Journal of International Scientific Publication:
Materials, Methods & Technologies, Volume 3

STUDY REGARDING SUPERVISION OF THE ACTIVITIES ON THE CONSTRUCTION SITE

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Abstract

There are cases when an investor tries himself to administer, design and/or supervise the activities on a construction site. The recommended solution for administering, designing and supervising the works is to appoint on contract a specialised consultant or specialised engineers to perform the services on behalf of the client with regard on the pre – established conditions and parameters.
In order to perform these services the consultants will sign contracts with the investor; the contract stipulates exactly the type of service the consultant is supposed to perform (managing, designing, supervising, etc.). The contract also makes clear the most important parameters to observe – to respect the completion time, to maintain the limits of the budget, to ensure safety on the site and to realise the quality of the work, as established by the technical specifications. The contract also makes clear the most important parameters to observe – to respect the completion time, to maintain the limits of the budget, to ensure safety on the site and to realise the quality of the work, as established by the technical specifications.

Key words: *supervisor engineer, contracting conditions, high quality projects*

1. INTRODUCTION

The investor wants the execution of the project to be supervised by one of his representatives, who will take care to be a successful construction; the best thing to do in this case is to resort to the services of professional consulting societies.

It is recommended to appoint this type of engineering service on contract only, and using authorised, experienced specialist (architects, structure specialists, installers, economists).

In the international practice it is not recommended that these types of services are performed by one of the investor's employee because these do not have the necessary contractual responsibility.

The engineering service of supervision of the construction site is part of the principles of the consulting – engineering profession, as follow:

- The professional status

The supervisor engineer act on behalf of the investor and for his best interest only. The engineer acts on complete faith towards the investor and correctly towards the contractors and suppliers and other participants at the investment.

- The independence

The supervisor needs to maintain an equidistant position regarding the investor, the contractors, the suppliers or other participants at the investment. He is not to accept any personal favour from none of

the participants; his decisions have to be objective and respecting the limits imposed by the investor.

- The competence

The supervisor has to possess the necessary qualification, knowledge and experience in order to fully accomplish his contractual liabilities. He should not undertake a project for which he doesn't have the necessary experience and qualification.

- The legitimacy

The supervisor needs to observe the Romanian legislation regarding the following facts: the professional training; the practice registration; the authorization or the certification; observing the present laws, settlements, norms and standards.

- The partnership

It is recommended that the engineer supervisor be part of a professional association and to respect the code of honour and the professional ethics of the association he is part of (Antill et al., 1990).

2. THE MAIN RESPONSIBILITIES OF THE SUPERVISOR ENGINEERS

The investor and the supervisor are signing a consulting contract for the supervision of the construction site; the main responsibilities of the supervisor are:

- Preparing the beginning of the activities
- Verifying the documentation needed for the legal authorizations and licences
- Verifying the site organization projects, the execution contracts and the execution technology and installation
- Verifying the quality of the materials, the installations and the equipments that enter the site; verifying and approving the execution graphics of the activities and monitoring their fulfilment
- Verifying the quality of project execution; verifying and controlling the tests, the samples for materials and installations, as well as keeping evidence of the documents regarding these
- Controlling the existence of the complete and authorised documents on the site; verifying the correct editing of the construction book
- Verifying all the activities and works performed, before the reception commission inspects the project; participating to all the work meetings, inspections, receptions
- Elaborates periodically reports (monthly) regarding the development of the project and the quality and presents them to the investor

2.1 The supervising contract

It is recommended to use the standard consulting contract formed of the contractual form, the general contracting conditions, and the special contracting conditions. These services can be extended or, on the contrary, limited according to the investor's wishes and interests.

The fees for the consulting services are usually established based on the period of time spent performing the services (monthly payment) or based on a percentage from the entire value of the investment.

The complete services of supervision of the construction site are presented in the following chapter.

2.2 Services of construction site supervision

Verifying and authorizing the site organisation system and the project of the main technologies execution, elaborated by the main contractor before the beginning of the works.

The main contractor, at the beginning of the activities, should monitor and authorize the organisation of the sample room for the main materials, confections and equipments which are to be purchased and used during the construction process.

The main contractor should coordinate his activities with those of the other specialised contractors and suppliers in what regards the used of the routes, the common spaces and facilities; they should also collaborate to create the working fronts, to ensure the security and order on the site, and all the necessary things in order not to exceed the budget and to observe the completion date and the established quality standards (Dozzi Anti et al., 1990).

