESIS

The habilitation thesis entitled “Innovative prefabricated industrial products for homes in disadvantaged areas” has 3 parts as follows:

In part I, chapter 1 presents the candidate for the qualification for PhD management in the field of Engineering and production management, namely Professor PhD Engineer Laurențiu Liviu Rece full professor, and vice-rector at the Technical University of Constructions Bucharest.

It presents the evolution of the candidate, graduate of the Polytechnic University of Bucharest, Faculty of Machine Building Technology, TCM specialization, since graduation in 1983 with an average of 9.26, then as a trainee engineer and until now as a full professor, with basic activities in the field required for habilitation, Industrial Engineering / Engineering and Production Management.

The candidate has spent all the last 30 years, all stages from production engineer, then design engineer (first at an institute in the field and then as a research engineer in UTCB), then assistant professor, head of works, associate professor and since 2004 university professor and currently.

Chapter 1 briefly presents the specifics of teaching and research activities carried out over time. The written books, the newly introduced disciplines, the internships carried out in the country and abroad and the didactic evolution are mentioned.

Also here, but on the research area are presented the contributions in the field required for habilitation, the dozens of contracts and grants made over time, patents (3 already received and another 2 being awarded), articles published in the country and abroad highlighting the fulfillment of all CNATDCU conditions on all indicators individually, but also globally almost 3 times (over 1500 CNATDCU points compared to the minimum 530 required).

The detailed papers are in the list of papers and in the candidate's file.

Also in Chapter 1 was a review of the most outstanding achievements during his university career, as well as the presentation of elements related to professional prestige, awards obtained over time and various functions of representation in the country and abroad.

Chapter 2 presents an interdisciplinary research that the candidate launched at the university, coordinating an extensive group of teachers and specialists in several fields of activity, so as to create a new complete and interdisciplinary industrial product, non-existent on the Romanian market at present, nor in other countries.

The respective project was also submitted for patenting, at OSIM, 3 years ago (2018) and is in an advanced form of verification. Its originality has been confirmed both in the country and abroad, and the formalities for granting the patent are to be carried out, in favor of the university and the group of co-authors led by the candidate for habilitation.

This project is about the design and then the introduction in the industry for the mass production of a prefabricated bathroom for isolated houses in rural areas (also equipped with an extension / a kit for modernizing the kitchen). The theme of this project comes from the desire of the university and the group of authors to give a viable solution for the modernization of peasant households, knowing that over 80% of the several million rural households are not equipped with even minimal utilities and are with far behind what it should be at the moment, and from several points of view.

The project launched by the candidate solves all these things related to increasing the comfort and quality of housing, being adapted both for the most common situation (that in which the household has no water supply or sewerage), but also for specific situations, where there are nearby (on the street) some of these utilities, only the house does not benefit from them for various reasons.

The prefabricated bathroom is designed so that it can be attached / attached to the peasant house, can be brought to its floor level through an innovative system of adjustable foundations, creating a very useful and advantageous surplus space, especially if you consider and the fact that peasant houses are generally undersized.

Moreover, the bathroom module is designed to integrate with the exterior of the architecture of the peasant houses, but inside to ensure the comfort of the block of flats through utilities and forms. It is an idea and a project that have not been realized so far either as a project or physically / industrially somewhere (maybe just various individual and particular formulas embedded in various areas, mostly as improvisations and without complying with existing regulations, as is done in our project).

The candidate even intends, after licensing, with the help of several PhD students and other interested specialists from UTCB or UPB, to prepare the manufacturing for him, so that the project can be taken over by a company with adequate potential, to be physically completed first. as a prototype and then in series production with high productivity and acceptable costs, so that it can be effectively implemented where the conditions are met, and especially in more isolated rural houses, where it does not exist at the moment (and probably nor in the near future) a feasible solution.

The supporting element of this objective is that at present even financial support on structural funds can be accessed, given an existing program at the level of the European Union which aims to eradicate or at least significantly reduce this state of affairs (existing in several countries, not only in Romania) until 2023 - 2024.

Chapter 3 continues the theme started in Chapter 2 -referring to industrial products for housing in disadvantaged areas- but addressing the second category of such housing, this time in urban areas, namely: comfort blocks 2 or 3 remaining from the communist period, blocks of flats in which the apartments have insufficient space and most of them lack balconies. In many of these blocks (of those that still stand) some interior rearrangements were made so as to gain some space, but the problem of the absence of balconies remained.

Through one of the patents submitted under the UTCB title, by a group of UTCB teachers and production specialist, coordinated by the author of the habilitation thesis, a solution was launched that would support the solution of this problem - even if only partially, in certain areas where this is desired and where the necessary approvals will be obtained. It is a project of metal structure / construction, of prefabricated balcony, modular and standardized to adapt to these types of buildings and which the author of the thesis will later try to industrialize if he finds the necessary

human and material resources to transforms it into a verified and certified industrial product with which to solve - where desired - the mentioned problem.

Things seem to be an advanced and relatively large-scale challenge at the moment, but the author of the thesis, who was also the coordinator of the patent project, attracted among the co-authors of the project, the owner of an important metal construction company, who is directly interested. in the materialization of the patent and which has already started work on one of the basic modules of the balcony at prototype level for testing.

In short, Chapter 3 makes an analysis of the current situation, of the balcony variants that would be suitable to be made in standardized and modular construction so that they can cover as many situations as possible; Prior to the filing of the patent, the necessary calculations were made to verify whether the solution is physically possible and whether it ensures the operational safety required by the construction regulations.

The dimensions and verification calculations were made in compliance with all the loads that appear on an ordinary balcony; several viable solutions were identified, elastic displacements were also checked, adequate dimensions and surfaces were provided -even more generous than on ordinary balconies-, but not so large as to affect in terms of resistance.

Several solutions have been identified which have been proposed in the patent and summarized in Chapter 3 (verified by advanced finite element calculation methods and specialized software).

The conclusion was that one can really go for the materialization of such a theme, especially since such balconies added to the buildings have been made both in the country and abroad, but as individual projects, with design costs and high manufacturing that would not be feasible for the proposed general purpose (that of implementation in housing in disadvantaged areas).

Chapter 4. The author of the thesis intends that following the authorization and the receipt of the patent on this topic to advance a development in the area of industrial engineering for the transposition into series production of this industrial product. In conclusion (and this is presented in **Chapter 4**, by Further Developments and **CONCLUSION**): the author sought to present in the habilitation thesis some concerns he has in research / design (interdisciplinary due to the specifics of the university where he works). There are projects that could be developed after habilitation by creating mixed, interdisciplinary groups that include doctoral students and experienced specialists from universities and abroad, in the sense of their industrialization. The author considers it opportune to carry out working groups, including through collaboration between universities, given that the potential in the area of industrial engineering that the university has is certainly much lower than that of similar universities with polytechnic profile, -gen Polytechnic University Bucharest or Transilvania Brașov or Politehnica from Timișoara - who have full faculties in that field and who could participate in these developments, if they consider that the topics, or at least one of them, are of interest.

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