

Architectonic Quality of Industrial Log Architecture in the Scope of Tectonics – Learning from Architectural Competitions

Matti Lakkala, Janne Pihlajaniemi, *University of Oulu, Oulu, Finland*

Abstract – Log is a highly topical building material. Despite the current potential of log, large-scale log buildings of high architectonic quality are rare. By increasing understanding of the architectonic quality of industrial log building, the quality of future log buildings can be enhanced. Our research data is based on the outcomes of two recent architectural competitions and interviews related to these. Methodology combines semi-structured interviews with research by design. The results describe, in the scope of tectonics, architectonic features that are essential for architectonic quality of a log building and are revealing of log structures, acknowledging the preconditions of log in the design, and making secondary design solutions characteristic for log. The results are coherent with ideals of tectonic theory.

Keywords – Architectural competition, architectonic quality, design research, industrial log, tectonic theory in architecture.

INTRODUCTION

Log is a highly topical building material. Massive wooden walls are a good solution in reducing the carbon footprint of construction industry. Walls of solid construction, especially log walls, are more reliable structures in moisture-related issues than common layered wall structures. Industrial glue-lam log, which is a highly technical product, has become the prevailing solution in Finnish log-house industry. The newest development is non-settling log, which makes the construction of a large-scale log building much easier by eliminating settling, which is the biggest technical deficiency of traditional log structure.

The public discussion in Finland suggests that utilization of industrial log building is increasing. However, despite current potential of log as a construction material and rapid technical development, large-scale log buildings of high architectonic quality are still rare. For example in Archdaily, a major web-based architectural publication that holds an archive of nearly 30 000 architectural projects, only a handful of these projects utilize log constructions. The barriers for using log are mainly similar than the barriers with wood building in general. These include, for example stereotypes [1]. Moreover, the intuition among architects still is that log is better suitable for rural settings than for urban centers [2].

Because of the ancient origin of log, architects face contradictions of modern and traditional when designing contemporary buildings with log. By increasing understanding of the architectonic quality of industrial log building, the quality of future log buildings can be enhanced. Because of the lack of good built examples, this paper studies the factors of architectonic quality through unbuilt presentations of log architecture in two recent architectural competitions. Architectural competitions have become a topic of architectural research, where competitions are

seen as “future oriented production of knowledge through architectural projects” [3, 10]. The authors of this paper have observed that log utilizing proposals have appeared in Finnish architectural competitions only recently. This could indicate that in Finland architects too have an increased interest in utilizing log building.

The concept of architectonic quality is in this paper approached from the viewpoint of tectonics of construction. This was considered fruitful as the focus is on log constructions, where the significance of structure is presumably prominent for architectonic quality. Hvejsel et al. [4] see as a current problem the fact that buildings are “performative structural frameworks rather than qualitative spaces for habitation and contemplation”. In order to achieve better architectonic quality in everyday practice, they point out the need to develop tectonic theory in architecture further and to bring this theory into application [4]. During the last decades, the discussion on tectonics in architecture has been growing, associated specifically with digital fabrication and parametric design [5], [6]. However, in contemporary architecture also simpler and especially homogeneous building techniques have been gaining popularity. One of these techniques is log building.

The existing scientific literature does not study the architectonic quality of log building from the viewpoint of tectonics. Frampton [7] addresses the notion of tectonics through historical buildings, but none of these are log buildings. With the research gap presented above, the research questions of this paper are as follows: What architectonic features of log construction are crucial for architectonic quality in the context of architectural competition proposals, and for what reasons? Can the features be explained through tectonic theory in architecture?

A. Tectonic Theory in Architecture

Architecture consists of multiple elements, one of which is tectonics. “It is my contention that the unavoidably earthbound nature of building is as tectonic and tactile in character as it is scenographic and visual, although none of these attributes deny its spatiality” [7, 2]. According to Frampton, tectonics means the expressive potential of constructional technique and its implications for architectural space, or “poetics of construction” [7, 2].

