

BULETINUL INSTITUTULUI POLITEHNIC DIN IAȘI
Publicat de
Universitatea Tehnică „Gheorghe Asachi” din Iași
Tomul LIX (LXIII), Fasc. 1, 2013
Secția
CONSTRUCȚII. ARHITECTURĂ

**STUDY CONCERNING THE DESIGN, THE EXECUTION OF
DEMOLITION WORKS AND THE RECOVERY OF MATERIALS
FROM THE RESULTING WASTES**

BY

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Received: January 22, 2013

Accepted for publication: February 12, 2013

Abstract. This paper want to identify and establish the current level of professionalism, the problems from building sites regarding the construction’s demolition, through the study of technological procedures, of methods of organization and administration of constructions’ demolition currently used on building sites in Romania.

Also, the paper has as aim the critical analysis of the observations resulted as answer to the questions from the enquiries filled by different construction companies which have as object of activity constructions’ demolition.

One of the objectives followed in this analysis is to establish the degree of knowing the problems connected with the constructions’ decommission–demolition, and what do they imply on the site and beside them.

Key words: demolition; recovery of materials; demolition wastes; management.

1. Introduction

The industry of constructions’ decommission and demolition, relatively new in our country’s economical landscape, makes that the number of

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companies having as object of activity constructions' demolition and the capitalization of resulting materials is relatively small. There exists an unequal development of this „industry”, with a higher weight in big cities where used to function factories and mills, until 1990, these becoming uneffectual after this date.

The rhythm of constructions' decommission and demolition, very slow until 1990, found a great forwarding after this date, as a result of the diminution of economical activity on major industrial platforms.

After 1990, the mentality concerning the product „construction” irrespective of its destination, in the sense of its approach as any product, changed. Any product, including the one resulted from the activity of constructions is useful and effective during economical life, during the investment's amortization, being possible after this date to analyse its keeping, sometimes through rehabilitation or demolition.

In Romania, and not only here, the lack of legislation concerning the norms applied in the projects of demolition lead to the occurrence of different problems during the works' course. This thing happens because there are not taken into account certain factors that appear along with the course of works and because of the lack of qualified personnel in the field of constructions' demolition.

The present work wants to identify and establish the current level of professionalism, the problems from building sites regarding the construction's demolition, through the study of technological procedures, of methods of organization and administration of constructions' demolition currently used on building sites in Romania.

Also, the work has as aim the critical analysis of the observations resulted as answer to the questions from the enquiries filled by different construction companies which have as object of activity constructions' demolition.

2. The Plan of Experimental Analysis's Course

The author considered that the laboratory of experimental attempts for the organization of demolition works is *the building site*, the place where takes place, at a natural scale, the activity of administration, coordination and execution.

The analysis came off on several demolition sites in Moldova, where the author followed their activity on a long period of time. There he discovered the need of elaborating a methodology which can to develop the idea of constructions' demolition and decommission' management and the idea of resulting materials' capitalization.

Starting from this observation, he established a plan of experimental analysis' course, supposing two major phases:

a) The acquisition of information from the building site, connected with all the factors that might influence one way or another the demolitions' execution.

b) Data processing in the sense of identifying the causes that might lead to the unachievement of initial proposed objectives or their achievement through the assumption of some risks connected with the inobservances of contractual terms, the wrong evaluation of budgets allocated for projects or work accidents.

3. Experimental Analysis

The experimental analysis is based on a questionnaire developed on a number of 30 questions concerning a series of aspects such as

a) The name and the form of organization of the construction company.

b) The period of activity in constructions' market, the rate of turnover, works portfolio.

c) Information concerning the level of knowledge of legislation in the field of construction's demolition.

d) The type of management applied in the company, as well as the methods used for constructions' demolition.

e) Information connected with the experience of the personnel that executes the demolition projects and criteria of its hiring.

f) Norms of environment protection and the capitalization of wastes resulted from demolitions.

In Table 1, the author presents the questionnaire that stood at the base of experimental analysis.

Table 1

Questionnaire Concerning the Assessment and the Analysis of Practices Connected with Constructions' Decommission and Demolition

The name of the company
1. The function that you hold in this company
2. Since when does this company activate on construction's market?.....years.
3. Specify the category/categories of works that this company executes.....
4. This company is:
a) A stock company.
b) A limited liability company (LLC).
c) A family business.
d) Another type of organization.
5. The annual company's turnover is:
a) Smaller than 500.000 lei.
b) Between 500.000 and 1.500.000 lei.
c) Bigger than 1.500.000 lei.

