

Design and equipping educational institutions – technical descriptions of the wooden products

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Abstract: Equipping educational institutions with quality and contemporarily designed furniture and equipment is a serious problem in Croatia and abroad. There are many inconsistencies and the quality of furniture and equipment is rather low. Dimensions are not suitable for children and youth and materials used are inadequate and harmful for users' health. All these problems are partially a consequence of inadequate technical descriptions and lack of quality attributed to the products in use, especially in cases where companies bid on public tenders.

With the aim to improve the conditions for bidding and equipping public institutions with furniture and equipment, a team of experts at the Department of furniture and wood products of the Faculty of Forestry in Zagreb published the Manual for Wood Products Quality for Educational Institutions in the framework of the project entitled *Wood Is Good* and financed by the Croatian Chamber of Economy, Hrvatske šume d.o.o. and the Ministry of Agriculture. The intention of the Manual is to stimulate and introduce high-quality furniture, equipment, construction products (doors, windows and floors) as well as other products made of wood and wooden materials in line with the HRN EN norms into the public procurement system and other tendering procedures, actively involve architects and designers in the production and motivate responsible methods for monitor and control production and delivery of wood products for equipping educational institutions.

The authors believe that this document can serve as the platform for interdisciplinary analysis of various problems related to equipping educational institutions and preserving health of users. It can also strengthen cooperation between experts and scientists active in the fields of education, pedagogy, sociology, medical science, ergonomics, design, architecture, construction, technology, economy, ecology, wood and wood materials production and processing and many other.

Keywords: equipment, educational institution, kindergarten, school, equipping, design, technical description

1 Introduction

The existing written documents about pre-school, primary and secondary education in most cases do not pay enough attention to quality of adequate furniture and equipment or other products needed in educational institutions for all activities related to the educational process and psycho-physical, cognitive and other needs of children and youth (Pasalar 2003, Higgins et al. 2005, Dudek 2005, Grbac and Domljan 2007, Domljan 2011, Domljan and Vlaović 2011). Aside from non-quality materials, problems often arise because of disproportioned dimensions of furniture in relation to end-users which can even result in health problems such as musculoskeletal deformities and low back pain (MSD/LBP) (Linton 1994, Knight and Noyes 1999, Paracells et al. 1999, Haviarova et al. 2001, Watson et al. 2002, Domljan 2011).

One of the most important problems noticed over a longer period of time in Croatia is primarily related to inconsistency and lower quality of products procured for the educational

institutions along with inadequate materials used in production which prove to have harmful effects on health (Domljan 2011). Producers hold certificates on the tested furniture quality proving that all precondition have been met and such documents are delivered in public procurement procedures but thus procured furniture very soon gets ruined and proves to be inadequate for users' needs. The biggest problems result from non-observation of required descriptions contained in the technical specifications or inadequacy of technical descriptions lacking clarity and detailed elaboration. This results in self-willed interpretation on the behalf of incompetent investors who often do not consult experts. In many cases public procurement procedures for equipping educational institutions do not control the quality of procured products since they do not demand delivery of product samples or at least photographs showing the elements of an offer. The result is a wide range of products delivered for facilities that are rarely controlled in the final phase of the delivery and usually do not correspond with the basic standards of quality in respect of preservation of children and young people's health (Domljan and Vlaović 2011).

1.1 Problem

Croatian educational system comprises pre-school, primary, secondary and high school education and institutions of higher education (***, 2012) and education takes place in facilities for a designated purpose such as kindergartens, schools or colleges.