As a theoretical approach to architecture, tectonics focuses on the practice of construction. Beim describes an intrinsic relationship between architectural form and development of construction where one depends on the other. “As such, building technology and practices of construction can be regarded as sources or agencies of meaning in architecture. In contemporary architectural theory and practice, this definition of construction relates to the concept of *tectonics*” [8, 16]. Tectonics is often associated with

TABLE I
BREAKDOWN OF PARTICIPANTS BY GENDER, OCCUPATION, AGE RANGE, COMPETITION REPRESENTED,
AND ROLE IN THE COMPETITION [AUTHORS OF THE ARTICLE]

Interviewee (n=4)	Male/Female	Professional background	Age range	Represented competition	Role in competition
#1	Male	Architect	30–40	Finnish competition	Main author of the winning proposal
#2	Female	Architect	30–40	Finnish competition	Professional member of the jury (1/2)
#3	Female	Architect	40–50	Finnish competition	Professional member of the jury (2/2)
#4	Male	Architect	40–50	Norwegian competition	Professional member of the jury (1/2)

revealing or expressing the constructional logic of a building. This is not, however, the whole truth according to Bech-Danielsen et al: “Tectonic thinking is not only about portraying a constructional logic. Tectonics is to create material realities that reveal narrative meaning. Tectonics is to construct with cultural references” [9, 5].

Tectonic thinking is defined as “a central attention towards the nature of the making, and the application of building materials (construction) and how this attention forms a creative force in building constructions, structural features and architectural design (construing)” [9, 12]. In other words, according to tectonic thinking, architecture derives its legitimacy from material’s properties and building practice itself. How and which materials are used is central in the tectonics of a building. Focus on material properties and their implications for architectural design has been the target of interest in the architectural field “throughout centuries” [10]. In addition, the process of making the building construction is important for the tectonics of the building. “Architecture based on tectonic principles tells us the stories of its making by exposing the logic of both the separate unit and its connection to the building structure as a whole” [10]. This is crucial from the viewpoint of log architecture, since it consists of individual logs that constitute the whole.

Hvejsel et al. state that “the tectonic traditionally denote an honest unification of form, technology and materials” [4]. However, they feel that the complexity of current building practices demand adding the notion of cladding to the discourse of tectonic theory. This notion is necessary in the case of almost any other contemporary building technique, but with log, a form of solid construction, the case is different. In log building, log itself often forms the surfaces of walls and the bearing structure of the building. Thus, the significance of log construction seems evident for log architecture. In this sense, tectonic theory in architecture and constructing with logs share common ground in many ways.

I. METHODS AND RESEARCH PROCESS

The research methods used in this paper combine semi-structured interviews [11] with research by design [12], [13]. Two architectural competitions – of the Museum of Norwegian Forest Finns (12/2017, Norway) and of mixed-use high school and cul-

tural building Monio (2/2018, Finland) form the basis for the research data. The Norwegian competition (NC) had 200 entries, of which 32 utilized log building. None of these was awarded. The Finnish competition (FC) had 57 entries of which two (2) utilized log. The other one of these, further discussed in the results chapter of this paper, was the winning proposal.

B. Data

The research data consists of three parts. The semi-structured interviews act as a primary source of results (1). The log-utilizing proposals were not awarded in NC. Therefore, the jury had not evaluated them in detail, and thus accurate recollections of individual proposals did not come up in the interview. Thus, we could not discuss the features of any singular proposal of NC in the interview. That is why we utilized the features found in all of the proposals of NC as quantitative data (2). These two data sources are supplemented by reflected analysis of design processes of two entries that the authors of this paper made for the NC (3).

