Saimaa University of Applied Sciences
Technology, Lappeenranta
Double Degree Programme in Civil and Construction Engineering

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DESCRIPTION OF THE TURNKEY CONSTRUCTION PROJECT SYSTEM FOR INTERNATIONAL AND RUSSIAN CUSTOMERS

Bachelor's Thesis 2012

Abstract

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The purpose of this work was to create a technical brochure with a description of a turnkey construction project system in Karjalan Rakennus ja Maalaus OY. Also the term "project" was explained and the phases of the project lifecycle were defined. The main target was to offer some new developments, which would make the turnkey construction project system clearer and usable for Russian customers and positively influence on the purchase decision.

In the theoretical part of the study the main issue was to tell the most important technical things of the construction process, which are interesting for customers and influence on the purchase decision. The information was gathered from literature and Finnish regulations concerning construction as well as from the web pages of Finnish and Russian building companies, interviews, visits to the building site and direct observation.

As a result of this the technical brochure was done. The terms "project" and "project lifecycle" were explained. The phases of the project lifecycle were looked through from initiation to closing the construction project. Some new developments, which can attract more international and Russian customers, were offered to the company.

Keywords: turn key construction project system, project lifecycle, obtaining building permit, construction process

CONTENTS

1. INTRODUCTION

The aim of the thesis is to explain the turnkey construction project system to international and Russian customers. First of all, it is necessary to define the term “turnkey” and then find out how this system works in Karjalan Rakennus ja Maalaus OY. The best way to understand the framework of turnkey is to look through the construction project and to present material in a logical sequence. In this case the term “project” will be explained. To make the work coherent, it is decided to consider construction project through the prism of its lifecycle. In this instance the collocation “project lifecycle” will be described. So, the project will be looked through all its phases, beginning with contracting process to preparing closing documents and warranty procedures.

The purpose of the practical part of the work is to create a technical brochure, which will make the turnkey construction project system in Karjalan Rakennus ja Maalaus OY clearer and usable for international and Russian customers. This brochure should give a clear vision of the project for a customer. The most important technical things of the construction project will be found out. The most significant thing in this case is to correctly determine what things are the most interesting for customers and influence on the purchase decision.

The main target of the thesis is to find out some new developments, which can attract more international and Russian customers and to offer them to the company. Some improvements, which can help the company in expanding its consumer market, will be presented.

1.1 Turnkey construction project system

Turnkey construction project system is the transfer of the completed project by the contractor’s company to the customer in operation in full working order. Today this type of service has become very popular. The desire to move into a new house and start a summer holiday or permanent residence as soon as possible is quite natural.

Many companies often offer their customers construction of the house using turnkey construction project system in their advertisements. To begin with it is

necessary to understand what it means. First of all, these companies offer a full range of services, namely, design, construction process itself and general contracting. The company's work begins with a project of the house. Customers can choose a ready-made project; otherwise they will be offered an individual design. The execution of the house begins after project approval. But before construction it is important to solve some theoretical questions. Making all necessary documents is an important aspect in this case. Secondly it is needed to find out what is “general contractor”. It is the company engaged in the construction of the customer’s house, which takes the responsibility not only in its construction, but also provides management of the construction process from start to delivery to the customer. The most important thing is to entrust it to professionals, who perform all work on time and at the proper level.

1.2 Introduction to Karjalan Rakennus ja Maalaus OY

Karjalan Rakennus ja Maalaus OY is a well-known and reliable construction company which is operating in the eastern Finland. They build with respect for the traditions of the Finnish infrastructure, leaving the professional skills for future generations. Karjalan Rakennus ja Maalaus OY works in the construction field as the main contractor also they also do project management tasks as well as new construction renovations. They operate in public sector, build offices and private construction projects. Project models are targeted at the private sector.

Karjalan Rakennus ja Maalaus OY offers to the customers the following services:

- General operations. Taking care of the construction project: the contractor’s obligations and civil works. Karjalan Rakennus ja Maalaus OY choose subcontractors and material suppliers carefully, the selection takes into account their ability to deliver flawless products and services;
- Painting and decorating works, they provide overall project management responsibility;

- Development and construction. This service is designed mainly to private consumers, they build using RS-system complied with the system's responsibility. RS-system is the law of regulation designed to protect the customer. The construction company provides its shares to the bank as a guarantee. The bank gives a bank guarantee to the customer, which ensures safety during the construction;

- Project management contracting. This form of contract includes design and consulting activities, the cost of which is set to the desired target price at the beginning of the project.

The main activity of the company is construction of row houses and holiday houses for private customers. Figure 1.1 shows row houses in Imatra made by the company.

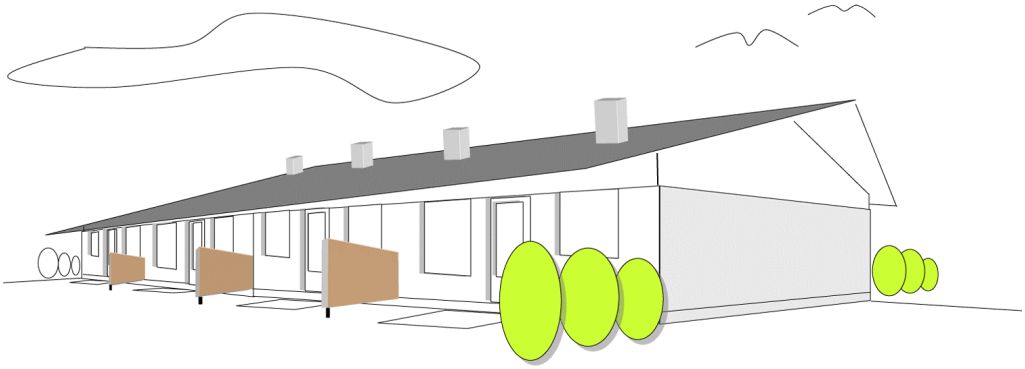


Figure 1.1 Row houses in Imatra

In architecture and city planning, row house is a style of medium-density housing that originated in Great Britain in the late 17th century, where a row of identical or mirror-image houses share side walls.

A holiday house is a cottage used for accommodation, they are typically small houses. There is Saimaa Villa in Puumala made by Karjalan Rakennus ja Maalaus OY in figure 1.2.

