

Abstract

The job of a construction manager entails a great responsibility in many aspects. A successful project execution requires his involvement from the first phases until the end of the process. Analytical skills, logical reasoning, and proactive behavior are some of the abilities that define a construction manager.

In collaboration with a Spanish construction company, Civil Stone, we have analyzed several civil projects recently executed. In doing so, it is shown the performance of the tasks carried out by a construction manager in real cases. We will see how to elaborate a technical and economic plan, make a good organization and manage the resources to get a successful project. In other words, we will see how to lead a project and overcome the challenges that may appear.

What can be concluded from the analysis performed is that the execution of a project is a complex process. Work on the previous steps, as choose the accesses to the work site and its perimeter fence, or examine the project items, all of them are the responsibility of the construction manager. It will be seen that it is necessary to adapt to new situations to have control of the work at all times.

The aim of this thesis is to help those engineers who are doing their initial steps in the world of construction, especially civil projects. Through real experiences, they will have a first contact with the procedures that must be followed in every project, as well as how to solve problems efficiently.

Resumen

El trabajo de un jefe de obra conlleva una gran responsabilidad en muchos aspectos. Para que la ejecución de un proyecto sea exitosa, esta requiere de su implicación desde las fases previas hasta la finalización del proceso. Capacidad analítica, pensamiento lógico y comportamiento proactivo son algunas de las características que definen a un jefe de obra.

Con la colaboración de una empresa constructora española, Civil Stone, nos hemos adentrado en varios proyectos ejecutados recientemente. De este modo, se muestra el desempeño de las tareas realizadas por el jefe de obra en casos reales. Observaremos cómo realizar la planificación técnica y económica, llevar a cabo una buena organización y gestionar los recursos para que un proyecto sea exitoso. En otras palabras, saber cómo liderar un proyecto y sobreponerse a los desafíos que puedan surgir.

Lo que se puede concluir del análisis realizado es que ejecutar un proyecto es un proceso complejo. Trabajar en los pasos previos, como escoger los accesos a la obra y el vallado perimetral, o revisar los elementos del proyecto, son responsabilidad del jefe de obra. Se podrá ver que es necesario adaptarse a nuevas situaciones para tener control de la obra en todo momento.

Esta tesis pretende ser de gran ayuda para aquellos ingenieros que inicien sus pasos en el mundo de la construcción, especialmente de la obra civil. A través de experiencias reales, van a tener una primera toma de contacto con los procedimientos que hay que llevar a cabo en todo proyecto, así como a resolver los problemas de manera eficiente.

Preface

This master thesis is the last project of my university studies. These last six years have been very profitable and I have been able to learn what I am most interested: civil engineering. During my career, I have studied in three different universities. My studies have been mainly in UPC Barcelona (Spain), but also in STU Bratislava (Slovakia) and NTNU Trondheim (Norway). I would like to appreciate these universities that have participated in my academic training as they all have taught me different things in both, academic and personal life. I strongly recommend other students to go in exchange. Leaving your comfort zone, such as going abroad, makes you improve your skills, learn new cultures and adopt a mature personality. This allows you to have different approaches and more resources when working on problems which will make it easier to solve them.

About the motivation to work on this topic for the project, it was originated after working in the project management team for a construction company in 2018. As an assistant of a construction manager, I have been involved in the execution of projects. It is very satisfying to participate in the performance of public projects to improve current infrastructures. In the near future, I want to take the lead in the implementation phase procedures and take part in decision-making and the planning of different projects. In order to accomplish that, I need to be aware of the complex situations that can occur and be able to handle them in the best possible way.

I would like to express my gratitude to Civil Stone company, and especially Fernando Ares. He has taught me during my stay and helped me when needed. I would like to thank my supervisor, Olav Torp. Also, say thanks to Martina and Nuria to be part of my project in some way, and thanks to my UPC college friends for all the teamwork all these years. And to my parents, Joan and Flora, for supporting me in everything I do and for giving me the opportunity and the right tools to become what I want to be. I am very proud of what I have achieved so far but it could not be possible without them.

Last but not least, I want to dedicate this thesis to my dear friend Daniel Gavilanes. He will motivate me to do my job and make sure I will do it with passion. He deserved to enjoy this profession and, as far as I am concerned, I will try to do it for both of us.

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List of Abbreviations

AC	Actual Costs
BC	Budgeted Costs
CC	Construction Company
CM	Construction Manager
CO	Cost Overrun
CS	Civil Stone S.L.
EC	Expected Costs
EMP	Environment Management Plan
HSC	Health and Safety Coordinator
HSP	Health and Safety Plan
LFA	Logical Framework Approach
LFM	Logical Framework Matrix
NTNU	Norwegian University of Science and Technology
ObCP	Observatorio de Contratación Pública
PG	Project Governance
PM	Project Manager
PMM	Project Management
PP&A	Project Planning and Analysis – NTNU course
PVC	Polyvinyl Chloride
QA	Quality Assurance
SCE	Successive Cost Estimation
SP	Successive Principal
STU	Slovak University of Technology
UPC	Polytechnic University of Barcelona
VAT	Value Added Tax
WMP	Waste Management Plan

1 Introduction

1.1 Background

Civil engineering projects are many and varied. Almost all the works we have in our environment are the result of their execution. Some examples are the construction of large infrastructures, such as airports, bridges or highways, or the action in local areas, such as the repair of roads and streets. But it is not just about construction. Any performance has an impact on society, trying to generate a concrete benefit and improve our quality of life. For this, it is necessary to take advantage of resources efficiently.

To design and develop a project, the collaboration between experts is needed to create an initial idea that defines the problem. It is necessary to establish the main purpose of the project too. Many times, several options are proposed, so is not easy to achieve an agreement that pleases everyone. Once the project definition is decided, it is time to implement the project. A construction company is responsible for carrying out these works. They have to execute what the project definition says. To ensure this is done properly, dialogue and cooperation between all parts are required.

1.2 Purpose of the work

In this project we will focus on the implementation phase of the projects, analyzing the execution of civil works. The purpose of this thesis is to analyze the works in order to do a good performance of their execution and to improve the execution in future occasions. To do that, we will examine works in the actuality to see their performance. We will focus especially on the functions that a construction manager must do to make a successful project. His decision-making is essential to achieve it.

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1.3 Problem definition

Some real cases performed by a construction company in Spain will be analyzed. Working with existing projects will give us accurate and objective information. So that, the collaboration with this company, called Civil Stone S.L., will be essential to collect documentation and data about their projects.

The objective is to get inside the construction company, especially in the eyes of the construction manager, and see how to plan the works, to manage difficult situations, to meet with other companies and to solve daily problems that will occur. As a construction manager, it is needed to have control of the situation and overcome the obstacles that can appear. Otherwise, the project can be unsuccessful in terms of quality, time or money.

We will study in detail different works in Catalonia, Spain, where the company Civil Stone use to work. It will be interesting to see some real cases and how they execute the works, how is the team organization and if they take care of the business profitably.

Good planning of the work execution is the key to reach the agreed terms with the other parts of the project. It is important to start asking for some easy but essential questions. How to execute the works? When do they start? What are the goals and the purposes? However, a construction company has to focus on satisfying the established outputs of the project. To have a good initiation, they may know where to start working first. It is recommended to split the project into several parts, in order to divide each part by categories or classes. This method will clarify the job and is a good way to organize the project items. In other words, the main project may be divided into other small projects.

Relations between the company and other organisms are crucial to have success. It is needed both an internal organization, such as setting up your team of work or establish storage areas and external organizations like the access to the work for the loading and unloading of materials. It is also important to review the measurements of the original project. Sometimes, it could have some mistakes, or the real scenario could have had changes from then until now.

We will describe and analyze some important factors that may be looked in terms of economy, security, and quality. Economic planning is fundamental in order to have benefits and not losses. A project won't be considered a success for a private company if they have losses. On the other hand, security has to be fulfilled at all times, from the beginning until the end of the works, whether there is someone working or not. Not only workers must be well protected, but good indications and warnings are required on the

perimeter of the works and the storage areas. We will see how to do an adequate enclosure of the work, affecting as little as possible traffic and pedestrians. Last but not least, contacts with other companies are necessary to contract services, materials, and other stuff. It is needed to ensure the quality of the services that you are hiring or renting to execute the works but trying not to exceed your initial budget.

In terms of economy, there are two parts interested in not to have cost overruns in public civil works. Firstly, the public entity responsible to award a project, which is going to finance the project, and then, the construction company, that has to execute the works. Both of them need to adjust to the project budget and guarantee its quality. Nowadays the market accepts dangerously low bids due to the strong competition between construction companies, and this can affect the original project.

The definition of the roles at work is another topic to be discussed. In addition to the construction manager, there are other charges of the public entities that will be involved in the coordination of the works. To assign a foreman is needed to manage with the daily works, to give instructions to the workers and to be in charge of the work when the manager is not there. The construction manager has to deal in the best possible way with all these organisms with fluent communication.

To sum up, project execution works are very dynamic and changing. Problems can occur frequently and the main task of the construction manager is to solve them with ability. Good planning is essential to reduce uncertainties, with a monthly, weekly and even daily organization. We will get inside the works and we will see how to adapt to every challenging situation trying to achieve the best project execution.

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1.4 Limitations

Developing a project is a very complex process. It will be tried to describe its most important issues through some examples, but they will be summarized. The intention is to bring new concepts to those who take their first steps in the field of construction. But

that does not mean that in all projects these indications must be assumed. Each project must be treated independently.

1.5 Research question

If we could ask a question it would be how to make a project succeed. But this question is very difficult to answer, due to its complexity. This is why the aim is not to answer just one question, but more: how to do a good economic plan, how to organize the execution of the tasks to finish the works within the deadline but guaranteeing safety, how companies can make such low bids to be awarded and guarantee the quality of the project... To sum up, which steps should be followed in the execution of a project? These mentioned aspects and many other things are required to achieve a successful project. This thesis deals with all these issues so these and more questions should be cleared.

2 Theory

It is time to present the main concepts related to a project. It is important to say that most of the following descriptions are general, but others will be based in the Spanish construction system. This is because both the projects and the construction company that will be examined in the analysis are located in Spain. This fact doesn't affect very much the construction procedure because planning and organization can be studied in a similar way despite being in one country or another. Nevertheless, some aspects such as the public tender procedure, the definition of the roles in the works or even economic planning could be different depending on the country.

On the other hand, we are going to make use of some terms taken from *Project Planning and Analysis (PP&A)* course, taught at NTNU Trondheim University. This subject has some concepts that can be useful for the study of the works. In that case, we will present them and define any ideas we consider suitable for the project, always quoting the sources.

2.1 Project definition

A constructive project has different phases. We can describe three different phases (Samset, 2010, p. 29-35):

- Front-end phase: It is when the idea of developing a project is thought. It can be defined by a public entity or a private company, but in both cases, teamwork is the key to make the project possible. Most of the time it needs coordination between more than one entity. It finishes when the decision to implement the project is taken.
- Implementation phase: Knowledge of professionals in different areas is essential to define the main concepts of the project. We include in this phase the planning, organization, and execution of the project. It ends when the execution is done and all the outputs planned at the beginning have been carried out.

- Operational phase: After the project execution, it is needed to see if the goals and purposes are fulfilled. For that, a certain time (months, even years...) is necessary to see if the results are as expected.

These phases should be followed to achieve a successful project. It doesn't mean that the implementation of these processes will guarantee success, but it is suggested not to skip any step to reduce the possibilities of a project failure. The more control and information we have about the project, the better to fulfill the aim.

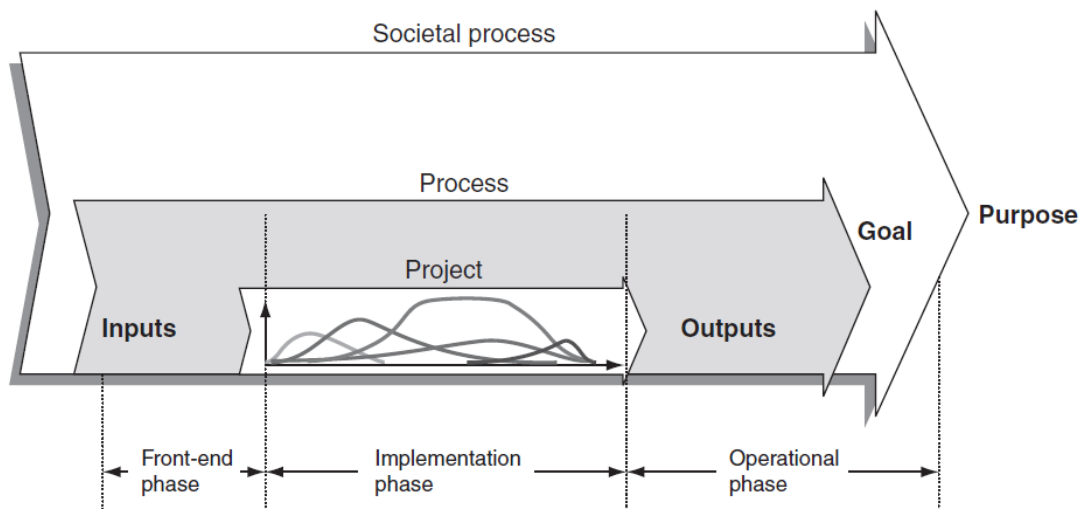


Figure 2.1: Phases of a project (Samset, 2010)

Once the main phases have been presented, from now on we will focus on the implementation phase. In this phase more than one action takes place, and also several entities are involved. The initiation of the project starts with the definition of the project aims. After that, the planning phase follows to organize the works and the time required to implement the project. Planning can be modified during the execution of the works because sometimes unexpected troubles can appear once the works have started, and plans have to be modified. We will define afterward which are the companies or entities responsible to carry on every phase. Then, the execution and control of the works are done simultaneously. The execution of the project is done by the construction company, and the control is checked by an external company or a public organization if it is a public work, or it can be done by the final client if it's a private project. The control is necessary to check if the execution is being done properly. Finally, the closeout is the time to make sure that every point defined on the planning has been reached. After that, we can consider the implementation phase completed.

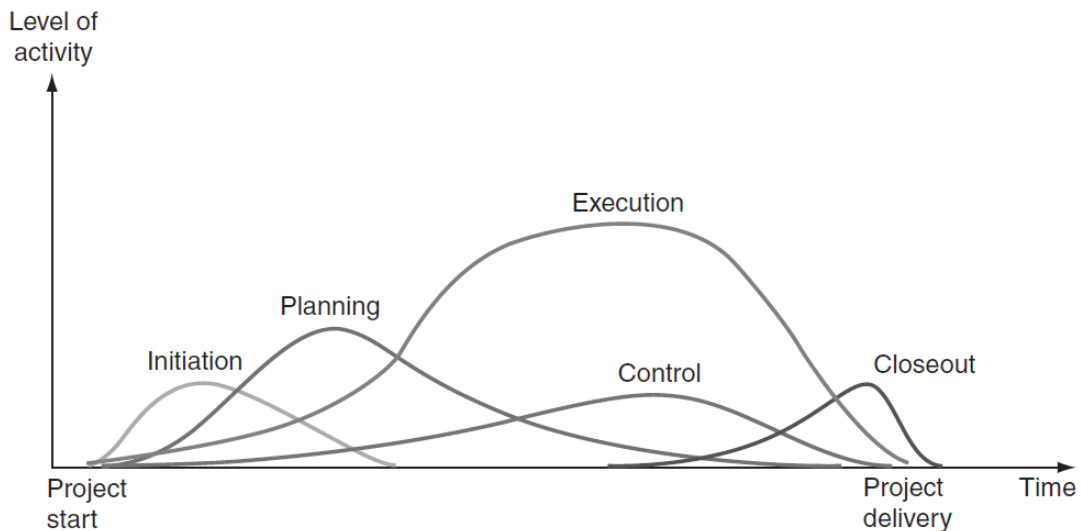


Figure 2.2: Processes in the implementation phase (Samset, 2010)

Even though we will have a look at all the processes related to the implementation phase, we will focus on the execution process which is the main topic of our study.

2.2 Definition of roles

In every project, there are so many people involved in it. We need to explain the role of the main important parts. Each one will have different functions in the work but, in the end, all of them will try to collaborate together to achieve a good performance.

A project can be public if it is awarded by a public organism (if the construction company wins a bid), or it can be a private project if the client is directly a private company or a private person. Depending on each case, the organization chart is larger or smaller (Aja & Castro, 2005, p. 139-148; Kalkins, 2014):

- Public project: In public projects, the main objective is to satisfy the needs of the people (neighbors, citizens, users...) to improve a present situation into a better scenario in the future. It can be the construction of new infrastructures or equipment or also repair some actual facilities. As we have said in the project definition, a control process is required during the execution of the works to check if things are going well. The relevant figures related to a public project are:
 - Client/Property: We call *client* or *property* to the person that is acting on behalf of the public entity, e.g. the city council, the government, etc. It is

common to have a presence of the public organization following the works because, despite the final user will be the citizens and the population, they are responsible to ensure that all processes are being done properly. For the construction company, they have to deliver the project to the public entity so, somehow, the public entity is their client or also called property.

- Project manager (PM): It is the person contracted by the property to be in charge of the control process. His/her function starts in the pre-phases of the project, not just on the execution works. Usually, this person is a technical architect or an engineer that has done the project design, in its entirety or in a part. So, he/she knows better than anyone the insides of the project. This person is almost always hired by the property, so he works for an external company and he is just contracted for a particular project. But sometimes, it can be that the property has a responsible person that does this job too. In that case, the client representative and the project manager is the same person.
- Construction manager (CM): It is the head of the construction company in the assigned project. The CM is responsible of carrying out the execution process, make good planning of the works to do, compose a team of workers, contract the materials and machinery needed to execute the works, among many other things. The project manager will supervise if the construction manager tasks are fulfilled. They might have a good relationship during the implementation phase and try to understand each other to get a successful project.
- Foreman: It is the extension of the CM in the daily works. It has to attend the orders from the CM about the execution planning and be in charge of all the workers. He must be at work at every time and communicate any possible incidence to the CM. He might report the daily works and have control of the staff. He also has to control the entrances and exits of workers or machinery to the work and deal with other companies when receiving materials. The foreman reports directly to the CM, so their communication must be fluent and be given regularly.
- Health & Safety Coordinator (HSC): The HSC has the function of ensuring that safety preventions are fulfilled in the work. It is designated by the property. He has to go to the work frequently to see if workers are properly equipped, if the closing of the work is fine, and if security elements are present. He can tell

to the CM to modify or adjust something planned if it is not as safe as he considers.

- **Workers:** They are responsible for the execution of the works. Inside the workers, there can be different categories depending on the experience and the position of each worker. There are some workers that will be during the whole project execution, while sometimes some workers are just temporary because of a determinate work. This is common with specialized jobs. Workers can work directly from the construction company or they can be subcontracted too. They all have to attend the orders of the foreman.

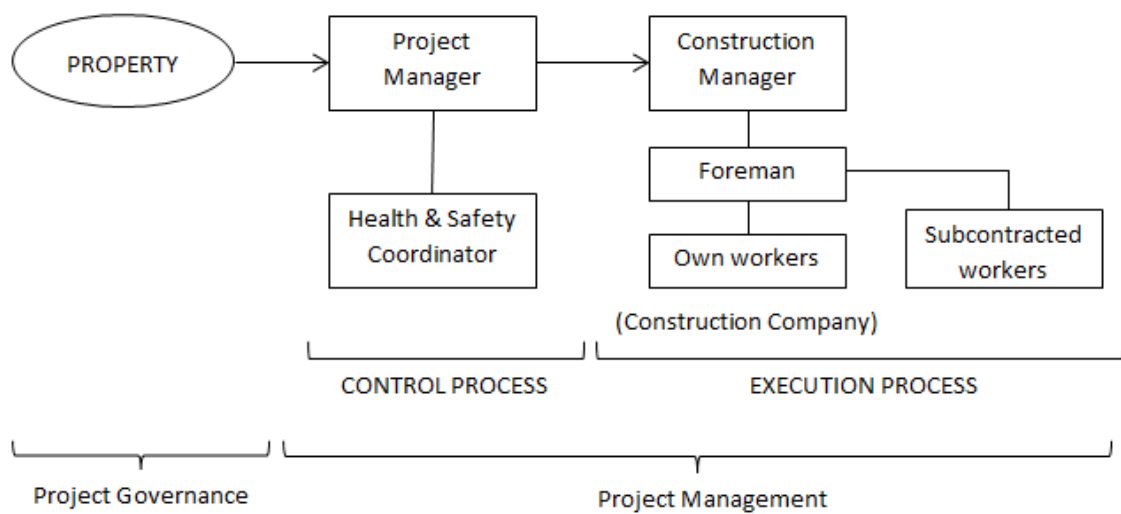


Figure 2.3: Simple organization chart of the roles in a public project

This organization chart is for a typical small or medium project. In this type of project, just one construction company takes part in the execution process, as a rule. But in huge projects it is common to have more than one company participating and maybe some charges, as the CM or the PM, have several people, so the organigram is more complex. Anyway, coordination between all parts is essential to achieve a good project execution. To inform about the work situation, every week must be a meeting called *site visit* where the main charges are present (property, PM, CM, HSC...) to check that everything is going as planned. It is mandatory to do a report of every site visit and sign it to approve the points.

- Private project: In private projects, we observe the same organization chart than in a public project. Figures of the PM and the HSC are also present. But in private

projects, we can find that the project manager can be responsible for elaborate the project from its initial phases and also to do the tasks of PM during the project execution. He can also do the HSC tasks if he is allowed too. The main difference in private projects is that is not needed a public contest to award the project. So the relation between the property and the construction company (CC) can be direct from the beginning and negotiate the terms and the budget. The property can also ask the CC to participate in the pre-phases of the project and elaborate it if the CC is qualified to do it. Quality certifications and safety controls at work are mandatory as in public projects, so the execution process doesn't change so much.

2.3 Work organization

To achieve a successful project, a good organization of the work is the key. We will focus on the paper of a construction company. The works don't start just on the execution phase. It is required a previous work to collect information about the project. We are going to show every phase needed to complete the process. The main figures here are the department of studies, in charge of the first phases, and then the role of the construction manager especially in the planning of the execution phase (Céspedes & Mora, 2009; Ardilla, 2017).

1. Studies and tender of the work: The CC needs to do a research process before present the required documentation to the property/client (public or private organization). It should be interesting to visit the place of work in order to do some observations and extract information about the place. Some factors to analyze can be the road communications to the work site and the main distances from the closest cities because it can affect the supply of materials and products. Also, the connections and the general services (electricity, water, gas...) that affect the works have to be analyzed.

With this information, it is easier for the department of studies to do an estimation of the costs and present a final offer to compete in the auction, and also give the requested documentation.

2. Pre-start phase: We suppose the CC has won the public auction and it is the chosen one to execute the works. Now the figure of the construction manager appears. Before the start of the execution, he has to check the general budget studied before by the department of studies. He has to do a classification of

the items of the project by categories and ask the different suppliers to give a budget for each item. He has to be in contact with other companies to negotiate the prices of the materials. He also might think if it is needed to subcontract some specialized jobs or machinery.

The CM has to do the planning of the works and an estimation of the equipment required to finish the execution within the deadline. He must select a team of workers to do the tasks and select a foreman to guide the workers. An important point is the writing of a health and safety plan. This plan can be started by the department of studies, but the CM has to finish it adding and modifying what is needed.

Another important matter is to check if the measurements of each item of the project are correct. The responsible for elaborate the project could have some mistake or maybe is some item missing in the budget. The CM must do a review of all the measurements and check if they are right, before the beginning of the execution, and tell the PM if he sees something wrong.

3. Project execution: To start the execution of the works is required to define the work methods with the team. Share the execution plan with the foreman and the workers is essential to define the tasks of each worker. Weekly meetings are recommended to be efficient in the execution.

At the beginning of the works, it is needed to define the enclosure of the performance area. To do that the CM may have a meeting with the police or the security forces of the town because sometimes it can affect some streets or roads. It is usual to work on pedestrian streets or traffic roads, so the works modify the common use of public services. It is necessary to have the approval of the police or some public organism that can authorize the enclosure of the work. Also, warnings are mandatory to notify the people and announce they might act with caution in the surroundings. All the security elements must be present at all times. In the same line, another topic to treat with the police is the place of the storage areas. They have to verify if the storage area proposed by the construction company is adequate and the affectations are as small as possible. Sometimes is necessary to readjust the current traffic lines or modify some pedestrian zones.

Another important point is the purchase of equipment and material. After the initial contacts with other companies for the acquisition of the items, it is time to make the final offers and select which items we will contract and which not.

It is common for the suppliers to do some final offers after negotiations with the CC with some discounts or lower prices than in the first contacts. Once suppliers have been decided and final offers signed, the CM may notify the foreman for the materials that will arrive at work. The reception of materials is important because they can modify the daily work, and also it needs the presence of a worker to warn the people and traffic on the entrance and exit of the vehicles.

As the work advances, workers may take new measurements frequently, especially of the heights and dimensions of the terrain. After excavations, repairs and other works, it is useful to check constantly if the new levels are expected. The foreman is responsible of command these tasks. The dialogue between the foreman and the construction manager must be daily and regular to share the progress of the works and to do together a plan of the following days. Project executions are dynamic and can change from the expected planning. Then, know how to adapt and adjust to new situations is essential. The CM will have the last word, but it is good to have the opinion of the foreman because he knows well the daily manages of the project.

The CM must follow if the execution is going as planned. The monitoring and evaluation of the tasks have to be done. The main points to fulfill are focused on the economic and technical plans. In the end, the budget has to be under control and the objective of the construction company is to earn money with the project, so this aim is shared with the CM. About the technical aspects, the quality of products and the quality of the realization of the works have to be satisfied. The PM will control that these parameters are fulfilled, but the CM has to ensure it too because if not, the CC will not finish the execution within the deadline. And this situation will cause trouble to the CC in terms of unexpected costs and an undesirable extension of time. To help in this task, quality controls may be asked to the suppliers to guarantee the quality of the materials and the works executed. Then, the results of these quality controls will be given to the PM and the property to show there were no irregularities in the procedures.

It is common to have periodic meetings between the CM and the control managers (PM, HSC, and property) to analyze the realized tasks and to agree about the future plans. These meetings are usually done once a week. The CM and the PM must do also works certifications every month. Work certifications are required to sum up the measurements executed until then. The CM has to

write the certification and the PM has to accept it. If they agree with the terms, this documentation will be used to do partial payments, from the property to the construction company. This is often the way to do the liquidation of the budget, month by month, according to the partial measurements done.

*Know how to adapt and adjust to new situations
is essential.*

4. Work delivery: Once the project execution is over, is the time to deliver the project to the property. A final meeting is mandatory to check the lasts measurements and make sure that all the points have been done properly and the aims of the project are fulfilled. The foreman has to deliver the work diary, where he has done a diary control with the events happened, the number of workers and if it has been any incidence.

The construction company has to give the final documentation to the PM, called *as-built documentation*. In it, a summary of the execution process is written and a list of documents must be added: delivery notes and invoices of the supplies used, final measurements, site visits record, quality test results, product guarantee, etc. The CC has the duty to ensure a one year guarantee to the property about all the products and the services done. This method is to ensure the quality of the execution process, so if something goes wrong with the services executed during the first year, the CC must repair it.

If any of the parts want to complain about any term of the contract, they can present a claim at this time.

In summary, project execution is a complex process that needs the cooperation of all the parts to make it possible. There will be situations where the construction company and the property may not agree. It is important to give in to the demands of others without creating a conflict. Good relations, transparency, and hard work will be the way to end the project in time and with the proper quality.

2.4 Construction manager functions

In the work organization process previously described we have seen several parts involved. Regarding the construction company role, the main figure is that of the construction manager (CM). He is in charge of the team of workers and responsible for supervising and leading the operations to execute the works. As a purpose of this project and in order to clarify the role of the CM, we are going to summarize the main functions of this figure in a list (Burger, 2019):

1. Project Management Planning:
 - Planning of the entire execution of the project.
 - Present the required documentation.
 - Manage the necessary supplies and materials.
 - Fluid communication with other important roles (PM and property).
2. Cost Management:
 - Do an economic plan.
 - Have a daily control of costs.
 - Make the project solvent for the construction company.
3. Quality Management:
 - Make sure that the project is being completed with a high-quality standard.
 - Get the quality certificates of all the equipment and services executed.
 - Guarantee the good quality of the subcontracted companies.
4. Contract Administration:
 - Sign the corresponding contracts with the property.
 - Reach agreements with other suppliers to contract materials and services.
5. Safety Management:
 - Ensure that correct processes are in place to make sure there are no accidents.
 - Make sure that the work meets all the legal requirements and follows the building regulation.
 - Check that the surroundings of the work site and the accesses are properly safe.

As we have seen the functions of the CM are many and varied. He needs to have daily and detailed information about the works in order to take the best decisions with a general view.

2.5 Safety

Civil engineering is a field where a lot of constructions are made every day, from big infrastructures such as airports, tunnels, railway stations or dams, to local performances as repairs or maintenance of roads and streets. No matter the dimension of the project, it is always mandatory to assume some safety measures to prevent any possible hazards at work. In this part, we want to sum up the main figures and elements related to safety in a work site and talk about its real value. As we have seen previously, the role of the Health & Safety Coordinator (HSC) is responsible for fulfilling all the parameters and the duties during the execution of the works (see HSC functions in 2.2 *Definition of roles*).