C. Interviews

Finnish architectural competitions have a long tradition of more than a hundred years and they have clear rules for judgement, including anonymity of the competitors in regard to the jury members [21]. This ensures that the winning proposal truly is a worthy winner. Thus, based on the results of an open architectural competition, the winning proposal of FC can be regarded as of high architectonic quality. Therefore, three quarters of the interviews were related to this competition. The interviews of chosen targets were considered as a suitable method for gaining deeper understanding of architectural projects and processes of the competitions. The interviewees were architects – members of juries and one competitor. These were one of the two professional members of the jury of NC, both of the professional members of the jury of FC and the main author of the winning proposal of FC. Thus, interviews cover two different aspects of architectural competition – that one of jury’s and of competitor’s. Breakdown of participants is presented in Table I.

The interviews concerned the evaluation and design processes as well as actual architectonic features of the competition proposals. Interviews contained general questions about participants’ views of architectonic quality, the image and perception of log

and log building, as well as questions on correlation between the use of log construction and architectonic quality. In the interviews, the results of only FC or NC were discussed with the corresponding participant. The interviews were carried out in August 2018, and recorded (audio).

D. Design Research

Because the research data is based on architectural competitions, the results of this study are based on the knowledge generated in design processes of the proposals, which is characteristic for design research. However, its definition is ambiguous [14]. Therefore, we will here elaborate on the mechanism of knowledge generation of this particular study. Archer [15] states, that “there exists a designerly way of thinking and communicating that is ... as powerful as scientific and scholarly methods of inquiry, when applied to its own kind of problems.” The creative process of practitioners, such as design professionals, is described as reflective practice [16]. Lucas [17, 43] describes this as a loop where acting and thinking alternate as a continuum. More precisely, design as a creative process is a form of inquiry where knowledge is born by iterative process of analysis and generating ideas and alternate solutions [18], [19].

The problem for the competitors to solve by means of design justifies why exactly these two competitions are exploited to answer the research questions of this paper. In both of the competitions one of the main objectives given in the competition brief was to deliver a solution that is of high architectonic quality. In addition, both competitions encouraged using timber construction. Thus, as the paper focuses only on the log-utilizing proposals, the design problem for competitors has been how to create a public building of high architectonic quality that utilizes log construction.

Approximately four hours of interviews were transcribed on some 30 pages of text documents, which were utilized for several close readings both as single narratives and by comparing differ-

ent responses to the same question. The analysis of the transcriptions followed the process of qualitative analysis [20, 262–263] and its iterative six-step cycle of moving from raw data to theoretically meaningful understanding. These findings were supplemented by quantitative data of NC and by reflected analysis of our own design processes. Our design processes during the NC were documented in a diary. Besides supplementing the findings of the interviews, the reflective analysis of our design processes informed our research and sharpened the scope of this research prior to conducting the interviews. In this sense, this study contains features of research by design method.

II. RESULTS

Architectonic quality is a multifaceted concept, which is difficult to define unequivocally. Due to this ambiguity, we wanted to make sure that when discussing the concept of architectonic quality with the participants, both the interviewee and the interviewer understand the concept similarly. Thus, in this paper, architectonic quality is approached through a definition provided by the interviewees of this study in the context of architectural competitions. This definition consists of criteria that were brought up in the interviews. The aspects that emerged were the overall scale and suitability for the place, recognition of the building site and its conditions, proportions of building volumes, functionality of the spaces in regard the intended use, spatiality, atmosphere or spirit, or image of the building, merging the outer and inner spaces as well as public and private spaces and the use of materials. One respondent described architectonic quality as interplay of space, light and material, and that one remembers the place from this interplay afterwards. The results display the manner in which the architectonic features of log construction affect these aspects and hence the architectonic quality.