Karjalan Rakennus ja Maalaus OY offers turnkey construction project system not only for Finnish people but also for international and Russian customers. The company works as general contractor. They provide project management through the overall project lifecycle from initiation to closing. A client can choose a pre-designed project, or he will be offered an individual design. After contracting process the customer has nothing to worry about, because he entrusts to professionals, who perform all work on time and at the proper level.

He just needs to wait and get his new house in operation in full working order. So after the final inspection the customer will get keys for his completely ready house, equipped with built-in kitchen, domestic appliances, fireplace, ventilation system, etc. The type of finish is also defined by the customer.

Figure 1.2. Saimaa Villa in Puumala

Karjalan Rakennus ja Maalaus OY operates in Finland. There is geographical and climatic introduction to Finland below, which help to understand in what conditions the company works.

1.3 Geographical and climatic introduction to Finland

Finland, officially the Republic of Finland (see fig. 1.3), is a Nordic country situated in the Fennoscandian region of Northern Europe. It is bordered by Sweden (length of border is 586 km) in the west, Norway in the north (length of border is 716 km) and Russia in the east (length of border is 1265 km), while Estonia lies to its south across the Gulf of Finland. Finland is bounded by the Baltic Sea, with the Gulf of Finland to the south and the Gulf of Bothnia to the west.

Finland's total area is 337,030 km^2 (130,128 sq mi). Finland is the seventh largest country in Europe after Russia, France, Ukraine, Spain, Sweden, and Germany. Of this area 10% is water, 69% forest, 8% cultivated land and 13%

other. Finland has a population of 5,282,583 people spread over 337,030 km^2 making it the most sparsely populated country in the European Union.

Figure 1.3. Finland on the world map

Finland is a country of thousands of lakes and islands – 187,888 lakes (larger than 500 m2/0.12 acre) and 179,584 islands. Its largest lake, Saimaa, is the fourth largest in Europe.

If something has a typical Finnish character, so is the climate and weather in Finland. There are four distinct seasons: the cold, dark winter, short spring, when everything seems to explode with bright colors, warm summers and the bright autumn, known for its breathtaking colors. The climate in Finland is healthy and fresh. The combination of cold winters and warm summers is a distinctive feature of the Finnish climate. The air is dry, and it always seems to be warmer than the thermometer shows.

Karjalan Rakennus ja Maalaus OY is working in South Karelia and South Savo region (see figure 1.4). Rather big cities are situated here: Lappeenranta, Imatra, Mikkeli, Savonlinna. This region is quite close to the Russian border that makes it more attractive to Russian people.

South Savo province is the region in south-eastern Finland, with the center in Mikkeli. South Savo is known as the most ecological region in clean Finland. It is located in the province of Eastern Finland, which besides Mikkeli includes famous cities Savonlinna and Pieksämäki.

In South Savo region the amount of forests and lakes is more than in any other area in Finland. About a quarter of its territory is occupied by different bodies of water: seven thousand freshwater lakes, most of them have preserved the

primeval cleanness, and countless lakes and forest ponds and meandering steams and rivers whose total length is five thousand miles. Forests, mostly conifers (pine and spruce) cover 80% of the territory.

Figure 1.4. Map of Finnish provinces

Nowadays the province is famous not only for the exclusive nature of the lakes, but also for international events in the cultural field. Here you can listen to the music of world-class and watch performances of famous ballet dancers. Many festivals, sporting events are held in Southern Savo year-round. You can do any kind of outdoor activities: golf, hunting, fishing and hiking along the forest paths, breathing in a conieferous healthful air, swimming in clean water, kayaking and canoeing, biking and horseback riding, picking berries and mushrooms; ice fishing, skating, skiing, snowmobiling in winter. There are views of South Savo in figure 1.5.

Figure 1.5. Views of South Savo

The South Karelia region is located on the eastern border of Finland, by Lake Saimaa and River Vuoksi. The region comprises the cities and municipalities of Imatra, Lappeenranta, Lemi, Luumäki, Parikkala, Rautjärvi, Ruokolahti, Savitaipale, Suomenniemi and Taipalsaari.

The territory of the province is wedge-shaped and spreads between Lake Saimaa and the state border. The uniqueness of the geographical location of South Karelia is its boundary position between the European Union and Russia. The main city is Lappeenranta, it is situated about 50 km from Vyborg. Another big city in South Karelia is Imatra. It is a boundary city. It is about 10 km from the centre of Imatra to the centre of Russian city Svetogorsk (former Finnish Enso). Both cities are located on the shore of Saimaa Lake, the distance between them is about 35 km.

Unique nature is the wealth of Finland. The South Karelian scenery features rugged rocky stretches and lush deciduous areas with exceptionally diverse fauna. The water system of Saimaa covers most of the region, in addition to

which there are hundreds of other lakes with clear waters. Lakes, located along the routes favored by migratory birds and waterfowl, are important for the global ecosystem.

Change of seasons is the wealth of Finland. In South Karelia this feature of the climate is even more marked as the area between the Saimaa and the Karelian isthmus has cold and snowy winters and warm summers. Due to the beautiful nature, lakes, rivers and islands there are all necessary conditions for a great holiday in South Karelia. This is one of the best areas for active recreation and ecotourism in the country. Here there is a whole range of different impressions, the whole palette of colors and flavors, which Finnish nature can give – you can fish, gather mushrooms or berries, swim, take pleasure in the warmth of the sauna or simply walk through the forests, listening to the soothing symphony performed by nature itself. There are views of South Karelia in figure 1.6.

Figure 1.6. Views of South Karelia

2. MAIN DEFINITIONS OF PROJECT MANAGEMENT

As it was mentioned before, Karjalan Rakennus ja Maalaus OY works as general contractor and provides overall project management. Firstly, the term “project management” should be defined. It has become very popular over the last few years, and a clear definition is not always in the forefront of people’s minds when they begin discussing a project or project management seeks to

accomplish. Project management is a science or discipline that seeks to plan, monitor, and manage resources in such a way as to bring about the successful completion of a project's stated objectives or goals.

The term "project" is a popular one that is bantered about in almost every aspect of life. The use of the term in titles also has become in vogue in the last few years. There is a variety of project managers, project analysts, project coordinators, and project assistants running through the hallways of numerous businesses.