- Health & Safety Plan (HSP): It is a mandatory document done by each contractor participating in a work that analyzes and studies the work site and proposes preventions to avoid the hazards. It is usually written by the department of studies and the construction manager. It must be drafted before the start of the execution work and the HSC has to approve it to allow the contractor to begin the works. The HSP is not a closed document; it can be updated and modified during the project execution. It must facilitate decision-making and the control of activities. Among the most important descriptions in the HSP, we can highlight the explanation of the work phases, general information of the project (location, description of important roles, etc.), climatology, previous performances, preventive measures, detailed description of the equipment and machinery, emergency data... There always has to be a printed copy of the HSP in the work site and be accessible to the staff.
- Incident reporting book: This book has to be present in every work site in order to control and monitoring any incident that occurs. The HSP must have access to this book and every time he visits the work he has to write and sign if the HSP is been followed or if there is some incidence. A weekly check is common from the HSP. He checks if the workers are wearing with the safety elements and using the equipment properly or if the enclosure of the work site is appropriate, among other things.
- Workers role: Workers are in potentially dangerous conditions in the work site. It is a place where the handle of vehicles, machinery, and tools is required. Executions of projects are all the time in constant activity, sometimes working at different heights or with dangerous materials. So, workers have to meet some requirements before the work to know how to be safe and use the equipment

properly. They must be trained and educated by his construction company or a specialized company about the preventions and hazards of their jobs. Depending on the role at work, some charges need more hours of training for a determinate position. Then, once at work, they must wear some general protection elements: clothing, gloves, hardhats, fire protection, glasses, etc. And if there is a special task that requires other protections, these must be taken too. Likewise, they have to keep informed of initiatives and new rules that can appear in the future and be always aware of the risks at work.

- Other elements: We can remark other elements regarding safety measures, such as a first aid kit, that must be in any execution process. It is useful for the first aids in little troubles or to attend a worker before the attention of the health services. Also, emergency data needs to be present at work. Every worker has to have access to emergency numbers and medical care directions.

Safety at work is a complex topic that has to be fulfilled by every member of the work site. It is sure that is not possible to take out the possibility that a hazard occurs anytime, but the aim is to reduce as much as possible the risk of suffering damage. In the end, safety is the most important issue in project executions, so prevention, information, and awareness are the keys to achieve a safe workplace. (Pallav & Sahu, 2006).

Safety is the most important issue in project executions, so prevention, information, and awareness are the keys to achieve a safe workplace.

Construction companies have to ensure that all their projects and their workers are supervised to ensure a safe place. For that reason, CC might have some certificate that confirms their performances are in a good way.

2.6 Economy

The economic factor is one of the most important aspects for every member of the project. Both the property and the construction company are interested in the budget.

About the property, they are not interested that the project has cost overruns. And the construction company wants to perform the works and obtain benefits at the end of the process. Then, all the parts are considering the economy in the implementation process, some are more focused on the costs and others on the profits. We will talk briefly about some important points related to economic planning and how to manage them.

2.6.1 Cost overrun

Cost overruns are unexpected incurred costs that are common in all kinds of public projects. We need to define the different costs that we can find in a project before to analyze what cost overrun (CO) is (Magnussen, 2009, p. 6):

- Estimated costs (EC): These are the costs forecasted at the initial phases of the project, before the decision to implement the project is made.
- Budgeted costs (BC): These are the costs determined at the decision to build the project. The property has to develop the budget, item by item, before the beginning of the execution.
- Actual costs (AC): These are the costs presented at the end of the project implementation. After the execution, there may have been some modifications that produce changes in the initial costs.

So then, cost overrun occurs when the actual costs are higher than the budgeted costs:

$$CO \rightarrow AC > BC$$

We are going to look at the most current mistakes that produce cost overrun in public projects (Alinaitwe, Apolot & Tindiwensi, 2013; Wroblewski, 2018):

1. Underestimation of the project difficult or complexity.
2. Unrealistic cost estimation.
3. Unplanned costs.
4. Changes in project scope.
5. Bad communication between parties.
6. Poor schedule management.
7. Poor monitoring and control.

8. Inadequate financing.
9. Project delays.
10. Lack of leadership.
11. Lack of coordination.
12. Lack of a contingency plan.

Bad organization before and during the implementation phase is responsible for having cost overruns in several projects. After seeing the main problems that can affect the budgeted costs, we will remark which solutions can be taken to solve CO worries (Viswanathan, 2012):

1. Identify problems on time.
2. Do a good project plan.
3. Manage as much information as possible.
4. Meet user needs better.
5. Use good scheduling tools.
6. Review similar projects (if possible).
7. Converge faster on a suitable solution.
8. Make sure the stakeholders are on the same page.
9. Check the capabilities of a provider before hiring.
10. Constantly track and measure progress.

These points will help us to prevent and to solve problems that can affect the budget. Despite the initial studies of the project are in charge of the property and the PM, and the CC is often just in charge of the execution process, it is useful to be aware of the topics that can cause troubles in the global project because all the stakeholders are interested in having a successful project. It is required a good knowledge of the economic situation and responsible implementation of their actions from every member involved in the project to avoid CO.

2.6.2 Cost estimation

In order to avoid cost overruns in projects, it is convenient to analyze the budget in the earlier phases of the project. To do that, there are several methods that help to do a good estimation of the costs. One of these methods is the Successive Cost Estimation

(SCE) represented through the Successive Principle (SP). The main characteristics of this principle are the following (Klakegg, 1994; Lichtenberg, 2006; Johansen et al., 2014):

- It considers a top-down organization instead of a bottom-up pyramid. This means the module is divided into different submodules. An overview of the project is done, but not detailed. Each submodule is then refined in greater detail. So it consists in divide the information in smaller parts to analyze it better.
- The most important elements are considered first. The most valuable items have a great weight regarding the total budget. The SP gives more importance to these items to identify better where efforts should be focused on.
- It considers every item and it is based on subjective estimations. Estimation methods are not exact, they just try to get close to the final costs, managing the more information they can to avoid unexpected costs. Qualified people with experience and knowledge on the topic are required to do these estimations.
- It is based in statistical calculations. It considers the possible uncertainties that can affect the real costs by stochastic estimations. According to the wide ranges that exist between the costs of the same item, it is possible to find out the percentage of the uncertainty of the final cost respect the expected cost.

The SCE needs a group work to elaborate an estimation of the costs. It will evaluate the risk of every item by quantifying uncertainties and make them visible. Using probability calculations it is possible to make accurate prognoses of the costs.

This method it is widely accepted in European entities, especially in the northern countries. It is more used in the initial phases to estimate the costs before the beginning of the execution processes, but it can be also used during the implementation phase to adjust the costs.

2.6.3 Budgets

In order to understand future explanations, it is convenient to introduce some aspects of the budget. Owing to the fact that the projects that will be analyzed follow the Spanish laws, some fees and tax values will be described according to this situation. But it can

change depending on the country where the works are executed. We will distinguish between three different budgets:

- Material execution budget (MEB): It includes the cost of the materials, workforce, tools, and equipment required to execute the tasks. When the costs of the items are described, it is usually referred to this budget.
- Contract execution budget (CEB): This budget adds some other costs to the material execution budget. First, general expenses (+13%) such as the cost of the construction manager, foreman and other members of the construction company from the administration department or auxiliary members. Then, another fee is included, called industrial benefit (+6%), and represents the margin of gain that has the CC for executing the work. So that the CEB is the result of adding a 19% of value to the MEB. It is usually used when saying the total amount of money a project.
- Contract execution budget plus taxes (CEB + VAT): It includes the value added tax (21%) to the contract execution budget. It is not common to have into account the VAT when negotiating with suppliers or doing economic plans, even though at the end it will be paid.

$$\text{CEB} = \text{MEB} + \text{general expenses (13\%MEB)} + \text{industrial benefit (6\%MEB)}$$

$$\text{CEB} = \text{MEB} + 19\%\text{MEB (VAT excluded)}$$

$$\text{CEB} + \text{VAT} = \text{CEB} + 21\%\text{CEB (VAT included)}$$

2.7 Quality and environment

A construction company must guarantee in any project some minimum requirements needed to develop the execution process in a successful way. We have seen the parameters related to safety, but now we will talk about quality and environment measures.

- Quality: Maintain quality during all the phases of the project is essential to achieve a successful process. The property will always demand a good quality of the services, materials, and equipment executed. On one side, construction

companies may have a certification of quality. On the other side, suppliers must always give quality certificates of their products in order that the property can be sure of their origin and their properties.

- Environment: It is common in civil works to modify and change the disposition of a place to carry out the execution of a project. This can affect the natural environment. Construction companies may avoid the negative effects that can be caused in the environment. Projects have to be fully integrated into their surroundings. In order to do that, in each project, the CC must elaborate an *Environment Management Plan* (EMP) and a *Waste Management Plan* (WMP) with preventive measures they will take to respect the environment and to explain what they will do with the management of the extracted materials.

With these standards in quality and environment, companies are proving their commitment with any project they are involved. It is important to consider everything about a project to have success.

2.8 Project development and evaluation

Projects have different phases from its beginning until its end. They have a lot of work to do before the implementation phase and they don't finish when the execution is over. To analyze a project in its whole it is needed to see it over time, with perspective. Despite this project is more focused on the execution process, and we will analyze deeply the project management phase later, we want to introduce some aspects about project governance and other elements that correspond also to other phases of a project. We think it is relevant to have a general idea of all the concepts related to a project.

2.8.1 Stakeholders

When a project is developed, many different parts are involved in. We have seen in 2.2. *Definition of roles* the members that take part in the implementation phase. But as it was said, a project has more phases, so we want to show the main parts that we see in a project, in all its phases (Samset, 2010, p. 20-26):

- Commissioner: Also called property/client. They are responsible for the existence of the project. They develop the initial idea in the front-end phase. Its role in the implementation phase is secondary. They have to supervise the project execution but they usually delegate the control phase to a project manager. When the execution is over, they must analyze the effects and repercussions of the project. This study must be done both short and long term.
- Contractor: Construction company role. They can sometimes be involved also in the pre-phases of the project but is not common at present. Their job is quite limited to the implementation phase. They are responsible for turn the inputs into outputs.
- Users: They are the beneficiaries of the project execution. A project is normally done to satisfy the user. They can be a group of people or populations in its whole. They are not involved in the front-end phase, neither at the implementation phase, but they are important to analyze the project at the end. The level of success of a project will be mainly based on the satisfaction of users.

These are the three main stakeholders of a project. In summary, we can say that the commissioner appears first and think about the idea, then the contractor executes the project and, in the end, the user takes advantage of it. About the commissioner, we can describe it as *Project Governance* and also we can define the contractor doing the functions of *Project Management*. We will see afterward which elements are they more focused on and the difference between them to have success.

2.8.2 Logical Framework Approach

Once presented the stakeholders we can talk about how to summarize the strategy in a project. The responsible for this task is the project governance (property). They have to ensure that the project will be carried out properly and present the aims and purposes that every member has to complete. To do that, many different methods can be followed but we will present a simple an effective system: the logical framework approach (LFA) (Samset, 2010, p. 188-199; European Integration Office, 2011). The LFA is used to be sure that the project is: well designed, described objectively, clearly structured and can be evaluated. In this line, it helps to identify the needs of the stakeholders and shows the potential risks and uncertainties of the project.

In the LFA the execution of the project is just the consequence of an initial idea and a future purpose. The aims of the project can be fulfilled at the short or long term and the implementation phase is the way to reach them. We are going to describe how to analyze the different steps with the LFA in order to clarify and organize the project. To do that, the use of the logical framework matrix (LFM) is useful to define the corresponding roles and to connect the links between every phase. In the LFM there are four elements that must be considered to fulfill the aims, and these are:

- Inputs: Those things that are needed to implement the project. Personnel, economic resources or equipment are common inputs that are necessary for every project. They need to be defined to be able to realize the activities.
- Outputs: Immediately after the implementation phase, outputs are the first fulfilled aim. They are the tool to reach the goal and purpose. Outputs are usually material and tangible things result of the activities done by the construction company.
- Goal: They are the first effects associated with a project. The goal is the link between the project execution and the purpose. The users are interested in the realization of the project goal because it is a direct cause for them. The realization of the activities by the CC is done to accomplish the goal.
- Purpose: This is the main reason why the property is interested in realizing and executing the project. It is a long-term effect. It doesn't affect a determinate group of people, but the society or the way of living. The purpose has to be seen as a benefit for the population after a certain time.

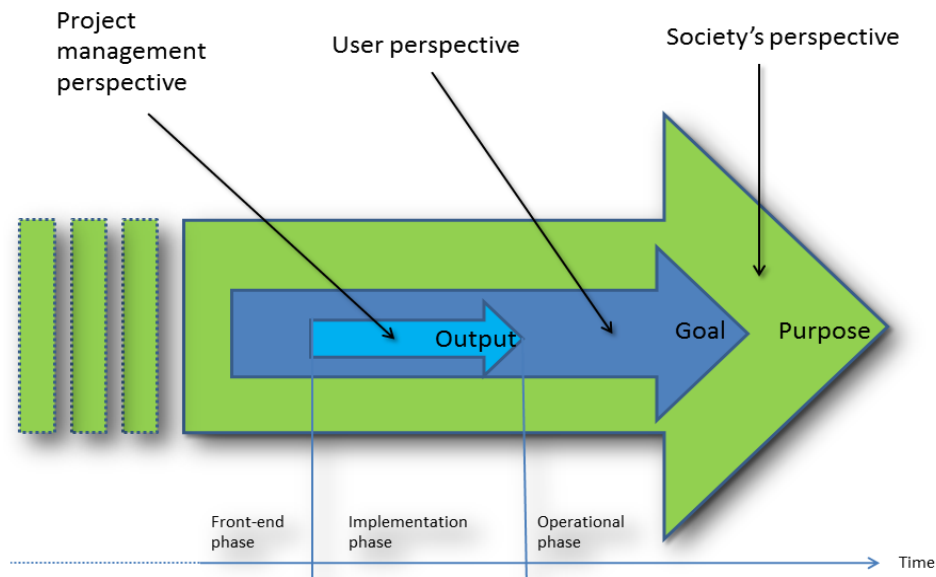


Figure 2.4: Objectives of each stakeholder (Haavaldsen et al., 2018)

Every stakeholder is more focused on an aim than another one (Haavaldsen et al., 2014). As it has said, the role of the CC is to turn the inputs into the outputs to achieve the goal. Then, people are more interested in the short-term effects of the goal benefits, and public entities are focused on achieving the purpose of the long-term effects. On the other hand, all these elements could be affected by uncertainties. The handling of information will be determinant to reduce these uncertainties and fulfill the aims.

The LFM is more complex than the description done, but this is enough to summarize the topics of the project and to apply the LFA. We will see more in detail in the analysis part how to deal with the risks and we will identify the objectives of each member of the project.

2.8.3 Success criteria

To evaluate the success of a project we will describe five key indicators that will tell us if a project is successful (Samset, 2010, p. 12-18 & 248-256). The elements are the following:

- Efficiency: It is the capacity of performing the activities of a project taking advantage of the resources in the shortest possible time. It is a measurable factor because it considers the productivity of the implementation process. Concepts as

time, quality and costs define the efficiency of a project. It is evaluated in the execution phase when inputs are becoming outputs.

- Effectiveness: It is the capability of producing the desired result. It is not a measurable item because it does not quantify the number of resources needed to achieve the aim, as efficiency does. Effectiveness defines if the goal has been reached, so it is a short term indicator that can be analyzed after the implementation of the outputs.
- Impact: It is the effect that the project causes to the people, the society, the environment, etc. The main group of people that will consider the impact of the project is the satisfaction of the users. It is difficult to measure the exact impact of a project but depending on its repercussion at the medium-term and long-term we will see its positive and negative effects.
- Relevance: It means the efficiency of the project with respect to the goal achievement. Relevance indicates if the needs of the users have been solved after the implementation of the works. It will show if the aims were well identified.
- Sustainability: A project is considered sustainable if it satisfies the real needs of the users without compromising the needs of future generations. Sustainability combines three main elements that are relevant to its evaluation: economy, environment, and social aspects. These three elements have to be efficient at the short-term and also at the long-term.

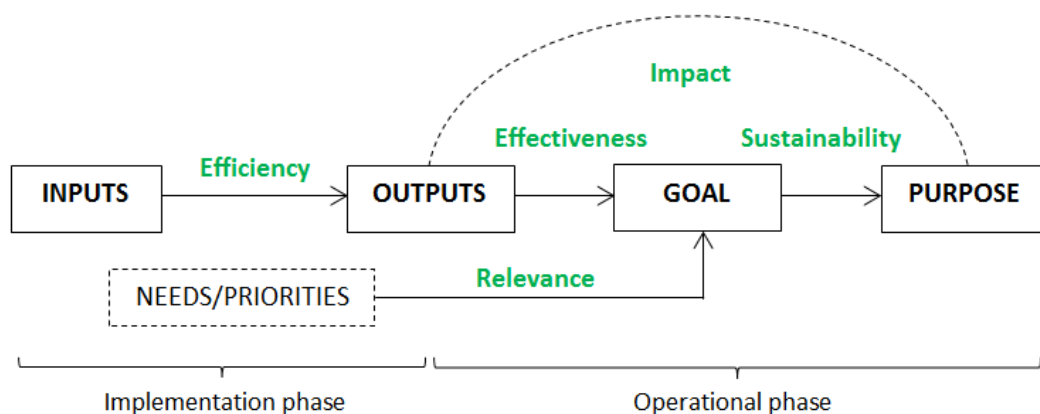


Figure 2.5: Key indicators of success to evaluate projects (Samset, 2010)

As can be seen in figure 2.5, the success criteria that are used to evaluate projects are found both in the project execution as at long-term phases. It is necessary to carry out a long process to analyze the results of a project, so it takes time to make a good evaluation of it.

2.8.4 Different perspectives

Regarding the role of the main members, they take care of following some of these key elements depending on their charge. As we have introduced in 2.8.1. *Stakeholders*, we can distinguish between the project governance – the commissioner – and the project management – contractor – (Samset & Volden, 2015). They have different perspectives in terms of fulfilling the elements of success.

The Project Governance (PG) is concerned in global aspects of the project, looking for long-term elements such as relevance, effectiveness or sustainability. They are focused on reach the goal and the purpose of the project. Their strategic performance is essential in the first phases of the project to do an effective and realistic plan that answers the needs of the users. They must be sure that the investment in that project is useful.

The Project Management (PMM) is related to the head roles of the construction company, especially the role of the construction manager. They are focused on the elements that affect the implementation process. Cost, time and quality - efficiency terms - are the most important factors to be considered by the PMM. Instead of relying on a strategic plan as the PG, the PMM has to be good in tactical performance. They must be able to adapt to external conditions during the execution process in order to be efficient.

Despite each part work to fulfill different elements during the project, it is needed the achievement of the objectives of both parts to obtain a successful result. In figure 2.6, it can be observed that the project governance is more concerned in the society while the project management is focused on the project itself. But if they do not both do an effort to collaborate together, success won't be achieved.

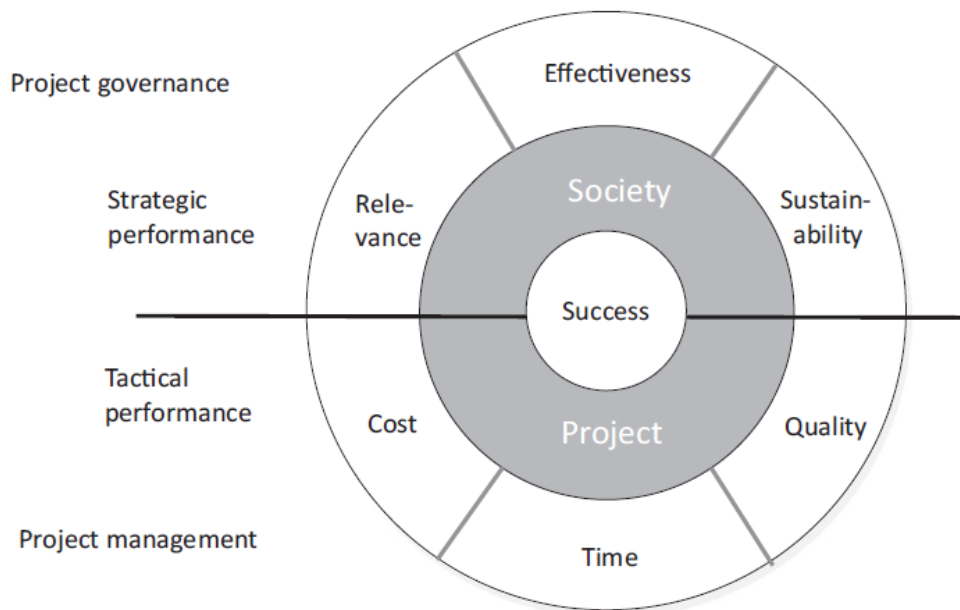


Figure 2.6: Different perspectives of each member (Samset & Volden, 2015)

3 Methodology

3.1 Key questions

What to do?

Once presented the main topics related with a project needed to understand the implementation process, we will describe the methodology used in this thesis to get the required information to do a complete analysis of the constructive procedure and to show how to implement the data. As it is known, the purpose is to get involved in the execution of the projects and to share real experiences to improve the knowledge in this area and contribute to solving doubts about it.

In order to analyze the implementation phase, two project executions will be studied. These works are located in Catalonia (Spain) and were awarded to the company Civil Stone. Afterward, we will describe better both projects, but the objective is to have an overview of the processes that are required in the work and check the main important points that take place such as safety, quality or economic control.

In summary, we will focus on the procedure that a construction manager should follow to achieve success. Work organization, deal with suppliers and coordination with other parties have to be well managed by the CM. Supervise at all times the works, have good communication with your team and be able to adapt to new situations are the key to reach the aims.

Why do this?

The objective of this thesis is to show the inside of a construction company paper in a project execution phase, and especially the role of the construction manager. It has been presented the roles that are found in the work, a common scheme of proper work planning and the functions that a CM has to carry out. We want to show the procedures that are involved in a project and bring them closer to the people, particularly to those who are motivated to work in the execution of the projects in the future.

Personally, as a civil engineer student, I have always been interested in civil works, buildings, and construction. This thesis is a good opportunity to help other students to have first contact with these topics, not just from a theoretical way but from real experiences. To do that, the analysis of some real works will be shared and their main aspects will be discussed.

In a general perspective, we want to analyze the behavior of the project management team in the implementation phase. And more in detail the role of the CM, which is essential to lead the works. It is significant to show their tasks and see which topics are in their scope. It will be useful to observe real situations to get used to typical aspects that usually take place in every project execution.

How to do it?

The methods used in this thesis are basically two: literature review and realistic cases of study. We will explain why the use of these procedures is the best way to analyze the implementation process.

About the literature review, information extracted from *Project Planning and Analysis* subject (NTNU) has been presented to understand better some general concepts related to all the phases of a project. Although we are focused on the execution processes, it is necessary to put in context other procedures that also take place during an ordinary project. There are also included articles and written documentation that respond to the clarification of concepts about different topics in construction.

On the other hand, we will do an analysis of two real cases corresponding to recently executed projects. For this part, the data will be obtained from the Spanish construction company Civil Stone, which is responsible for executing the works. The reason is that I have worked in that company and I have been involved in those projects as an assistant of the CM. So I know from a direct way the procedures that have been taken and the troubles that have occurred in those works.

Following this approach, a combination of practical knowledge of the subject based on observation and experience, and also the collection of documentation by Civil Stone will be adequate to develop the analysis of the project and their relevant conclusions. This procedure will be reliable to elaborate a consistent thesis.

3.2 Other descriptions

Research methodology

As for the theory, all the articles, books, reports, and other elements used to write the thesis or to better understand the most relevant concepts are detailed in the references. But it is necessary to mention the information sources that have been used to describe the practical part (analysis) where projects are examined. To obtain the data, I have been in contact with three construction managers (Fernando Ares, Jordi Campreciós, and José Iriarte), two foremen (Marco Antonio Tolosa and Daniel Domínguez) and an administrative (Sandra Arbós). All of them are employees of the construction company Civil Stone and they have been involved in the projects analyzed. Even though I have participated in the projects, they have helped me to contrast my ideas and validate the explanations.

Strengths and weaknesses

Regarding this method that combines theoretical concepts from literature with real cases of study, it is time to analyze the advantages and disadvantages that can be found.

The decision to investigate this topic is to have contact with real projects and consider the procedures that take place on them. It is a good opportunity to put into practice the elements studied previously and check if all the concepts that appear are well known or if there are unexpected topics that were not considered.

It is also important to describe the role of a construction company based on real experiences. Analyze the execution of several projects allow us to obtain suitable information about the functions of these entities and its members, especially the role of the construction manager. Conclusions obtained from these works will not be estimations or suppositions, but true facts that have been occurred in real projects.

On the other hand, there are some factors that may be unfavorable to get clear conclusions. Firstly, two real projects will be analyzed and we will obtain conclusions from them. But, as it has been detailed at the beginning of the thesis, every project is different and the stakeholders – project governance and project management – may adapt to any situation. We will observe the procedures of some particular projects but this does not mean that other projects have to be done in the same way.

Our cases of study take place in Catalonia, Spain, so the analysis is focused on the Spanish system. This situation will be useful to understand their way of working and of

course it can be used to clarify some doubts about the execution processes. But it is good to know that every country has different regulations and also the organisms and entities involved in the projects can have other roles than described in this thesis.

The projects that will be analyzed are not huge projects. The stakeholders involved in them can be well described than in a big project, and also when talking about safety, economic planning or suppliers contact, it will be easier to summarize their functions. In bigger projects, complexity is higher and more parties are implicated, so it is more difficult to do an exhaustive analysis.

Despite a project has more phases, we want to highlight the execution procedures. This project is a good reference to get used to the implementation processes that take place in a work site and see how to manage different situations. Then, it is necessary to know that we are going to analyze the projects in a general view, but rather particular examples that can help us to understand some facts in constructions.

Qualitative and quantitative data

About the documentation managed in this project, there are both qualitative and quantitative data. We will see some elements like economic planning or the definition of the roles that can be analyzed in an objective way. It is obvious that if the project exceeds the budgeted costs it won't be considered a successful project. But many other things, such as safety measures, daily planning or decision-making are not measurable. So some conclusions and decisions made during the work execution can be discussed if they are useful to the project, or if another alternative could be chosen instead.

As it is well known, execution procedures are dynamic and they don't have just a single solution. This implies that just a few things can be measured objectively, but a lot of them have to be evaluated with perspective. At short-term, quality certifications must be requested to ensure the quality of the materials, and routine controls must be done to check the signs of progress. But it takes time to analyze if the purpose of a project has been achieved. In addition, it is possible that some experts may not agree with their opinions about a project. This is due to not being able to quantify some items of the execution processes.

4 Analysis

In this part, we are going to analyze two civil work projects that have been recently executed. As it has said, we will focus on the implementation phase, paying attention to the processes carried out by the construction company. Both of them are public projects, which means that the CC won a public auction. In both of these projects I have been personally involved so I will talk from my own experience.

First, we will do a presentation of the Spanish construction company Civil Stone and also give relevant information on their projects. We will see where are they located, the aims of the project, what is needed to do and other general descriptions. Then, we will have a look at the previous steps required to start the works, such as the enclosure of the work site or the safety elements, needed to elaborate the health and safety plan. Also, we will see how to choose a proper entrance and exit of vehicles to the work site and where to select the location of the storage area, to store the equipment and the materials. Before the beginning of the works, measurements should be checked because if there is a mistake it can affect the budget.

Then, we will go into the execution processes, seeing the planning of the works and how are they organized. We will comment on how the procedures are developed and why we have chosen this order. A good economic plan is essential not to exceed the expected budget. To do that, we will divide the items into categories and we will see which ones deserve more attention than others. Relations with other suppliers are necessary to reach agreements on the price of the materials. Also, we will describe the roles of the leader members in both projects, and what happens in their meetings when the site visits take place.

After the execution of the works, we will show some real documents related to the project, as work certifications, and we will summarize the procedures that have taken place during the implementation phase.

In the end, we will make conclusions from both projects, analyze the pros and cons and observe what has been done well and what has not. The objective is to show real scenarios and to help students that want to be future construction managers how to manage, coordinate and supervise the execution of civil projects.

4.1 Construction company presentation

Construction is understood as the technique of manufacturing buildings and infrastructures and also the work of rehabilitation and restoration. To carry out this work, companies are required for their direction and coordination, through projects and planning. Depending on the size of the project, construction companies can also collaborate in the pre-phases of the project, not just on the execution process. That usually happens in huge projects with big budgets. But in small projects, they just do the execution of the works.

For this thesis, we will work on real projects executed by a Spanish company, Civil Stone (CS). This company was created in 2010 in Barcelona by a group of people with previous experience in construction services. They work specially in the execution of urban works, infrastructures, buildings, and rehabilitation. They are also specialized in structural reinforcement works. CS works with public and private entities, engineering companies and public organisms. They usually work in Catalonia, but they have also worked in other Spanish communities such as Valencia, Madrid or Extremadura.