On a general level, the interviews showed that the potentiality of using log construction is affected by context and preconcep-

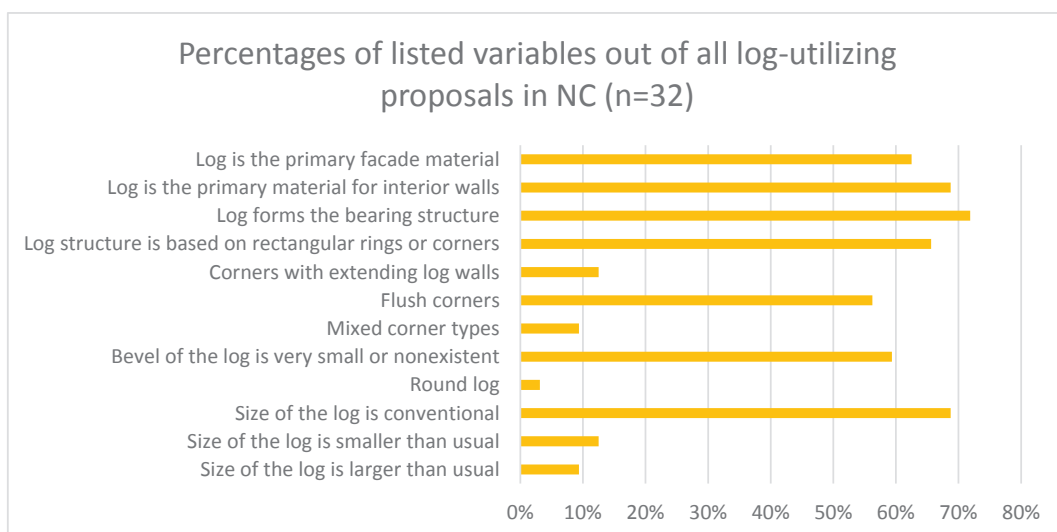


Fig. 1. Percentages of listed variables of all log-utilizing proposals in NC [Figure: Authors of the Article].



Fig. 2. The main entrance of *Monikko*, the winning proposal of FC [Aarti Ollila Ristola Architects Ltd].

tions. Many of the interviewees stated that, basically, log is a more suitable choice in provincial areas than in urban centers, but it was noted that this depends on how the material is used. In Finland, there is a vital log building industry and perhaps because of this log building of industrial production was the natural starting point for discussion with respondents in Finnish context. In Norway, such industry does not exist. There log building was assimilated more with traditional way of building by hand-hewing.

The results from all three parts of data sources have been divided into three categories. At the beginning of each subchapter, the general observations from interviews are presented among aspects of the quantitative data. Next, more detailed observations of *Monikko*, the winning proposal of FC, are presented. Finally, our own design processes are reflected from the point of view of the first two aspects.

E. Desire for Revealing the Log Structures

It seemed almost self-evident among interviewees that log goes to waste if covered. A prevailing perception was that revealing of log construction is a general starting point for log building. Also, of the 32 log-utilizing proposals of NC, 63 % utilized log as the primary façade material, and 69 % as a primary material for interior walls (Fig. 1). The most universal explanation for the need of revealing was that by this the ‘log-ness’ of the building is communicated most efficiently, without further explanations, which was an important image factor for the city of Tuusula. It was important to reveal the log structure also for the sake of architectonic quality.

For the author of *Monikko* (Fig. 2), architectonic quality in general stems from the utilized construction materials and their

use in correct parts of the building. The author added that it is important to make visible how and of what material the building is constructed and that by log, a tectonic material, this can be achieved. For the author it was the most important strength of log in terms of architectonic quality that the bearing structure is also a visible surface in the facades as well as in interiors. Another positive aspect was that the plain materiality continues from outside to inside.

Other respondents (members of the jury) replied similarly concerning this issue. The use of log and that it is revealed both inside and outside was seen as creating the identity for the building in the case of *Monikko*. Using a single visible material was seen also as a way of creating a clear entirety from a complex set of different functions.

Our own experiences were mainly coherent with interviewees’ opinions. However, we felt uneasy leaving log totally uncovered in the facades in the fear of too cottage-like appearance, and ended up covering most of the log in the facades (Figs. 3 and 4). This unveils some incoherence of designing with log.

