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**STUDIES ON THE PREDICTIBILITY AND QUANTIFICATION
OF QUALITY SPECIFIC ACTIVITIES IN THE
CONSTRUCTION- CONSTRUCTION FORMWORK**

BY

**NICOLAIE GABRIEL COSTOAEA*, MARINELA BĂRBUȚĂ and
CRISTIAN VELICU**

Technical University “Gh. Asachi” of Iasi,
Faculty of Civil Engineering and Building Services,

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Abstract. Satisfaction of user requirements for all performance behaviors of a building is mandatory. The correct execution and carrying out of the verifications is proved by the existence in the Construction Log Book of the documents certifying the quality of the construction works executed, documents drawn up during the execution of the construction works. All the documents in the Construction Log Book are proof of the quality obtained. Starting from the comparative analysis of the content of the documents drawn up (regarding the execution and verification of the formwork works existing on site), with the provisions of the project and the provisions of the norms, norms and legislation in force, this paper proposes the establishment of documents with known content before the beginning of the works building. Such an approach makes the verification activity predictable. The results obtained at the time of the check, recorded in the documents drawn up, can be measured by giving a score. By applying the weighted average calculation ratio, the score obtained can quantify the quality and may constitute for the investor or third parties an indicator of the quality of the construction works executed.

*Corresponding author: *e-mail*: gabi_costoaea@yahoo.com

Keywords: investor; check; score; comparison; system.

1. Introduction

By establishing the quality assurance system by the contractor, respectively through its own technical procedures / technical instructions, the scope of application, the input elements, the objectives, the identification of responsibilities, the control of the documents, the control of the records, the resources materials, human resources, machinery, working environment, knowledge of the work, communication with the investor, supply, distribution of works, processes of the quality system for the management of the works execution, the management system documents used for the execution of the works, control plans and intermediate verifications , forms, internal control, external control, laboratory tests, identification and traceability, monitoring and measurement ... etc.

The quality of the construction works executed, for the category of works - formwork, is attested on the site by the completed documents existing in the Construction Log Book. They prove the fulfillment of the requirements of the project, the norms, norms and legislation in force.

In most cases, these documents are: Minutes for verifying the quality of the work that is hidden, Qualitative reception report.

2. Argumentation of the Proposed Topic

We can define the formwork as the total of the laying and fastening operations according to a desired pattern (wooden/metal/plastic etc.) in which a fluid construction material is to be poured.

On the site, the following activities/verifications and documents were prepared that were drawn up for the execution of the formwork:

- the contractor of the construction works, upon receipt of the formwork and the supporting elements in the site, will receive qualitatively and quantitatively the materials;
- formwork and supporting elements will be stored on site;
- after the execution of the formwork, the investor, the contractor and (as the case may be) the designer will proceed to check the formwork. Formwork works must be in accordance with the provisions of the design and technical prescriptions. A qualitative reception report will be drawn up.

In most cases encountered on site, the form used is given as an example in Fig.1.

UNITATEA _____
 SANTIER _____ PUNCT DE LUCRU _____
 OBIECTUL _____

**PROCES-VERBAL
 DE RECEPTIE CALITATIVA**
 Nr. _____ Data _____

Cu ocazia verificarii efectuate la: _____

- Au stat la baza verificarilor, urmatoarele documente:

- Din verificarile efectuate pe teren si examinarea documentelor au rezultat urmatoarele:

- Au fost stabilite urmatoarele masuri (concluzii) :

- Mentii speciale:

	Numele	Prenumele	Semnatura
BENEFICIAR:	_____	_____	_____
PROIECTANT:	_____	_____	_____
EXECUTANT:	_____	_____	_____

Fig. 1– Example of minutes.

As can be seen in Fig. 1, the documents listed above are signed by the contractor, the investor and (as the case may be) the designer, they contain information about: identification of the contractor, date of the document, the stage of the work under review, the result of the verification, measures, special mentions.

In the presented form, used in the site, it is not clear from the contents of this document what were the verifications made, if dimensional or constructive deviations were found to the project or to the normative or normative specifications.

Records on verifying the construction of the support and support elements, on the correct completion of the formwork elements and ensuring the necessary tightness, on the checking of the plan and cross-section dimensions, the position of the voids, the position of the embedded / passage pieces (if any) the use of de-icing agents, are not found in the contents of the documents submitted.

So in the presented form the document does not show the investor if there were deviations, so that at the end of the works execution the investor to form an objective point of view regarding the quality of the construction works executed.

3. Results and Discussion

Records on verifying the construction of the support and support elements, on the correct completion of the formwork elements and ensuring the necessary tightness, on the checking of the plan and cross-section dimensions, the position of the voids, the position of the embedded / passage pieces (if any) the use of de-icing agents, are not found in the contents of the documents submitted.

So in the presented form the document does not show the investor if there were deviations, so that at the end of the works execution the investor to form an objective point of view regarding the quality of the construction works executed.