CS has its main office in Rubí, Barcelona, Catalonia. They also have a warehouse in the same city. They have worked in these 8 years in 180 works. Actually, they usually work at the same time in 7 or 8 different works.

The company is composed of around 25 members distributed in different departments. In the administration and finance accounting department they are in charge of the customer services, they deal with other companies and they take care of the files and documentation and also of the required payments. There is also a department of studies. This is one of the key parts of the company because all the work starts here. They are responsible to submit the necessary documentation to apply for the designation of a project. To do that, economic planning is indispensable in order to do an adequate offer to win the public auction.

Regarding the work execution, they have 4 construction managers and a group manager that supervises all the works. They lead and coordinate the works. We will talk more in detail about their functions later. Finally, CS has a group of workers (operators, bricklayers...) that execute the works, under the supervision of a foreman.

Public projects are more frequent in CS, but they also do some private works. In that case, the department of studies is highly qualified to develop a project idea and propose it to the client. Anyway, most of the projects they are involved in are public.

As can be guessed by the number of workers, Civil Stone is not a company involved in projects of great magnitude. They work in medium and small projects, in a local area. Sometimes in a more national ambit, but it is not an international company. Therefore, they subcontract regularly some construction equipment and machinery just for the works they need to. So, when the work is over, they can return the equipment without standing it in the warehouse. That is usual with huge vehicles or uncommon machinery.

About the workers, they also combine some own workers with workers subcontracted from other companies. This fact can occur if the project is quite big and they need many workers but for a certain time, or also for some particular jobs such as topographers or framers.

With this summary, it will be easy to understand some future concepts now that the main descriptions have been made. We will see the roles that every member has and the significance of each position.



Figure 4.1: Civil Stone company logo

Official certificates (see *Appendix 1: Quality certificates*)

- Health & safety: Civil Stone has a certificate of health and safety that follows international rules. This certificate is based on the standard OHSAS 18001 (Occupational Health and Safety Assessment Series). It enables organizations to demonstrate that they have a system in place for health and safety.
- Quality: The CC Civil Stone has a certificate following the standard UNE-EN ISO 9001 that confirms the quality management system that the company has in building and civil works.
- Environment: Civil Stone has a certificate that follows the standard UNE-EN ISO 14001 that guarantees they take care of vegetation, pollution, soil, landscape, and other factors.

4.2 Work n.1: Outdoor basketball court

4.2.1 General information

Before the execution of the works:

- Project title: Executive project for the construction of an outdoor basketball court in *Jardins de Can Ferrero* and for the redevelopment of a parterre in *Carrer Química*.
- Location: District of Sants – Montjuic, Barcelona, Spain
- Main description: Construction of an outdoor basketball court and redevelopment of a parterre
- Award date of the project: February 2018
- Expected date to start the works: March 2018
- Expected duration of the works: 2 months (60 days)
- Bid price: 122.788,44 € (CEB)
- Awarded price: 104.877,13 € (CEB)
- Award coefficient: 0,854
- Percentage reduction: 14,59 %
- Number of budget items: 56
- Client / Commissioner: BIMSA (Barcelona d'Infraestructures Municipals)
- Guarantee term (of the CC): 2 years

After the execution of the works:

- The real date of the start of the works: March 2018
- Real duration of the works: 65 days (+5 days)
- Modification of the budget: Yes
- Final price: 115.182,66 € (+9,83 %) (CEB)
- The final number of budget items: 67 (+11)

4.2.2 Project description

The first project we will analyze is composed of two different performances in a nearby location. These performances consist basically in two main points: the construction of an outdoor basketball court and the redevelopment of a parterre. Both performances are located in the district of Sants-Montjuic, in the city of Barcelona (Spain). This is an urban area located southwest of the city. The first performance is in *Jardins de Can Ferrero* park and the second one is in *Carrer Química* (street) and they are separated by 900 meters.

It is important to highlight that the following descriptions are obtained from the original project. This is just a summary to understand the aim of the project and know the intentions of the client. This means that could be some changes in the execution of these tasks, but we will describe the executed tasks later when describing the work plan.

We will start describing the outdoor basketball court work:

It consists in to replace a current gravel basketball court by a concrete basketball court in a park that is located between some buildings of a neighborhood. The approximate surface of the court is 1.100 m^2 . Actually, the court will include two basketball courts and one volleyball court, but to simplify the explanations we refer them just as a big "basketball court" because they are all in the same concrete slab. The performance is in a park which is green space, so there are neither pedestrian streets nor traffic lines affected.

There are also lighting tasks consisting of change some existing streetlights and introduce new electrical wiring and new streetlights too. Also, change several sewer grates and install sports equipment is required.

Tasks to do: Excavations, earthmoving, demolitions, lighting, sewerage, paving, and urban furniture.

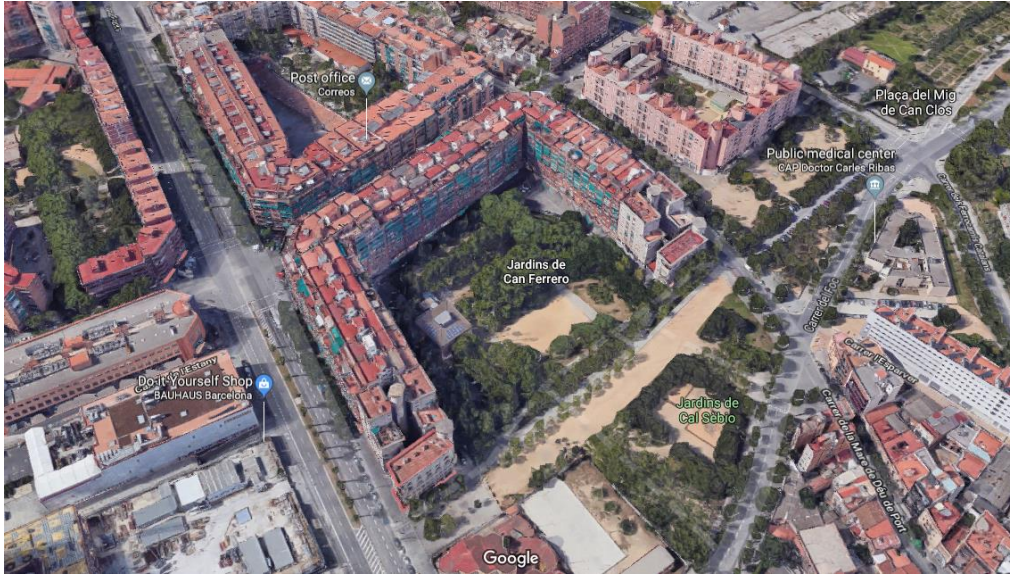


Figure 4.2: 3D view of Jardins de Can Ferrero (Google Maps)

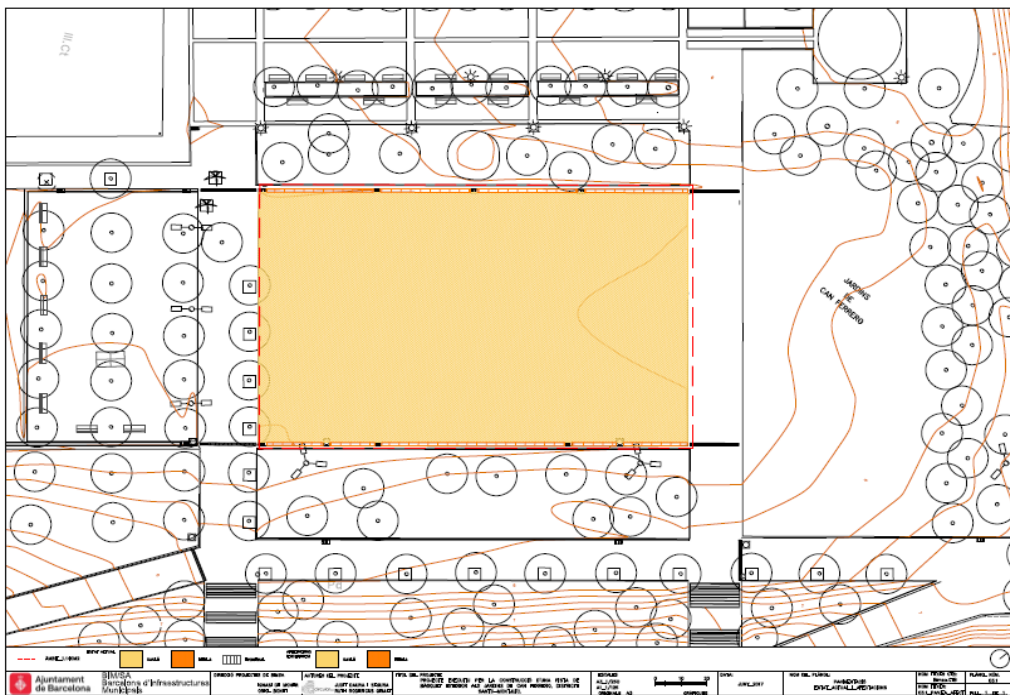


Figure 4.3: Current state of the gravel court (original project)

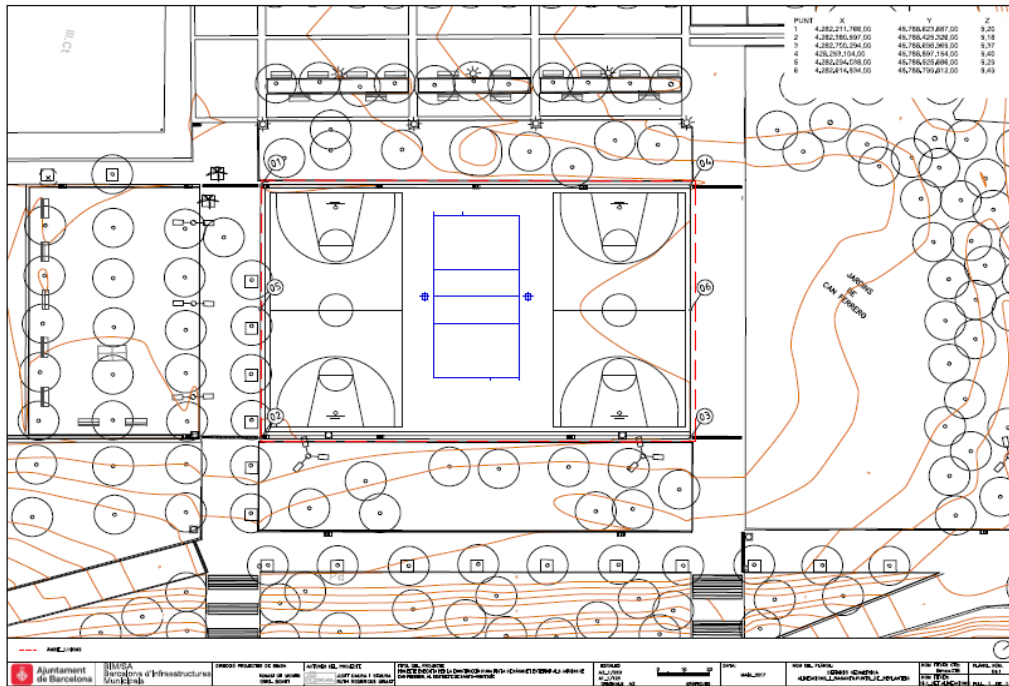


Figure 4.4: Future state of the concrete court (original project)

Then, we are going to describe the redevelopment of a parterre performance:

The main performance consists in modifying the current dimensions of a parterre (level space occupied by an ornamental arrangement of flower beds) of 200 m² because it is very wide now and it affects pedestrians, so they want to reduce its wide 1,5 m. The distance from the road to the parterre is small and they want to make it larger in order to improve the mobility of the pedestrians to walk on a wider sidewalk. There are also labors of gardening and irrigation in the parterre. They want to substitute some actual tubes of the irrigation system for new ones and improve the irrigation method.

Apart from that, it is necessary to replace some existing *panots* (small slabs with a flower inside or strips, typical of the sidewalks in Barcelona) and replace other elements of the street.

Tasks to do: Demolition, paving, gardening, irrigation, and urban furniture.

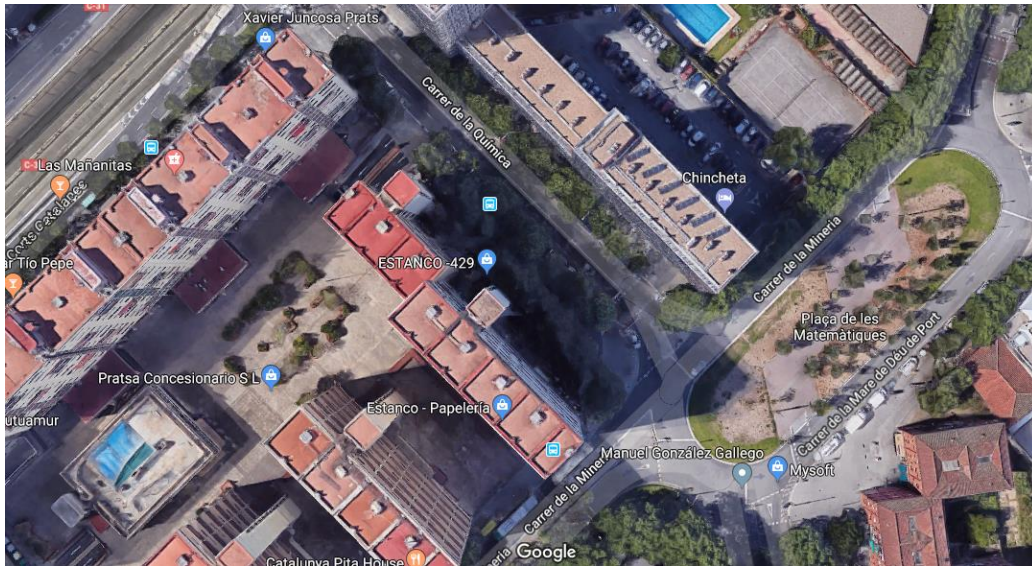


Figure 4.5: 2D view of Carrer Química (Google Maps)

As we will observe in the following two pictures (4.6 and 4.7), the current dimensions of the parterre disturb the path of the pedestrians because the sidewalk that is close to the road is very narrow (longitudinal right side of the parterre). If we compare the current situation in picture 4.6 with the new proposal situation in 4.7 we can see a reduction of the dimensions to make the sidewalk wider and more comfortable to the walkers.

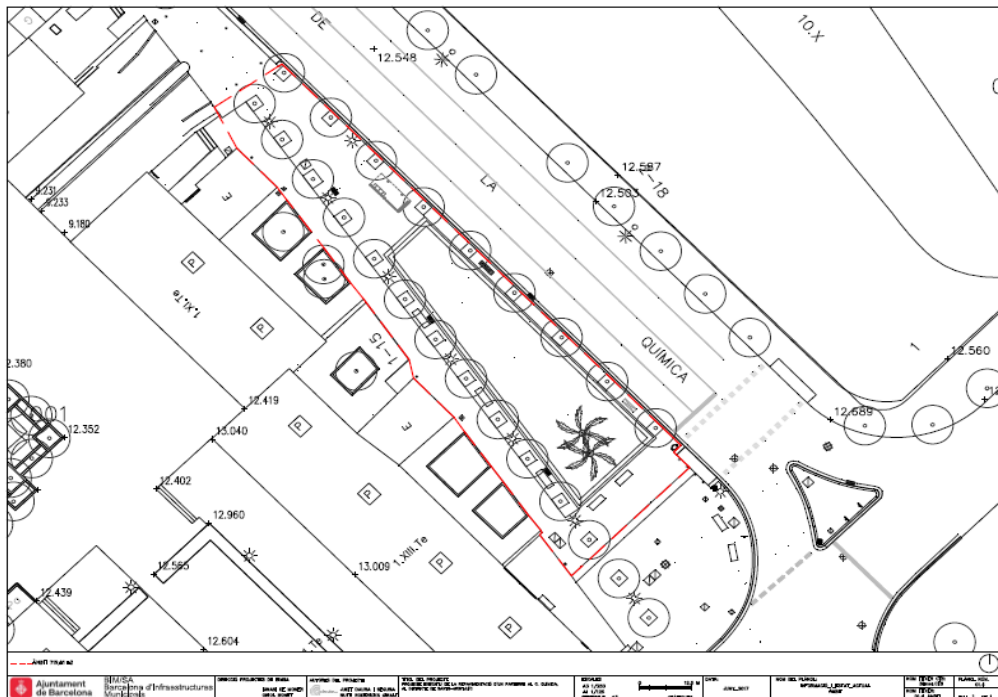


Figure 4.6: Current dimensions of the parterre (original project)

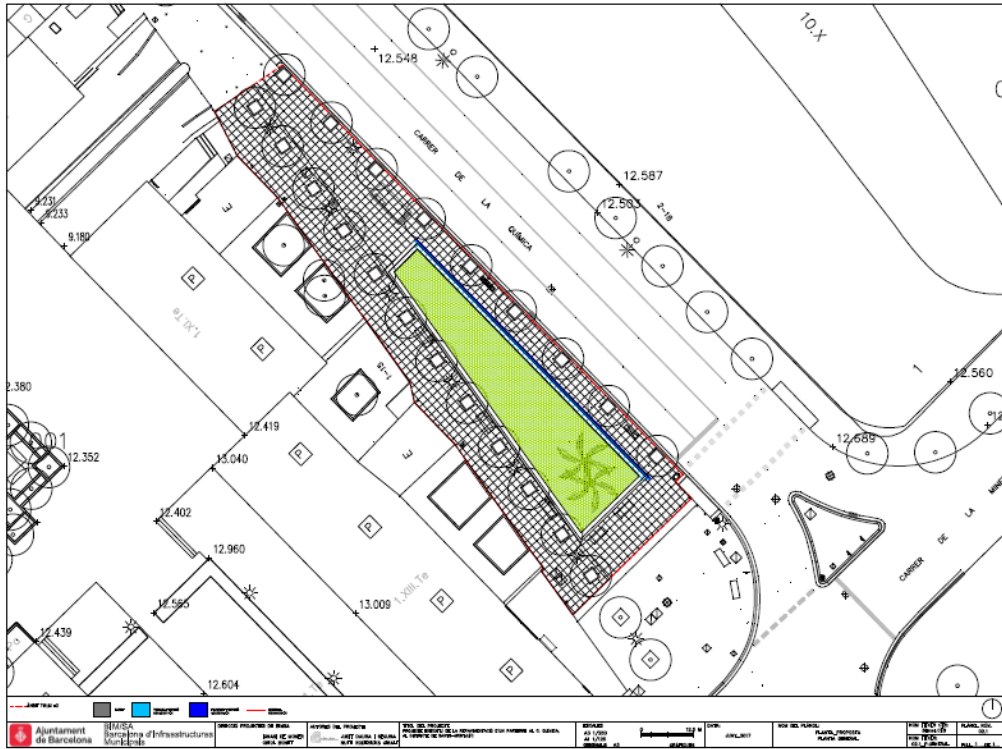
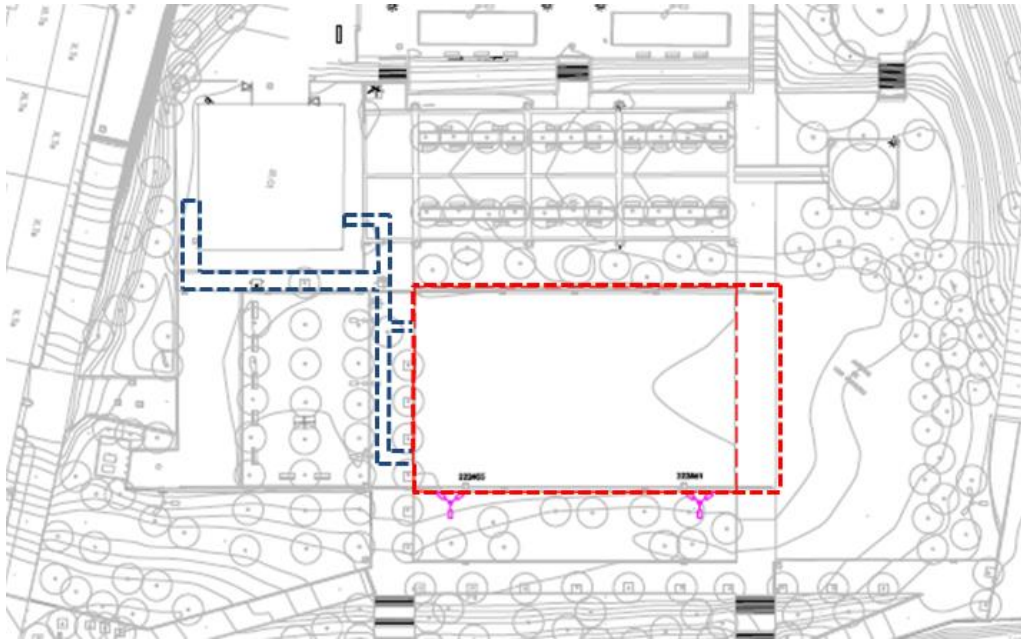


Figure 4.7: Proposal for the new dimensions of the parterre (original project)

4.2.3 Preliminary works

4.2.3.1 Perimeter fencing

Before the beginning of the works, the construction company has to elaborate the health and safety plan (you can see the description of the HSP in 2.5 *Safety*). One of the most important things in the HSP is the decision of how to do the enclosure of the work site. Pedestrians and vehicle paths have to be affected as little as possible. We are going to see which idea we had to make the perimeter fences in this project. We will begin with the basketball court area.



— Permanent enclosure (Heras fencing) — Temporary enclosure (Crowd control barriers)

Figure 4.8: Perimeter fences in Jardins de Can Ferrero (original project)

In figure 4.8 it is presented the proposed enclosure of the work site. It is possible to distinguish different enclosures. On one side, the perimeter of the basketball court will be fenced from the beginning until the end of the works (red lines). It is the main performance and there will be tasks to do at all times. On the other hand, there will be a temporary perimeter fence (blue lines) due to specific tasks that won't take the whole work time. These tasks are related to lightning procedures. It is necessary to introduce new electrical wiring to illuminate the court. Actually, there are just two streetlights that give light to the court. They want to replace the current spotlights to improve light quality and also introduce two new streetlights to illuminate the court better. Then, it is required to connect the new wire to the electrical grid. That is the reason for the temporary enclosure; make a ditch to connect the wire to a public connection in order to bring electricity to the streetlight system. It will be necessary to enable the passage to the pedestrians when these tasks are carried out introducing a plate over the ditch.

Now we are going to analyze the other place of work, the performance in the parterre in Carrer Química. This stretch of the street affects the entrance of two residential buildings so we will try not to prohibit the main entrance during the whole execution phase. So that there will be two different phases of enclosures.



Figure 4.9: Perimeter fence in Carrer Química (1st phase) (Civil Stone)

In the first phase, we are going to keep the entrances to the buildings free and let people walk on the left side of the parterre. The first task will be focused on reducing the dimensions of the parterre on the right side, close to the road. Perimeter fencing will be mainly done of Heras fencing (see *Appendix 2*), but the fences that will delimit the temporary passage will be crowd control barriers (see *Appendix 2*). With this solution, neighbors won't be very affected by the works, approximately during the first month of work.



Figure 4.10: Perimeter fence in Carrer Química (2nd phase) (Civil Stone)

In the second phase, we will change the perimeter fence. In this phase, the main task is to replace the current sidewalk pavement by new *panot* slabs (see *Appendix 2*). To do this, it is necessary to temporarily close the entrances to the affected buildings (left side). The reduction of the dimensions of the parterre will be done and also other tasks like installing irrigation tubes or electrical wires too. So people now will have access through the right side of the parterre. The entrances and exits to the buildings will be done from the top left corner which is the access to the parking. We will try to perform these tasks as quickly as possible to avoid modifying the routine accesses of the neighbors for a long time.

4.2.3.2 Storage area

For the selection of the storage area, we have two main options. The first one is to divide it into two work sites and have two different storage areas. This implies having more material that may be required and having to control both areas. The other option is to have only one storage area and distribute the tools and the equipment precisely,

according to the needs. We opted for the second alternative. In this way, we will not waste money renting more site offices than those that are necessary.

The storage area will be located in *Carrer Química*. We think we can get the space by getting some meters from the bus lane. During the execution of the works, buses can solve this problem going on the common vehicle lane just in this length. It is not a main street so it won't cause so many troubles. Then, it will be needed to organize well the daily works and get the necessary tools to the basketball court at the beginning of the working day and leave them again at the end of the day. To make a reminder, both sites are separated by 900 m.

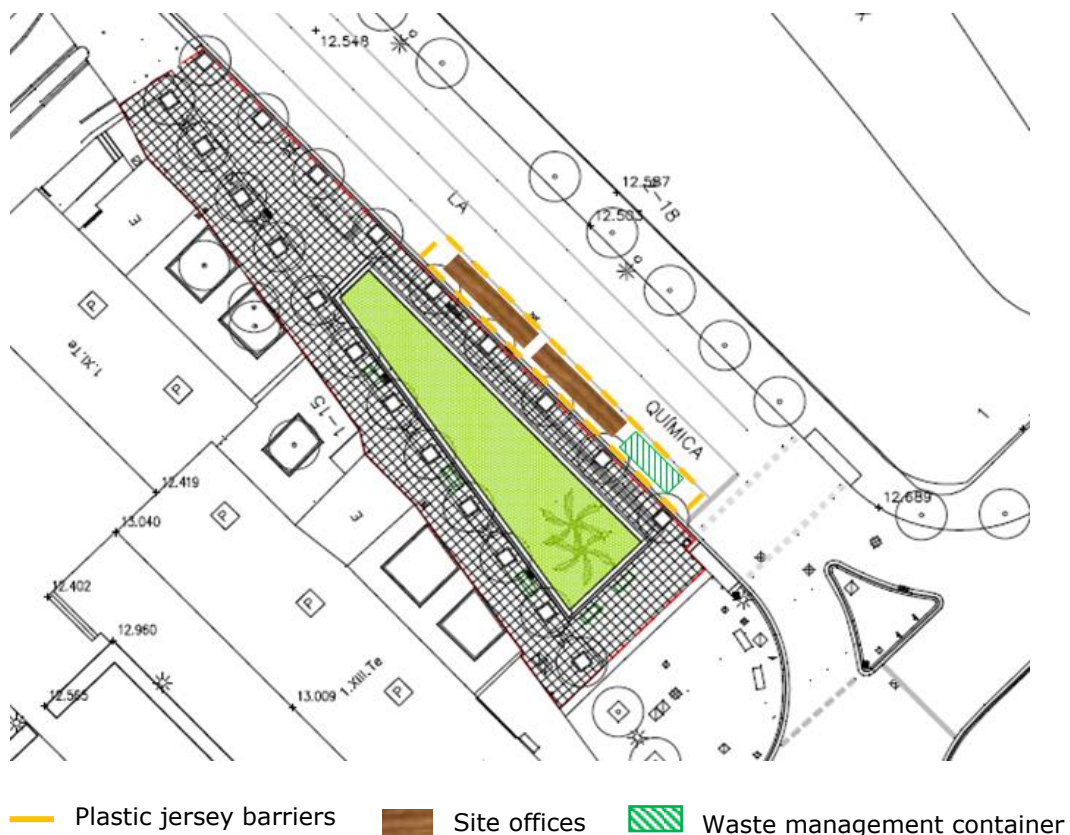


Figure 4.11: Location of the storage area (Civil Stone)

It will be needed to rent two site offices: one of them to store materials and equipment and the other as a module for workers. Also, rent a waste management container. The perimeter will be fenced with plastic jersey barriers (see *Appendix 2*). These plastic barriers are easier to carry and are more visible to drivers and pedestrians than concrete barriers.

4.2.3.3 Accesses

It is important to define the entrances and exits to the work site. In the performance of the basketball court, there will be an important movement of trucks due to the earthmoving tasks. As we observe in figure 4.12, there are two possible entrances to the park. From the left side coming from the main avenue, or enter from the right side. After evaluating both situations, the first alternative has two problems. The road is very narrow for a truck and there is also the terrace of a restaurant along the way. On the other hand, the right entrance is wider and the road is clear, and the access does not disturb the main street. So we have opted for the second alternative.



Figure 4.12: The chosen alternative to the access in Jardins de Can Ferrero (Google Maps)

About the performance of the parterre in *Carrer Química*, there are not big movements of vehicles as in the basketball court. So there is not necessary to think about access to the work site because the vehicles will just make short stops. In both cases will be mandatory to indicate and signal properly the movements of the vehicles to warn drivers and pedestrians.

4.2.3.4 Environmental care

From the environmental point of view, we have to consider certain aspects. First, we need to guarantee that the material extracted from the work will be deposited in an

authorized dump. So we should ask the supplier responsible for managing the materials that he will ensure a legal and authorized deposition.

Another point to focus on is to protect existing vegetation that may be affected by work procedures. In this project, we find vegetation elements that must be protected. In *Carrer Química*, there are 21 trees that have to be protected not to get damaged during the execution tasks. Some wooden boards will be placed around the trees to avoid any hurt produced by the workers when they are using the machinery.

In *Jardins de Can Ferrero* performance, we just have to take care of the grass and small bushes when the vehicles and trucks go into the park. The roads of the park are not very wide so it is easy to go through the vegetation. The construction company has to agree that they must repair a vegetation area if they damage it replanting what it was previously.