F. Designing by Preconditions of Log Structure

Another key factor behind architectonic quality of *Monikko* that came up was the utilization of log according to preconditions of log structures. The preconditions were recognized as limited span length of log structure and the fact that in order to be stable, log wall ‘never’ just ends – it turns or crosses. As such, these were seen as weaknesses or constraints of log structure, compared to other materials. However, some of the most prominent features of architectonic quality of *Monikko* were related to designing according to these limitations.



Fig. 3. The main entrance of *5x5...6*, one of the two proposals made by the authors of this paper for NC [Figure: Authors of the Article].



Fig. 4. The main entrance of *Fenix*, one of the two proposals made by the authors of this paper for NC [Figure: Authors of the Article].



Fig. 5. Interior view from the 'main street' of *Monikko* [Aarti Ollila Ristola Architects Ltd].

The relevance of bearing structure for architectonic quality of log buildings was also discussed. On a general level, it was seen as positive for architectonic quality of log buildings that the bearing structure forms a crucial part of the architecture. Also, 72 % of the log-structured proposals of NC utilized log as a bearing structure and in 66 % the log structure was based on use of rectangular rings or crossings of log walls, which is distinctive for log structure according to the interviewees.

The designers of *Monikko* had felt that the preconditions of log construction have to be the starting point of the whole building, beginning from the overall layout. The author described how the fundamental spatial and structural solution, as a three-dimensional maze consists of spans and structure heights reasonable for log structure. The authors of *Monikko* had made a conscious decision to make not just the outer walls, but also the interior bearing walls out of logs (Fig. 5).

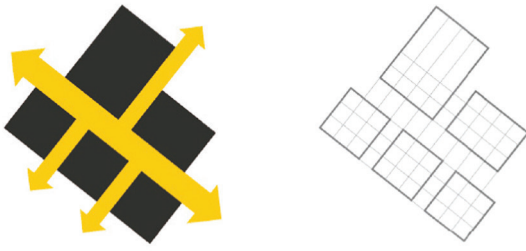


Fig. 6. Overall layout of *Monikko* consists of smaller ‘houses’ inside the building [Aarti Ollila Ristola Architects Ltd]



Fig. 7. Interior view of *5x5...6* [Figure: Authors of the Article].



Fig. 8. Interior view of *Fenix* [Figure: Authors of the Article].

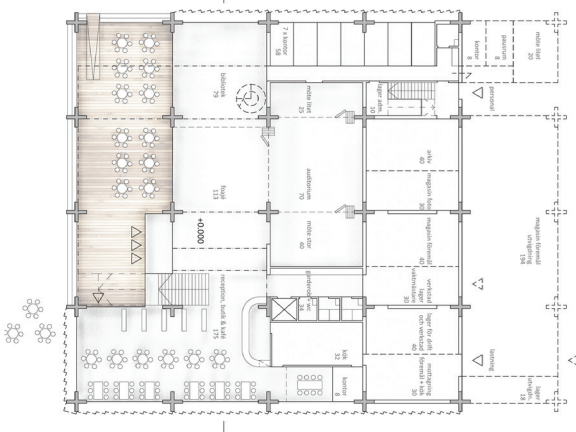
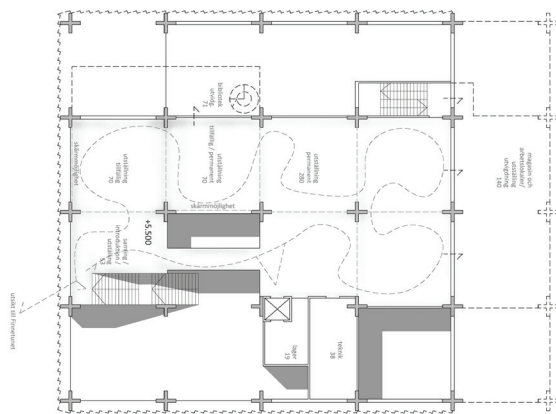


Fig. 9. Floor plans of *5x5...6* [Figure: Authors of the Article].