Once the checks are completed, it is possible to set scores from 1 to 10. "1" is the minimum value of the score and was very bad, and "10" is the maximum score and was very good.

Building Permit No from date

Name of construction works (according to AC):

Address of investment:

Investor / Beneficiary:

Investor Address:

Nr. investor phone:

Executor:.....

Execution Address:

Nr. contractor:

FORMWORK FOR CONSTRUCTION								
VERIFIED ELEMENT								
Nr.crt.	Verification / document to be drawn up	Deviation according to the norm	Deviation found	Meets the requirement		Date of verification and document preparation	Who attended verification (surname first)	Score obtained when the requirement was met
				YES	NOT			
1	Verbal Reception Forms for formwork were presented with reference to procedures, records, traceability, staff qualification, handling of nonconformities	the mandatory requirement according to the provisions of Norm NE 012 / 2-2010, section 7.4.2					Construction-site responsible Contractor	A score of 10 is awarded to meet the requirement, for lack of document or absence of signatures 0
2	The minutes shall specify the checks carried out, the resulting findings and the passing of the next phase. Upon completion of the execution of the formwork, the findings regarding:	mandatory requirement					Construction-site responsible Contractor	Total score awarded = sum (a) + b) + c) + d) + e))
3	<i>a) the construction of the supporting and supporting elements;</i>	<i>the mandatory requirement according to the provisions of C56 / 85 Norms V, Chapter I, Section 2.3 and NE 012 / 2-2010, section 7.4.1.2</i>					Construction-site responsible Contractor	A score of 2 is awarded to meet the requirement, 0 is awarded for non-fulfillment
4	<i>b) correct completion of the shuttering elements and ensuring the necessary tightness;</i>						Construction-site responsible Contractor	A score of 1 is awarded to meet the requirement, 0 is awarded for non-fulfillment

5	<i>c) the dimensions in plan and cross sections;</i>						Construction-site responsible Contractor	Through the project, deviations can be established against which differentiated scores can be established. A score of 5 is awarded to meet the requirement, 0 is awarded for non-fulfillment
6	<i>d) position of the voids, embedded / passage pieces</i>						Construction-site responsible Contractor	A score of 1 is awarded to meet the requirement, 0 is awarded for non-fulfillment
7	<i>e) de-breaking agents</i>						Construction-site responsible Contractor	A score of 1 is awarded to meet the requirement, 0 is awarded for non-fulfillment

Note (scoring arithmetic mean of row 1 and row 2)

Conclusions according to the achieved grade: The formwork can be considered as appropriate / inappropriate, it may pass / can not proceed to the next stage.

Fig. 2 – Check Formwork Forms Sheet.

Upon completion of the formwork, based on the score obtained, considering the preset minimum score of 5, the work may be declared appropriate or inadequate. All the documents proving the quality of the works executed together with this data sheet will be found in the Construction Log Book.

At the end of the execution, the score obtained for this category of works, along with the scores for the other categories of works executed, will be the basis for calculating the overall score.

4. Conclusions

As we have shown, all the documents that are being prepared, all the quality checks and requirements are known at the beginning of the execution of the formwork, so predictability is ensured.

The quality of the formwork can be measured by determining the score, so quantification is ensured.

Based on the existing records of the Construction Log Book, based on the scores, the Investor can base its decision regarding the assignment of works for the construction of a certain performer or the reception of executed construction works.

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STUDII PRIVIND PREDICTIBILITATEA ȘI CUANTIFICAREA ACTIVITĂȚILOR SPECIFICE CALITĂȚII LA CONSTRUCȚIA CLĂDIRILOR – LUCRĂRI DE COFRARE

(Rezumat)

Satisfacerea exigențelor utilizatorilor pentru toate performanțele de comportare în exploatare a unei construcții sunt obligatorii. Execuția corectă și efectuarea

verificărilor se dovedește prin existența la Cartea tehnică a construcției a documentelor care atestă calitatea lucrărilor de construire executate, acte întocmite pe parcursul execuției lucrărilor de construire. Toate documentele existente la Cartea tehnică a construcției constituie dovada calității obținute. Pornind de la analiza comparativă a conținutului documentelor întocmite (privind execuția și verificarea lucrărilor de cofraj, existente în șantier), cu prevederile proiectului și prevederile normativelor, normelor și legislației în vigoare, prezenta lucrare propune instituirea unor documente cu conținut cunoscut înainte de începerea lucrărilor de construire. O astfel de abordare face ca activitatea de verificare să fie predictibilă. Rezultatele obținute în momentul efectuării verificării, consemnate în documentele întocmite pot fi măsurate prin acordarea unui punctaj. Prin aplicarea relației de calcul care ține cont de media ponderată, punctajul obținut poate cuantifica calitatea și poate constitui, pentru investitor sau terți, un indicator al calității lucrărilor de construire executate.