4.2.3.5 Measurements review

Before the beginning of the tasks, it is important to check that all measurements from the items in the budget are correct. Because in case there are any mistakes you can demand to the client what you consider is wrong. If you do not ask for these changes on time, maybe you will have more problems to demand once the tasks have started.

In this project, there were two considerable items that were wrong (before starting the tasks). The first item was about waste management treatment. In the budget was considered the removal and transport of waste from the basketball gravel court but it was missing a dumping control tax. This tax is required when the trucks arrive and deposit the waste in the dump. The amount of money missing from this item is about 2.000€. The property accepted and assumed this increment.

The second item that had a significant mistake was the implementation of a new concrete slab (13x16x25) that covers the perimeter of the basketball court. In the budget, the measurement was 1 m long, like a unit measurement, but in fact, it was 164 m long. The cost of this new measure is around 2.700€. In this case, the CC said to the property if they wanted to maintain the current concrete slabs and do not buy new ones. They accepted so there was no increment of the budget in this item.

4.2.4 Aims of the project

We are going to describe the aims of every stakeholder. As it was explained in 2.8.2 *Logical Framework Approach*, the construction company is responsible to carry out the outputs, users are interested in taking advantage of the goals of the project, and the property, in this case, the city council, is focused on achieving the purpose. Then, we will try to identify those aims. We assume that the inputs are already achieved because the project has economic viability, a good work plan is written and the selection of the construction company is already done.

OUTPUTS	GOALS	PURPOSES
Construct an outdoor basketball court + Redevelop a parterre	Have a better basketball court to play + Have a wider sidewalk	Improve district facilities and infrastructures
<u>Uncertainties</u>	<u>Uncertainties</u>	<u>Uncertainties</u>
No unforeseen events conditioning the project + Good quality of performed tasks	The noise of the park will not disturb neighbors + Pedestrian satisfaction	The line of continuous progress of the city remains

Table 4.1: Logical framework matrix of the project (project n.1)

To be able to evaluate if those aims are fulfilled, we need to do it in some years. Goals can be evaluated sooner, maybe in a few months after the end of the tasks. But purposes are related to a global perspective of a district or an entire city. So this table is useful to identify the intentions of each stakeholder, but we will not do an exhaustive evaluation of the project because we are more focused on the implementation phase.

4.2.5 Analysis of project items

After the review of the measurements of the budget items, it is required to do another classification of the items, which could be different from the original project (see

Appendix 3: Original project budgets for original project classification). The reason is to group activities thinking in their suppliers. For instance, some demolition tasks can be divided into earthmoving works that need huge machinery and in small workforce tasks. Or also we can group gardening and irrigation activities in the same group because they will probably be done by the same supplier.

Then, it is convenient to make a new classification of the activities to get ready to request offers from suppliers and have control of the items and their budgets.

	Activity	Description	Nº of items	Budget
1	Concrete	Concrete HM-20 and HM-30	2	17.643,23 €
2	Lighting	Installation of lampposts and LED spotlights and electrical wiring works	9	17.179,08 €
3	Earthmoving	Includes: demolition, earthmoving, transportation and waste management tasks	14	16.696,74 €
4	Prefabricated elements	Installation of several elements: concrete slabs, <i>panot</i> , scuppers, concrete boxes, etc.	6	14.053,57 €
5	Granular material	Artificial aggregates for concrete base	2	5.247,76 €
6	Tubes	Tubes and pipes for the sewerage system	1	4.786,22 €
7	Sports equipment	Installation of basketball and volleyball equipment	2	4.099,99 €
8	Others	Extra items for unexpected but justified contingencies	2	2.630,77 €
9	Gardening	Supply of topsoil, tree planting, and irrigation tasks	6	2.337,70 €
10	Health & Safety	Risks prevention and health and safety measures	2	2.049,90 €
11	Topography	Realization of a topographic survey	2	1.921,78 €
12	Workforce	Tasks to be carried out by our own workers	6	1.387,97 €
13	Painting	Line marking paint for sports courts	1	365,41 €
TOTAL	---	---	55	90.400,12 €

Table 4.2: New classification of the activities (project n.1)

Partial budgets

- ❖ *Jardins de Can Ferrero* performance: 64.074,10€ (29 items)
- ❖ *Carrer Química* performance: 26.326,02 € (26 items)

In this classification, there is one less item from the original project because, as it has said in 4.2.3.5 *Measurements review*, the property has decided to maintain some existing concrete slabs and not buy new ones. So this item has been removed. And also there is an increment of the budget caused by the dumping control tax that was missing. The budget has been increased by 2.284,63 €.

About the budget, it is necessary to distinguish between the material execution budget (MEB) and the contract execution budget (CEB). The CEB is the result of adding some general expenses to the MEB. When we talk about the cost of the items we refer to the MEB, but when we talk about the global project budget, we usually use the CEB. From now on, all the prices shown will be in terms of MEB.

- ❖ Initial MEB: 88.132,03 €
- ❖ Current MEB: 90.400,12 € (+2.268,09 €)
- ❖ Current CEB: 107.576,15 €

Even though there is a modification of the budget, it is not important to focus on it now. What is necessary is to identify the items with a higher cost to pay attention to them. As explained in the theory, the Successive Cost Estimation method is a good method to detect risks and manage uncertainties (2.6.2 *Cost estimation*). We are not going to do an exhaustive research of the costs because the department of studies has done it before. However, we will focus on the items that have a considerable weight in the global budget because their cost is very high. As it is described in the Successive Principle, the most important elements must be considered first. Then, these items will be compared with the offers presented by the suppliers and we will have proper knowledge of the costs.

From the 55 items of the project, here is a selection of the items with a higher budget:

	Activity	Item description	N° of items	Budget	% total budget
1	Lighting	Various	9	17.179,08 €	19,00 %
2	Concrete	HM-30/P/20/I+E	1	13.911,79 €	15,39 %
TOTAL	---	---	10	31.090,87 €	34,39 %

Table 4.3: Items with a higher budget of the project (project n.1)

These two elements/activities represent more than a third part of the budget. We have considered all the lighting elements and a specific kind of concrete for the performance of the basketball court (165 m³ of concrete HM-30). We are going to analyze the offers obtained by the suppliers and compare them with their budget prices. It is understood that the following comparatives are made in fair market conditions and all suppliers guarantee quality and they can offer a good service:

- 1) Lighting items: All the items related to lighting tasks have been grouped because it will be an external company that will execute these tasks. So it is possible to include all the articles in the analysis. About the offers received there are just two for a simple reason: not all the electrical companies are able to manage the electrical network because they do not have authorization from the city council. That is the reason why just two companies could realize these tasks. So there are only two offers for these services.

	Budget	% project budget	Company name
Original project	17.179,08 €	100 %	---
Supplier offer 1	17.350,92 €	101 %	ALUVISA
Supplier offer 2	14.881,14 €	86,6 %	CITELUM

Table 4.4: Comparison for offers of various lighting items (project n.1)

- Selected offer: CITELUM (-13,4%)

- 2) Concrete HM-30: There are required 165 m³ of concrete HM-30/P/20/I+E for the pavement of the basketball court. For this item, it is needed to extract the exact

cost of the material, because the general cost of the item sometimes includes the workforce tasks and other costs. In the project, there is a section called price justification that breaks down all the single prices. There can be found the exact price of the concrete element and compare it with the received offers.

	Budget	% project budget	Company name
Original project	13.911,79 €	100 %	---
Supplier offer 1	11.685,84 €	84 %	BETON CATALAN
Supplier offer 2	11.169,00 €	80,3 %	PROMSA
Supplier offer 3	10.698,15 €	76,9 %	LAFARGE
Supplier offer 4	10.676,25 €	76,7 %	FORMIGONS TENES

Table 4.5: Comparison for offers of 165 m³ of concrete HM-30 (project n.1)

- Selected offer: FORMIGONS TENES (-23,3%)

After making the comparison of the suppliers' offers, the result is a good price on both elements. Both the lighting items and the concrete offers are good and allow us to have an adequate margin at this time. This gives the CM confidence to start the works and to plan the tasks. The offers that have been selected can be seen in *Appendix 4: Successful offers*.

4.2.6 Description of tasks

Once done the analysis of the project items it is time to describe the execution of the tasks. The duration of the project is 2 months. Not counting weekends, it is 12 weeks. The project was planned to start in mid-March, but it was not possible due to some incidents with the neighbors. When they knew that the works were going to start, they installed a tent in the center of the basketball court to prevent the start of the works. Their reasons were that they did not want to have more works in the neighborhood. The construction company stayed out of the conversations between the city council and the neighbors. This problem delayed two weeks the beginning of the works but, in the end, they finally reached an agreement.



Figure 4.13: The start of the works was delayed by the neighbors (Civil Stone)

The works started on March 26 and they lasted 13 weeks, one week more than established. Due to some days of heavy rain, the property accepted this extra week to finish the works. June 22 was the last day of work, one week after the deadline but admitted by the property.

We need to remember that there were two different performance areas: the basketball court in *Jardins de Can Ferrero* and the redevelopment of the parterre in *Carrer Química*. The development of the tasks performed during these 13 weeks in both areas is described below:

Weeks 1 & 2 (March/April)

After starting some week after planned, first tasks were focused on the basketball court because it had more work than the performance in the parterre. The perimeter of the court was fenced properly. The storage area was established in *Carrer Química*, but the enclosure of the work area was not done yet. Tools and required machinery were stored. Containers for rubble and waste were located on both sites.

Identify and locate the main services before the start of the works is mandatory in every work: drainage system, electrical wiring, irrigation system, etc. Several trees of the park were protected with wooden boards. Demolitions in the basketball court started. The surface layer of gravel had to be reduced, to be able to concrete after. In the parterre, there was a Yucca palm with huge dimensions that, after the tasks of reduction of the parterre, it will disturb pedestrians. That Yucca had to be pruned. In one of the first site

visits, the construction company said they were not able to prune any public plant or tree. The property decided that they will send some gardeners who work from the city council to prune it.

Weeks 3 & 4

Earthmoving tasks were performed in the basketball court. Transportation and deposition labors were done too. Some ditches for the electrical network were prepared. When checking an existing concrete pipe of the drainage system (40 m length), to replace some scuppers, they realized the pipe was clogged. The property decided to replace that concrete pipe by a new corrugated pipe. This was the first big unforeseen event that had to be handled.

In *Carrer Química*, the first phase of the enclosure was done to start the works during the following days. Several trees were protected. Demolition tasks were the first thing to do, to reduce the dimension of the parterre.

There were two days of heavy rains where was not possible to work. This fact delayed the work plan.

Weeks 5 & 6 (May)

In the basketball court, cables for the electrical network were installed. The objective is to give a lighting connection to new lampposts to improve the light of the court. Demolitions and earthmoving tasks to decrease the height of the surface layer finished. About the drainage system, the new PVC corrugated pipe (40 m length and 400 mm in diameter) was introduced substituting the old concrete pipe.

In *Carrer Química*, when reducing the width of the parterre they realized that some existing irrigation tubes were inoperative. The property decided to add a new item to the project to install new tubes. The CC introduced new irrigation tubes in the parterre. The Yucca palm that was in the parterre was finally pruned.



Figure 4.14: Workers performing tasks in the parterre (Civil Stone)

Weeks 7 & 8

The tasks of the drainage system were finished in the basketball court. After reducing the height of the surface layer, it was time to put an aggregate subbase layer of 20 cm that would be placed under the concrete layer, to give consistency. Soil compaction tasks were required to compact the material, to avoid voids in the soil.

Paving tasks of the sidewalk in *Carrer Química* were done. Now the sidewalk is 1,5 meters wider. It was paved with 60x40 cm concrete slabs, as the existing slabs. Installation of the curbs in the parterre was done too.

After these tasks, the perimeter fence changed to the second phase. It consisted of let free passage on the repaired sidewalk and to close the other side of the sidewalk to replace 365 m^2 of *panot* slabs. Some trees had to be protected. Then, demolition tasks started.



Figure 4.15: Application of an aggregate subbase layer in the basketball court (Civil Stone)

Weeks 9 & 10 (June)

It was time to extend concrete HM-30 into the basketball court. 165 m³ of concrete were required to cover a layer of 15 cm. Before pouring and spreading the concrete, the bases for the basketball goals and the volleyball posts were installed. The holes for their foundations were prepared too. Once again, it was necessary to compact the soil to ensure the resistance and impermeability of the concrete.

In *Carrer Química*, they were still doing paving tasks of *panot* slabs.

Weeks 11 & 12

After concreting the court, sports equipment was installed: two new basketball goals and two volleyball posts. Also, they replaced two hoops from the other two existing basketball goals that were not in good condition. This change of hoops was not planned in the project, so it was a new element to add to the budget. After the installation of the sports equipment, it was necessary to do some quality tests to check their resistance.

The paving of the slabs in *Carrer Química* finished. All the fences were removed and the area was cleaned.

These weeks were some days of heavy rain again, and it was not the first time. That is why the property gave an extra week to finish the works.

Week 13

In the last week of the execution phase, two new lampposts were installed in the basketball court. The lights of two other existing lampposts were replaced too. Then, there were four lampposts in court. The lines of the basketball and volleyball courts were marked.

In *Carrer Química*, there were gardening tasks to do: plant some new ivies and manage the irrigation network.



Figure 4.16: Final result of the performance in the basketball court (Civil Stone)

Summary

The works started later than planned due to some problems between the city council and the neighbors. Some rainy days caused the work to be finished a week later too. Nevertheless, those delays were not the fault of the construction company. During the execution process, there were several elements that had been added to the initial budget. The most remarkable one was the substitution of a 40 m pipe of the drainage system. The performance of the basketball court took more time and dedication than the modification of the parterre. In general terms, all tasks were performed as expected and the result was satisfactory. The development of the tasks can be seen in *Appendix 5: Photographic report*.

4.2.7 Challenges of the construction manager

After describing the implementation phase, we are going to make a list with the main challenges faced by the CM during this project:

1. From the original project, there were some missing items. For example, a waste management treatment fee, that had to be included in the budget. Or the measurement of a concrete slab that went in the borders of the basketball court was wrong (see 4.2.3.5 *Measurements review*). It is the responsibility of the CM to check any possible mistake before the beginning of the works and discuss it with the property. Then, ask for a missing amount of money, if required.
2. As a CM, it is as important to know what your duties are as to know which ones are not. In the execution of this project, there were some situations in which the CM did not have to take part. For instance, when the tasks were planned to begin, the neighbors paralyzed them. It could be thought that the CM can intervene in this problem, but it is not his task. He had to let the city council deal with it, and wait until a solution is reached.

Another case to manage was the pruning of the Yucca palm, in the parterre of *Carrer Química*. The construction company is not able to take decisions about vegetation species. That aspect is the competence of the city council. Once again, the CM has to communicate it to the property and let them do the tasks. Therefore, it is very important to be aware of which issues are the competence of the CM and which ones are not.

3. It is needed to handle unexpected situations that can occur during the implementation phase. In the basketball court, there was a pipe of the sewerage system that was collapsed. Also in the parterre, there were some existing irrigation tubes that were not working. In these circumstances, the CM has to dialogue with the property and negotiate to solve the troubles, in order to reach an agreement. The CM must consider the time and money that it will cost to work on these unforeseen events and say it to the property. Finally, both cases were repaired by the construction company.
4. The delay of the beginning of the works (2 weeks later than planned), caused by the protests of the neighbors, had a negative effect on the construction company.

The equipment and machinery required, the installation of the offices and containers in the storage area and the workers and the foreman that had to work in the project, have a cost for the CC that has to be refunded by the property.

There were also some rainy days that prevented the realization of the tasks. If the CM considers it affects the works plan, he can ask the property to postpone the deadline of the processes, as it was done in this case. An extra week was conceded to finish the tasks. Then, the CM has to claim these inconveniences to the property and negotiate to defend his interests, on behalf of the construction company. External problems can't affect the CC in terms of cost and time.

4.2.8 Project balance

Even though the project did not begin as expected, with some unexpected troubles, it was ended in good conditions. As for the items of the original project budget, there have been 11 added items due to several unplanned activities: installation of new irrigation tubes, change of an existing pipe of the sewerage system, a missing dumping control tax, etc. These facts, and considering the delays of the first weeks, increased the final budget to an amount of 115.182,66 € (CEB). With this result, it is necessary to make two comparisons with respect to the objectives of each entity (see *Appendix 6: Project certifications* for the final costs):

- Property: If we compare the final budget with the initial budget, 104.877,13 € (CEB), there is an increase of 9,8%. It is true that there was a reduction of almost 15% in the tender but, in the end, we have to compare the final cost with the awarded price, because it would have to be the expected cost. Then, there has been a cost overrun of around 10% for the property.
- Construction company: As we have been focused on the tasks performed by the construction manager, it is important for him and for his company to have benefits after the end of the works. The total cost for the CC has been 97.286,80 € (CEB), taking into account both direct costs (equipment, materials, machinery, etc.) and indirect costs (administrative staff, workers, foreman, CM, etc.). Compared with the final budget, it results in a benefit of 15,5%. For the construction company, it has been a successful project.

The two goals of the project were achieved: improve the conditions of the basketball court and make the sidewalk of *Carrer Química* wider, by reducing the dimensions of the parterre. They finished a week later than planned but accepted by the property due to rainy episodes. Then, the project can be considered executed in time.

The most challenging tasks of the project were: determine the accesses of the trucks and vehicles to the basketball court and choose the right emplacement of the storage area. The initial election done by the CM to enter in the park was a clever solution. And locate the storage area in *Carrer Química* was not an inconvenience. Good coordination between the two different performance areas was essential.

To see if the purpose of the project has been achieved, it will be necessary to wait a while. The city council considered that the project was well executed, but the feedback of the neighbors will be remarkable. Also, it has to be seen if there are more significant improvements in the neighborhood to move forward with a good strategic plan for the city.

4.3 Work n.2: Renovation of the main road of Sant Andreu de la Barca

4.3.1 General information

Before the execution of the works:

- Project title: Renovation project of *Plaça de l'Ajuntament* (2nd phase)
- Location: Sant Andreu de la Barca, Barcelona, Spain
- Main description: Restructuring of the cross-section of the main road of the city
- Award date of the project: May 2018
- Expected date to start the works: June 2018
- Expected duration of the works: 4 months (120 days)
- Bid price: 250.171,74 € (CEB)
- Awarded price: 239.385,39 € (CEB)
- Award coefficient: 0,957
- Percentage reduction: 4,31 %
- Number of budget items: 70
- Client / Commissioner: City Council of Sant Andreu de la Barca
- Guarantee term (of the CC): 2 years

After the execution of the works:

- The real date of the start of the works: July 2018
- The real date of the end of the works: November 2018
- Real duration of the works: 120 days
- Modification of the budget: Yes
- Final price: 262.882,52 € (+9,82 %) (CEB)
- The final number of budget items: 62 (-8)

4.3.2 Project description

This project is located in Sant Andreu de la Barca, a city of 30.000 inhabitants, 20 km from Barcelona. The project consists in renovating the main road of the city, *Carretera de Martorell*, which is the main entrance to the town and the connection to the highway. There are several services in this street as the police station or the town hall. The whole project has three phases due to its complexity. Civil Stone is in charge to execute the second phase which consists in restructure the cross-section of the road and one of the sidewalks. The first phase consisted to adapt the other sidewalk. The third and last phase will consist in construct a new roundabout, also on the same road.

The objective of the project is to order and adapt traffic and give priority use to pedestrians with respect to vehicles. They want to make the median strip wider, introduce some parking spaces instead of a current side road and change the dimensions of the sidewalk. The aim is to copy the dimensions of the other sidewalk of the road that was improved in the first phase of this project. At the end of the execution tasks, they want to have symmetry between both sides of the road.

There are demolition and asphaltting works and also works of adaptation of the service networks. For instance, sewer system tasks, gardening and irrigation tasks or public lighting activities. This last performance consists of move some current street lights to a new place just a few meters. About the gardening works, they take place in the new median strip that will be constructed. By last, some urban furniture has to be installed too.

Tasks to do: Demolition, earthmoving, asphaltting, paving, lighting, sewerage, gardening, irrigation, signaling and urban furniture.



Figure 4.17: 3D view of Carretera de Martorell (Google Earth)

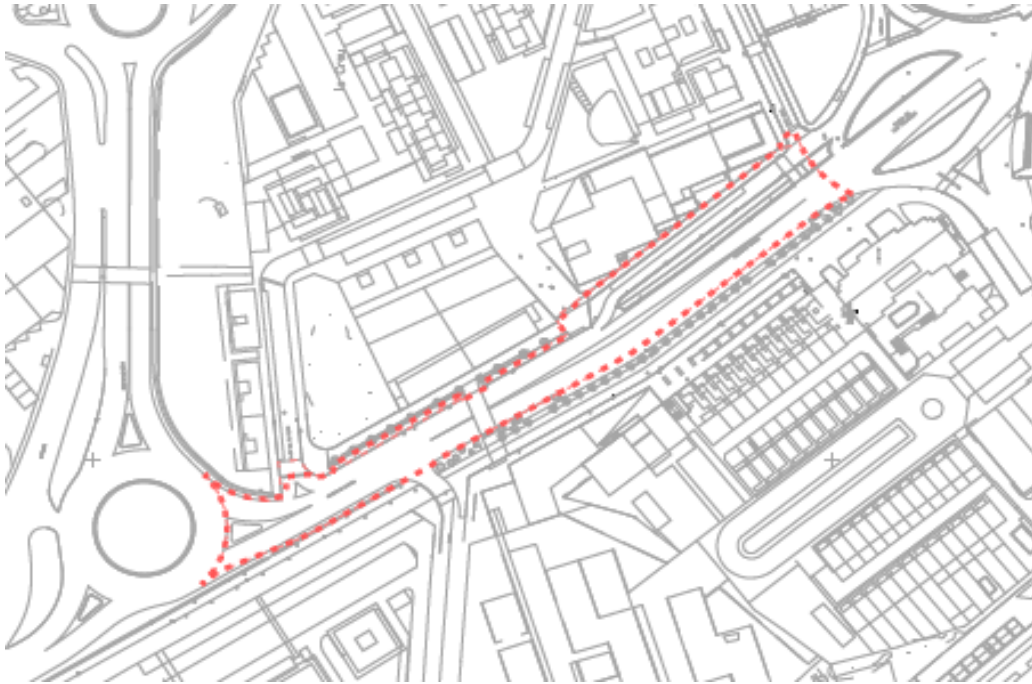


Figure 4.18: Work area of phase 2 (original project)



Figure 4.19: Perspective of the road after the execution tasks (original project)

4.3.3 Preliminary works

4.3.3.1 Perimeter fencing

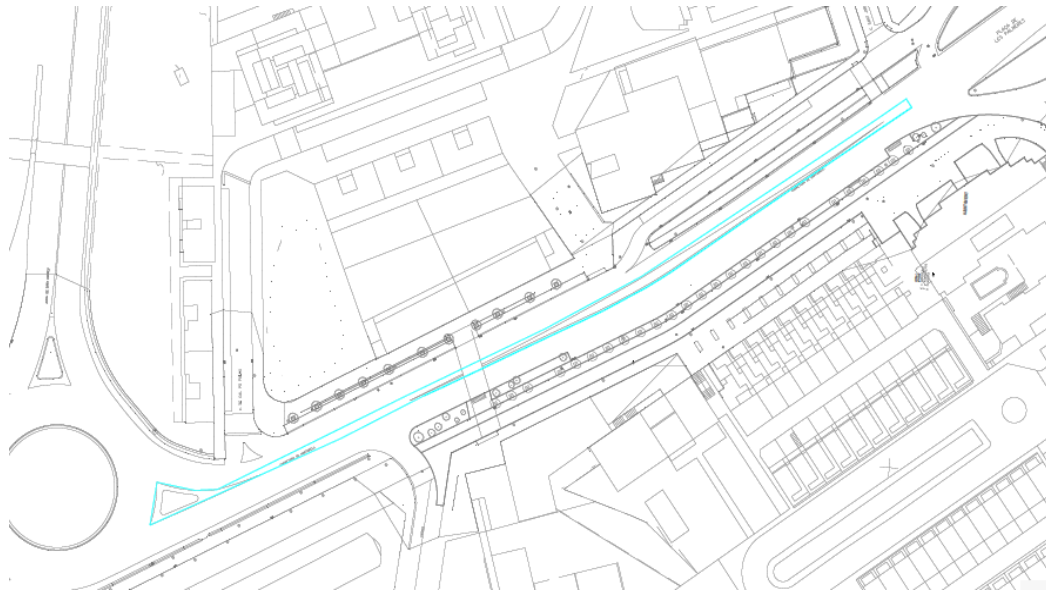
The decision of how to fence the perimeter of the work is not simple in this case because we are working on one of the main roads of the town, which implies that there is a lot of traffic involved. We have to try to cause the minimum changes as possible in regard to the current routes of the neighbors. There will be two different phases of enclosure in this project. First, the perimeter fence of the sidewalk and the side road will be done to perform demolition and pavement tasks (figure 4.20). After completing these performances, it will be time to move the fences. In the second phase, the new perimeter fence will be surrounding the area of the new median strip, in the middle of the road, to enable its construction (figure 4.21). This performance will not alter the traffic. It will just reduce a bit the wide of the traffic lanes, but vehicles will be allowed to drive as usual. Then, most of the time only one sidewalk will be closed and the road will be used as usually. Pedestrians will have to cross to the other sidewalk that has been repaired in the first phase of this project.

About the works on the road, they will be shortly (just a few days) but very significant. It basically affects the accesses of the vehicles to the road so it will be explained afterward in 4.3.3.3 *Accesses*.



— Heras fencing

Figure 4.20: Perimeter fence in *Carretera de Martorell* (1st phase) (Civil Stone)



— Heras fencing

Figure 4.21: Perimeter fence in *Carretera de Martorell* (2nd phase) (Civil Stone)

4.3.3.2 Storage area

The storage area proposed by the project manager was not a practical solution because it was located on the other sidewalk (figure 4.22), where no tasks had to be done. This implies to cross the street every time the workers need to pick up or collect some materials or to throw the waste with the vehicles. Then, the CM thought to move the location of the storage area to a closer place (figure 4.23). With this change, we will not disturb traffic or pedestrians as much as in the other location. Both the project manager and the police department approved this new proposal and agree that it is a better solution.

In figure 4.22, apart from the proposal of the storage area, it can be observed a different enclosure than finally adopted. It was the proposal of the project manager in the pre-phases of the project, but this option was not carried out.



Figure 4.22: First proposal of the storage area by the PM (original project)

In figure 4.23 we can observe how the new location is more favorable than the first proposal because it is located closer to the scope of action.



Figure 4.23: Final proposal of the storage area by the CM (Civil Stone)

4.3.3.3 Accesses

About the accesses affected by the works, there is an important point to focus on, which is the redirection of traffic when asphaltting the road. The CM has thought a different proposal than the proposal of the project manager. The PM allowed the construction company to completely block traffic, when needed, by closing the road in both directions to execute the tasks. But the CC has proposed another solution. It consists of close only one direction of the traffic (exit lane of the city) and allows vehicles to enter the city. So the asphaltting tasks of the road will be done on the same day but in two different periods. First, half of the road will be asphalted. Then, when the first part will be over, the other part of the road will be asphalted.



Figure 4.24: Temporary traffic direction when performing road tasks (Google Maps)

As we see in figure 4.24, when performing road tasks it is necessary to divert traffic through the inner streets of the city to give them an alternative exit (red arrows). But the entrance to the city would be done as usually (green arrows). Affected accesses must

be properly indicated as well as the signage along the perimeter fence. Both the project manager and the police department have approved this proposal and agree that it is a better solution. As soon as asphaltting tasks are ended, traffic will be restored as usual.

It is important to remark that road repair tasks will only take a few days of the whole project, but it is necessary to have everything decided in time to coordinate the work with the police department and the property.

Another access that is affected during the execution of the works is the access to the existing side road, which will disappear after the implementation tasks. Trucks and vehicles that have to supply materials to the work site, they will have access to the side road. But this road will not be operative for non-authorized vehicles. It is a loading and unloading zone, especially for the supermarket which is in front. But this problem has been solved because there is another loading zone for vehicles in the adjacent street so they can stop near too.

4.3.3.4 Environmental care

There are not significant aspects of environmental care in this project. The most important one is to ensure that all the materials extracted from demolitions and earthmoving tasks must be deposited in an authorized dump. We must guarantee that the supplier, who will carry the materials that are not usable, accepts and satisfies our demands.

Say also that all the materials and new equipment installed during the execution phase must fulfill some quality parameters within the corresponding standards.

4.3.3.5 Measurements review

Before the start of the execution tasks, it is necessary to check all the measurements of the budget items. In this case, there were two items that were not correct. First, there was an item related to pavement milling tasks that its measure was oversized. It said that there were 10.000 m^2 of the surface to be milled but, in fact, there were only 5.000 m^2 . On the other hand, there was another item that their measurement was incorrect. It is about agglomerate asphalt paving works, where 500 m^2 of surface were missing in the budget.

These changes in the items measurements produced a reduction of the budget of around 3.500 €. That is why it is important to review the plans, drawings, and measurements before the beginning of the works.