This was noticed by the members of jury as well. They felt that the limitations of a log structure were turned into a strength in *Monikko*, when organizing the spaces into several smaller ‘houses’ inside the building (Fig. 6). With this distinctive solution for log, the large scale of the building was managed, and it linked the building volume better to the scale of the surrounding environment. The fundamental spatial concept of ‘main street’ was also seen as consequence of the limited span length of log structure, and as a further consequence “a very rich spatial weave” ensued. How the architects had fitted the room program to the requirements of log building, and how it created something new, beau-

tiful and exciting was seen as important merit of the proposal, in terms of architectonic quality. It was stated by the members of the jury as well that the bearing structures affected the architectonic quality of *Monikko* very much, but it was not merely because of the log being used but because the structure was done so skillfully in log’s terms.

For us as well, the use of log as a bearing structure was self-evident. In the other proposal for NC (Figs. 7 and 9), we used rational grid of cross-shaped log columns as a bearing structure, which could easily lead to a monotonic impression, and tie hands in solving the room program. In the other proposal, we ended up

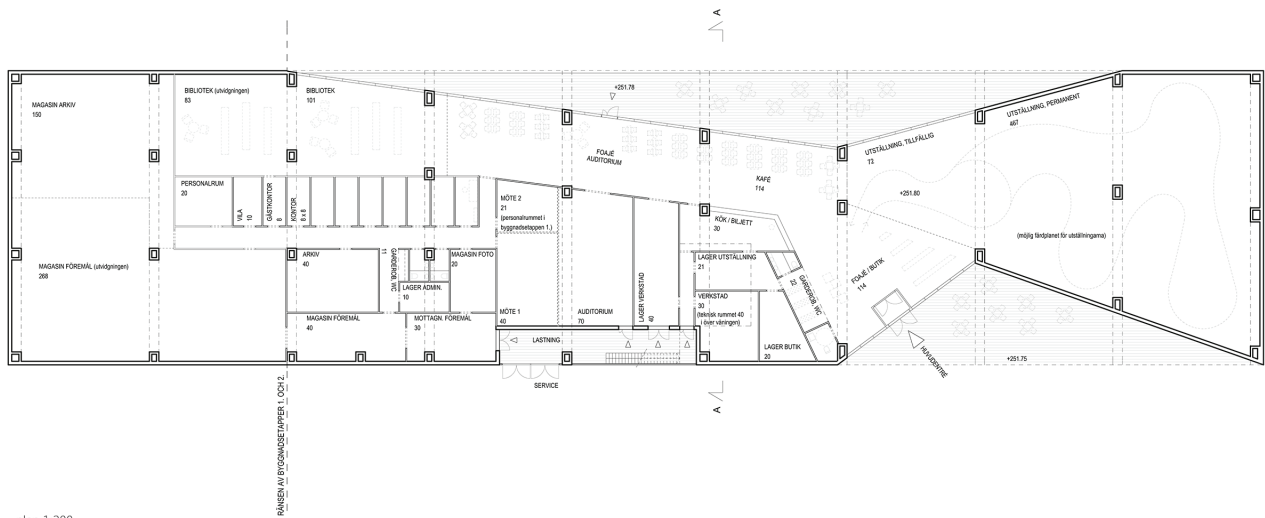


Fig. 10. Floor plans of Fenix [Figure: Authors of the Article].