There are several documents describing the procedures to be applied in equipping and defining the type and quantity of furniture for every room also stating information about how the interiors and exteriors of educational institutions should look like (Auf-Franić et al. 2003; Auf-Franić et al. 2004). From an architectural point of view, such interiors and exteriors in most cases have modern designs and responsible construction. However, the selection of furniture, equipment, flooring, doors, windows and other wood products used for interiors very often leaves this important segment for decision-making in hands of incompetent professions. Croatia lacks adequate and sufficient literature describing possible procedures for equipping educational and pedagogical facilities, defining quality, dimensions, requests and regulations for particular types of furniture, design and construction solutions as well as other details about how to equip educational facilities with quality furniture and wood equipment, floors, carpentry and other wood products (Domljan 2011; Case study for the 2002-2013 period). In general, the influence of products on the overall educational and pedagogical process and end-users is insufficiently taken into consideration. Over the past twenty years the Croatian educational system has introduced some important reforms that, among other things, intend to introduce co-working methods for learning and research. Unfortunately, those reforms have not changed the perception and design of furniture and equipment so that children work on old-fashioned, poorly designed furniture that does not correspond to functional and ergonomic requirements and use equipment that prevents them from participating in the new teaching and learning processes (Domljan 2009; Domljan 2011). This is mostly the case in primary and high school facilities and very often in kindergartens, too. All the above-mentioned factors indicate the most important problem conditioning the present situation where children and young people remain exposed to products that reflect negatively on their healthy development.

Aiming to improve the conditions for procuring furniture and equipment in educational institutions, the team of experts at the Department of furniture and wood products of the Faculty of Forestry, in Zagreb in the framework of the project entitled *Wood Is Good* and financed by the Croatian Chamber of Economy, Hrvatske šume d.o.o. and the Ministry of Agriculture, carried out the project named *Publication of the wood products technical description book*. The project took place from April 2012 to April 2013 and included cooperation between interdisciplinary experts from various fields such as medical science,

ergonomics, economy, public procurement, wood constructions and technology, architecture, design and other. Field research, data collected from the existing documents and scientific research resulted in the *Manual for Quality Preparation of Technical Descriptions for Wood Products Used in Educational Institutions*.

This paper reflects on the Manual, its objective, aim and application. The authors used an exemplary description for a school chair used by children in order to present description methods for other wood products contained in the Manual.

2 Project purpose and objectives

The purpose of this Project is to stimulate the introduction of high-quality furniture, equipment, construction, products (doors, windows and floors) as well as other products made of wood and wooden materials in line with the HRN EN norms into the public procurement system and other procedures related to equipping kindergartens and primary and secondary schools in Croatia. This can be done by means of technical descriptions, recommendations, norms and specialized product descriptions for wood products and materials used for equipping educational facilities.

Apart from the above-stated, the purpose is also to engage other professions, such as architects and designers, in the creation of wood products and stimulate responsible mechanisms for monitoring and controlling production process and delivery of wood products used in equipping. Thus, all procedures related to decision-making, procuring and equipping necessarily have to involve not only investors and producers/suppliers of furniture and other wood products, but also other professionals such as architects, designers, constructors, quality experts, medical specialists, experts in ergonomics and other in order to improve product quality and competitiveness as well as to find a solution for the problem related to inconsistency noticed in the present procedures used for equipping educational facilities. The intention is also to stimulate the application of the new solutions (in terms of design, construction, technology and so on) for wood products founded in contemporary scientific research and expertise.

The main objective of the Manual is to provide a framework for defining quality in technical descriptions for particular wood products that are most often used for equipping kindergartens and schools and which are defined in the existing regulations and documents on the national level. To be more precise, the main objective is to introduce a unified and comparative quality system for wood products that could be used by producers/suppliers in order to competitively participate in public procurement procedures for equipping educational facilities and improve the quality and better use of wood products.

3 The content of the manual

Manual for Quality – Preparation of Technical Descriptions- Wood Products - Tome I – Educational Institutions is a result of the project named *Publication of the wood products technical description book*. It is composed of three main parts.

The first part is composed of two chapters. The first chapter entitled ABOUT THE MANUAL contains some basic remarks and explains the purpose, objective and expected results of the Project whereas the second chapter entitled CONTEMPORARY FINDINGS serves as an introduction in various problems linked to equipping educational facilities, lists all the existing documents in Croatia and analyses the results of scientific research in the field of contemporary educational processes, design of the environment in question, equipping and general influence of furniture and equipment on healthy development of children and young people attending classes in kindergartens and primary and secondary schools in Croatia.