It is important to review the plans, drawings, and measurements before the beginning of the works.

4.3.4 Aims of the project

In order to define the aims of the project to be able to evaluate it in the future, we are going to do a logical framework approach. Descriptions of concepts are done in 2.8.2 *Logical Framework Approach*. We will assume that inputs are fulfilled. We take as inputs elements: economic financing, work permits, full documentation, the election of a construction company, etc. We understand these parameters are already completed. We will focus on the outputs, goals, and purposes of this project and their possible uncertainties.

OUTPUTS	GOALS	PURPOSES
Restructure <i>Carretera de Martorell</i> (main road of the city)	Improve traffic efficiency + Prioritize pedestrians use	Contribute to city growth: modern, sustainable and efficient
<u>Uncertainties</u>	<u>Uncertainties</u>	<u>Uncertainties</u>
No unforeseen events conditioning the project + Good quality of performed tasks	Traffic volume will not increase too much + Pedestrian satisfaction	Have the same concept of modernity as other cities + The city has growth capacity

Table 4.6: Logical framework matrix of the project (project n.2)

In this table, we can observe the objectives that every stakeholder wants to reach. It is important for a construction manager to be aware of all the concepts associated with a project. Anyway, his dedication is mainly to execute the tasks properly and fulfill the

outputs. Then, we will not dedicate this thesis to evaluate the project after its execution, but we already know the aims of the work.

4.3.5 Analysis of project items

In this project, there are 71 budget items. They are classified by categories for the property in the original project (you can see *Appendix 3: Original project budgets*) but, when the construction company gets the project, it is necessary to do another division by activities. These modifications are done thinking about suppliers. For instance, some gardening and irrigation items that are in different categories can be grouped together because their tasks will be done by the same supplier. Also, some simple demolition tasks included in any categories could be removed considering that CC workers can do those tasks. Then, we will split the items according to our criteria, and we will see the amount of money included in their budget.

	Activity	Description	Nº of items	Budget
1	Prefabricated elements	Installation of several elements: curbs, concrete slabs (<i>panot</i>), scuppers, concrete boxes, etc.	11	55.239,38 €
2	Concrete	Concrete HM-20 for base	1	27.948,62 €
3	Gardening	Controlled felling, topsoil supply, tree planting, and irrigation tasks	14	25.670,29 €
4	Asphalting	Road paving tasks	3	20.705,00 €
5	Earthmoving	Includes: demolition, earthmoving, transportation and waste management tasks	9	17.016,20 €
6	Signage	Vertical signage (traffic signs) and horizontal signage (road marking)	9	13.750,23 €
7	Others	Extra item for unexpected but justified contingencies	1	10.525,73 €
8	Milling	Milling of existing asphalt pavement	1	5.448,79 €
9	Tubes	Tubes and pipes for the sewerage system, irrigation, etc.	4	4.717,81 €

10	Health & Safety	Risks prevention and health and safety measures	1	4.449,51 €
11	Urban furniture	Installation of various elements: benches, chairs, bollards, and bins	4	4.217,49 €
12	Workforce	Tasks to be carried out by our own workers	6	3.248,75 €
13	QA	Quality tests and control	1	2.985,48 €
14	Lighting	Change of place of existing lampposts	5	1.665,10 €
TOTAL	---	---	70	197.588,38 €

Table 4.7: New classification of the activities (project n.2)

There is a new budget amount that is 3.575,81 € less than the initial budget due to the changes produced by the review of the measurements (4.3.3.5 *Measurements review*). There was a considering reduction of the milling surface and also an increment of the surface of agglomerate for the asphalt. Despite this modification, it is not relevant yet because there will probably be more budget changes during the execution phase. So the final budget can change again.

- ❖ Initial MEB: 201.164,19 €
- ❖ Current MEB: 197.588,38 € (-3.575,81 €)
- ❖ Current CEB: 235.130,17 €

After this classification by activities, it is time to identify the items with a higher cost to have control of the economy. Before awarding the project, the department of studies has estimated the costs, so it is deduced that there are not big risks or big uncertainties in any item. However, checking items with a higher budget is the best way to know if the economic plan is being fulfilled. It does not mean that other items do not have to be checked, but it is good to have a reference.

	Activity	Item description	Nº of items	Budget	% total budget
1	Concrete	HM-20/B/20/I	1	21.470,40 €	10,87 %
2	Asphalting	Bituminous mixture BBTM 11A	1	13.763,25 €	6,97 %
TOTAL	---	---	2	35.233,65 €	17,84 %

Table 4.8: Items with a higher budget of the project (project n.2)

These two items represent around 18% of the total budget, almost a fifth part. It is not a huge amount, but considering that there are 70 items in the whole project with very varied costs, concrete HM-20 (497 m³) and bituminous mixture BBTM for asphalting the road (3.461 m²) are the most significant elements to analyze. If we compare the price of concrete HM-20 in table 4.7 with the one in table 4.8 we observe that is different. This is because we have extracted the single price of the material without added costs (from the original project document).

We are going to analyze the offers obtained by the suppliers and compare them with their budget prices. It is understood that the following comparatives are made in fair market conditions and all suppliers guarantee quality and they can offer a good service:

- 1) Concrete HM-20: Offers received by different suppliers will be analyzed. Prices are shown for 497 m³ of concrete HM-20/B/20/I.

	Budget	% project budget	Company name
Original project	21.470,40 €	100 %	---
Supplier offer 1	30.317,00 €	141,2 %	PROMSA
Supplier offer 2	28.329,00 €	131,9 %	LAFARGE
Supplier offer 3	28.329,00 €	131,9 %	FORMIGONS TENES

Table 4.9: Comparison for offers of 497 m³ of concrete HM-20 (project n.2)

- Selected offer: FORMIGONS TENES (+31,9 %)

In this case that there were two equal offers, the reason for select this company was the distance to the work site. While the *Formigons Tenes* factory is located 9

km from the work site, the factory of *Lafarge* is 30 km away. Then, the cost of transport has been considered to choose the first company.

- 2) Bituminous mixture BBTM: This mixture is required to perform the asphaltting tasks of the road. The comparison of the offers received is the following:

	Budget	% project budget	Company name
Original project	13.763,25 €	100 %	---
Supplier offer 1	22.496,50 €	163,5 %	ASFALTEM
Supplier offer 2	21.631,25 €	157,2 %	ASFALTOS BARCINO

Table 4.10: Comparison for offers of 3.461 m² of bituminous mixture BBTM (project n.2)

- Selected offer: ASFALTOS BARCINO (+57,2 %)

As can be observed, the result of the selected offers (*Appendix 4: Successful offers*) in the items with the highest budget is not as desired. There is an increase in the cost of 14.726,60 € if we consider both items. It is not a good start if we think in economic terms. The reason is that the unit prices of these elements in the project are very low compared with market prices. What has to be done is to manage carefully the remaining 82% of the budget, composed by the other 68 items. But for the moment, the CM knows that these two main elements will produce losses. The more information you have, the better.

The more information you have, the better.

4.3.6 Description of tasks

After having done all the previous studies, it is time to describe the execution tasks. In the original project, there is a proposal to organize the tasks but it is not mandatory to follow it. The only point that should be fulfilled is the deadline. That is why implementation procedures are going to be explained week by week, to see which

activities are done at every moment. The time to do the works is 4 months, without counting the weekends, which results in 24 weeks, including weekends. The project has to be executed at the latest in November, so it means works has to start at the end of June.

In some meetings that took place before the beginning of the tasks, the CC said they can't start to work in June due to other projects of the company, which are still in process. That situation reduces the deadline in two weeks so they will have 22 weeks. Finally, the works started the first week of July.

Weeks 1 & 2 (July)

Firsts two weeks were to do the initial tasks of the project. Establish the site offices in the storage area and bring there all the required materials were the first thing to do. Then, do the perimeter fencing of the site work as planned. 100 units of Heras fences were needed to cover 360 m of the perimeter. It is necessary to signal properly the perimeter of the work to advice pedestrians. And also notify the affected parking spaces that are inside the work area in advance.

It was time to identify the current main services, such as the drainage or electrical network. Topography tasks have to be done. Take measures of the main points of the place was necessary to be able to execute other labors.

Weeks 3 & 4

Demolition tasks started. There was a median strip between the main road and a side road. Both elements must be broken. The objective is to remove the side road, do the sidewalk wider and also make a wider main road. These two weeks consisted of break existing curbs and break the side road. Both transportations of rune and deposition in the authorized location have to be done during these weeks.



Figure 4.25: Demolition tasks in the existing median strip of the road (Civil Stone)

Weeks 5 & 6 (August)

It was necessary to increase the height of the previous road to reach the height of the sidewalk in order to make it wider. Topography tasks were required again. Demolition tasks continued. All the existing concrete slabs (*panot*) of the sidewalk had to be removed, so these tasks were initiated.

A new decision was made by the property. Instead of introducing new *panots* of 20x20x4 cm in the sidewalk, as it was planned, they decided to pave the street with concrete slabs of 60x40x7 cm. This change is due to the other sidewalk, which had been already repaired in the first phase of the project because it had these grey concrete slabs of 60x60x7 cm. So they wanted to copy the same model of the sidewalk and do this modification in the project. This increased the cost of the material because the new slabs were more expensive than *panots*.

Weeks 7 & 8

Demolition tasks finished with the works in the existing median strip. It had to be completely removed. Two existing lampposts had to be extracted from the median too. The curb installation tasks in the sidewalk started. Topography labors were required to establish new measures.

Weeks 9 & 10 (September)

Curb installation tasks continued. Also, the same quantity of white paving slabs had to be installed on the side edge of the road, along the sidewalk. These white slabs of 20x20x4 cm are used to drain surface water when there is rain. Paving tasks of concrete slabs started. There were 900 m^2 of the surface to be paved, which means more than 3.700 slabs were required. These tasks took some weeks. Excavations of the ditches for the installation of the drainage system materials were done.

Weeks 11 & 12

The tasks of paving concrete slabs on the sidewalk continued. Curbs and white slabs were already installed.

There were two existing lampposts previously extracted that had to be located in the new median strip. Apart from these two, the property asked if it was possible to install four more lampposts that were extracted from the other sidewalk, in the 1st phase of the project. In the first moment, they were supposed to be installed in the 3rd phase, but they changed their minds and decided to install all at the same time. The company accepted but it supposed an extra cost. Implementation of the lampposts tasks would be done in a few weeks, not yet.

Weeks 13 & 14 (October)

The paving of concrete slabs on the sidewalk continued. When doing tasks of the drainage system, they realized that a current concrete pipe of 800 mm diameter was clogged and it was not in useful conditions. Then, they decided to change that current pipe for a new PVC corrugated drain pipe of 500 mm diameter and 30 meters length. This performance was not planned so it meant another increase in the budget.

Weeks 15 & 16

The paving of concrete slabs on the sidewalk finished. Some existing scuppers from the drainage system had been moved in a new location, adapting them to the new disposition of the road. About the new corrugated pipe that had to be installed, those days there were heavy rains, especially on October 15 and 16. This inconvenience delayed the process.

Weeks 17 & 18 (November)

The corrugated pipe for the drainage system was finally installed. The works on the sidewalk and the main services were finished. The enclosure of the work changed to the 2nd phase, surrounding the future median strip. Works to construct the new median started. Topography tasks were required. Ditches for introducing irrigation tubes in the median of the road have been done.

On week 18, the last week of October, there were two more days with heavy rain. Added to the rains of the previous weeks, the construction company said to the property that they would finish the works the last week of November, a week later than planned. This was within the established deadline but if there were more problems the deadline could be altered.



Figure 4.26: Workers performing tasks in the new median strip (Civil Stone)

Weeks 19 & 20

A lot of performances were made during these weeks. In order to install curbs and white slabs (more than 400 m) around the entire median as fast as possible, there were more

workers executing the tasks. They were able to complete the tasks in those two weeks. Gardening tasks started. They had to plant 25 palms in the median of the road and 12 pear trees in big pots on the sidewalk. Also, introduce 160 m^3 of topsoil for both plants and small flowers in the median too. The installation of six lampposts was done too. Coordination between all these performances was very important to execute the tasks.

One of the main tasks of the execution process was carried out: the asphaltting of the road. First, the milling of the surface of the road was made. Then, the bituminous mixture was poured to asphalt the road. These tasks took two days, in which the traffic had to be redirected.



Figure 4.27: Carrying out asphaltting tasks on the road (Civil Stone)

Weeks 21 & 22

The last two weeks were to finish gardening and irrigation tasks. They had to program the irrigation system and check that it worked correctly. After the asphaltting of the road, they had to perform signaling tasks: road marking paint on the road and several traffic signs for vertical signage. In the last days, they had to check all the installed elements of

the project and improve some details if necessary. Then, clean the entire work area was required before the end.

Summary

The execution tasks started two weeks after the expected start date. Nevertheless, the project was executed on time. The point is that there were two main tasks to execute: demolitions and paving. These procedures were well organized. The first weeks served to demolish existing elements and establish future measures. Then, it took a few months to carry out paving tasks, but it was a clear and routine work that could be advanced quickly. In the last weeks, it was required to have more workers performing paving tasks in the median to finish within the deadline. Another key factor was the asphaltting of the road. Thanks to the work of redirecting the accesses, thought before the start of the project, that procedure was implemented successfully.

Regarding the project elements, there were two main unexpected changes that had increased the final budget: the change of concrete slabs type (from *panot* to 60x40 cm slabs) and the substitution of a pipe from the drainage system. Nevertheless, there were other elements that had not been implemented by the construction company. These items were: the installation of urban furniture elements (benches, bins, and bollards) and some gardening elements (flowers and shrubs). The reason was that the modifications on the budget increased the cost of the project and the property decided to do those performances in another way. These facts produced an increment of the budget but a reduction of the number of items (the total amount of the costs will be analyzed in 4.3.8 *Project balance*).

There were some rainy days during the implementation phase but the property has allowed the CC to finish a week later than planned. The development of the tasks can be seen in images in *Appendix 5: Photographic report*.

4.3.7 Challenges of the construction manager

After describing the implementation phase, we are going to make a list with the main challenges faced by the CM during this project:

1. The works started with a delayed started date. Due to other projects of the construction company, the CM was not able to start the work in June, but two

weeks later. The foreman, some workers, and machinery were not available then. The solution was to do a good plan of the perimeter fencing and the accesses and deal with suppliers in the previous days to have everything under control once started.

2. In the previous studies, it was seen that the main items had a higher cost than their price in the project budget (4.3.5 *Analysis of project items*). That supposed a probable increment of the final cost for the company. The CM had to manage this situation with better control of the remaining items and make proper use of resources and labor.
3. There were some troubles with the enclosure of the work. There was a supermarket affected by the works on the sidewalk. Their workers just had one entrance to go in (not the main entrance) and it was located inside the area of work. The solution was to improvise a temporary narrow path near the walls of the building to allow workers to enter.
4. When asphaltting the road, the redirection of traffic was a key factor to manage. The election of the temporary accesses through alternative ways was essential to coordinate traffic. The modification done by the CM, different from the proposal of the project, was a better solution for not closing both directions of the road. The new proposal consisted in close only one direction of the road, instead of both directions, allowing then the entrance to the city in the usual way.

4.3.8 Project balance

The execution of the project was finally ended in time. It took 120 days to finish the works, as planned. Regarding the elements that were in the initial project, there have been a lot of modifications: change of concrete slab model, new tasks to perform as the installation of lampposts or the new corrugated pipe, the non-installation of gardening elements and urban furniture... These modifications produced a reduction of the number of final items from 70 to 62, 8 items less.

In terms of budget analysis, the final cost of the project was 262.882,52 € (CEB) (see *Appendix 6: Project certifications*). As it was done in the previous case, it is necessary to analyze it for both entities; the property, and the construction company:

- Property: The awarded price of the project was 239.385,39 € (CEB), with a reduction of 4,3% respect to the original price. Finally, the cost of the project execution increased by 9,8%. This can't be considered a success for the property, because the budget has been exceeded by almost 10%.
- Construction company: The total cost of the CC for the whole project has been 228.758,45 € (CEB), including both direct and indirect costs. This means they spent almost 13% less than they earned from the property. It is 34.124,07 € of benefits for the CC. This fact results in a success for the company.

Regarding the challenges of the work, there have been two main aspects that may be considered. The most important one probably is the traffic redirection plan, when asphaltting the road. It was not an easy problem to solve, but it was done successfully. Another topic to talk about, are the numerous modifications that affected the project (storage area emplacement, enclosure of the work, changes of elements, etc.). The construction manager, the workers, and especially the foreman, had to be adapted constantly to new situations during the implementation of the tasks. But they did it well.

The main goal of the project has been achieved, which was to renovate the road and adapt the sidewalk to make it wider and more functional. However, analyze if the traffic efficiency has been improved is difficult to do it yet. It requires more time to see if traffic is more fluid because the project has been recently executed. It will be interesting to carry out some studies related to this topic.

This project can be considered useful and beneficial. In the same way, the city is expected to continue growing towards a more efficient and modern model.

5 Discussion

In this part of the thesis, interpretation of the results obtained from the projects analyzed will be presented. It will be seen if the initial statements of the thesis have been answered. First, the analysis of the project will be examined and discussed. Then, some practical considerations on the thesis will be mentioned. And finally, it will be commented on what measures could have been taken to improve the quality of the thesis.

5.1 Evaluation of results

To be able to evaluate the results of this project, it is good to refresh its purpose from the beginning: "The purpose of this thesis is to analyze the works in order to do a good performance of their execution and to improve the execution in future occasions". And also an extract from the research question: (...) how to do a good economic plan, how to organize the execution of the tasks (...), how companies can make such low bids to be awarded and guarantee the quality of the project...". As can be seen, the goals required to achieve the purpose were diverse. The main objective was to show the activities carried out in the implementation phase and the challenges that a construction manager had to face.

In this line, it was wanted to give greater importance to the processes of the implementation phase than to the result itself. It has been given as much relevance to previous performances (accesses, enclosures, location of the storage area...) as to the description of the tasks. The reason was to get involved in all the procedures that must be followed, step by step.

Regarding the works analyzed, both have similar evaluations. As has been told in the project, the objective of a construction company is to fulfill the requirements of time, cost and quality. To accomplish the tasks within the deadline, it was explained how to negotiate with the property in case of delays by justified reasons. Both projects were finished in time. Concerning the quality of the performed tasks, it is difficult to examine it because it is not a measurable element. However, it was shown some quality certificates of the company to ensure its compromise. Moreover, the properties of the two

performances were satisfied with the final results. They also have quality certificates of every material and element installed in the project.

With respect to the cost of the projects, I would like to get deeper into the topic. The comparisons between the stakeholders and their final cost have been done. For the construction company, they were profitable projects. On the other hand, in both projects we have seen how the initial budgets were finally increased, meaning cost overruns for the properties.

The point is to evaluate the percentage of reduction of the bid prices. Although in the projects that have been analyzed the reduction was 14,6% and 4,3%, respectively, in other cases the reduction is larger. In 2016, public administrations in Spain contracted projects with an average decrease of 29,1% with respect to the bidding budgets (Mesones, 2017). In this situation, two approaches can be done. First, it is difficult for construction companies to guarantee a good quality of the performances with such low bids. Users are the ones who will ultimately pay that price. And second, public administrations usually tend to incur cost overruns. Due to these low prices, they end up making budget modifications upward.

According to a study made by Transparency International and the Spanish Public Procurement Observatory (ObCP), there are around 20.000 million euros of losses per year due to cost overruns in public tenders in Spain (del Rosal, 2017). Personally, I think bids must be more regulated and also excessive cost overruns in projects may be avoided. It is a complex topic and could be discussed extensively, but these measures will give more quality to projects and will reduce irregularities committed with public spending.

5.2 Practical considerations

This thesis has been developed from performances in real projects. This fact means that the decisions made and the solutions adopted have been true. It was important to describe the process from real cases to give consistency to the explanation. There was no better way to understand the performance of the activities than from the vision of a construction company.

But the projects analyzed have been just two examples among many other projects. There are elements that must be considered in every project, but each execution phase

is different. So, it does not mean that the approaches and decisions made have to be replicated in other cases. Every project has to be studied separately.

As for the construction manager, his functions and challenges have been shown in both projects. However, there was probably more than one solution that fits every problem. The only requirement is to put things in perspective when making decisions and do it objectively. Be surrounded by experts and handle the right information are good pieces of advice to have success.

To explain the procedures that occur in the execution phases, more than two projects could have been analyzed. But I preferred to focus on these two because they are the ones I got involved with. In my opinion, it was preferable to describe real work experiences than other projects of the company that I did not know much about them. Furthermore, projects are complex to dissect. It was better to develop two implementation phases properly than many projects incomplete.

5.3 What else could have been done?

In this project, there were some topics that could have been more developed. For instance, the economic plan was not evaluated exhaustively. The reason is that the objective was not to focus on a single matter. Disaggregate the cost of each element was a tough job. I considered that the aims of the project were practical tasks and organization plans, more than detailing the economic plan.

Another topic that could be mentioned is the technical plan done by the construction manager before the start of the tasks. I decided to explain directly the description of the tasks. That is because works are dynamic and they have unexpected changes. So, despite the CM had a strategical plan to carry out the tasks at the beginning, it was not significant.

As it was previously mentioned, analyze more projects could be better to see other challenges to face. Any project is useful to learn new things and to understand how to solve problems. Personally, I would have liked to analyze an unsatisfactory project. Both of the projects studied were successful for the construction company. But sometimes it is not like that. I think it could have been interesting to see the position of the CM in adverse situations.

What I would like to have done is an evaluation of the projects after their executions. The five indicators of success (Samset, 2010) were presented in the theory of the project and

I regret not to use them to value the projects. The problem is that both projects have been recently executed (June and November 2018). In this short time, is difficult to see if purposes have been achieved. Although some of the indicators could be applied, others like impact and sustainability were not able to analyze them yet. It would also have been needed to converse with neighbors and users to obtain their feedbacks. Also, for one of the projects (Sant Andreu de la Barca), traffic volume data would have been useful to make an assessment. To get that and other answers, contact with the property and responsible for public administrations would have been profitable.

6 Conclusion

This thesis has been developed to show the activities and challenges that can be found in the execution of civil projects. The objective was to analyze the works and explain how to do a good performance of the tasks, what has been done successfully. From the point of view of a construction company, it has been seen how to carry out the implementation phase taking advantage of resources.

The role of the construction manager has been specially described. He has responsibilities at all times, both in the early stages of the project and in its execution. Economic planning, preliminary work, team management, and safety measures are some of the tasks that have been evaluated.

The activities that a construction manager has to perform consist of choosing the right organization, develop strategies, and use analytical tools. These parameters are consonant with the topics covered by the Project Management subject. It is shown that a CM has many competencies, having knowledge of several topics and participating in a lot of tasks.

This thesis has been an opportunity to relate my studies in civil engineering with my future work in construction projects. I tried to put into practice my skills and comprehension in the matter. It has been proven that projects are complex but the implementation phase has been deeply analyzed and many concepts have been explained. Collaborate with an external company has been very useful to get information and work in real cases. I considered it was suitable to combine literature review with factual experiences to get more details and treat both issues.

The main goal of this work is to help students who are beginning to make contact with project management, specifically in construction projects. For those who study civil engineering who are interested in becoming future construction managers, it is a good occasion to learn the procedures and processes that are relevant in every project.

In reference to this topic, it could be interesting to continue analyzing more projects. For instance, projects executed in Norway to make a comparison between different countries, or also study another kind of project, focused on building construction or other areas. Any type of analysis can be useful to examine the functions of the construction manager and continue to improve efficiency and performance in future works.

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Appendices

Appendix 1: Quality certificates

Appendix 2: Elements used in project's execution

Appendix 3: Original project budgets

Appendix 4: Successful offers

Appendix 5: Photographic report

Appendix 6: Project certifications

Appendix 1: Quality certificates

I. Health & Safety



Certifica que el Sistema de Gestió de la Seguretat i Salut en el Treball de l'organització,

CIVIL STONE, S.L.U.

Ctra. Sant Cugat, 63B, Local 26

08191, Rubí, Barcelona

Aplicable a les activitats de:

CONSTRUCCIÓ, EDIFICACIÓ I OBRA CIVIL

Conformes amb la norma:

OHSAS 18001:2007

Certificat Número: 110/15

Data de certificació inicial
15/05/2015
Data de caducitat
15/05/2021

Data d'emissió
15/05/2018

La Direcció

David Galeote Godàs

Per obtenir qualsevol aclariment addicional relatiu a l'abast i validesa d'aquest certificat com a l'aplicabilitat dels requisits de la norma es pot obtenir consultant a l'Entitat de Certificació. La vigència del certificat està supeditada a la realització de les auditories de seguiment anuals.

II. Quality of service



Certifica que el Sistema de Gestión de la Calidad de l'organització,

CIVIL STONE, S.L.U.

Ctra. Sant Cugat, 63B, Local 26

08191, Rubí, Barcelona

Aplicable a les activitats de:

CONSTRUCCIÓ, EDIFICACIÓ I OBRA CIVIL

Conformes amb la norma:

UNE-EN ISO 9001:2015

Certificat Número: 1056/15

Data de certificació inicial
15/05/2015
Data de caducitat
15/05/2021

Data d'emissió
15/05/2018



La Direcció

David Galeote Godàs

Per obtenir qualsevol aclariment addicional relatiu a l'abast i validesa d'aquest certificat com a l'aplicabilitat dels requisits de la norma es pot obtenir consultant a l'Entitat de Certificació. La vigència del certificat està supeditada a la realització de les auditories de seguiment anuals.

III. Environment management



Certifica que el Sistema de Gestión Ambiental de l'organització,

CIVIL STONE, S.L.U.

Ctra. Sant Cugat, 63B, Local 26

08191, Rubí, Barcelona

Aplicable a les activitats de:

CONSTRUCCIÓ, EDIFICACIÓ I OBRA CIVIL

Conformes amb la norma:

UNE-EN ISO 14001:2015

Certificat Número: 508/15

Data de certificació inicial
15/05/2015
Data de caducitat
15/05/2021

Data d'emissió
15/05/2018



La Direcció

David Galeote Godàs

Per obtenir qualsevol aclariment addicional relatiu a l'abast i validesa d'aquest certificat com a l'aplicabilitat dels requisits de la norma es pot obtenir consultant a l'Entitat de Certificació. La vigència del certificat està supeditada a la realització de les auditories de seguiment anuals.