Whenever a term begins to get such a broad usage in society, it will typically tend to lose some of its specific meaning. It is certain that if someone were to ask a group of individuals to write out a definition of the word, he would receive a number of answers each having its own nuances. This is not to say that all the definitions would be wrong, but might not be applicable to the very situation where the term might be used. In this work a project can be defined as a temporary endeavor that seeks to create a unique product or service and is constrained by cost, time, and scope. Each part of this definition plays a critical role in clearly understanding what exactly a project is, so each part will be briefly considered.

Temporary endeavor. A project is by its nature a temporary undertaking. It has a definite start date and a definite end date. During this time, the work that will produce the goal of the project is completed.

A unique product or service. By unique it is meant that the product is one of a kind. There is nothing more unique than a project that seeks to construct a home. Even if one is building the same style of home on the same street, it is unique. Even if one were to build the same style of home in the same area, a variety of factors would be unique to each project, such as: land, weather, subcontractors, materials, timing, client, etc. Because of the unique nature of each project, special planning is required to make certain that the work of the project is done properly and to the specifications provided. Building a home is very different than running a batch of products through a controlled production line, and because of these differences, the work must be managed differently. It is the uniqueness of each project that creates the challenges that the project manager must rise to meet in order to successfully complete the project.

Constrained by cost, time, and scope. There are three constraints that are present on every project – cost, time, and extent of the work. There is a set cost or budget, a set time to complete the work, and a set amount of work to be performed. In every project that is executed, one must grapple with these constraints (Griffin 2010, pp 2-4).

3. PROJECT LIFECYCLE

A lifecycle is a progression through various phases of development. The term is used in reference to a number of areas. The reason for term's usefulness in many areas is that it helps one think through a process or phenomenon in a logical manner, which is to say that allows someone to think through the process or phenomenon in natural manner.

Projects, like many other processes, have a lifecycle. The lifecycle of some projects might vary slightly depending on the type of the project or context of the project, but, in general, most projects can be described as having the same lifecycle.

Figure 3.1 Project lifecycle

The phases in a building construction project are:

1. Initiation
2. Planning
3. Executing
4. Controlling
5. Closing

A visual presentation of the phases and their relationship to one another is seen in figure 3.1. The process begins at initiation and then progresses through other phases and ends at the closing phase. What is also of interest is the fact that the flow of lifecycle is not entirely liner, but, in some cases, there is an iterative nature of the lifecycle. For example, during the controlling phase, the project

manager may realize that part of the project plan will have to be re-worked in order to accommodate an unknown situation that has arisen, which will require that a portion of the project needs to be re-planned and re-executed. This iterative nature can be seen in figure 3.2.

The arrows in figure 3.2 that lead from the bottom of the execution and controlling phase symbols back to the planning phase show that once the work is performed and monitored it may need to be re-planned, passing through the planning phase again constraints (Griffin 2010, pp 8-9).

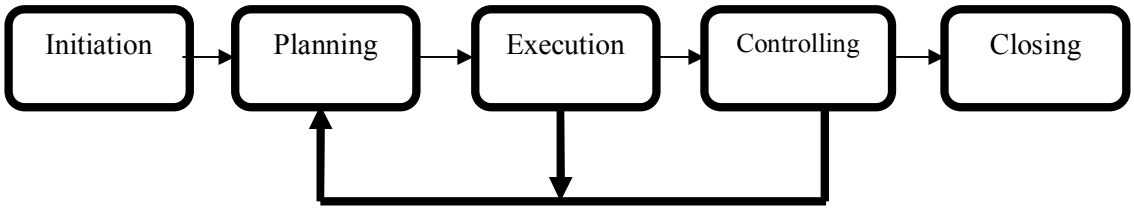


Figure 3.2 The nature of project lifecycle

4. INITIATION PHASE

The initiation phase of the project begins with an idea, the idea to build something – a house, a duplex, a small commercial project. The idea could come from an employee, the CEO, the contractor, or the customer. During the initiation phase, the project manager is not concerned so much about the source of the idea as with whether the idea can be transformed into a viable, profitable project. The goal of this phase is to render a judgment on the idea.

In order for the idea to be considered, a process for analyzing it and a standard or a scale against which to measure the results of the analysis must be in place. The process comprises the steps required to gather the necessary information to measure the project according to the standard. The standard is the criteria by which the company decides to take on the project. If the process is faulty, the proposed project will not be accurately measured against the standard. If the standard is too exclusive, projects that could be beneficial to the company will be rejected. If the standard is too inclusive, projects that will harm the long term health of the organization will be accepted.

Ideas for construction projects can come from a variety of sources. Broadly speaking, however, they will come from one of two sources. They will come

from within the organization itself for the benefit of the company; this type of a project is called an internally initiated project. Projects can also be initiated externally or by someone other than a member of the organization. These externally initiated projects are typically proposed by individuals, businesses, or government or public organizations to meet their specific building needs.

Internally initiated and the externally initiated projects differ in some ways, but they also share a number of steps. The internally initiated project is by its nature a speculative project, as there is no specific purchaser or customer yet known. The company is building the home or office building with the hope that a qualified buyer comes willing, ready, and able to purchase or lease the property. Because the company does not have this buyer in mind, it must choose where to build the home, what style of home to build, how much to price the home, and so on. With an internally initiated project, the construction company takes on much more responsibility and risk. Once the company has accepted this increased risk and chosen the site and the plan, then the steps of the initiation phase are similar to that of the externally initiated project. The steps for each type are below to compare and contrast them.

The steps in an internally initiated project:

1. Perform market research
    1.1. Building plan and key feature list
    1.2. List of acceptable locations
    1.3. Financial needs analysis
    1.4. Projected sales price
2. Create a summary of proposed work
3. Preliminary cost estimate
4. List key stakeholders
5. Preliminary risks and rewards analysis
6. Preliminary scope statement

By contrast, the externally initiated project will typically carry a much lower degree of risk, because the customer is initiating the project. If the company properly vets the potential client and takes proper steps during the contracting phase, the company can have a high degree of assurance of being paid for the work performed. Because the client will provide a location, a set of plans, and

financing for the construction project, the initiation phase includes fewer steps, as less research is necessary.