6. The number of company's employees:
- 1...4 employees.
 - 5...9 employees.
 - 10...19 employees.
 - 20...99 employees.
 - 100...499 employees.
 - Over 500 employees.
7. The number of demolition works between 2005-2011:
- 1...5 works.
 - 6...14 works.
 - 15...49 works.
 - Over 50 works.
8. Note down with digits from 1 to 4 the order of demolished objectives according to the type of demolitions found by you on site:
- | | |
|--------------------------|---------------------------------------|
| <input type="checkbox"/> | demolitions industrial constructions; |
| <input type="checkbox"/> | demolitions civil constructions; |
| <input type="checkbox"/> | demolitions bridges; |
| <input type="checkbox"/> | demolitions structural elements. |
9. The causes why these constructions have been demolished:
- Normal ageing, given by the limited life duration of materials and elements of which the constructions are done and by the normal conditions of exploitation.
 - Accidental ageing (earthquakes, explosions, slippings or settlements of setting terrain).
 - Moral ageing which appears because of the evolution of users' exigencies.
10. You obtained these works by:
- Direct entrusting.
 - Auctions' participation.
11. At the contracting of demolition works do you take into account the capacity of your company of finalizing the works according to contracts?
- Yes.
 - No.
 - I don't know.
12. Do you think that a methodology concerning the design and the execution of demolition would be necessary?
- Yes.
 - No.
 - I don't know.
13. At present, in Romania, how many laws do you know that have in their contents problems connected with constructions' demolition? Name some of them.....
14. Do you consider necessary the existence of frame content for a demolition technical project?
- Yes.
 - No.
 - I don't know.
15. Inside the company of demolitions is it useful the existence of demolition procedures?
- Yes.
 - No.
 - I don't know.

16. The method of demolition used by you most often is:
- The classic method through manual procedures.
 - The powered method.
 - The method through controlled explosions.
 - Other methods
17. Is there in your company personnel specialized in constructions' demolition?
- Yes.
 - No.
18. Estimate the weight of extra expenses during the execution for:

	100 %	50%	0%
a) The lack of specialized personnel.			
b) The wrong assessment of execution terms' program.			
c) Other causes.			

19. The most often used procedure in the case of powered demolitions was:
- Vertically powered demolition, „overhand”, with compact equipments used through the crane elevation.
 - Powered demolition through traction or pushing.
 - Powered demolition with pellet.
 - Powered demolition with scissors or pneumatic hammer.
20. Tick one of the following modes of choosing the work force in your company
- Through interviewing.
 - Through recommendations.
 - Through practicals.
21. In your company, the decisions concerning some important events during the execution are taken
- Individually.
 - After a group analysis.
22. In your company, how often is done an instructing, work protection and are there signed the afferent tables?
- Once a month.
 - At hiring.
 - At the beginning of each new project step that needs it.
23. In your company is applied:
- The management through objectives.
 - The management through projects.
 - The management through budgets.
24. For the activity in your company do you use for the demolition works' programming:
- The Critical Path Method.
 - The Successive Method, In Parallel Method, In Chain Method.
 - Gantt Graphics.
 - None of the above.
25. For a better over time pursuit of the execution, the comparative analysis between the initial program and the site achievements, should be done:
- Daily.
 - Weekly.
 - Monthly.
 - Quarterly.

26. How did you gain the knowledge in the field of constructions' demolition?
- a) Practical, at the working place.
 - b) From other people in the company.
 - c) Through individual study.
 - d) Through participation at special courses and seminars.
 - e) Through reading: magazines, textbooks.
 - f) I don't have.
27. Does in your company exist the idea of wastes capitalization?
- a) Yes.
 - b) No.
28. How do you capitalize constructions' wastes?
- a) By reusing them in the company at other works where these materials can be used.
 - b) By selling them to different economic agents who have as object of activity recycling.
 - c) We don't capitalize.
29. Do you want to receive the results of this questionnaire after data processing?
- a) Yes, at the address
 - b) No.
30. Suggestions, additions, opinions or other commentaries concerning the themes.

After the distribution of these questionnaires at construction companies that have as object of activity constructions' demolition, the author received a number of 30 questionnaires filled by specialists, by the managers of the building sites where works like these took place.