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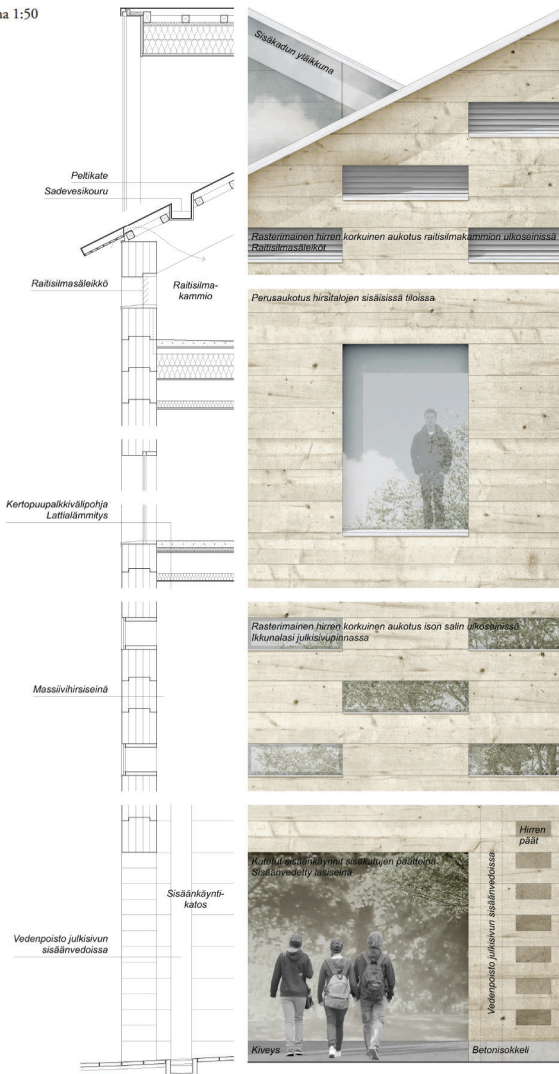


Fig. 11. Façade excerpt showing the detailing of Monikko [Aarti Ollila Ristola Architects Ltd].

creating the form first, then fitting the log structure to it (Figs. 8 and 10). This on the other hand led away from certain practicality and easiness characteristic to log constructions. We feel that the log structure of Monikko balances itself successfully between these extremities.

G. The Importance of Further Design Solutions that Are Characteristic for Log and the Effect of Presentation

Designing secondary design solutions in terms of log, and detailing of logs appeared important for the architectonic quality of log building, but at the same time, detailing was affected by the requirements for presentations of architectural competitions. It was noted that the design task with log should be similar to that with brick when choosing the correct type. It was stated in general that visible joints are beautiful, and short corners and flush log walls were preferred. This was the dominant practice in NC as well, since only one proposal utilized round logs and only 22 % other than short corners.

The author of Monikko described that façade motifs, openings and ornamentation were designed through characteristics of log building. Showing the requirements of presentation, the author also described how in the proposal’s presentation the logs and the joints were stylized to be plain enough for a competition proposal.

Again, members of the jury considered these crucial as well, as beauty of the façade was mentioned as an essential element in architectonic quality of Monikko. By this, it was referred to the small openings in the log walls, where quite imaginatively an opening is created by taking a piece of log out of the wall. (Fig. 11) The jury felt that in the case of Monikko, all of log’s details were beautifully presented.

According to our own experience, the significance of presentation is vital in architectural competitions. It is a question of presenting the design in appropriate accuracy, which in the case of these competitions is rather schematic. Though detailing in competition proposal surely indicates the actual intentions of

architects, the requirements of presentation also affect the detailing of logs in this context of architectural competitions.

III. DISCUSSION

The results pointed out many architectonic features of log construction that affect the aspects of architectonic quality brought up by the participants. Designing according to the preconditions of log structure and using log as a visible material throughout the building, greatly raises the significance of log construction for the architectonic quality of log building. When comparing the results of this paper to the framework of tectonic theory, it is evident that many aspects of tectonics are very coherent with the results, since the results indicate that in high quality log architecture the construction, and the way it is arranged, forms an essential, if not the most crucial part of architectonic quality.

For log architecture, it seems that architectonic quality originates itself in practical use of log material and novel solutions created by practicality. Humble adequacy and robustness seem to be characteristic for log buildings of high architectonic quality. It is an interesting question whether this is characteristic especially to log constructions, or is just in coherence with the current spirit of contemporary architecture?