The steps in an externally initiated project:

1. Create a summary of proposed work
2. Preliminary cost estimate
3. List key stakeholders
4. Preliminary risks and rewards analysis
5. Preliminary scope statement

The externally initiated project will be considered in this work, as the most typical way of starting a construction project. First of all, foreigners' rights for acquiring real property and construction should be discussed.

4.1 Foreigners' rights for acquiring real property

In Finland there are no restrictions to foreigners acquiring real property or movable property, putting them on the same footing as the Finns. The only exceptions are the Aland Islands (for their acquisition approval from the Finnish Government is required) and border zone (there is a need to explain why housing is necessary exactly on this territory). Laws and rules for the acquisition of real estate and construction for Finnish citizens and foreigners are mostly the same. Therefore, the place of person's residence or place of company usually does not matter. It should also be kept in mind that ownership of real estate in Finland is not a basis for obtaining a residence permit, although in some cases, it can help to get it. The Finnish legislation allows all transactions of real estate by foreigners, so, according to the law the nationality of participants in the transaction does not matter. This applies to both individuals and legal entities (companies).

The rules for construction are also the same for Finnish citizens and foreigners. However, municipalities may impose the requirement of permanent residence, for example in case of the acquisition the land for housing construction, to which the engineering and utility systems have been built (for example, roads, energy, water, sewerage). This is due to the fact that at constant residing the owner of

the house is registered in the local municipality and pays taxes to the municipality. A foreigner cannot be registered in the municipality and the municipality will not receive money from taxes (except the annual tax on real estate). Service lines are very expensive items for the municipality.
It was basic information about purchasing land by foreigners in Finland. Now it is necessary to understand what the next step will be. So, the client has land and comes to Karjalan Rakennus ja Maalaus OY. Firstly, a project manager should be assigned.

4.2 Assignment of a project manager

Even before beginning the steps for initiating a project, the question of who will lead the project should be considered. The project manager should be assigned to the project as early as possible. The sooner the project manager can assemble the core project team, the better it will be for the project. Some companies may call this individual the construction manager. The title is not as important as the function. The project manager is the individual who will be responsible for planning, executing, controlling, and closing the project when it is completed. Therefore, the sooner this assignment can be made to the project the better.
The next step is to define the scope. As construction of holiday houses is discussed in this work the next step is to select the house.

4.3 Selection of the house

Before starting the initiation phase the house and the way of construction should be defined. In general there are two ways of house planning and construction in Finland. The first way is that a customer can choose a ready-made house (standard house kit). The second way is an individual project; the client may bring his own drawings made by himself or another architect.
Designing process will be more broadly discussed in chapter 5.

After the choice of a house the next step is getting a building permit from the local authorities.

4.4 Obtaining the building permit

For all construction work a building permit or some approval from authorities is needed. The precondition for the application of a building permit is that the applicant is the titleholder of the building site. Most often this means ownership of the land or its tenement. The applicant shall have in his use a designer who is approved competent and fulfils the regulated requirements.

The application shall include attached the master drawings of the building where it is to observe that the construction will be in keeping with the local detailed plan and fulfill the requirements set to construction. The basic provisions for this are given in the Act and the more exact regulations in the Degree and in the National Building Code of Finland. The basic rule is that for construction of a house a building permit is required. For each site the building right is determined individually. The building right is a document entitled to build some facilities on the site. The building permit is required for the following activities:

- construction of the building itself;
- repair and reconstruction works, which can be equated with the construction of the building;
- expansion of the building;
- increase of the floor area (for example, the reconstruction of a cold attic to a warm attic);
- construction works, if they have an impact on the health and safety of users of the building;
- significant change in the operational use of the building or its part.

Every construction project is unique and represents a range of activities. The final decision about the necessity of obtaining a permission is taken by the authorities for construction supervision.

4.5 The procedure for obtaining a building permit

A building permit should be requested in writing form. Typically, the application is submitted on a special blank, which is available from the supervisory authority. The required documents and the information that is needed to obtain a building permit is listed on this blank. In the application it is necessary to provide the following information:

- personal information about the applicant, phone number and e-mail address;
- information about the construction site;
- explanation of the construction project;
- information about the main and specialized designers;
- information about the person who can provide the additional information (such as a trustee or a main designer);
- possible bail (required if the construction work should begin before the decision to issue a permit entry into force);
- the order of presentation of solutions and bank details.

The application for a permit also should be signed and dated (Nykänen, 2009). After obtaining a building permit the initiation process could start.

4.6 Initiation process

As stated above, the purpose of the initiation phase is to perform the research necessary to make an informed decision about whether to proceed with a particular project. The information necessary to make that decision will depend on the type and source of the project. What is needed is a process to move from idea to project. There are four steps to initiate a project, regardless of whether it is internally or externally initiated. They are:

1. Creating the project proposal
2. Reviewing the project proposal
3. Approving the project proposal
4. Transitioning to the planning phase

4.6.1 Creating the project proposal

Creating the project proposal requires gathering the information necessary to make a decision. Internal and external projects require different types of information. The externally initiated project will be considered in this work, as the most typical way of starting a construction project. For an external project, the client approaches the construction company to initiate the project. The client provides a site location, chooses the plans, usually has a time frame in mind, and sets a budget based on his financial situation. The client must be considered at every point while initiating the project. The steps to initiate an externally initiated project are:

1. Create a summary of proposed work
2. Prepare preliminary cost estimate
3. List key stakeholders
4. Perform preliminary risks and rewards analysis
5. Develop preliminary scope statement

Create a summary of proposed work. By reviewing the client's plan, considering the time frame, and analyzing the finances, a summary of proposed work (SOPW) is developed for approval. Once the project manager writes a SOPW; reviewing that document with the potential client to ensure agreement on all expectations is helpful. In the SOPW for an external client, the project manager may want to include additional information, such as a specific set of plans and building specifications as provided by the client.