Appendix 2: Elements used in project's execution

2.1. Heras fence



2.2. Crowd control barrier



2.3. Plastic jersey barrier



2.4. Panot (20x20x4 cm concrete slab)



Appendix 3: Original project budgets

I. Project 1: Outdoor basketball court // *Jardins de Can Ferrero* (basketball court) – 1 of 2

PROJECTE EXECUTIU PER LA CONSTRUCCIÓ D'UNA PISTA DE BASQUET EXTERIOR
ALS JARDINS DE CAN FERRERO AL DISTRICTE DE SANTIS-MONTJUÏC

PRESSUPOST							Data: 28/09/17	Pàg.: 1
Obra	00	EXECUTIU PISTES BASQUET						
Fase obra	01	TREBALLS PREVIS						
NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT			
1	F22V010	M3	EXCAVACIÓ MANUAL DE CALES EN ZONA DE SERVEIS (P - 5)	91,33	3,000	273,99		
2	F9WZV02	U	DESMUNTATGE I COL·LOCACIÓ PER SITUAR A NOVA RASANT DE MARC I TAPA DE POUS DE CLAVEGUERES O ALTRES SERVEIS, EN OBRES DE QUALSEVOL PAVIMENT (P - 13)	74,62	2,000	149,24		
TOTAL Fase obra						00.01	423,23	
Obra	00	EXECUTIU PISTES BASQUET						
Fase obra	02	MOVIMENTS DE TERRES GENERAL						
NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT			
1	F221C420	M3	EXCAVACIÓ I CÀRREGA DE TERRA PER A CAIXA DE PAVIMENT EN TERRENY COMPACTE, AMB MITJANS MECÀNICS (P - 4)	3,43	383,250	1.314,55		
2	F227T00F	M2	REPAS I PICONATGE DE CAIXA DE PAVIMENT, AMB COMPACTACIÓ DEL 95% PM (P - 6)	1,36	1.095,000	1.489,20		
3	F2R3UT6X	M3	TRANSPORT DE TERRES INERTS A INSTAL·LACIÓ AUTORIZADA DE GESTIÓ DE RESIDUS, AMB CAMIÓ DE 12 T I TEMPS D'ESPERA PER A LA CÀRREGA AMB MITJANS MECÀNICS (P - 9)	4,16	1.314,000	5.466,24		
TOTAL Fase obra						00.02	8.269,99	
Obra	00	EXECUTIU PISTES BASQUET						
Fase obra	03	ENLLUMENAT						
NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT			
1	FG31H554	M	CABLE AMB CONDUCTOR DE COURE DE 0,6/1 KV DE TENSIO ASSIGNADA, AMB DESIGNACIÓ RVFV, TETRAPOLAR, DE SECCIÓ 4X6 MM2, AMB ARMADURA DE FLEIX D'ACER I COBERTA DEL CABLE DE PVC, COL·LOCAT EN TUB (P - 18)	3,26	424,500	1.383,87		
2	FG38E355	M	CONDUCTOR DE COURE NU, UNIPOLAR D'1X35 MM2 I MUNTAT EN MALLA DE CONNEXIÓ A TERRA (P - 19)	3,11	424,500	1.320,20		
3	FDK2U102	U	PERICÓ DE REGISTRE DE 0,60 X 0,60 X 0,70 M DE MIDES ÚTILS AMB PARET DE 15 CM DE MAO CALAT DE 29 X 14 X 10 CM. ASENTADA SOBRE LLIT DE SORRA, INCLOSA LA TAPA I MARC D'ACER GALVANITZAT. CLAU I PANY HOMOLOGATS (P - 17)	157,17	5,000	785,85		
4	FDGECI03	M	CANALITZACIÓ EN ZONA SENSE PAS DE VEHICLES AMB TUB DE PROTECCIÓ DE POLIETILÈ CORRUGAT EXTERIOR I INTERIOR LLIS D80 AMB GUIES DE PLÀSTIC, COL·LOCAT AL FONS DE RASA SOBRE SOLERA DE SORRA DE RIU, INCLOS EXCAVACIÓ, REBLERT AMB MATERIAL SELECCIONAT O DE LA PROPRIA EXCAVACIÓ, COMPACTAT AL 95% P.M., COL·LOCACIÓ DE DOS BANDES DE PROTECCIÓ I AVIS DE PLÀSTIC A LA PART SUPERIOR DE LA RASA, CÀRREGA I TRANSPORT DEL MATERIAL RESULTANT A LLOC DE CLASSIFICACIÓ DE RESIDUS DINS DE L'OBRA, INCLOS PART PROPORCIONAL D'EXCAVACIÓ MANUAL EN ZONES DE DIFÍCIL ACCÉS. (P - 16)	13,20	424,500	5.603,40		
5	XPA00RR	PA	PARTIDA ALÇADA A JUSTIFICAR PER A LA ADEQUACIÓ DE LA XARXA EXISTENT PER TAL QUE QUEDI TOT CONNECTAT ALS ARMARIS EXISTENTS (P - 0)	1.000,00	1,000	1.000,00		
6	XPA000Z	PA	PARTIDA ALÇADA A JUSTIFICAR PER A LA LEGALITZACIÓ DE LES INSTAL·LACIONS ELÈCTRIQUES D'ENLLUMENAT DAVANT ORGANISMES OFICIALS. (P - 0)	1.500,00	1,000	1.500,00		

euros

PROJECTE EXECUTIU PER LA CONSTRUCCIÓ D'UNA PISTA DE BASQUET EXTERIOR
ALS JARDINS DE CAN FERRERO AL DISTRICTE DE SANTIS-MONTJUÏC

PRESSUPOST							Data: 28/09/17	Pàg.: 2
7	XPA00IN	PA	PARTIDA ALÇADA A JUSTIFICAR PER A LA VERIFICACIÓ I FITXA INFORMÀTICA (P - 0)	500,00	1,000	500,00		
8	XPA00EP	PA	PARTIDA ALÇADA A JUSTIFICAR PER A L'ENLLUMENAT PROVISIONAL D'OBRA (P - 0)	500,00	1,000	500,00		
9	XPA0EP2	PA	PARTIDA ALÇADA A JUSTIFICAR PER LES MESURES LUMINÍQUES AMB I SENSE REGULACIÓ, FACTOR DE POTÈNCIA DE LA INSTAL·LACIÓ D'ENLLUMENAT FINALITZAT (P - 0)	500,00	1,000	500,00		
10	FHMIE505	U	COLUMNA CILÍNDRICA TIPUS PRIM, DE 10,00 M D'ALÇÀRIA, CORONAMENT SENSE PLATINA, AMB BASE PLATINA I PORTELLES, AMB TRACTAMENT DE RILSANITZACIÓ FINS A LA PORTELLA I ACABAT ANTIGRAFITI ALS 3 M INFERIORS, COL·LOCADA SOBRE DAU DE FORMIGÓ, INCLOU L'EXECUCIÓ DE LA FONAMENTACIÓ, GRUAMENT, ANIVELLAMENT, INSTAL·LACIÓ DE PRESA DE TERRA, INSTAL·LACIÓ ELÈCTRICA COMPLETA DE L'INTERIOR DEL SUPORT I TRANSPORT DE TERRES SOBRIANTS A L'ABOCADOR (P - 20)	2.614,45	2,000	5.228,90		
11	FHN5FX1	U	PROJECTOR LED AMB GRAU DE PROTECCIÓ IP-66 I IK08, AMB UN TOTAL DE 100 LED I UN DISPOSITIU D'ALIMENTACIÓ I CONTROL REGULABLE DE 300 W DE POTÈNCIA TOTAL, FLUX LLUMINÓS 31500 LUMEN, TEMPERATURA DE COLOR 4000 K, VIDA ÚTIL >= 83000 H, AILLAMENT ELÈCTRIC CLASSE I, AMB ACCESSORI PER FIXAR LATERALMENT I ACOBLAT AL SUPORT (P - 21)	681,60	12,000	8.179,20		
TOTAL Fase obra						00.03	26.501,42	
Obra	00	EXECUTIU PISTES BASQUET						
Fase obra	04	CLAVEGUERAM						
NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT			
1	FD5R3030	U	BASTIMENT I REIXA TIPUS BARCELONA P7 DE FOSA DÚCTIL, RECOLZADA, PER A EMBORNAL, DE 750X275X36 MM, CLASSE C250 SEGONS NORMA UNE-EN 124, AMB UN PES DE LA REIXA DE 27,8 KG, COL·LOCAT AMB MORTER (P - 15)	181,97	7,000	1.273,79		
TOTAL Fase obra						00.04	1.273,79	
Obra	00	EXECUTIU PISTES BASQUET						
Fase obra	05	FERMS I PAVIMENTS						
Capítol	01	ENDERROCS						
NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT			
1	F21LC110	M2	DEMOLICIÓ DE PAVIMENT DE VORERA DE QUALSEVOL TIPUS I BASE DE FORMIGÓ DE QUALSEVOL GRUIX, AMB MITJANS MECÀNICS, INCLOU CÀRREGA I TRANSPORT DELS MATERIALS RESULTANTS A ABOCADOR AUTORITZAT (P - 3)	6,40	25,200	161,28		
2	F242CI60	M3	CLASSIFICACIÓ DE MATERIAL RESIDUAL I CÀRREGA AMB MITJANS MECÀNICS A CONTENIDOR O CAMIÓ (P - 8)	1,94	34,020	66,00		
3	F241CI01	M3	TRANSPORT DE TERRES O RUNA AMB CAMIÓ DE 7 T, FINS ABOCADOR DE TERRES O RUNES AUTORITZAT, INCLOS CANÓ D'ABOCAMENT I MANTENIMENT DE L'ABOCADOR. (P - 7)	13,44	34,020	457,23		
TOTAL Capítol						00.05.01	684,51	
Obra	00	EXECUTIU PISTES BASQUET						
Fase obra	05	FERMS I PAVIMENTS						
Capítol	02	NOVAMPLANTACIÓ						
Sotscapítol	02	PISTA						

euros

I. Project 1: Outdoor basketball court // Jardins de Can Ferrero (basketball court) – 2 of 2

PROJECTE EXECUTIU PER LA CONSTRUCCIÓ D'UNA PISTA DE BÀSQUET EXTERIOR
ALS JARDINS DE CAN FERRERO AL DISTRICTE DESANTS-MONTJUÏC

PRESSUPOST

Data: 28/09/17

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NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	F931201J	M3	BASE DE TOT-U ARTIFICIAL , AMB ESTESA I PICONATGE DEL MATERIAL AL 98% DEL PM (P - 10)	26,81	219,000	5.871,39
2	F965U3CI	M	PEÇA DE FORMIGÓ PER A FORMACIÓ DE LÍMIT MULTISTEP TERANA DE BREINCO O EQUIVALENT DE 13*16*25 CM. D'ALTA QUALITAT FABRICAT AMB ÀRIDS GRANÍTICS-SILÍCICS I AMB CONTINGUT MÍNIM DE 15% D'ÀRID RECICLAT. MONOCAPA, HIDROFUGAT, ACOLORIT EN MASSA AMB ÒXIDS DE FERRO D'ALTA RESISTÈNCIA; AMB DISTANCIADORS DE 3MM. INCORPORATS, DE CANTELLS ARESTATS, COLOR A DEFINIR PER LA DF. COL LOCAT A TRUC DE MACETA AMB MORTER PASTAT M-15 DE 3 CM DE GRUIX SOBRE BASE DE FORMIGÓ (NO INCLOSA EN EL PREU). REJUNTAT AMB SORRA-CIMENTCOL LOCADA AMB FONAMENT DE FORMIGÓ (P - 11)	19,36	1,000	19,36
3	F9C127G5	M3	PAVIMENT DE FORMIGÓ SENSE ADDITIUS HM-30/P/20II-E DE CONSISTÈNCIA PLÀSTICA, GRANDÀRIA MÀXIMA DEL GRANULAT, 20 MM, ESCAMPAT AMB TRANSPORT INTERIOR MECÀNIC, ESTESA I VIBRATGE MECÀNIC I ACABAT REMOLINAT MECÀNIC (P - 12)	99,16	164,250	16.287,03
4	FBA1G110	M	PINTAT SOBRE PAVIMENT D'UNA FAIXA CONTÍNUA DE 10 CM. AMB PINTURA REFLECTORA I MICROESFERES DE VIDRE, AMB MAQUINA AUTOPROPULSADA (P - 14)	0,93	460,000	427,80
5	XPAG00F2	PA	PARTIDA ALÇADA D'IMPREVISTOS A JUSTIFICAR EN OBRA (P - 0)	2.650,00	1,000	2.650,00
6	XPASIS002	U	PARTIDA D'OBRA PER A LA REALITZACIÓ D'UN AXECAMENT TOPOGRÀFIC FINAL D'OBRA SEGONS INDICACIONS DEL PLEC D'ESPECIFICACIONS TÈCNiques PER AL MANTENIMENT DE LA CARTOGRAFIA MUNICIPAL 3D DE L'AJUNTAMENT DE BARCELONA (P - 23)	1.450,00	1,000	1.450,00

TOTAL Sotscapítol 00.05.02.02 26.705,58

Obra	00	EXECUTIU PISTES BÀSQUET
Fase obra	06	MOBILIARI ESPORTIU
Capítol	01	ELEMENTS

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	BQS2UBX1	U	CISTELLA DE BÀSQUET FABRICADA SEGUN NORMA UNE EN 1270. PAL CILINDRIC D'ACER. TAULER D'ACER PERFORAT AMB RECTANGLE MASSIS, AMB CARTELA I TIRANTS DE REFORÇ PER IMPEDIR LA SEVA DEFORMACIÓ I TRENACAMENT, DOBLE CERCOL D'ACER MASSIS AMB ANELLES PER A LA XARXA. XARXA DE MALONS DE CADENA DE FERRO SOLDADA. ACABATS GALVANITZAT EN CALENT. LA CISTELLA ESTÀ PROVEÏDA DE PEÇA D'ANCORATGE PER ENCASTAR A TERRA AMB PLATINES. (P - 1)	840,00	4,000	3.360,00
2	BQS2UBX2	U	PALS I XARXA DE VOLEIBOL FABRICADA SEGONS NORMA UNE EN 1270. PAL CILINDRIC DE DIÀMETRE 88,9MM. GALVANITZAT I BERNISSAT AMB POLS SINTERITZADA. XARXA DE POLIETILE. (P - 2)	720,00	2,000	1.440,00

TOTAL Capítol 00.06.01 4.800,00

Obra	00	EXECUTIU PISTES BÀSQUET
Fase obra	07	GESTIÓ DE RESIDUS

euros

PROJECTE EXECUTIU PER LA CONSTRUCCIÓ D'UNA PISTA DE BÀSQUET EXTERIOR
ALS JARDINS DE CAN FERRERO AL DISTRICTE DESANTS-MONTJUÏC

PRESSUPOST

Data: 28/09/17

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NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	XPAG00F1	U	PARTIDA D'OBRA A JUSTIFICAR PER A LA GESTIÓ DE RESIDUS PROCEDENTS DE L'EXECUCIÓ DE LES UNITATS DE CONSTRUCCIÓ EN BASE A L'ANNEX DE MEMÒRIA AMBIENTAL I GESTIÓ DE RESIDUS (P - 22)	2.100,00	1,000	2.100,00

TOTAL Fase obra 00.07 2.100,00

Obra	00	EXECUTIU PISTES BÀSQUET
Fase obra	08	SEGURETAT I SALUT

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	XPASIS001	PA	P.A. DE COBRAMENT ÍNTEGRE PER LA SEGURETAT I SALUT A TOTA L'OBRA (P - 0)	1.600,00	1,000	1.600,00

TOTAL Fase obra 00.08 1.600,00

euros

II. Project 1: Outdoor basketball court // Carrer Química (parterre) – 1 of 2

PROJECTE EXECUTIU PER A LA REPAVIMENTACIÓ D'UN PARTERRE AL C. QUÍMICA, AL DISTRICTE DE SANTS-MONTJUÍ

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Obra	00	CONSTRUCTIU PARTERRE				
Fase obra	01	TREBALLS PREVIS				
NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	F222V010	M3	EXCAVACIÓ MANUAL DE CALES EN ZONA DE SERVEIS (P - 5)	91,33	2,000	182,66
TOTAL Fase obra			00,01			182,66

Obra	00	CONSTRUCTIU PARTERRE				
Fase obra	10	FERMS I PAVIMENTS				
Capítol	01	ENDERROCS				

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	F21PV045	M	DEMOLICIÓ DE VORADA I BASE DE FORMIGÓ (P - 2)	2,69	35,040	94,26
2	F21PV055	M	DEMOLICIÓ DE RIGOLA DE PANOTS I BASE DE FORMIGÓ (P - 3)	2,08	34,050	70,82
3	F2213222	M3	EXCAVACIÓ PER A REBAIX EN TERRENY FLUIX (SPT <20), REALITZADA AMB PALA EXCAVADORA I CÀRREGA DIRECTA SOBRE CAMIÓ (P - 4)	3,20	35,560	113,79
4	F21LC110	M2	DEMOLICIÓ DE PAVIMENT DE VORERA DE QUALSEVOL TIPUS I BASE DE FORMIGÓ DE QUALSEVOL GRUIX, AMB MITJANS MECANICS, INCLOU CÀRREGA I TRANSPORT DELS MATERIALS RESULTANTS A ABOCADOR AUTORITZAT (P - 1)	6,40	314,940	2.015,62
5	F242C160	M3	CÀRREGA AMB MITJANS MECANICS A CONTENIDOR O CAMIÓ (P - 7)	1,94	151,144	293,22
6	F241C101	M3	TRANSPORT DE TERRES O RUNA AMB CAMIÓ DE 7 T, FINS ABOCADOR DE TERRES O RUNES AUTORITZAT, INCLOS CANON D'ABOCAMENT I MANTENIMENT DE L'ABOCADOR. (P - 6)	13,44	151,144	2.031,38
TOTAL Capítol			00,10.01			4.619,09

Obra	00	CONSTRUCTIU PARTERRE				
Fase obra	10	FERMS I PAVIMENTS				
Capítol	02	NOVA IMPLANTACIÓ				
Sotscapítol	02	VORERES				

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	F9WZVX1	U	DESMUNTATGE I COL·LOCACIÓ PER SITUAR A NOVA RASANT DE MARC I TAPA D'ARQUETES DE SERVEIS EN QUALSEVOL PAVIMENT (P - 14)	34,18	8,000	273,44
2	F9WZVX2	U	DESMUNTATGE I COL·LOCACIÓ PER SITUAR A NOVA RASANT DE BANCOS EXISTENTS (P - 15)	28,70	5,000	143,50
3	F931201J	M3	BASE DE TOT-U ARTIFICIAL , AMB ESTESA I PICONATGE DEL MATERIAL AL 98% DEL PM (P - 8)	26,81	10,160	272,39
4	F936CV01	M3	BASE DE FORMIGÓ DE RESISTÈNCIA DE 20 N/MM2 DE CONSISTÈNCIA PLÀSTICA I GRANDÀRIA MÀXIMA DEL GRANULAT 20 MM ABOCAT DES DE CAMIÓ AMB ESTESA I VIBRATGE MANUAL, AMB ACABAT REGLEJAT (P - 9)	79,64	54,861	4.369,13
5	F9F5U0X1	M2	PAVIMENT DE PECES PREFABRICADES DE FORMIGÓ DE 40X20X4 CM, COLOR GRIS, ACABAT LLIS, COL·LOCADES AMB MORTER SOBRE BASE FORMIGÓ (P - 12)	36,96	6,500	240,24
6	F9F5UCX1	M2	PAVIMENT DE PECES PREFABRICADES DE FORMIGÓ DE 60X40 CM I 27CM DE GRUIX AMB UNA ARESTÀ VISELLADA, COLOR LLIS, COL·LOCADES AMB MORTER SOBRE BASE FORMIGÓ (P - 13)	64,45	12,480	804,34
7	F9E131UA	M2	PAVIMENT DE PANOT DE 4 PASTILLES, FLOR O RATLLAT PER A VORERA, DE COLOR GRIS, DE 20X20X4 CM, CLASSE 1A, PREU	33,73	365,740	12.336,41

euros

PROJECTE EXECUTIU PER A LA REPAVIMENTACIÓ D'UN PARTERRE AL C. QUÍMICA, AL DISTRICTE DE SANTS-MONTJUÍ

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			SUPERIOR, COL·LOCAT A TRUC DE MACETA AMB MORTER MX1 1:0,5:4 I BEURADA DE CIMENT PORTLAND (P - 11)			
8	F991532X	U	ESCOCELL QUADRAT DE 120X120 CM DE LLUM I 25 CM DE FONDÀRIA, AMB 4 PECES DE MORTER DE CIMENT DE 113X20X7 CM, D'UN CANTELL BISELLAT, REJUNTADES AMB MORTER I BASE DE FORMIGÓ DE RESISTÈNCIA DE 15 NMM2 (P - 10)	84,53	12,000	1.014,36
9	XPASIS002	U	PARTIDA D'OBRA PER A LA REALITZACIÓ D'UN AIXECAMENT TOPOGRÀFIC FINAL D'OBRA SEGONS INDICACIONS DEL PLEC D'ESPECIFICACIONS TÈCNiques PER AL MANTENIMENT DE LA CARTOGRAFIA MUNICIPAL 3D DE L'AJUNTAMENT DE BARCELONA (P - 0)	800,00	1,000	800,00
10	XPAG00F2	PA	PARTIDA ALÇADA D'IMPREVISTOS A JUSTIFICAR EN OBRA (P - 0)	430,00	1,000	430,00
TOTAL Sotscapítol			00.10.02.02			20.683,81

Obra	00	CONSTRUCTIU PARTERRE				
Fase obra	13	JARDINERIA I XARXA DE REG				
Capítol	01	AFECTACIONS				

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	FQBAU010	U	PROTECCIÓ D'ARBRES AMB ELEMENTS DE FUSTA DE 1,2 A 1,8 M D'ALÇÀRIA (P - 16)	28,68	21,000	602,28
TOTAL Capítol			00.13.01			602,28

Obra	00	CONSTRUCTIU PARTERRE				
Fase obra	13	JARDINERIA I XARXA DE REG				
Capítol	02	PLANTACIONS I SEMBRES				
Sotscapítol	02	ENJARDINAMENT				

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	FR622C2	U	PLANTACIÓ D'ARBUST O ARBRE DE PETIT FORMAT EN CONTENIDOR D'1,5 A 3 L, EXCAVACIÓ DE CLOT DE PLANTACIÓ DE 30X30X30 CM AMB MITJANS MANUAUS, EN UN PENDENT INFERIOR AL 35%, REBLERT DEL CLOT AMB TERRA DE L'EXCAVACIÓ BARREJADA AMB UN 10% DE COMPOST I PRIMER REG (P - 20)	1,86	120,000	223,20
2	FR3P22RR	M3	SUBMINISTRAMENT I ESTESA DE TERRA PER A LES PLANTACIONS ENTRE UN 1,57 -2,32 % SMS DE MATÈRIA ORGÀNICA, AMB UNA TEXTURA ARENOSA, EXEMPTA DE MATERIALS AMB GRANULOMETRIA SUPERIOR ALS 8 MM, AMB UN PH ENTRE 7,5 I 7,7 I CONTINGUT EN FERTILITZANT A L'ORDRE DE 1-2KG/M3 AXI COM ESTIMULADOR D'ARRELAMENT (1KG/M3). LA TERRA HA D'ESTAR LLUIRE DE PATÒGENS, MALES HERBES I CONTAMINANTS, AMB UNA CONDUCTIVITAT ELÈCTRICA MENOR D'1,2 DSM, SEGONS NTJ 07A, SUBMINISTRADA A GRANEL I ESCAMPADA AMB RETROEXCAVADORA PETITA I MITJANS MANUAUS (P - 17)	34,36	20,000	687,20
3	FR4DN43B	U	SUBMINISTRAMENT D'HERERA HELIX D'ALÇÀRIA DE 125 A 150 CM, EN CONTENIDOR DE 3 L (P - 19)	3,09	120,000	370,80
4	FR3SE254	M2	ENCORNAMENT AMB ESCORÇA DE PI DE 10 A 35 MM, SUBMINISTRADA EN SACS DE 0,8 M3, ESCAMPADA AMB MITJANS MANUAUS EN CAPA UNIFORME DE GRUIX FINS A 10 CM (P - 18)	5,90	40,000	236,00
5	XPAG00X1	P	PARTIDA D'ANY DE GARANTIA DE LA JARDINERIA IMPLANTADA EN OBRA, SEGONS PLEC DE PRESCRIPCIONS TÈCNiques PER AL DISSENY, EXECUCIÓ I MANTENIMENT D'OBRA DE JARDINERIA. (P - 0)	720,00	1,000	720,00

euros

II. Project 1: Outdoor basketball court // Carrer Química (parterre) – 2 of 2

PROJECTE EXECUTIU PER A LA REPAVIMENTACIÓ D UN PARTERRE AL C. QUÍMICA, AL DISTRICTE DE SANTS-MONTJUÍ

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TOTAL	Sotscapítol	00.13.02.02	2.237,20
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Obra	00	CONSTRUCTIU PARTERRE
Fase obra	13	JARDINERIA I XARXA DE REG
Capítol	03	REG
Sotscapítol	01	ELEMENTS ACCESSORIS

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
1	EGPA00R2	U PARTIDA ALÇADA A JUSTIFICAR PER A LA L'ADEQUACIÓ DE LA XARXA EXISTENT. REPARACIÓ I/O REPOSICIÓ DELS ELEMENTS NECESSARIS. (P - 0)	500,00	1,000	500,00

TOTAL	Sotscapítol	00.13.03.01	500,00
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Obra	00	CONSTRUCTIU PARTERRE
Fase obra	24	MESURES CORRECTORES D'IMPACTE AMBIENTAL

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
1	XPAG00F1	U PARTIDA PER A LA GESTIÓ DE RESIDUS PROCEDENTS DE L'EXECUCIÓ DE LES UNITATS DE CONSTRUCCIÓ EN BASE A L'ANNEX DE MEMÒRIA AMBIENTAL I GESTIÓ DE RESIDUS (P - 0)	1.200,00	1,000	1.200,00

TOTAL	Fase obra	00.24	1.200,00
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Obra	00	CONSTRUCTIU PARTERRE
Fase obra	26	SEGURETAT I SALUT

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
1	XPASIS001	PA P.A. DE COBRAMENT INTEGRAL PER LA SEGURETAT I SALUT A TOTA L'OBRA (P - 0)	800,00	1,000	800,00

TOTAL	Fase obra	00.26	800,00
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euros

III. Project 2: Renovation of the main road of Sant Andreu de la Barca – 1 of 3

Projecte de Reurbanització de la Plaça de l'Ajuntament FASE 2
Sant Andreu de la Barca

PRESSUPOST

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Obra	01	Pressupost FASE 2
Capítol	01	ENDERROCS I MOVIMENT DE TERRES
Títol 3	01	ENDERROCS

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
1	F9Z1U010	m Tall de paviments de qualssevol tipus amb disc de diamant (P - 28)	2,55	641,000	1.634,55
2	M219UF63	m2 Fresatge mecànic de paviments asfàltics per cada cm de gruix, amb un gruix de 0 a 6 cm i en encaixos aïllats, amb fresadora de càrrega automàtica i talls i entregues a tapes i raïxes amb compressor, càrrega de runes sobre camió i escombrat i neteja de la superfície fresada (P - 69)	1,11	10.324,000	11.459,64
3	F2191306	m Demolició de vorada col·locada sobre formigó, amb martell trencador muntat sobre retroexcavadora i càrrega manual i mecànica de runa sobre camió o contenidor (P - 1)	3,30	595,000	1.963,50
4	F2194AK5	m2 Demolició de paviment de formigó, de fins a 20 cm de gruix i fins a 2 m d'amplària amb retroexcavadora amb martell trencador i càrrega sobre camió (P - 2)	6,73	201,000	1.352,73
5	F2194JK5	m2 Demolició de paviment de panots col·locats sobre formigó, de fins a 20 cm de gruix i fins a 2 m d'amplària amb retroexcavadora amb martell trencador i càrrega sobre camió (P - 3)	4,94	519,000	2.563,86
6	F2194KK5	m2 Demolició de paviment de mescla bituminosa, de fins a 20 cm de gruix i fins a 2 m d'amplària amb retroexcavadora amb martell trencador i càrrega sobre camió (P - 4)	4,76	765,000	3.641,40
7	F21DQU02	u Demolició d'embornal de 70x30x85 cm, de parets de 30 cm de maó, amb mitjans mecànics i càrrega sobre camió (P - 5)	7,25	14,000	101,50
8	F21R12D0	u Tala controlada estàtica mecànica d'arbre de 10 a 15 m d'alçada, deixant la soca a la vista, aplec de la brossa generada i càrrega sobre camió grua amb pinça, i transport de la mateixa a planta de compostatge (no més lluny de 20 km) (P - 8)	294,78	6,000	1.768,68
9	F21H1A41	u Desmuntatge de llumenera, columna exterior, accessoris i elements de subjecció, de fins a 10 m d'alçada, com a màxim, enderroc de fonament de formigó a mà i amb compressor, aplec per a posterior aprofitament i càrrega manual de runa sobre camió o contenidor (P - 6)	138,12	2,000	276,24
10	F21QQB02	u Retirada d'element superficial com pilones, senyals verticals, topalls, papereres, mobiliari, etc., enderroc de daus de formigó, i càrrega manual i mecànica de l'equipament i la runa sobre camió o contenidor (P - 7)	13,67	16,000	218,72
TOTAL	Títol 3		01.01.01		24.980,82

Obra	01	Pressupost FASE 2
Capítol	01	ENDERROCS I MOVIMENT DE TERRES
Títol 3	02	MOVIMENTS DE TERRES

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
1	F221C620	m3 Excavació i càrrega de terra per a caixa de paviment en terreny de trànsit, amb mitjans mecànics (P - 9)	4,13	312,500	1.290,63
2	F2412020	m3 Transport de terres per a reutilitzar en obra, amb dumper per a transports i temps d'espera per a la càrrega amb mitjans mecànics (P - 13)	2,53	0,000	0,00
3	F2R35069	m3 Transport de terres a instal·lació autoritzada de gestió de residus, amb camió de 12 t i temps d'espera per a la càrrega amb mitjans mecànics, amb un recorregut de més de 10 i fins a 15 km (P - 15)	3,85	312,500	1.203,13
4	F2RA7L00	m3 Deposició controlada a dipòsit autoritzat, amb canó sobre la deposició controlada dels residus de la construcció no inclosos, de residus de terra inerts, procedents d'excavació, amb codi 170504 segons la Llista Europea de Residus (ORDEN MAM/304/2002) (P - 16)	4,68	312,500	1.462,50

EUR

Projecte de Reurbanització de la Plaça de l'Ajuntament FASE 2
Sant Andreu de la Barca

PRESSUPOST

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5	F2A15000	m3	Subministrament de terra adequada d'aportació (P - 14)	5,02	187,500	941,25
TOTAL	Títol 3		01.01.02		4.897,51	