The reasons behind the results are somewhat ambiguous. The other results of this study (Chapter II, F, G) could be the natural consequence of the desire of log being visible. Then again, when a building is designed elegantly in a way characteristic to the construction material, it is likely that the architect would want to express this by revealing the construction. Therefore, it is difficult to say if characteristic use of log is a consequence of the desire to leave the log visible, or vice versa. Log is also one of the few structurally bearing materials that serves as insulation and can be visible, both inside and outside, so one could also ask why cover it. Of course, in the case of possible realization of the competition proposals, technical reasons for covering the log structure both inside and outside – such as weather and fire protection – might exist, but in the scope of this paper, revealing of log construction was seen essential for architectonic quality.

CONCLUSION

This paper presents as results crucial architectonic features related to log construction that affect the architectonic quality in the context of unbuilt presentations of log architecture. Three main results emerged. Firstly, it was seen crucial that log structures are revealed. Another key factor for architectonic quality of log buildings was that log is utilized according to the preconditions of log structures. Thirdly, besides the overall layout, also the secondary design solutions are to be designed in terms of log. Moreover, this result suggests that plain detailing of logs and joints are desired also for construction, but this remains a bit unclear because the detailing was affected by the demands of presentation in competition context.

As a conclusion of the results, we believe that log construction and the way it is arranged mainly constitutes the architectonic

quality in high quality log architecture. The results are coherent with the ideals of tectonic theory.

The findings of this study are mainly applicable in architectural practice when designing log buildings. In addition, log industry can benefit from the results by exploiting them in the future product development of log.

Since this study is mainly qualitative and focuses on the opinions of only a small, yet carefully chosen group of people, the results are not to be interpreted through a quantitative lens, i.e. these results would require further investigation before their validity for larger population can be determined. However, given the expertise that participants had on the research subject, the results can offer useful insights for the designing architects. Therefore, further studies on the matter, hopefully also with built examples, are needed. As professionals were the target group here, it would be important to compare these findings with the views of laypersons as well.

When discussing how material-oriented log architecture is or should be, all respondents were unanimous that in high quality log architecture it is important to design in material's own terms. It was pondered by one participant, however, that designing according to the material's properties is important in general in high quality architecture – log just happens to have a bit different restrictions than, for example, steel and concrete has.

ACKNOWLEDGEMENT

We would like to thank the participants of the interviews for crucial contribution to this paper, and the city of Tuusula for allowing the competition proposals to be used for research. This paper is part of the research conducted in the Modern Log City project, which is a three-year research project realized between years 2016 and 2019 in the Oulu School of Architecture, University of Oulu. The project is funded by European Regional Development Fund (ERDF) and the log house manufacturers of Northern Ostrobothnia.

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CONTACT DATA

Matti Lakkala
 Oulu School of Architecture
 University of Oulu
 Address: P.O.Box 8000, FI-90014 Oulun yliopisto, Oulu, Finland
 E-mail: matti.a.lakkala@gmail.com

Janne Pihlajaniemi
 Oulu School of Architecture
 University of Oulu
 Address: P.O.Box 8000, FI-90014 Oulun yliopisto, Oulu, Finland
 E-mail: janne.pihlajaniemi@oulu.fi



Matti Lakkala (b. 1988), M.Sc. (Tech.), Architect SAFA, graduated from the Oulu School of Architecture, University of Oulu in 2016. He has worked in architectural offices on projects of public, commercial and residential buildings. One reference is Pudasjärvi log-structured school campus in Northern Finland. He is currently working as a project researcher in Modern Log City research project at the Oulu School of Architecture, University of Oulu, and is a doctoral student (architecture) of the University of Oulu Graduate School.



Janne Pihlajaniemi (b. 1970), Professor, D.Sc. (Tech.), M.Sc. (Tech.), Architect SAFA. He is currently a Professor of architecture with the Oulu School of Architecture, University of Oulu and is also a partner in M3 Architects. The working history includes realized examples of log architecture (e.g. Pikku-Paavali Day-care Centre in Pudasjärvi, 2013). He is a responsible leader of Modern Log City research project and Head of Oulu School of Architecture.