Prepare a preliminary cost estimate. Creating a preliminary cost estimate is an important step. Three basic methods to create this preliminary cost estimate will be named here:

1. Order-of-magnitude or ballpark
2. Approximate or top-down
3. Definitive or bottom-up

The ballpark estimate is the quickest and easiest to perform. Typically, it is based on some type of multiplier such as price per square meter. It has a plus-or-minus 35-percent margin of variation. The second cost estimate method is the approximate or the top-down estimate, which is based on more concrete, historical data, such as past similar projects. This method of estimating is

statistically more reliable than the ballpark estimate as it typically has a plus-or-minus 15-percent margin of variation. The final method is the definitive or the bottom-up estimate. This method is both the most time consuming and the most reliable estimate. With this method of estimating, the project manager will look at each piece of work required to build the home and provide a detailed quote. This is a very accurate method and typically only has a variation of 5 percent or less.

List key stakeholders. Stakeholders are individuals who have a vested interest in the project. Listing key stakeholders and their relationship to the project provides critical information for the key decision makers. Stakeholders can be ranked according to their potential influence on the project. There are some sample classifications below:

1. Key stakeholders: The key stakeholder wields considerable influence over the project. This could be the overseeing decision maker from the company, who is called the project sponsor. It could also be people who elevate themselves to this level because of their opposition to the project. Other key stakeholders would include the project manager, the core project team, the financing institution, and any other individuals and organizations that could have a major impact on the project.
2. General stakeholder: General stakeholders are people who will have an interest in the project, but their influence will not greatly impact the direction of the project (construction subcontractors, the local government officials).

During the initiation phase it is most important to simply identify and list any concerns or cautions associated with each key stakeholder. A more detailed approach to managing all stakeholders will be developed later on during the planning phase.

Perform preliminary risks and rewards analysis. The construction industry is abundant with opportunities to reap profitable and personally fulfilling rewards, but it is also vulnerable to loss and failure. When considering a potential project, it can be very helpful to list not only what the benefits of a project are, but also what the potential pitfalls are. By carefully weighing the potential risks and rewards, the builder can help ensure project success.

Develop preliminary scope statement. The preliminary scope statement should be seen as a guiding statement for the project. It sets the course to follow and the boundaries to stay within. This is why it is wise for the scope statement not only to include what work is to be included in the project, but also what work will be excluded from the project. Therefore, the preliminary scope statement should be a general statement about the work that is being proposed, as well as the boundaries to that work. If the project progresses from the initiation phase to the planning phase, the scope statement will need to be revisited and updated to include the work that has been agreed on in the construction documentation.
After moving through these steps, a report should be prepared that will enable the management of the company to determine whether to proceed with the proposed project (Griffin 2010, pp 17-30).

4.6.2 Reviewing the project proposal

Once the project manager has completed the above steps and gathered the information into an appropriate report format, the report is ready to be reviewed. Reviewing the project proposal is no mean task. The reviewer must be able to analyze the report to determine, first, whether the report is accurate and, second, whether the proposed project fits the goals of the company.
Reviewing the proposal for accuracy does not necessarily mean that the one performing the review must rework all the numbers, but it does mean that he should look at the report with a critical eye.
The author of the report could have also made a faulty conclusion from the facts.
In order for pitfalls to be avoided, the reviewer needs some type of a standard or baseline to compare the project against. This ensures that each project is considered according to the same factors and that the organizational competencies and goals are considered during the review process. This can be achieved through a number of means or methods. For example, the organization may develop a few different types of checklists to guide the reviewer.

In addition to these checklists and baselines, the reviewer must rely on his general feel of the project. Not every project can be reduced to a set of statistics and reports. The reviewer should possess the experience necessary to look at a project, consider all the data, and develop a conclusion based on his experience and expert judgment, which, if proven reliable, should weigh heavily on whether the project should be accepted.

Once the review has been completed by the person within the company responsible for such matters, the reviewer should offer a recommendation. If the proposal is rejected, then the reasons should be noted. If the proposal is recommended, then the proposal will progress to the next step: approval (Griffin 2010, p 31).

4.6.3 Approving the project proposal

Approving the proposed project is an exciting step. Much work has been put into developing the proposal, and the work has paid off, as the proposal has been reviewed and given a positive review for approval.

Depending on the type of the project, the process for approving a project will vary.

If the project is an externally initiated project, the approval process will most likely be a little more involved than internally initiated because there are competing parties involved. If the proposal is recommended, the builder must outline the terms of the contract review by the client.

Most of the time, the company will have a standard contract form. The following is a list of issues that are of primary concern to both the project manager and the client and should be detailed in the contract:

- Construction specifications
- Contract price and construction budget
- Quality standards
- Construction time frame
- Special clauses or notes
- Inspection guidelines

- Builder warranty
- Conflict resolution

4.6.4 Transitioning to the planning phase

After the contract has been prepared, then it will be reviewed and modified by the attorney representing each party. Once all modifications have been agreed to and the final copies have been executed, the time comes to transition to the planning phase, which is the second phase of the project lifecycle.
Before transitioning to the second phase of the project lifecycle it is important to pay special attention on the contract process in Karjalan Rakennus ja Maalaus OY and also on the designing process.

4.7 Contract process in Karjalan Rakennus ja Maalaus OY

Karjalan Rakennus ja Maalaus OY has a standard contract form which was mentioned in 4.6.3.
Construction specifications. When the client comes to the company to propose the project, he provides a list of construction specifications and a set of blueprints. This may have been augmented during the first half of the initiation phase, and those additions must be considered as well. The final draft of the work being proposed will need to be included as part of the construction contract.
Contract price and construction budget. The second concern included in the contract is the price and the construction budget. Depending on the type of the contract being executed, these may be different numbers. This section should also include a payment schedule for the work completed. Typically, there will be a nonrefundable down payment and then draws on the construction loan at various points in construction.
Quality standards. It is also important to refer to a quality standard to which the project shall adhere. The company has a construction specification list that

addresses the construction techniques and materials. This avoids the customer's complaining of ignorance that a certain material was going to be used in construction. The contract should also refer to some type of building standard against which the construction could be compared.

Construction time frame. The clause that deals with the time allowed to complete the construction project is utmost importance to the project manager. If an unrealistic amount of time is allotted, the client should expect some disappointment. The clause dealing with the time frame will typically also include extensions that become necessary due to client change orders, natural disasters, weather delays, material shortages, and other unforeseeable events. It will also typically include a per-day fine for going past the target date, which will be charged to the contractor.