The main contractor, as well as the other sub – contractors should monitor the execution of the activities, including the following:

- Procuring the necessary authorizations and respecting the conditions imposed by these
- There should always exist on the construction site the complete design documents, having the stamps of the project's verification and that of the investor specifying accepted for construction
- The existence of the assurance programmes for the quality of the works and that of the people in charge with the quality on the construction site
- Realising high quality projects according to the design documents, the technical specifications and the construction legislation regarding the quality in the construction field
- Respecting the site organisation project and the approved execution technologies
- There should be used only quality materials and equipments, which totally correspond to the approved samples existent in the samples room organised at the beginning of the activities
- Bringing on the site only the materials, equipments and labourers which are needed for executing the activities, respecting the rhythm and terms stipulated in the "schedule of the activities"
- To permanently keep evidence of the performed activities so as the payments (payrolls) clearly reflects their value, accordingly to the contractual liabilities
- Accomplishing all the contractual liabilities regarding the following aspects: ensuring the performed projects, the construction equipments and installations, the staff and the third parties as well; taking work – safety measures and measures for protection against fire; keeping the site tide and neat; securing the goods on the construction site

When there are situations of unfulfilling or delaying one of the tasks mentioned at number 4, the consultant will point it out to the contractors, will inform the investor and will find solutions for an urgent correction of the issue.

The following documents should be elaborated and up-dated by the main contractor and the other contractors:

- The site diary, consisting of the weather prognosis, the air temperature, the performed activities, the installations existent on the site, the number of labourers present, special problems appeared during the construction process and remarks on the quality
- The concrete register, elaborated accordingly to the effectual legislation, reporting the dates when

the concrete was poured and tested

- Records regarding the taking over of the locations, records of hidden works, records of certifying the quality of the project (in its initial stage and at the end). This last process is performed together with the representatives of the construction quality inspection
- The quality certificates for the materials and equipments used during the process
- Records of the tests performed on the installations before their integration in the construction process and/or before their actual setting to function

On the construction site there always have to be records on the following documents: the construction authorization and licences, the contracts and additional papers, the execution documents and plans, the site regulations, the papers stipulating the necessary changes, the modifications from the original project, the new approved technologies, facts regarding the materials, the equipments and the installations acquired and set to function (technical characteristics, samples, assembly instructions, setting to function, exploitation, etc.) and other necessary documents.

The main layouts of the activities, authorized by a qualified instrument man, should always exist on the site – the tracing plan, the general coordinating plan and the local tracing plan).The consultant will take care that, at the end of the activities, the execution projects contain all the approved and performed changes and modifications.

The final projects have to be the true image of the performed activities, in order to be introduced in the construction book.

All the records and registrations performed by the consultant have to be available for the beneficiary when the project is over.

The consultant will monitor the manner in which the liabilities of the contracts of acquiring the materials, the equipments and the installations are respected; he will also check all the orders, the payments, the delivery dates, the quality and will inform the beneficiary if there seems to be any kind of problem (delays, low quality, etc); the consultant will also try to remediate the issue as soon as possible finding the best solution for it.

Organising and supervising the activities on the construction site – the storage of materials, equipments and installations, their protection and security until they are to be integrated in the construction process.

The consultant, together with the designer and the maintenance staff of the beneficiary, will assist the verifications and tests performed by the constructors on the installations and plants assembled and ready to set to function.

When the project is almost ready (partially or totally), the consultant has the duty to check all the modifications performed, as well as those that are going to be performed, and to make a list with these.

He will concede a period of time to deal with these changes in order not to affect the entire project completion time; he will also point it out to the contractors and will inform the investor.

The consultant can estimate the completion time of the project and will inform the beneficiary in order to convoke the reception commission. The consultant will ask the constructors that, thirty days from the preliminary reception record, they should present themselves for a check up with the final situation of the activities; after the proper verification this document will be handed to the investor for approval and the final payment.

The consultant will monitor the behaviour of the project during the guarantee period and if there are

any problems he will inform the beneficiary; together with the designer, he will try to find the best and quickest solution to remediate the problem. The consultant will monitor and keep record of the defections.

The consultant will inform the beneficiary when the project is considered to be definitively completed and respecting the quality standards requested; at the end of the guarantee period the reception commission is being convoked (Mincks et al., 1999).

The consultant will organise and register the activities of this commission and will write the final reception recorded of the project; in case there are some new problems, he will make sure these are remediate in time.

The consultant will elaborate two copies of the construction book, if his contract stipulates so; the copies will be based on his personal records and on the documents elaborated by the designer and the constructors; finally this will be handed over to the beneficiary.

The consultant will maintain relations with the authorities from the constructions-investment field during the activities; he will make sure that the authorities are pleased regarding the fact that the project observes the effectual legislation and settlements.

3. THE RISKS MANAGEMENT

The risk is defined as the possibility of an unfavourable event to happen and the possibility of preventing and reducing the danger or the procedure used to make decisions regarding a known or evaluated risk and the actions to perform in order to reduce the consequences of the risk or even the possibility of avoiding it.

The main activities in the risks management are the following: establishing the strategy to adopt regarding the risk; identifying the risk or the possible danger; the risk control

The main factors of risk are: health and safety risks; environmental risks; activity resulted risks.

All these risk factors have a common denominator: the cost of the activities or works that can generate material losses, life losses or damages to the environment (Ritz G. J., 1994).

3.1 The qualitative approach of the risks

The consequences of a danger can be approached under two different aspects: quantitative and qualitative.

- Quantitative – damages, losses, human accidents, installations and equipments deterioration, interrupting or the sudden ending of the activities
- Qualitative – neglect, minor, serious or disastrous consequences

Also, the probability or the frequency of a risk can be approached under the same aspects, quantitative and qualitative:

- Quantitative – how frequently the risk happen over a period of an year, during a project or the probability of that dangerous event to really happen
- Qualitative – the risks can be classified as improbable, occasional, probable, and very possible.