The second part represents the main part of the Manual. It contains three chapters which are linked to the previous ones. The third chapter is entitled AN INTRODUCTION TO WOOD PRODUCT QUALITY. It describes general conditions and quality factors and provides explanations for some of the basic terms contained in the Glossary. This part of the Manual also gives recommendations for the norms applied in the field of furniture and furniture parts as well as characteristics for construction and other wood products. The fourth chapter FURNITURE AND EQUIPMENT lists the most important requirements and recommendations for designing furniture and equipment. These include specifications for technical quality, constructional and safety regulations, ergonomic and anthropometric factors, pedagogical and esthetical requirements, application of wood and non-wood materials, surface finishing, upholstering and other. The most important examples are given and described for various types of furniture used for storing, working and consuming food, sitting and lying together with equipment elements. Technical descriptions are also given for some of the typical examples for each particular type of furniture. The fifth chapter entitled CONSTRUCTION PRODUCTS also provides a list of requirements and recommendations and describes some exemplary prototypes in this category: doors, windows and wooden floors.

The sixth chapter VISIONS AND NEW PROPOSALS FOR EQUIPPING is contained in the third part of the Manual. It intended for all types of users, i.e. children, young people, parents, teachers and others but mostly for those who participate in designing and equipping educational facilities or designing and producing furniture and equipment that will be used inside of such facilities. This chapter underlines all problems arising from inadequately designed furniture and equipment and underpins the importance of an appropriate connection between furniture and user's health with some of the existing solutions and good equipping practices. The final chapter or CONCLUSION accentuates the importance of interdisciplinary cooperation among experts in various fields since the intention of the Manual is to positively contribute to the creation of a comprehensive and stimulating environment through the use of quality and "healthy" wood products.

4 Technical descriptions for wood products

Technical descriptions for products used in equipping facilities with quality furniture are the biggest problem. If a particular technical description is incorrect and written unambiguously there is a possibility that investors, producers, procurers and other interested parties in the process of procuring and equipping educational institutions simply cannot understand the overall process.

Aiming to achieve a unified quality of technical descriptions for particular wood products that are most frequently used for equipping educational institutions, the Manual lists some of the basic elements of furniture and equipment whose typology is founded in the Croatian Pedagogical Standards (**2008a, **2008b, **2008c), together with expended variants for each type.

Wood products used for equipping educational institutions in most cases comprise furniture for sitting and working (chairs, armchairs, tables and other), furniture for lying (beds), furniture for storing (cabinets, shelves, glass cabinets and other), and construction products (doors, windows, wooden floors). The Manual contains more than one hundred wood products described as possible but not single solutions. Various specificities and characteristics are defined for each group (type) along with relevant explanations for individual product typology. Each individual product belonging to a particular type is presented spatially (sketch) and described in a way it contains dimensions, purpose,

construction description, materials, processing, safety requirements and enforceable norms and product variants (if there are any).

Mainly, the products are described in a twelve main parts. For example, the school chair is described as follows:

1. Technical description No.:
2. Product name: *School chair, height 5 (green)*
3. Product use and brief description:
4. Design and quality standard:
5. Functional (overall) dimensions: composed / packed:
6. Type and quality of wood materials:
7. Type and quality of non-wood materials:
8. Processing accuracy:
9. Construction and assembling:
10. Surface treatment:
11. Packaging:
12. Picture of the product (Fig.1)



Figure 1. School chair

5 Conclusion

Interiors used for education are not generic. Each new project should take into consideration time, place and users as well as dimension of children and young people's healthy development. The entire process should be rational, responsible and defined by norms, which does not presuppose their inflexibility. Thus, the Manual does not define single solutions and designs but rather provides a set of recommendations, requirements and research data for use in the production of quality wood products offering various possibilities for design and further development and research.

Furniture and equipment are by no means the most important elements of educational process but they strongly influence its methods and overall quality. Sometimes furniture and equipment play a decisive role in motivating or discouraging students from learning and participating in school work and protecting their health together with other factors listed in the Manual. The authors believe that further research in the field should take that direction.