Special clauses or notes. It seems that in almost every contract there is a collection of special clauses or notes that does not naturally fall into any other section of the contract. The builder should not draft these types of clauses or allow the client to do so. The attorney for either party should both draft and review any special clauses as a means of mitigating misunderstandings and disputes that might arise from these unique clauses.

Inspection guidelines. The section on inspection guidelines should detail the types of inspections the client can perform at various points of construction. By implementing clear inspection guidelines as part of the construction contract, both parties have clear expectations and understandings.

Builder warranty. There are two guarantee systems in Finland, this question will be broadly discussed in chapter 9.

Conflict resolution. The final consideration is to address what remedies the parties will have if one of the parties fails to comply with the terms of the contract. Most contracts will typically call for some type of arbitration; the only remaining remedy is the court. The builder should consult with an attorney to make certain that the company is adequately protected before signing any contract.

However, each contract is unique and the list of issues mentioned above can be reduced or expanded. For example, a clause about additional works may be added.

The contracting process in Karjalan Rakennus ja Maalaus OY is very easy for the client. In this stage new or changed space needs of the customer are stated and various alternatives aimed at satisfying the needs are discussed. The contracting process consists of two steps. The first step includes a start-up meeting, on which customer's needs are discussed. Presentation includes project background, size and location. After this, preliminary plans are sent to the customer, the company makes some changes if it is needed and gets the permission from the customer. A first contract on obtaining building permit is developed. The next step is to get a building permit from the authorities. After obtaining the building permit a new contract is developed. During this process triple-constraint components are defined: scope, time and cost. Environmental management plan may also be integrated into contract documents. If construction work is to proceed, the decision to start project planning is made. The company prepares all necessary documents to start the project and the customer just needs to sign. Rakennusurakan yleiset sopimusehdot YSE 1998 is used as a basis for drawing up the constructing of the contracts in Karjalan Rakennus ja Maalaus OY.

5. DESIGN PROCESS

In this chapter the designing process in Karjalan Rakennus ja Maalaus OY will be described. As it was mentioned before, the first step in the designing process is the choice of the house.

One way is to choose a ready-made project. In Finland standard house kits are produced on the factories of construction companies. Karjalan Rakennus ja Maalaus OY works with Honkatalot. Honkatalot is a well-known Finnish company which is the world market leader in the field of wooden construction. It is an international company recognized world-wide. A lot of people around the world choose the products of Honka Company. Honkatalot has a large catalogue with various types of houses. The key point is to find a model which appeals to the customer in architecture and in style. The house can be any of Honka models as such or modified according to all customer specific changes.

If the client selects the standard project, an experienced architect will help to correct the design of the house to satisfy all customer needs. So, every standard home can be an individual home. This way is usually the most economical way of house planning and construction.

Another possibility is to choose not standard house. In this case it is necessary to design an individual project. The house can be completely unique, realized according to the client's own plans. The customer can draw a project himself and then it will be corrected by the specialist from Honkatalot. Another way is to bring drawings designed by another architect. And the last way of designing an individual project is to do it with the help of the architectural department of Honka Company. The best way is to trust for Honkatalot architects, because they know all restrictions for construction, the modern rules of the Finnish construction.

The second step in the designing process is to choose the way of the construction of the house. The houses can be turnkey or not turnkey, the client can choose everything that suits him.

As Karjalan Rakennus ja Maalaus OY works as general contractor, it has to handle with rather a great amount of designers (architects, designers of HVAC-system, designers of low current, etc), even so it manages with every designer and works together as one system. The best way to successful handling is to make a right choice of the main designer. He will be responsible for overall project and also responsible for ensuring that highly specialized designers have good qualifications in their fields (electrical work, water and ventilation systems, etc).

6. PLANNING PHASE

The planning phase is the second phase in the project lifecycle. This phase is different from the initiation phase in number of ways, but the most important ways that it is different is that it is iterative. This means that the planning phase is continually revisited throughout the life of the project. The planning never truly ends until the project is completed and closed. Once the project has been

initiated, the project manager moves to the planning phase, never returns to the initiation phase; once the project moves from the planning phase to the execution phase, the planning phase will be revisited as the project progresses and conditions change.

6.1 Customizing the project plan

Because all construction projects are different, the project plan will need to be customized to match the needs of each project. There are components that should be common to most project plans:

1. Project scope and scope management
2. Construction schedule – work breakdown structure (WBS)
3. Cost control
4. Quality assurance
5. Human resource
6. Communication plan for team members and stakeholders
7. Risk management
8. Purchasing and contract administration
9. Project baselines

The first step is to determine which portions are necessary – or rather, which are not necessary. By default, every construction plan should contain the nine major sections previously mentioned. If the project manager or a stakeholder believes that one section is unnecessary, the reasoning for such a position should be considered and decided upon. But by default, all nine sections should be included. The project manager and the project team should also ask whether there are any special features to the project that make another section necessary.

By including all nine sections by default, the project manager can assure that a comprehensive approach to planning construction project is being taking. Going through each of nine sections helps to ensure that no portion of the project is being disregarded or overlooked. The second benefit of including all nine sections is that the project manager can work to eliminate the problems that often arise from assumptions (Griffin 2010, pp 42-44).

6.2 Developing the project plan

The project has been researched, the project manager has been assigned, the construction documents have been compiled (blueprints, material specifications, etc.), and the time has come to actually develop the project plan. The next section of the chapter provides a brief overview of the components of the project plan, and some details are discussed.

6.2.1 Project scope and scope management

As it was mentioned, one of the steps in the initiation phase of the project is development of a preliminary scope statement. During the planning phase, the statement will be revised and expanded, if necessary. It is not always necessary to modify this phase as the project unfolds if accurately reflects the goals and the boundaries of the project.
The scope of the project refers to what is and what is not included in the project. This portion of the project plan will focus on accomplishing the following tasks:

1. Finalizing the scope statement
2. Developing the work breakdown structure (WBS) and WBS dictionary
3. Developing the scope management plan

It is important to pay special attention on developing the work breakdown structure (WBS) and WBS dictionary as it is a significant part of project plan. WBS will be used in developing other parts of the project plan.