The qualitative approach of the risks is mainly based on logical speculations of the type “What will happen if…”. The consequences in time and the probable costs of that risk are estimated.

The result has to classify the risk as less probable to happen from a logical point of view as possible,

while the consequences in time and the probable costs to be minimum or close to zero.

3.2 The quantitative analyses of the risks

These types of analyses can be performed by:

- Consolidating the variables as an analysis of the sensibility; considering the effect of the probability parameters and evaluating their effect on the safety of the project
- Analysing a probability model by statistic graphics reflecting the frequency of an event and its cost

Combining the two types of analysis will have as result a complex, mathematical pattern, developed on automatic calculations in order to determine the probability of a risk to happen.

The method of dealing with the risk is the direct consequence of a proper analysis of the facts mentioned above.

3.3 The possible risks during the stages of a project execution

Identifying the dangers, evaluating and controlling the risks are different from one project to another, according to the participants at the investment and the risks associated to each of the activity that will be performed on the site (Table 1).

It presents a sketchy identification of the activities generating risks in the execution stages of a project, as well as the actions to take by the project manager when these facts happen.

Table 1 – Generating risk activities

The stages of a project	Phases	Risk	The activity
Preliminary documentation	market studies; geo – technical studies; pre – feasibility studies; financing studies	low quality or inexperienced consultants; approaches too optimistically towards the risks	the policy of dealing with the risks; an engineering plan for the risks; identifying the risks; evaluating
The conception stage	the city planning certificate; the authorizations; the feasibility studies; the financing programme	low quality consultants; not knowing and not observing the legislation; too optimistic approaches; the wrong profitability parameters	the risks; the permanent control of the conception; eliminating the approaches that are too optimistic; close selection of the consultants, designers and contractors;

The execution stage	the construction permit; the final authorizations; the technical project; the execution details; contracting the activities; executing the works; acquiring the necessary materials, installations and equipments; supervising the activities; warranties, insurances, payments closing	low qualified designers, consultants and contractors; unknowing and not respecting the effectual legislation;	quality control of the project and its execution; permanent supervision, control, verifications; the needed revisions and correction
The setting to function stage	the preliminary reception of the project; correcting the defections; the final reception	quality compromises; the lack of studies, tests and samples; the lack of post-execution and utilisation documents	the risk policy at reception; the control of the performed changes, tests and samples; the quality control of the products fulfilling the authorities' request

3.4 The advantages of a proper risk analysis

A technological approach of the risks can offer a great deal of long – term beneficial advantages, such as:

- Better and more precise perception of the risks and their effect on the project
- A better anticipation of the unpredictable events, as well as a better selection of the responses to the risks
- A well conducted feedback in the processes of conception and execution and faster actions by reducing at maximum the effects of the risks or by finding solutions that will anticipates some of the consequences, the project will have a good feed – forward
- The courage, the perspicacity, the knowledge and the quick response of the project manager are essential for the technology of avoiding or diminishing the risks
- The biggest risks appear when making the decisions in the first two stages – the preliminary documentation and the conception stage (pre – feasibility and feasibility studies). These stages have the greatest impact on the future project

The investor needs to have total and efficient control over the quality realization of these parts of the project. The project manager has to actively be involved in the monitoring process of the activities during the whole period of realizing the project.

The estimation regarding the budget of the project and the estimated completion time are essential, therefore they need profound and continuous analyses, verifications, monitoring and corrections.

The delays in the completion time and the exceeding of the budget can substantially affect the estimated profit; in order to prevent this to happen the budget of the project and the completion date are to be permanently monitored and corrected by the project manager (Zlate M., 2004).

4. CONCLUSIONS

The management techniques for avoiding the risks are the duty of the project manager and it is a common and still evolving practice.

It is thus important for the manager to be aware of the possible risks in every stage of the project, to conduct qualitative and quantitative risks analyses, to act in such a manner as to avoid the risks, to have all the necessary insurances and to assign the risks to the participants at the investment, as equally as possible.

The investor can proceed assign the risks to the participants at the investment. This transfer does not mean that the risks are reduced or eliminated. The undertaking of the risks by the participants (consultants, designers, managers, supervisors, contractors and suppliers) includes the following:

- The capacity of executing a project that includes risks
- Acknowledging and accepting the risks assumed
- The financial power to cover the effects of the risks

The investors, the project managers and the main contactors can assign the risks to other executing – subordinates by:

- Contractual liabilities
- Renting the things necessary for the investment (installations and means of transportation)

The assignment of the financial risk (totally or partially) can be done by the following methods:

- The compensations and damages should be stipulated in the contracts
- Warranties
- Complete insurances
- The immediate pay of the damages

The financial assignment of the risks diminishes the general costs of the risks, but it does not represent a real transfer of the losses, because in a long term the losses have to be paid (insurances rates and/or damages sustained by the partners). It is therefore more efficient to prevent and try to avoid the risk from happening.

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