4. The Interpretation of Experimental Analysis' Results

Following processing the data acquired through the filling of questionnaires distributed at constructions companies that have as activity field constructions' demolition, the author of this work obtained the following results:

- a) The legal form of business organization of companies that execute demolition works is in a weight of 40% stock companies and 40% are limited liability companies, from a percentage of 100%.
- b) A rate of 70 % of constructions' companies have had activity in the field of demolition for over 10 years.
- c) 60% of the questioned companies, with activity in the field of demolition have an annual turnover smaller than 500,000 lei, and 40% get beyond the annual turnover of 1,500,000 lei.
- d) A rate of 40% of the people interviewed said that in their company the number of employees doesn't exceed 4 men, and 30% of the people interviewed say that the number of employees in their company is between 100 and 499 de employees.

e) 70% of the respondents said that in the last five years they have executed between 6 and 14 demolition works.

f) A considerable number among the demolished constructions were industrial constructions.

g) 60% of the interviewed said they have demolished the constructions that had a normal ageing, given by the limited life duration of materials and elements of which the constructions are done, and the rest until 100% said that moral ageing, appeared because of users' exigencies, made these constructions to be demolished.

h) The getting of works portfolio is done by direct entrusting at over 70% of the interviewed, the rest of 30% participating at auctions in order to get the works.

i) All the interviewed said that at contracting the demolition works they take into account the capacity company's resources of finishing the works according to the contracts signed with the beneficiaries.

j) Over 85% of interviewed company administrators answered fair to the question connected with the need of a methodology concerning the management of constructions' decommission and the capitalization of resulting materials.

k) At the question „At present, in Romania, how many laws do you know that have in their contents problems connected with constructions' demolition? ”, the answers were: „I don't know” or mentioned as following:

- The majority of assignees of the companies that execute demolitions through controlled explosions mentioned laws concerning the condition of blasting materials, such as Law 126/1995 and laws concerning the works' authorization;
- The assignees of the companies that execute demolitions through other methods lined laws such as Law 10/1995, law concerning the quality in constructions or Law 319/2006 concerning work security.

l) Over 85% of interviewed company administrators answered fair to the question connected with the need of elaborating a frame content for the demolition technical project.

m) In the construction company that has as object of activity constructions' demolition is useful the existence of demolition procedures, said over 85% of respondents.

n) 50% of the interviewed said that they demolish the constructions using powered procedures, 30% classic manual procedures and 20% the method of controlled explosions.

o) 75% of the companies that have demolition sites don't have special personnel for constructions' demolition.

p) The weight of extra expenses is allocated equally (a rate of 50%) both to the lack of qualified personnel and to the wrong establishment of execution terms' program.

q) The most often used procedure in the case of powered demolitions is the one through powered demolition with scissors or pneumatic hammer.

r) 60% of those who filled the questionnaire declared that the work force is chosen through interviewing.

s) The important decisions throughout the execution of demolition works are taken in 60% of the cases individually, and after a group analysis, 40%.

t) The instructing and work protection are done once a month, how 70% of those interviewed declare, but 30% say that it would be good that the instructing to be done at the beginning of each new project step.

u) In 40% of companies is applied the budget management, 30% the projects management and 30% the objectives management.

v) 70% of the companies don't use any method of programming the demolition works.

w) The comparative analysis between the initial program and the site achievements should be done weekly in the opinion of 85% of those questioned.

x) The knowledge in the field of constructions' demolition were gained at the working place in proportion of 60%.

y) 70% of the respondents said that in the company where they carry on their activity, the idea of wastes' capitalization does not exist.

z) 40% reuse the wastes in the company at other works, 20% sell the wastes to economic agents who handle with their recycling.

The interest of the administrators of constructions' companies with activity in the field of demolitions towards the theme approached in this thesis is high, the proof being the fact that the majority of those questioned applied for receiving the results after processing the data from the questionnaire.

In the United States of America, in the year 2005 there were on demolitions' market about 1,827 companies. In Romania the phenomenon is in a ceaseless development.

In Fig. 1, the author presents a classification made by Statistics of U.S. Businesses, Wrecking & Demolition Contractors of United States of America, of demolition companies, dependent on the number of employees they have.

Another statistic study effectuated by the author, taking into consideration about 171 demolished constructions in Romania, using data from the portfolio of Romanian construction companies, that have as object of activity constructions' demolition, permitted him a classification presented in Fig. 2.