6.2.1.1 Developing the work breakdown structure (WBS) and WBS dictionary

The WBS is a chart that shows the work necessary to accomplish the project. It is a chart that is most easily understood by seeing an example, as shown in figure 6.1. The WBS provides an excellent overview of the project. One of the purposes of the WBS is to show how the project is internally related.
A second purpose of the WBS is to help facilitate the planning process, as it is a very valuable planning tool. The WBS and WBS dictionary provide a wealth of information for those planning the project. The WBS dictionary is a closely related document, which provides details about each activity on the actual WBS (Griffin 2010, p 45).
The steps to develop a WBS are:

1. Gather necessary documents (building plans, blueprints, material and feature specifications, building contract, etc.)
2. Gather necessary people (project team, general contractor, subject matter experts, etc.)
3. Create a high-level structure of the project
4. Add low-level details to high-level structure
5. Create WBS dictionary

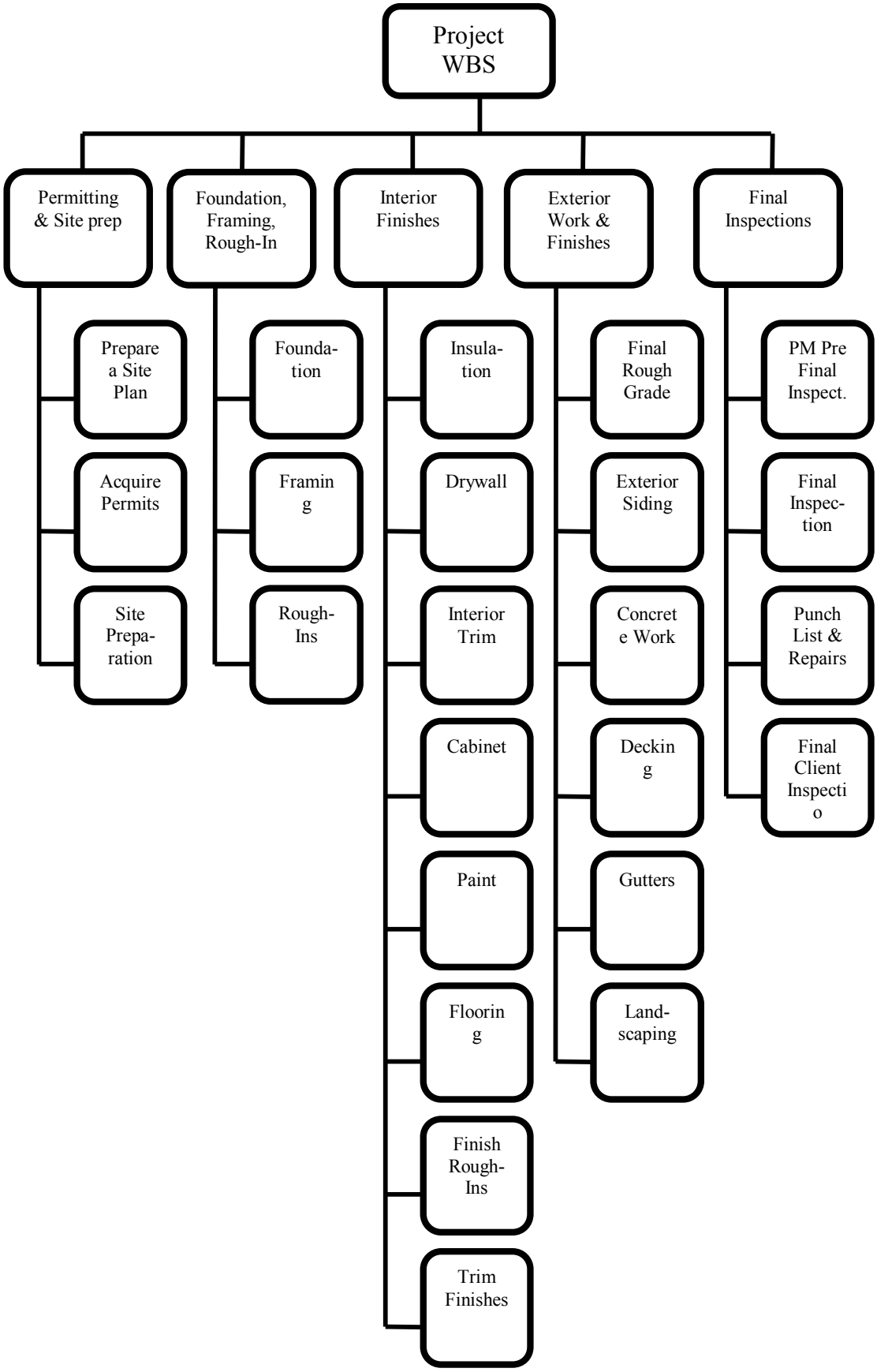


Figure 6.1 Sample WBS

The WBS dictionary performs three critical functions:

1. The WBS dictionary defines each element of the WBS
2. The WBS dictionary describes the resources necessary to perform the task
3. The WBS dictionary prescribes the processes to follow when carrying out the work described

6.2.2 Construction schedule

The construction schedule is the document that will guide the entire project. In order to develop a construction schedule, the project manager must first develop a work breakdown structure (WBS) and WBS dictionary, which seeks to name and define all tasks necessary to contrast the structure. Developing the construction schedule also requires sequencing of tasks, developing time estimates, identifying the individuals or subcontractors responsible for each task, and developing a method to control the schedule. Developing the construction schedule is one of the most time-consuming portions of the project plans. It involves carefully considering each task of the project and creating a road map that will lead to project success. The steps to create a project schedule are:

1. Define task
2. Sequence task
3. Estimate required task resources
4. Estimate task duration
5. Develop schedule
6. Manage the schedule

6.2.3 Cost control plan

The cost control plan accomplishes three primary tasks. First, it estimates the cost of each activity required to construct the building. The WBS is used as the guiding document. Second, it develops a budget for the entire project. Last, the cost control plan includes the information on how project costs will be monitored throughout the life of the project.

Controlling costs is one of the major challenges of a construction project. Almost anyone who has spent time in the construction industry knows of a company that did not survive due to uncontrolled costs. Those who effectively manage construction costs will fare much better in the long run than those who do not.