Obra	01	Pressupost FASE 2
Capítol	02	FERMS I PAVIMENTS

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
1	F965A6DD	m Vorada recta de peces de formigó, doble capa, amb secció normalitzada de calçada C3 de 28x17 cm, de classe climàtica B, classe resistent a l'abrasió H i classe resistent a flexió T (R-5 MPa), segons UNE-EN 1340, col·locada sobre base de formigó HM-20/P40II de 25 a 30 cm d'alçada, i rejuntada amb morter M-5 (P - 18)	21,87	727,000	15.899,49
2	F966A6DD	m Vorada corba de peces de formigó, doble capa, amb secció normalitzada de calçada C3 de 28x17 cm, de classe climàtica B, classe resistent a l'abrasió H i classe resistent a flexió T (R-5 MPa), segons UNE-EN 1340, col·locada sobre base de formigó HM-20/P40II de 25 a 30 cm d'alçada, i rejuntada amb morter M-5 (P - 19)	47,71	20,000	954,20
3	F97422A9	m Rigola de 20 cm d'amplària amb peces de morter de ciment color blanc, de 20x20x4 cm, col·locades amb morter de ciment 1:8, elaborat a l'obra amb formigonera de 165 l (P - 20)	9,75	747,000	7.283,25
4	F9E13204	m2 Paviment de panot per a vorera gris, de 20x20x4 cm, classe 1a, preu alt, col·locat a l'estesa amb sorra-ciment de 200 kg/m3 de ciment portland i beurada de ciment portland (P - 24)	22,65	909,000	20.588,85
5	F9365H11	m3 Base de formigó HM-20/B/20I, de consistència tova i grandària màxima del granulat 20 mm, abocat des de camió amb estesa i vibratge manual, amb acabat reglejat (P - 17)	58,70	497,580	29.207,95
6	F9915325	u Escocell de 106x106 cm i 25 cm de fondària, amb 4 peces de morter de ciment de 113x20x7 cm, amb un cantell bisellat, rejuntades amb morter mixt 1:0,5:4, elaborat a l'obra en formigonera de 165 l i col·locat sobre base de formigó HM-20/P10II (P - 23)	67,38	22,000	1.482,36
7	F9H314PE	m2 Paviment de mescla bituminosa discontinua en calent, per a capes de rodadura BBTM, 11A BM3b (F-10) amb betum modificat, reciclat de mescla bituminosa i granulat granític, per a una capa de trànsit de 3 cm de gruix (P - 27)	4,40	3.000,000	13.200,00
8	F9H118E1	t Paviment de mescla bituminosa continua en calent tipus AC 22 surf BC50/70 S (S-20), amb betum millorat amb cauxu, de granulometria semidensa per a capa de rodadura i granulat granític, estesa i compactada (P - 25)	58,26	55,008	3.204,77
9	F9H11AE1	t Paviment de mescla bituminosa continua en calent tipus AC 22 bin BC50/70 D (D-20), amb betum millorat amb cauxu, de granulometria densa per a capa intermèdia i granulat granític, estesa i compactada (P - 26)	58,26	55,008	3.204,77
10	F985V025	m Gual per a vehicles de 60 cm d'amplària amb peces prefabricades planes de formigó de 60x40 cm i amb peces especials extremes, base de formigó i rejuntat amb morter (P - 21)	223,02	6,000	1.338,12
11	F985V030	m Gual peatonal de 120 cm d'amplària amb peces prefabricades de formigó de 60x40 planes, amb peces especials extremes, base de formigó i rejuntat amb morter (P - 22)	187,00	12,000	2.244,00
12	FDG5L201	m Canalització amb prisma tubular format per 2 conductes de tub de PE (AD) DN 110 mm de doble capa segons norma UNE-EN 50086-2-4, protegit amb dau de formigó HM-20, incloent excavació i rebiment de rasa; col·locació de cinta de senyalització, fitxer guia en cada conducte, banda de protecció, manigüets d'unió, càrrega i transport de terres sobrants al gestor de residus o centre de reciclatge a qualsevol distància, amb estesa i compactació si s'escau i taxes d'abocament, incloent mandrinat de mur. Tot inclos completament acabat, segons plans. (P - 42)	18,28	36,000	658,08

EUR

III. Project 2: Renovation of the main road of Sant Andreu de la Barca – 2 of 3

Projecte de Reurbanització de la Plaça de l'Ajuntament FASE 2
Sant Andreu de la Barca

PRESSUPOST

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TOTAL Capítol 01.02 99.265,84

Obra 01 Pressupost FASE 2
Capítol 03 SANEJAMENT

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	FZ226223	m3	Excavació de rasa de fins a 2 m d'amplària i fins a 2 m de fondària, en terreny no classificat, amb retroexcavadora gran i càrrega mecànica del material excavat (P - 10)	8,98	45,000	404,10
2	FZ28B0F	m3	Relímit i piconatge de rasa d'amplària més de 0,6 i fins a 1,5 m, amb material seleccionat de la pròpia excavació, en tongades de gruix de fins a 25 cm, utilitzant picó vibrant, amb compactació del 95 % PM (P - 12)	12,03	37,500	451,13
3	FD7JJ146	m	Claveguera amb tub de paret estructurada, amb paret interna llisa i externa corrugada, de polietilè HDPE, tipus B, àrea aplicació U, de diàmetre nominal exterior 315 mm, de rigidesa anular SN 4 kN/m2, segons la norma UNE-EN 13476-3, unió de maniguets, amb grau de dificultat mitja i col·locat al fons de la rasa (P - 39)	19,80	30,000	594,00
4	FD5J5398	u	Caixa per a embornal de 70x30x85 cm, amb parets de 14 cm de gruix de maó calat, areossada i llicada per durs i esquerdejat per fora amb morter mit 1:0,5:4, elaborat a l'obra amb formigera de 165 l sobre solera de 10 cm de formigó HM-20/P/20/1 (P - 37)	166,82	20,000	3.336,40
5	FD5ZBJC4	u	Reixa fixa, per a embornal de fosa grisa, de 780x380x40 mm i 45 kg de pes i col·locada amb morter (P - 38)	87,40	20,000	1.748,00
6	FDKR0035	u	Arranjament, col·locació a cota i anivellament d'arquetes de clavegueram existents, inclou subministrament de tapa i bastiment tipus igual a l'existent. Tot inclòs completament acabat (P - 45)	261,00	6,000	1.566,00

TOTAL Capítol 01.03 8.099,63

Obra 01 Pressupost FASE 2
Capítol 04 SENYALITZACIÓ I ABALISSAMENT

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	FBA18110	m	Pintat sobre paviment d'una faixa discontinua de 10 cm 1/2, amb pintura reflectora i microesferes de vidre, amb màquina autopropulsada (P - 29)	0,57	1.000,000	570,00
2	FBA1G110	m	Pintat sobre paviment d'una faixa contínua de 10 cm, amb pintura reflectora i microesferes de vidre, amb màquina autopropulsada (P - 30)	0,89	243,000	216,27
3	FBA31110	m2	Pintat sobre paviment de faixes superficials, amb pintura reflectora i microesferes de vidre, amb màquina d'accionament manual (P - 31)	8,94	150,000	1.341,00
4	FBB11241	u	Placa amb làmina reflectora de nivell 1 d'intensitat, circular de 50 cm de diàmetre, per a senyals de trànsit, fixada mecànicament (P - 32)	37,84	2,000	75,68
5	FBB21401	u	Placa amb làmina reflectora de nivell 1 d'intensitat de 40x60 cm, per a senyals de trànsit, fixada mecànicament (P - 33)	74,79	10,000	747,90
6	FBB22721	u	Placa amb pintura no reflectora rectangular de 30x95 cm, per a senyals de trànsit, fixada mecànicament (P - 34)	92,31	2,000	184,62
7	FBB22A11	u	Placa amb pintura no reflectora rectangular de 95x70 cm, per a senyals de trànsit, fixada mecànicament (P - 35)	175,16	2,000	350,32
8	FBB21220	m	Suport rectangular de tub d'acer galvanitzat de 100x50x3 mm, col·locat a terra formigonat (P - 36)	34,60	40,000	1.384,00

TOTAL Capítol 01.04 4.869,79

Obra 01 Pressupost FASE 2

EUR

Projecte de Reurbanització de la Plaça de l'Ajuntament FASE 2
Sant Andreu de la Barca

PRESSUPOST

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Capítol 05 SERVEIS AFECTATS

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
1	FTAD0020	u	Partida alçada a justificar per a imprevistos durant l'execució de les obres (P - 65)	1,000	11.000,00
2	FTAD0030	u	Partida alçada de cobrament íntegre per a la constitució, la senyalització i el manteniment dels desviaments provisionals de trànsit, accessos a les propietats (garatges i accés peatonal), els possibles desplaçaments provisionals de parades bus, etc....durant el desenvolupament de les obres de la FASE 2 (P - 66)	1,000	9.500,00

TOTAL Capítol 01.05 20.500,00

Obra 01 Pressupost FASE 2
Capítol 06 JARDINERIA I REG

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT	
1	FR48F62L	u	Trachycarpus fortunei de 70 a 80 cm d'alçada d'estipit, amb pa de terra amb un diàmetre 20 cm superior al del tronc (P - 59)	75,00	29,000	2.175,00
2	FRBJ2D	u	Subministrament de Pyrus Calleryana de perímetre de 20 a 25 cm, amb pa de terra de diàmetre mínim 67,5 cm i profunditat mínima 47,25 cm segons fórmules NTJ (P - 56)	123,08	22,000	2.707,76
3	FR61246B	u	Plantació d'arbre planifol amb pa de terra o contenidor, de 25 a 35 cm de perímetre de tronc a 1 m d'alçada (a partir del coll de l'arrel), excavació de clot de plantació de 120x120x80 cm amb mitjans mecànics, en un pendent inferior al 25 %, reblert del clot amb terra de l'excavació barrejada amb un 10% de compost i primer reg (P - 61)	54,00	51,000	2.754,00
4	FRZ22A23	u	Aspratge doble d'arbre mitjançant 2 rols de fusta de pi tractada en autoclau de secció circular, de 10 cm de diàmetre i 2,5 m de llargària, clavat al fons del forat de plantació 30 cm, i amb 2 abraçadores regulables de goma o cautxú (P - 63)	25,49	51,000	1.299,99
5	FR4D8211	u	Subministrament de Felicia amelloides en contenidor d'1 l (P - 60)	1,22	770,000	939,40
6	FR662331	u	Plantació d'arbre o arbre de petit format en contenidor de 3 a 5 l, excavació de clot de plantació de 40x40x30 cm amb mitjans manuals, en un pendent inferior al 35 %, reblert del clot amb terra de l'excavació i primer reg (P - 62)	5,07	770,000	3.903,90
7	FR3P2111	m3	Terra vegetal de jardineria de categoria alta, amb una conductivitat elèctrica menor de 0,8 dS/m, segons NTJ 07A, subministrada a granel i escampada amb retroexcavadora mitjana (P - 57)	25,90	160,200	4.149,18
8	FR3PE212	m3	Escorça de pi de 10 a 35 mm, subministrada a granel i escampada amb retroexcavadora petita i mitjans manuals (P - 58)	26,68	53,400	1.424,71
9	F2221J01	m	Excavació amb mitjans mecànics de rasa per a instal·lació de xarxa de reg de 40 cm d'amplària per 60 cm de fondària, reblert i compactació amb terres seleccionades sense pedres de la pròpia excavació, inclòs banda de senyalització. (P - 11)	4,75	300,000	1.425,00
10	FFB20225	m	Conducció de polietilè de 40 mm de diàmetre exterior, de baixa densitat PE-40 i 10 bar de pressió nominal, inclòs subministrament, col·locació, unió i p.p. peces especials. Tot inclòs completament acabat. (P - 46)	3,12	300,000	936,00
11	FDGSU000	m	Canalització amb 1 tub corbale corrugat de polietilè de 63 mm de diàmetre nominal, de doble capa, i dau de recobriment de 40x20 cm amb formigó HM-20/P/20/1 (P - 43)	6,42	320,000	2.054,40
12	FJSSUA10	u	Anella per a reg d'arbres formada per 2,5 m de canonada de 16 mm de degoter íntegrat autocompensant i antiscudor, tipus Unitecline o equivalent, amb un total de 7 unitats de goters de 2,3 l cada 0,33 m. Finalitzada amb tap terminal i collaret de connexió a la xarxa de PPFV amb dos pems. Inclou la protecció amb tub de drenatge de 50 mm i el	11,59	30,000	347,70

EUR

III. Project 2: Renovation of the main road of Sant Andreu de la Barca – 3 of 3

Projecte de Reurbanització de la Plaça de l'Ajuntament FASE 2
Sant Andreu de la Barca

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soterrament a 15 cm (P - 51)

TOTAL	Capitol	01.06			24.117,04
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Obra	01	Presupost FASE 2			
Capitol	07	ENLLUMENAT			

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
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1	F22262Z3	m3	Excavació de rasa de fins a 2 m d'amplana i fins a 2 m de fondaria, en terreny no classificat, amb retroexcavadora gran i càrrega mecànica del material excavat (P - 10)	8,98	72,960	655,18
2	F228AB0F	m3	Rebliment i piconatge de rasa d'amplaria més de 0,6 i fins a 1,5 m, amb material seleccionat de la pròpia excavació, en tongades de gruix de fins a 25 cm, utilitzant picó vibrat, amb compactació del 95 % PM (P - 12)	12,03	48,640	585,14
3	FDG50210	m	Canalització per a enllumenat públic, inclosa excavació, sorra, tub de PEAD de DN 110 mm, lamina de plàstic per a senyalització i rebellit compactat de rases. Tot inclòs completament acabat, segons plànols. (P - 40)	8,37	310,000	2.594,70
4	FDG50220	m	Canalització d'enllumenat públic per a pas de calçada inclosa excavació, formigó, tub de PEAD de DN 110 mm, lamina de plàstic per a senyalització i rebellit compactat de rases. Tot inclòs completament acabat, segons plànols. (P - 41)	18,06	60,000	1.083,60
5	FG310015	m	Conductor de coure armat tipus RVFV 0,6/1 kV, secció 4x6 mm2. Inclou subministrament i col·locació. Tot inclòs. (P - 47)	4,56	50,000	228,00
6	FG310020	m	Conductor de coure armat tipus RVFV 0,6/1 kV, secció 4x10 mm2. Inclou subministrament i col·locació. Tot inclòs. (P - 48)	5,79	20,000	115,80
7	FG380020	m	Cable nu de coure de 35 mm2 de secció per a xarxa d'enllumenat. Inclou connexions i proves, subministrament i col·locació. Tot inclòs. (P - 49)	5,14	50,000	257,00
8	FDKR0030	u	Arranjament, col·locació a cota i anivellament d'arquetes d'enllumenat existents, inclou subministrament de tapa i bastiment tipus igual a l'existent. Tot inclòs completament acabat. (P - 44)	128,77	10,000	1.287,70
9	FHM32N8B	u	Muntatge en nova ubicació de bacul existent, de 10 m d'alçària i 1,5 m de sortint, d'un braç amb base platina i porta, segons norma UNE-EN 40-5, col·locat sobre dau de formigó. Inclou la part proporcional de treballs d'obra civil (P - 50)	431,54	2,000	863,08

TOTAL	Capitol	01.07			7.670,20
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Obra	01	Presupost FASE 2			
Capitol	08	MOBILIARI URBA			

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
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1	FQ211112	u	Paperera trabucable de 31 cm de diàmetre, de planxa pintada d'1 mm de gruix, amb base perforada i suports de 50x20x1,5 mm, ancorada amb dau de formigó (P - 54)	88,69	8,000	709,52
2	FQ42F025	u	Pilona de fosa amb protecció antioxidant i pintura de color negre forja, de forma cilíndrica, de 1000 mm d'alçària i 95 mm de diàmetre, ancorada amb dau de formigó (P - 55)	66,15	15,000	992,25
3	FQ11U607	u	Banc tipus Neobarmino de 180cm de llargada de Fundició Benito o equivalent formada per 6 taulons de 110x35 de fusta tropical tractada amb Lignus, protector fungicida, insecticida i hidròfuga, amb suports de fosa i cargols d'acer inoxidable. Inclòs daus de formigó (P - 52)	218,90	9,000	1.970,10
4	FQ11UC45	u	Cadira tipus Neobarmino de 70cm de llargada de Fundició Benito o equivalent formada per 6 taulons de 110x35 de fusta tropical tractada amb Lignus, protector fungicida, insecticida i hidròfuga, amb suports de fosa i cargols d'acer inoxidable. Inclòs daus de formigó (P - 53)	147,13	5,000	735,65

EUR

Projecte de Reurbanització de la Plaça de l'Ajuntament FASE 2
Sant Andreu de la Barca

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TOTAL	Capitol	01.08			4.407,52
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Obra	01	Presupost FASE 2			
Capitol	09	SEGURETAT I SALUT			

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
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1	FTAD1200	u	Seguretat i Salut (P - 68)	4.650,00	1,000	4.650,00
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TOTAL	Capitol	01.09			4.650,00
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Obra	01	Presupost FASE 2			
Capitol	10	GESTIO DE RESIDUS			

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
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1	FTAD0010	u	Gestió de Residus (P - 64)	3.650,00	1,000	3.650,00
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TOTAL	Capitol	01.10			3.650,00
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Obra	01	Presupost FASE 2			
Capitol	11	VARIS			

NUM. CODI	UA	DESCRIPCIÓ	PREU	AMIDAMENT	IMPORT
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1	FTAD0040	u	Partida alçada de cobrament íntegre per a la realització del Control de Qualitat durant l'execució de les obres de la FASE 2	3.120,00	1,000	3.120,00
			(P - 67)			


TOTAL	Capitol	01.11			3.120,00
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EUR

Appendix 4: Successful offers

I. Project 1: Outdoor basketball court

a) CITELUM (lighting items)


				Delegació Barcelona C/Motors, 170 Zona Franca 08038, Barcelona Tel 93 289 72 01 - Fax 93 223 90 12		VALORACIÓ								
<table border="1"> <thead> <tr> <th>DATA</th> <th>Nº VALORACIÓ</th> <th>Nº REV</th> <th>PÀGINA</th> </tr> </thead> <tbody> <tr> <td>21/03/2018</td> <td>V18-027-BCN</td> <td>0</td> <td>1 de 1</td> </tr> </tbody> </table>				DATA	Nº VALORACIÓ		Nº REV	PÀGINA	21/03/2018	V18-027-BCN	0	1 de 1	Client: CIVIL STONE	
DATA	Nº VALORACIÓ	Nº REV	PÀGINA											
21/03/2018	V18-027-BCN	0	1 de 1											
NOM OBRA / POBLACIÓ				Contacte: Pau de la Cruz Telèfon: 639905261 e-mail: paudelacruz@civilstone.es										
Nom obra: Pista bàsquet Jardins Can Ferrero Població: BARCELONA														
PARTIDA	UNITAT	QUANTITAT	CONCEPTE	PREU UNITARI	IMPORT									
1	M	424,5	CABLE AMB CONDUCTOR DE COURE DE 0,6/1 KV DE TENSIÓ ASSIGNADA, AMB DESIGNACIÓ RVFV, TETRAPOLAR, DE SECCIÓ 4X6 MM2, AMB ARMADURA DE FLEIX D'ACER I COBERTA DEL CABLE DE PVC, COL·LOCAT EN TUB	5,21 €	2.211,65 €									
2	M	424,5	SUBMINISTRE DE CONDUCTOR DE COURE NU, UNIPOLAR D'1X35 MM2	2,94 €	1.248,03 €									
3	PA	1	PARTIDA ALÇADA A JUSTIFICAR PER A LA L'ADEQUACIÓ DE LA XARXA EXISTENT PER TAL QUE QUEDI TOT CONNECTAT ALS ARMARIS EXISTENTS	S/V	S/V									
4	PA	1	PARTIDA ALÇADA A JUSTIFICAR PER A LA LEGALITZACIÓ DE LES INSTAL·LACIONS ELÈCTRIQUES D'ENLLUMENAT DAVANT ORGANISMES OFICIALS.	750,00 €	750,00 €									
5	PA	1	PARTIDA ALÇADA A JUSTIFICAR PER A LA VERIFICACIÓ I FITXA INFORMÀTICA	INCLÒS	INCLÒS									
6	PA	1	PARTIDA ALÇADA A JUSTIFICAR PER A L'ENLLUMENAT PROVISIONAL D'OBRA	S/V	S/V									
7	PA	1	PARTIDA ALÇADA A JUSTIFICAR PER LES MESURES LUMÍNiques AMB I SENSE REGULACIÓ, FACTOR DE POTÈNCIA DE LA INSTAL·LACIÓ D'ENLLUMENAT FINALITZAT	INCLÒS	INCLÒS									
8	U	2	COLUMNA CILÍNDRICA TIPUS PRIM, DE 10.00 M D'ALÇÀRIA, CORONAMENT SENSE PLATINA, AMB BASE PLATINA I PORTELLES, AMB ACABAT ANTIGRAFITALS 3 M INFERIORS, COL·LOCADA SOBRE DAU DE FORMIGÓ. INCLOU INSTAL·LACIÓ DE PRESA DE TERRA, INSTAL·LACIÓ ELÈCTRICA COMPLETA DE L'INTERIOR	2.191,73 €	4.383,46 €									
9	U	4	PROJECTOR LED ATMX. 8000 LUMNENS 3000°K UNA LINEA SIN PROGRAMACIÓ C-PROTECCIÓ OBRENTENSIONES	411,50 €	1.646,00 €									
10	U	8	PROJECTOR LED TMX. 20000 LUMNENS 3000°K UNA LINEA SIN PROGRAMACIÓ C-PROTECCIÓ SOBRETENSIONES	580,25 €	4.642,00 €									
				SUMA:	14.881,14 €									
TOTAL VALORACIÓ				14.881,14 €										
NOTA				CONFORMITAT CITELUM										
* Per formalitzar la valoració, caldrà la realització del pressupost amb els amidaments i preus finals. * Valoració subjecta a variació de projecte * Validesa de la valoració 30 dies * AQUESTA VALORACIÓ NO INCLOU CAP TREBALL D'OBRA CIVIL NI CAP DESPESA A COMPANYIA O PUNT DE SERVEI. * Imports inferiors a 3.000€: PAGAMENT ANTICIPAT A: ES47 2013 0628 4802 0059 9965 Enviar justificant de pagament a: joller@citelum.es - areyes@citelum.es - mreina@citelum.es * Imports sense IVA * AL TRES ACORDS:				Atentament Josep Lluís Gómez Cap Delegació Barcelona										

Doc.7ZZ.06 Rev.0
 CITELUM IBERICA S.A. Ronda Universitat,16 08007 Barcelona - Telèfon: +34 934 591 444 - Fax: +34 932 077 198 - www.citelum.es
 Reg. Merc. Barcelona. Tomo 24179. Folio 124. Hoja nº. B-67164. Insc. 10ª - C.I.F. A-59087361



De conformitat amb el que estableix la Llei Orgànica 15/1999 de Protecció de Dades de Caràcter Personal, informem que les dades personals seran incorporades a un fitxer automatitzat sota la responsabilitat de CITELUM IBERICA SA, amb la finalitat de poder atendre els compromisos derivats de la relació que mantenim amb vostè. Pot exercir els seus drets d'accés, rectificació, cancel·lació i oposició mitjançant un escrit a l'adreça: RONDA UNIVERSITAT N º 16 BAIXOS 08007 BARCELONA. Si en el període de 30 dies no ens comunica el contrari, entendrem que les seves dades no han estat modificades, que es compromet a notificar-nos qualsevol variació i que tenim el consentiment per a procedir al tractament d'acord a la finalitat indicada anteriorment.



b) FORMIGONS TENES (concrete HM-30)



TARIFA PREUS m3/2018

CLIENT: CIVIL STONE At/Sr./a Pau	OBRA: Pista bàsquet / Jardins can Ferrero-Sants Data oferta: 15/03/2018 * Volum aprox. 165m3
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Bonificació: -25,50€/m3 Preu/Tarifa	Oferta: MFT-18089	Comercial: David Viñas.
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EHE-08 Nw/mm2	Preu/Tarifa	A-12	F	L	B. Estàtica	Paviment/Bomba/Mur	Iib	IIIa	IV	Qa	Qb	Qc
HM20/B/20/I	87,50 €	3 €	3 €	6 €	5 €	2 €	-	-	-	-	-	-
HA25/B/20/I-IIa	90,50 €	3 €	3 €	6 €	5 €	2 €	3 €	3 €	-	-	-	-
HA30/B/20/I-IIa	95,50 €	3 €	3 €	6 €	5 €	2 €	-	-	4 €	4 €	5 €	5 €
HA35/B/20/I-IIa	100,50 €	3 €	3 €	6 €	5 €	2 €	-	-	4 €	4 €	5 €	5 €
HA40/B/20/I-IIa	105,50 €	3 €	3 €	6 €	5 €	2 €	-	-	4 €	4 €	5 €	5 €

EH-91 Kg/cm2

H75/B/20	82,50 €	3 €	3 €	6 €	-	-	-	-	-	-	-	-
H100/B/20	83,50 €	3 €	3 €	6 €	-	-	-	-	-	-	-	-
H125/B/20	84,50 €	3 €	3 €	6 €	-	-	-	-	-	-	-	-
H150/B/20	85,50 €	2 €	2 €	6 €	-	2 €	-	-	-	-	-	-
H175/B/20	86,50 €	3 €	3 €	6 €	5 €	2 €	-	-	-	-	-	-

OFERTES ESPECIALS: HM-30/P/20/I+E.....65€/m3

DOSIFICACIONS DM/DH (Mortor/Formigó) per kg. ciment/m3							
D50	79,50 €	D125	82,50 €	D200	85,50 €	D275	90,00 €
D75	80,50 €	D150/HL150	83,50 €	D225	86,50 €	D300	92,50 €
D100	81,50 €	D175	84,50 €	D250	87,50 €	D325	95,00 €
D350	97,50 €	D375	100,50 €	D400	105,00 €		

TARIFA PREUS - Saques/Big-Bag		DOSIFICACIONS DM/DH (Mortor/Formigó) per kg. ciment/m3							
DBB-100	64,50€/BB	DBB-175	67,50€/BB	DBB-250	72,50€/BB	DBB-325	78,50€/BB	DBB-400	84,50€/BB
DBB-125	65,50€/BB	DBB-200	68,50€/BB	DBB-275	74,50€/BB	DBB-350	80,50€/BB	DBB-425	86,50€/BB
DBB-150	66,50€/BB	DBB-225	70,50€/BB	DBB-300	76,50€/BB	DBB-375	82,50€/BB	DBB-450	88,50€/BB

* Preus per saques (BB) plenes a planta.
 * Formigons Tenes, S.L. No es fa responsable del producte ensacat ni de les característiques del mateix, un cop estigui retirat de planta pel client.

♦ **OBSERVACIONS/SUPLEMENTS:**

- El subministra en dissabte te un increment de **50,00 €/per viatge**. L'horari serà de 7:30h. - 13:00h.
- Transport: per carregues incompletes es cobrarà un suplement de: **15,00 €/m3, fins a 6m3.**
- A partir dels 90 minuts de sortida de planta, per cada fracció de ½ hora mes, es cobraran: **29,00 €.**
- Fibra Polipropilè 600gr./m3: **4,00 €/m3.** Per altres tipus de fibres i/o dosificacions d'altres additius, consultar preus.
- Per formigons amb ciment SR, s'haurà de sol·licitar preu i disponibilitat prèvia...
- Per pluja es parará el subministrament a no ser que rebem l'ordre contrari del client.
- La tarifa és vàlida dins l'horari laboral 7:30h.-19:00h. de dilluns-divendres. Pels subministres fora d'aquest horari consultar suplement.
- **LA VALIDESA MÀXIMA DE LA TARIFA SERÀ FINS: 30/08/2018, o nova revisió, quedant supeditada a partir d'aquesta data, a una possible pujada en el preu del ciment/transport; en tal cas, s'haurà d'aplicar o repercutir la mateixa ens els preus d'aquesta oferta i que podria estar aproximadament entre 3,00€-4,00€/m3.**
- Les condicions i acord de venda d'aquesta tarifa, prevalen a les de qualsevol contracte aliè anterior o posterior, conjuntament amb la validesa del mateix, amb un termini màxim de 15 dies per acceptar-les des de data oferta. * Aquesta tarifa anul·la les anteriors.
- **FORMA DE PAGAMENT:** Tots els pagaments superiors a 60 dies, son sota sol·licitud expressa del client i estem exempts de responsabilitat.

> PAGAMENT: A concretar (Prèvia autorització del dept.financer)

-No s'accepten retencions-

*-- En el cas d'efecte acceptat, taló, pagaré, confirmen, etc... els documents hauran d'estar al nostre abast com a màxim a 30 dies naturals respecta a la data de la factura, de no ser així, ens veurem amb el dret d'aturar el subministrament fins que la situació es regularitzi. No s'acceptarà l'ajornament del pagament per motius de vacances, inventaris, dies de no pagament, validació per data d'entrada i/o, vist i plau factures. *-- En els preus d'aquesta tarifa s'aplicarà el IVA corresponent. (21%)

*-- Es recorda en aquest document que, en cas d'incompliment de la forma de pagament, s'incorre en l' il·legalitat d'aplicació de la llei 15/2010, Lluita Morositat Operacions Comercials i sentència 23/11/2016 del TS sobre "Plazos de Pago", interès de Demora de Pagament segons art.9 de la llei 3/2004 del 8%.

*-- Per a totes les qüestions que puguin derivar-se de la interpretació, execució i compliment del present contracte (en especial per a tota controvèrsia relacionada amb el pagament de les factures que s'emetin com a conseqüència de la present relació contractual), les parts i amb renúncia expressa al fur judicial que, si escau li pogués correspondre per raó del seu domicili social, es sotmeten a la jurisdicció i competència dels Tribunals de Mollet del Vallès.


El Comprador:

-signatura i segell-



1ª Pág. /Oferta tarifa hormigones.
 2ª Pág. /Oferta tarifa bombeos.
 3ª Pág. /Accesos a obra, Protección de datos y Ley contra morosidad.
Las tres páginas están vinculadas como un único documento a aceptar atendiendo que la firma de una de ellas acepta la tercera.