Present research indicates that most of attention, energy and resources were invested in analyzing working environments mostly used as offices and problems encountered by the working population sitting in offices. Now is the time to reconsider healthy development of children and young people in educational institutions where comfort, motivation, communication and well-being play the most important role. New programmes, technologies and working processes in all segments of educational system require changes. It is up to us, as

socially responsible beings, to stimulate, adopt and apply such changes for the well-being of the youngest population and the society as a whole.

The Manual presented in this Paper is, hopefully, a contribution to such intentions.

References

- Auf-Franić H., Oluić V., Žarnić T., Bertina M., Korlaet L., Rister V., Roth-Čerina M. (2003): Nurseries and kindergartens – Guidelines for programming, planning and designing (in Croatian), University of Zagreb - Faculty of Architecture, Zagreb, Acta Architectonica
- Auf-Franić H., Oluić V., Žarnić, T., Bertina M., Korlaet L., Rister V., Roth-Čerina M. (2004): Primary schools. Programming. Planning and designing (in Croatian), Golden marketing, Tehnička knjiga, University of Zagreb - Faculty of Architecture, Zagreb.
- Domljan D. (2011): Designing school furniture as a precondition for preserving pupils' health (in Croatian); doctoral thesis. University of Zagreb, Faculty of Forestry, Zagreb.
- Domljan D., Vlaović Z. (2011): Technical documentation for equipping kindergartens, Project: Introducing standardized equipment and furniture in the pre-school educational system (in Croatian), University of Zagreb - Faculty of Forestry.
- Dudek M. (2005): Children Spaces. Architectural Press, An imprint of Elsevier, Oxford, Burlington, UK.
- Grbac I., Domljan D. (2007): Furniture for a healthy life, *Sigurnost* 49 (3): 263-279.
- Haviarova E., Eckelman C., Erdil Y. (2001): Design and Testing of Environmentally Friendly Wood School Chairs for Developing Countries. *Forest Products Journal* 51 (3): 56-64.
- Higgins S., Hall E., Wall K., Woolner P., McCaughey C. (2005): The Impact of School Environments: A literature review. Design Council. The Centre for Learning and Teaching. School of Education, Communication and Language Science, University of Newcastle, UK. [<http://www.cfbt.com/PDF/91085.pdf>]
- Knight G., Noyes J. (1999): Children's behavior and the design of school furniture. *Ergonomics* 42 (5): 747-760.
- Linton S.J., Hellsing A.L., Halme T., Åkerstedt K. (1994): The effects of ergonomically designed furniture on pupils' attitudes, symptoms and behavior. *Applied Ergonomics* 25 (5): 299-304.
- Paracells C., Stommel M., Hubbard R.P. (1999): Mismatch of classroom furniture and student body dimensions. Empirical findings and health implications. *Journal of Adolescent Health* 24 (4): 265-273.
- Pasalar C. (2003): The effects of spatial layouts on students' interactions in middle schools: multiple case analysis, doctoral dissertation, Faculty of North Carolina State University, USA.
- Watson K.D., Papageorgiou A.C., Jones G.T., Taylor S., Symmons D.P.M., Silman A.J., Macfarlane G.J. (2002): Low back pain in schoolchildren: occurrence and characteristics. *Pain*, 97, 87-92.
- *** (2008)a: National pedagogical standard for pre-school education, the Croatian Parliament, 16 May 2008. [http://narodne-novine.nn.hr/clanci/sluzbeni/2008_06_63_2128.html]
- *** (2008)b: National pedagogical standard for elementary school education, the Croatian Parliament, 16 May 2008. [http://narodnenovine.nn.hr/clanci/sluzbeni/2008_06_63_2129.html]
- *** (2008)c: National pedagogical standard for high school education RH, the Croatian Parliament, 16 May 2008 [<http://narodne-novine.nn.hr/clanci/sluzbeni/339619.html>]
- *** (2008)d: HRN EN 1729-1: Furniture – Desk and chairs for educational institutions – 1st part: Functional dimensions (EN 1729-1:2006), HZN Zagreb, CEN Brussels.

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