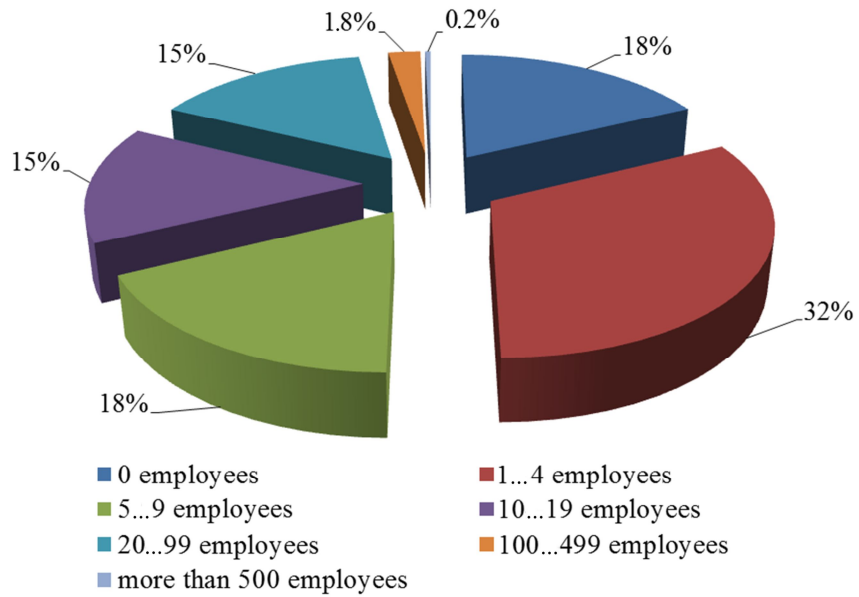


Fig. 1 – The classification of demolition companies dependent on the number of employees.

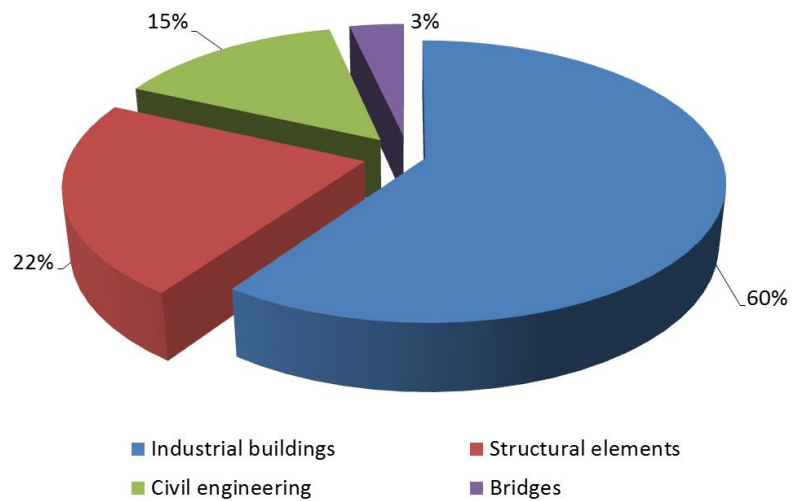


Fig. 2 – Demolition classifications dependent on the type of to-be-demolished objectives in Romania.

It is observed that over 60% of the demolished constructions were industrial buildings, 15% civil engineering, 3% bridges and 22% partial demolition of structural elements.

5. Conclusions

One of the objectives followed in this analysis was to establish the degree of knowing the problems connected with the constructions' decommission–demolition, and what do they imply on the site and beside them. Therefore, it came out that over 85% of the respondents answered fairly at the question connected with the need of a methodology concerning the management of constructions decommission and the capitalization of resulting materials.

The elaboration of some efficient managerial methods and techniques connected with constructions' demolition, materialized into a methodology that wants to be a guide to follow for those who perform such activities, represents an objective of this experimental analysis.

In conclusion, the author proposes and claims the elaboration of a methodology concerning the management of constructions decommission and the capitalization of resulting materials.

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STUDIUL PRIVIND PROIECTAREA, EXECUȚIA LUCRĂRILOR DE DEMOLARE ȘI RECUPERAREA MATERIALELOR DIN DEȘEURILE REZULTATE

(Rezumat)

Se urmărește identificarea și stabilirea nivelului de profesionalism actual, problemelor din șantiere referitoare la demolarea construcțiilor, prin studiul procedurilor tehnologice, metodelor de organizare și conducere ale demolării construcțiilor folosite curent pe șantierele din România.

De asemenea, se efectuează o analiză critică a constatărilor rezultate ca răspuns la întrebările din chestionarele completate de diferite firme de construcții ce au ca obiect de activitate demolarea construcțiilor.

Unul dintre obiectivele urmărite în cadrul cercetării este stabilirea gradului de cunoaștere a problematicii legate de dezafectarea–demolarea construcțiilor, și implicarea acestora în șantier și în afara acestuia.