II. Project 2: Renovation of the main road of Sant Andreu de la Barca

a) FORMIGONS TENES (concrete HM-20)



TARIFA PREUS m3/2018

CLIENT: CIVIL STONE
At/Sr./a Pau

OBRA: Plaça Ajuntament F2 / Sant Andreu de la Barca
Data oferta: 11/06/2018 * **Volum aprox.** 497m3

Bonificació: -30,50€/m3 Preu/Tarifa **Oferta: MFT-18101** **Comercial: David Viñas.**

EHE-08 Nw/mm2	Preu/Tarifa	A-12	F	L	B. Estàtica	Paviment/Bomba/Mur	I Ib	IIIa	IV	Qa	Qb	Qc
HM20/B/20/I	87,50 €	3 €	3 €	6 €	5 €	2 €	-	-	-	-	-	-
HA25/B/20/I-IIa	90,50 €	3 €	3 €	6 €	5 €	2 €	3 €	3 €	-	-	-	-
HA30/B/20/I-IIa	95,50 €	3 €	3 €	6 €	5 €	2 €	-	-	4 €	4 €	5 €	5 €
HA35/B/20/I-IIa	100,50 €	3 €	3 €	6 €	5 €	2 €	-	-	4 €	4 €	5 €	5 €
HA40/B/20/I-IIa	105,50 €	3 €	3 €	6 €	5 €	2 €	-	-	4 €	4 €	5 €	5 €
EH-91 Kg/cm2												
H75/B/20	82,50 €	3 €	3 €	6 €	-	-	-	-	-	-	-	-
H100/B/20	83,50 €	3 €	3 €	6 €	-	-	-	-	-	-	-	-
H125/B/20	84,50 €	3 €	3 €	6 €	-	-	-	-	-	-	-	-
H150/B/20	85,50 €	2 €	2 €	6 €	-	2 €	-	-	-	-	-	-
H175/B/20	86,50 €	3 €	3 €	6 €	5 €	2 €	-	-	-	-	-	-

OFERTES ESPECIALS: HM-20P/20I....57€/M3

DOSIFICACIONS DM/DH (Mortor/Formigó) per kg. ciment/m3									
D50	79,50 €	D125	82,50 €	D200	86,50 €	D275	90,00 €	D350	97,50 €
D75	80,50 €	D150/HL150	83,50 €	D225	86,50 €	D300	92,50 €	D375	100,50 €
D100	81,50 €	D175	84,50 €	D250	87,50 €	D325	95,00 €	D400	105,00 €

TARIFA PREUS - Saques/Big-Bag									
DBB-100	64,50€/BB	DBB-175	67,50€/BB	DBB-250	72,50€/BB	DBB-325	78,50€/BB	DBB-400	84,50€/BB
DBB-125	65,50€/BB	DBB-200	68,50€/BB	DBB-275	74,50€/BB	DBB-350	80,50€/BB	DBB-425	86,50€/BB
DBB-150	66,50€/BB	DBB-225	70,50€/BB	DBB-300	76,50€/BB	DBB-375	82,50€/BB	DBB-450	88,50€/BB

* Preus per saques (BB) plenes a planta.
 * Formigons Tenes, S.L. No es fa responsable del producte ensacat ni de les característiques del mateix, un cop estigui retirat de planta pel client.

OBSERVACIONS/SUPLEMENTS:
 • El subministra en dissabte te un increment de **50,00 €/per viatge**. L'horari serà de 7:30h. - 13:00h.
 • **Transport: per carregues incompletes** es cobrarà un suplement de: **15,00 €/m3, fins a 6m3.**
 • **A partir dels 90 minuts** de sortida de planta, per cada fracció de ½ hora mes, es cobraran: **29,00 €.**
 • **Fibra Polipropilè 600gr./m3: 4,00 €/m3.** Per altres tipus de fibres i/o dosificacions d'altres additius, consultar preus.
 • **Per formigons amb ciment SR, s'haurà de sol·licitar preu i disponibilitat prèvia...**
 • **Per pluja** es parará el subministrament a no ser que rebem l'ordre contrària del client.
 • **La tarifa es vàlida dins l'horari laboral 7:30h.-19:00h. de dilluns-divendres.** Pels subministres fora d'aquest horari consultar suplement.
 • **LA VALIDESA MÀXIMA DE LA TARIFA SERÀ FINS: 30/09/2018, o nova revisió, quedant supeditada a partir d'aquesta data, a una possible pujada en el preu del ciment/transport: en tal cas, s'haurà d'aplicar o repercutir la mateixa ens els preus d'aquesta oferta i que podria estar aproximadament entre 3,00€-4,00€/m3.**
 • **Les condicions i acord de venda d'aquesta tarifa, prevalen a les de qualsevol contracte aliè anterior o posterior, conjuntament amb la validesa del mateix, amb un termini màxim de 15 dies per acceptar-les des de data oferta.** * Aquesta tarifa anul·la les anteriors.
 • **FORMA DE PAGAMENT:** Tots els pagaments superiors a 60 dies, son sota sol·licitud expressa del client i estem exempts de responsabilitat.

> PAGAMENT: A concretar (Prèvia autorització del dept.financer)

-No s'accepten retencions-

*- En el cas d'efecte acceptat, taló, pagaré, confirmen, etc... els documents hauran d'estar al nostre abast com a màxim a 30 dies naturals respecta a la data de la factura, de no ser així, ens veurem amb el dret d'aturar el subministrament fins que la situació es regularitzi. No s'acceptarà l'ajornament del pagament per motius de vacances, inventaris, dies de no pagament, validació per data d'entrada i/o, vist i plau factures. *- En els preus d'aquesta tarifa s'aplicarà el IVA corresponent. (21%)
 *- Es recorda en aquest document que, en cas d'incompliment de la forma de pagament, s'incorre en l' il·legalitat d'aplicació de la llei 15/2010, Lluita Morositat Operacions Comercials i sentència 23/11/2016 del TS sobre "Plazos de Pago", interès de Demora de Pagament segons art. 9 de la llei 3/2004 del 8%.
 *- Per a totes les qüestions que puguin derivar-se de la interpretació, execució i compliment del present contracte (en especial per a tota controvèrsia relacionada amb el pagament de les factures que s'emetin com a conseqüència de la present relació contractual), les parts i amb renúncia expressa al fur judicial que, si escau li pogués correspondre per raó del seu domicili social , es sotmeten a la jurisdicció i competència dels Tribunals de Mollet del Vallès.

El Comprador:

-signatura i segell-

1ª Pág. /Oferta tarifa hormigones.

2ª Pág. /Oferta tarifa bombeos.

3ª Pág. /Accesos a obra, Protección de datos y Ley contra morosidad.

Las tres páginas están vinculadas como un único documento a aceptar atendiendo que la firma de una de ellas acepta la tercera.

1/3

b) ASFALTOS BARCINO (bituminous mixture)



ASFALTOS BARCINO

C/ Mossen Josep Pons, 1, 2ª planta, oficina 15
08228 FONTS VES (TERRASSA)

TELEF: 93 351 38 82 FAX: 93 408 01 90

N.I.F.: B66533456

CIVIL STONE S.L

CL MARCONI 59 P B J

08191 RUBI

BARCELONA - ESPAÑA

FECHA	PRESUP.	CLIENTE	N.I.F.	TELÉFONO	PÁG.
25/06/18	1800625	43000013	B65349623		1

UD.	DESCRIPCIÓN	MEDICIÓN	PRECIO	IMPORTE
-----	-------------	----------	--------	---------

OBRA: PLAÇA AJUNTAMENT - ST. ANDREU DE LA BARCA.

m2.	3cms BBTM 11A PMB 45/80-65 (F10gtc BM)	3.000,000	6,250	18.750,00
tn.	AC22 BIN B 50/70 D.	55,008	77,000	4.235,62
tn.	AC22 BIN B 50/70 S.	55,008	69,000	3.795,55

TOTAL IMP.	%	IMPORTE	BASE	%	IVA	TOTAL
26.781,17			26.781,17	21,00	5.624,05	32.405,22 €

CONDICIONES GENERALES:

Precios calculados para ejecución continua y con camiones tipo bañera, en días laborables de Lunes a Viernes. *Si existen sobre-espesores por causa de la mala nivelación en la superficie sobre la que se aplica el aglomerado, correrán a cargo de Uds. * En capas de espesor igual o inferior a 6 cm. la compactación será igual o inferior al 95% del Ensayo Marshall. * **FORMA DE PAGO: Mediante confirmación a 90 días. * **RETENCIÓN: No se contempla.** * **REVISIÓN DE PRECIOS: Oferta sujeta a la variación de los productos petrolíferos.** * Sobre estos precios se aplicará el 21% en concepto de I.V.A. * **VALDEZ DE LA OFERTA: 1 mes.** * Si esta oferta es de su interés, rogamos nos la remitan aceptada por e-mail. *La conformidad de la oferta es imprescindible para la ejecución de los trabajos. * ASFALTOS BARCINO, S.L. no se responsabiliza de deterioros producidos en la obra ejecutada consecuencia de defectos en la construcción o características resistentes de las capas o terrenos subyacentes a los del firme o pavimentación ofertado.**

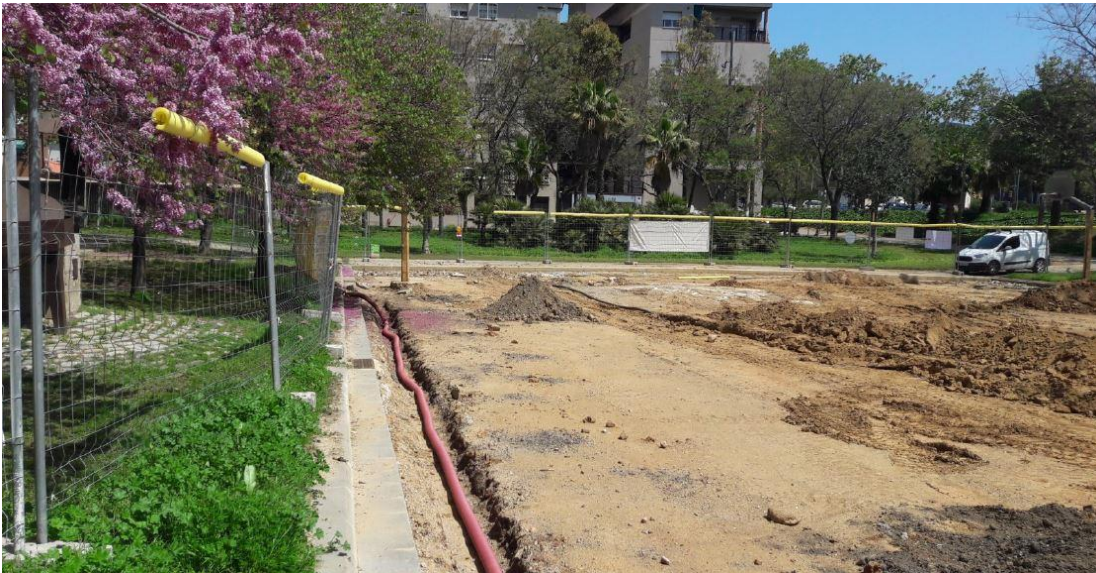
De conformidad con lo que establece la Ley Orgánica 15/1999 de Protección de Datos de Carácter Personal, le informamos que sus datos personales serán incorporados a un fichero bajo la responsabilidad de ASFALTOS BARCINO S.L., con la finalidad de poder atender los compromisos derivados de la relación que mantenemos con usted. Puede ejercer sus derechos de acceso, cancelación, rectificación y oposición mediante un escrito a la dirección: C/Mossen Josep Pons, 1, 2ª planta, oficina 15-08228-Terrassa. Si en el periodo de 30 días no nos comunica lo contrario, entenderemos que sus datos no han sido modificados, que se compromete a notificarnos cualquier variación y que tenemos su consentimiento para tratarlos a fin de poder tramitar su facturación.

Appendix 5: Photographic report

I. Project 1: Outdoor basketball court

- *Jardins de Can Ferrero* (basketball court)

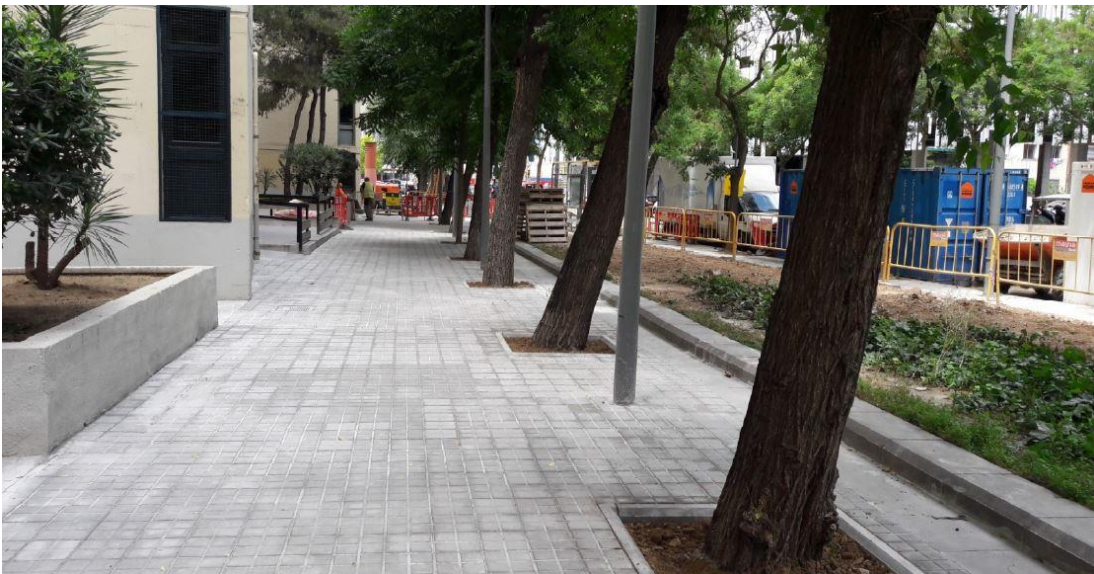






- Carrer Química (parterre)







II. Project 2: Renovation of the main road of Sant Andreu de la Barca











Appendix 6: Project certifications

I. Project 1: Outdoor basketball court // Jardins de Can Ferrero (basketball court)

PROJECTE EXECUTIU PER LA CONSTRUCCIÓ D'UNA PISTA DE BÀSQUET EXTERIOR
ALS JARDINS DE CAN FERRERO AL DISTRICTE DESANTS-MONTJUIC

NºExpedient: 900.1619.109 Adjudicatari: CIVILSTONE S.L

RESUM DE LA CERTIFICACIÓ			Data: 01/10/18	Pàgina: 1		
Certificació nº 4	Data certificació: 01/10/18	Inici: 16/06/18	Tancament: 15/07/18			
NIVELL	CODI	DESCRIPCIÓ	PRESSUPOST	IMP.ACUM. CERT Nº3	IMP.CERT. MENS Nº 4	IMP.ACUM. CERT Nº4
NIVELL 4: Sotscapitol						
Sotscapitol	00.05.02.02	PISTA	22.746,20	19.721,23	0,00	19.721,23
Capítol	00.05.02	NOVAIMPLANTACIÓ	22.746,20	19.721,23	0,00	19.721,23
NIVELL 3: Capítol						
Capítol	00.05.01	ENDERROCS	571,97	2.313,96	0,00	2.313,96
Capítol	00.05.02	NOVAIMPLANTACIÓ	22.746,20	19.721,23	0,00	19.721,23
Fase obra	00.05	FERMS I PAVIMENTS	23.318,17	22.035,19	0,00	22.035,19
Capítol	00.06.01	ELEMENTS	4.010,00	2.005,00	0,00	2.005,00
Fase obra	00.06	MOBILIARI ESPORTIU	4.010,00	2.005,00	0,00	2.005,00
NIVELL 2: Fase obra						
Fase obra	00.01	TREBALLS PREVIS	353,57	353,57	0,00	353,57
Fase obra	00.02	MOVIMENTS DE TERRES GENERAL	6.907,81	4.346,57	0,00	4.346,57
Fase obra	00.03	ENLLUMENAT	22.797,96	19.002,92	2.500,00	21.502,92
Fase obra	00.04	CLAVEGUERAM	1.064,14	1.064,14	0,00	1.064,14
Fase obra	00.05	FERMS I PAVIMENTS	23.318,17	22.035,19	0,00	22.035,19
Fase obra	00.06	MOBILIARI ESPORTIU	4.010,00	2.005,00	0,00	2.005,00
Fase obra	00.07	GESTIO DE RESIDUS	1.754,37	0,00	0,00	0,00
Fase obra	00.08	SEGURETAT I SALUT	1.600,00	1.600,00	0,00	1.600,00
Fase obra	00.09	PREUS CONTRADICTORIS	0,00	11.183,65	3.757,00	14.940,65
Obra	00	EXECUTIU PISTES BÀSQUET	61.806,02	61.591,04	6.257,00	67.848,04
NIVELL 1: Obra						
Obra	00	EXECUTIU PISTES BÀSQUET	61.806,02	61.591,04	6.257,00	67.848,04
Obra			61.806,02	61.591,04	6.257,00	67.848,04
IMPORT TOTAL PRESSUPOST			61.806,02 €			
DIFERENCIA ENTRE PRESSUPOST I TOTAL CERTIFICAT			-6.042,02 €			
IMPORT TOTAL ACUMULAT CERTIFICACIÓ NÚMERO 4					67.848,04	€
IMPORT TOTAL ACUMULAT CERTIFICACIÓ NÚMERO 3					61.591,04	€
IMPORT TOTAL CERTIFICACIÓ NÚMERO 4					6.257,00	€

PROJECTE EXECUTIU PER LA CONSTRUCCIÓ D'UNA PISTA DE BÀSQUET EXTERIOR
ALS JARDINS DE CAN FERRERO AL DISTRICTE DESANTS-MONTJUIC
NºExpedient: 900.1619.109 Adjudicatari: CIVILSTONE S.L

FULL DE FACTURACIÓ

Certificació Nº: 4 Data certificació:01/10/18

Inici: 16/06/18

Tancament: 15/07/18

Certificació Actual

IMPORT D'EXECUCIÓ MATERIAL CERTIFICAT A ORIGEN.....	67.848,04
13,00 % Despeses Generals SOBRE 67.848,04.....	8.820,25
6,00 % Benefici Industrial SOBRE 67.848,04.....	4.070,88
IMPORT DE CONTRACTE ACUMULAT.....	80.739,17

Certificació Anterior

IMPORT DE CONTRACTE ACUMULAT DE CERTIFICACIÓ ANTERIOR.....	73.293,34
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Certificació Mensual

IMPORT CERTIFICACIÓ ACTUAL MENSUAL (80.739,17 - 73.293,34).....	7.445,83
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IMPORT A FACTURAR PER L'ADJUDICATARI EN LA CERTIFICACIÓ Nº 4	€	7.445,83
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(Aplicació de l'article 85.f de la Llei de l'IVA sobre subjecte passiu)

(SET MIL QUATRE-CENTS QUARANTA-CINC EUROS AMB VUITANTA-TRES CÈNTIMS)

El Promotor de les Obres

El Promotor de les Obres

Ernest Santolaria Fominaya
Director Tècnic
Departament d'infraestructures - BIM/SA

Esteve Piazuolo Làzaro
Director Tècnic Adjunt
Departament d'infraestructures - BIM/Si

El Director de les Obres

El Contractista

Marc Ventós Lario
Enginyer Industrial
Col·legiat nº13.066

Fernando Ares Marquina
CIVILSTONE SL

II. Project 1: Outdoor basketball court // Carrer Química (parterre)

PROJECTE EXECUTIU PER A LA REPAVIMENTACIÓ D'UN PARTERRE AL C. QUÍMICA, AL DISTRICTE DE SANTS-MONTJUÏ
 N°Expedient: 900.1619.109 Adjudicatari: CIVILSTONE S.L

RESUM DE LA CERTIFICACIÓ

Data : 01/10/18

Pàgina: 1

Certificació n° 4

Data certificació: 01/10/18

Inici: 16/06/18

Tancament: 15/07/18

NIVELL	CODI	DESCRIPCIÓ	PRESSUPOST	IMPACUM. CERT N°3	IMP.CERT. MENS N° 4	IMPACUM. CERT N°4
NIVELL 4: Sotscapítol						
Sotscapítol	00.10.02.02	VORERES	17.553,68	18.122,19	0,00	18.122,19
Capítol	00.10.02	NOVA IMPLANTACIÓ	17.553,68	18.122,19	0,00	18.122,19
Sotscapítol	00.13.02.02	ENJARDINAMENT	1.890,37	608,57	145,15	753,72
Capítol	00.13.02	PLANTACIONS I SEMBRES	1.890,37	608,57	145,15	753,72
Sotscapítol	00.13.03.01	ELEMENTS ACCESSORIS	500,00	768,46	0,00	768,46
Capítol	00.13.03	REG	500,00	768,46	0,00	768,46
NIVELL 3: Capítol						
Capítol	00.10.01	ENDERROCS	3.904,56	3.582,66	721,93	4.304,59
Capítol	00.10.02	NOVA IMPLANTACIÓ	17.553,68	18.122,19	0,00	18.122,19
Fase obra	00.10	FERMS I PAVIMENTS	21.458,24	21.704,85	721,93	22.426,78
Capítol	00.13.01	AFECTACIONS	508,83	508,83	0,00	508,83
Capítol	00.13.02	PLANTACIONS I SEMBRES	1.890,37	608,57	145,15	753,72
Capítol	00.13.03	REG	500,00	768,46	0,00	768,46
Fase obra	00.13	JARDINERIA I XARXA DE REG	2.899,20	1.885,86	145,15	2.031,01
NIVELL 2: Fase obra						
Fase obra	00.01	TREBALLS PREVIS	154,32	154,32	0,00	154,32
Fase obra	00.10	FERMS I PAVIMENTS	21.458,24	21.704,85	721,93	22.426,78
Fase obra	00.13	JARDINERIA I XARXA DE REG	2.899,20	1.885,86	145,15	2.031,01
Fase obra	00.24	MESURES CORRECTORES D'IMPACTE AMBIENTAL	1.014,27	0,00	0,00	0,00
Fase obra	00.26	SEGURETAT I SALUT	800,00	800,00	0,00	800,00
Fase obra	00.27	PREUS CONTRADICTORIS	0,00	1.781,00	1.751,00	3.532,00
Obra	00	CONSTRUCTIU PARTERRE	26.326,03	26.326,03	2.618,08	28.944,11
NIVELL 1: Obra						
Obra	00	CONSTRUCTIU PARTERRE	26.326,03	26.326,03	2.618,08	28.944,11
Obra			26.326,03	26.326,03	2.618,08	28.944,11

IMPORT TOTAL PRESSUPOST 26.326,03 €

DIFERENCIA ENTRE PRESSUPOST I TOTAL CERTIFICAT -2.618,08 €

IMPORT TOTAL ACUMULAT CERTIFICACIÓ NÚMERO 4 28.944,11 €

IMPORT TOTAL ACUMULAT CERTIFICACIÓ NÚMERO 3 26.326,03 €

IMPORT TOTAL CERTIFICACIÓ NÚMERO 4 2.618,08 €

FULL DE FACTURACIÓ

Certificació Nº: 4 Data certificació: 01/10/18

Inici: 16/06/18

Tancament: 15/07/18

Certificació Actual

IMPORT D'EXECUCIÓ MATERIAL CERTIFICAT A ORIGEN.....	28.944,11
13,00 % Despeses Generals SOBRE 28.944,11.....	3.762,73
6,00 % Benefici Industrial SOBRE 28.944,11.....	1.736,65
IMPORT DE CONTRACTE ACUMULAT.....	34.443,49

Certificació Anterior

IMPORT DE CONTRACTE ACUMULAT DE CERTIFICACIÓ ANTERIOR.....	31.327,97
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Certificació Mensual

IMPORT CERTIFICACIÓ ACTUAL MENSUAL (34.443,49 - 31.327,97).....	3.115,52
IMPORT A FACTURAR PER L'ADJUDICATARI EN LA CERTIFICACIÓ Nº 4 €	3.115,52

(Aplicació de l'article 85.f de la Llei de l'IVA sobre subjecte passiu)

(TRES MIL CENT QUINZE EUROS AMB CINQUANTA-DOS CÈNTIMS)

El Promotor de les Obres

El Promotor de les Obres

Ernest Santolaria Fominaya
Director Tècnic
Departament d'infraestructures - BIM/SA

Esteve Piazuolo Làzaro
Director Tècnic Adjunt
Departament d'infraestructures - BIM

El Director de les Obres

El Contractista

Marc Ventós Lario
Enginyer Industrial
Col·legiat nº13.066

Fernando Ares Marquina
CIVILSTONE SL

III. Project 2: Renovation of the main road of Sant Andreu de la Barca

Projecte de Reurbanització de la Plaça de l'Ajuntament FASE 2
Sant Andreu de la Barca

RESUM DE LA CERTIFICACIÓ

Data: 29/11/18

Pàgina: 1

Certificació nº 6

Data certificació: 30/12/18

Inici: 01/12/18

Tancament: 30/12/18

NIVELL	CODI	DESCRIPCIÓ	PRESSUPOST	IMP.ACUM. CERT Nº5	IMP.CERT. MENS Nº 6	IMP.ACUM. CERT Nº6
NIVELL 3: Títol 3						
Títol 3	01.01.01	ENDERROCS	24.980,82	18.855,79	1.519,32	20.375,11
Títol 3	01.01.02	MOVIMENTS DE TERRES	4.897,51	7.735,91	233,02	7.968,93
Capítol	01.01	ENDERROCS I MOVIMENT DE TERRES	29.878,33	26.591,70	1.752,34	28.344,04
NIVELL 2: Capítol						
Capítol	01.01	ENDERROCS I MOVIMENT DE TERRES	29.878,33	26.591,70	1.752,34	28.344,04
Capítol	01.02	FERMS I PAVIMENTS	99.265,84	109.202,64	5.717,90	114.920,54
Capítol	01.03	SANEJAMENT	8.099,63	13.524,23	2.279,82	15.804,05
Capítol	01.04	SENYALITZACIÓ I ABALISSAMENT	4.869,79	4.647,61	705,50	5.353,11
Capítol	01.05	SERVEIS AFECTATS	20.500,00	20.500,00	0,00	20.500,00
Capítol	01.06	JARDINERIA I REG	24.117,04	6.781,13	-261,15	6.519,98
Capítol	01.07	ENLLUMENAT	7.670,20	11.539,77	6.184,48	17.724,25
Capítol	01.08	MOBILIARI URBA	4.407,52	0,00	0,00	0,00
Capítol	01.09	SEGURETAT I SALUT	4.650,00	4.650,00	0,00	4.650,00
Capítol	01.10	GESTIÓ DE RESIDUS	3.650,00	12.791,27	4.256,31	17.047,58
Capítol	01.11	VARIS	3.120,00	0,00	0,00	0,00
Obra	01	Pressupost FASE 2	210.228,35	210.228,35	20.635,20	230.863,55
NIVELL 1: Obra						
Obra	01	Pressupost FASE 2	210.228,35	210.228,35	20.635,20	230.863,55
Obra			210.228,35	210.228,35	20.635,20	230.863,55
IMPORT TOTAL PRESSUPOST			210.228,35	€		
DIFERENCIA ENTRE PRESSUPOST I TOTAL CERTIFICAT			-20.635,20	€		
IMPORT TOTALACUMULAT CERTIFICACIÓ NÚMERO 6					230.863,55	€
IMPORT TOTALACUMULAT CERTIFICACIÓ NÚMERO 5					210.228,35	€
IMPORT TOTAL CERTIFICACIÓ NÚMERO 6					20.635,20	€

FULL DE FACTURACIÓ

Certificació N°: 6 Data certificació:30/12/18

Inici: 01/12/18

Tancament: 30/12/18

Certificació Actual

IMPORT D'EXECUCIÓ MATERIAL CERTIFICAT A ORIGEN.....	230.863,55
(APLICANT COEFICIENT D'ADJUDICACIÓ = 0,956884192)	220.909,68
13,00 % Despeses Generals SOBRE 220.909,68.....	28.718,26
6,00 % Benefici Industrial SOBRE 220.909,68.....	13.254,58
IMPORT DE CONTRACTE ACUMULAT.....	262.882,52

Certificació Anterior

IMPORT DE CONTRACTE ACUMULAT DE CERTIFICACIÓ ANTERIOR.....	239.385,37
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Certificació Mensual

IMPORT CERTIFICACIÓ ACTUAL MENSUAL (262.882,52 - 239.385,37).....	23.497,15
21,00 % IVA SOBRE 23.497,15.....	4.934,40
IMPORT A FACTURAR PER L'ADJUDICATARI EN LA CERTIFICACIÓ N° 6	€ 28.431,55
(inclòs IVA)	

(VINT-I-VUIT MIL QUATRE-CENTS TRENTA-UN EUROS AMB CINQUANTA-CINC CÈNTIMS)

TADEC
Tècnics Associats de Consulta
Director d'Obra
Carles Guilemany i Casadamon

CIVILSTONE
Cap d'Obra
Fernando Ares Marquina