In most situations the builder wants to control costs as much as possible. There are two basic means to accomplish this goal: company-wide cost control policy/procedures plans and project-specific cost control plans.

The steps of the cost control plan are:

1. Estimate costs
2. Create a project budget
3. Employ cost control tools

6.2.4 Quality assurance plan

The quality assurance plan is focused on two items. First, it is focused on the quality of the actual work. It is imperative that the project manager plans and executes those steps necessary to make certain that the home being built meets the expected level of quality. This implies that there is an understanding that exists between the key stakeholders as to what the quality of the structure should be. This means that not only is a specific level of quality planned for, but it is also evaluated as construction progresses.

Second, the quality assurance plan focuses on ensuring that the project is performing according to the plan. Developing the plan is a major undertaking. But consider that someone takes the time to develop a plan, as has been discussed and will be discussed, but the time is never taken to ensure that the

plan is followed. It is never verified that the budget is being followed, or that the schedule is being updated, or that the potential project risks are being watched, or that the change orders are being properly recorded and administered. This would no doubt lead to the failure of the project. Therefore, the quality assurance plan also specifies how to ensure the quality of the project itself.
The quality of both the construction work and the project work is planned and documented in the quality assurance plan.

6.2.5 Human resource plan

The human resource plan is primarily concerned with how people will be hired, how they will be developed or trained, if necessary, and how they will be managed. This applies to not only employees of the construction company, but any subcontractors that might be hired to work on the project. Much of residential construction is outsourced to subcontractors. Therefore, project managers must have definitive approach to acquiring, developing, and managing subcontractor teams.
A construction project will hire primarily two types of people: internal employees and subcontractors. Internal employees are full-time or part-time employees of the construction company. Subcontractors refer to those companies or individuals hired from outside the construction company to perform a specific task on the project. So the human resource plan will deal with both types of people.
The human resource plan focuses on the following steps:

- Determine staffing needs
- Acquire staff
- Develop the timetable
- Identify training needs
- Offer recognition and rewards
- Ensure compliance

- Ensure safety

6.2.6 Communication plan

One of the most important aspects of any project is communication; this is especially true with construction projects. The communication plan will provide a comprehensive guide to making certain that employees, subcontractors, vendors, customers, and other stakeholders receive communication in a timely and accessible manner. The words timely and accessible have taken on a new meaning in the past decade or so.

There are a number of tools that can be employed to communicate with the project team and stakeholders: cell phone, fax, text messages, e-mail, even Twitter. Some builders are seeking to leverage of new communication tools, such as Facebook, Twitter, private message boards, and blogs to enhance communication for the construction project. All the more old-fashioned tools (telephone, fax, e-mail) are useful and so are the newer methods (Twitter, Facebook, text messaging) but the primary question is what communication methods will most effectively meet the needs of the current project.

Another issue that must be considered as the methods of communication increase is contract law. Those involved in construction management may be parties to dozens of contracts at any given time. These legal contracts most likely contain deadlines for communicating various types of information to various people at certain points and times. Does a tweet (a short message) on Twitter qualify as a legally valid form of communication? These are some of the issues that must be considered when creating a project communication plan.

The communication plan answers the following questions:

- Who will update the communication plan?
- Who needs information?
- What information is needed?
- When is information needed?

- How should information be sent?
- Who is responsible for sending information?

6.2.7 Risk management plan

Risk is a natural part of any undertaking. Every action taken, and even inaction, carries a degree of risk. In the context of this work, risk refers to an unforeseen event that causes a deviation from the project plan. Using this definition, risk could refer to both positive and negative events. For example, if the cost of certain material drops during the course of a project, this is a positive risk event. If a subcontractor suddenly goes out of business, this is a negative risk event. It is important that the project manager attempts to plan for all possible risk events, both positive and negative, by creating a risk management plan as a part of the main project plan.

The risk management plan is composed of two major sections. In the first section, the project manager identifies and analyzes risks and plan responses. In the second section, he develops a plan to monitor the various parts of the project so as to identify problems either before they arise or before they have done much harm to the project.

6.2.8 Purchasing and contract administration plan

A major portion of the construction project is purchasing materials and services and administering the contracts that regulate those purchases and other project work. It is a behind-the-scenes portion of the project that can be a strong contributor to project success or project failure. Purchasing materials at the wrong time, not understanding what exactly is being purchased, hiring the wrong subcontractor, or not effectively managing the contracts with subcontractors and suppliers can lead to project delays, cost overruns, and quality control issues. The project manager must ensure that a strong plan is

developed and that the plan is followed by a qualified individual. The actual plan includes:

1. Purchase management
2. Subcontractor management
3. Contract management

6.2.9 Project documentation and project baselines

This section of the project plan is primarily a reference section. First, it contains the documentation that guides the project, such as:

1. Project contract
2. Construction specifications-blueprints and building plans
3. Site survey
4. Building permit, insurance policy, septic tank approval and installation guidelines, sedimentation control plan, watershed control plan, and other necessary documentation
5. Subcontractor and vendor work contracts

The purpose of including this information is to make certain that it is easily accessible throughout the life of the project. Too many builders do a poor job of keeping up with these vital documents which guide the construction project. It is often a good idea to include copies in the project folder and keep the originals in a separate location in case something is misplaced. As construction progresses, these documents can be referenced during inspections and discussions with subcontractors to make certain that they understand how they are to perform their work.

This section also contains the baselines pertinent to most construction projects, such as the cost and schedule baseline. These baselines provide a basis for comparison as the project progresses. By comparing actual results with planned

results, the project manager can determine whether the project is on schedule or within the cost guidelines. Failing to compare actual results with planned results can lead to unexpected delays or cost overruns, which might have been avoided if the project manager had taken the time to analyze the project's progress.

6.3 Transitioning to the execution phase

Much time has to be spent on the planning phase of the project. This is not because the other areas of the project lifecycle are unimportant. It is because if more time is invested in the planning phase of the project, less work will be required down the line. This may seem incorrect, as nothing gets physically built during the planning phase, so most contractors do not see the point in spending so much time doing it; they would rather get to the execution phase. If the time is invested during the planning phase, the execution phase is simply a matter of executing the plan while making the necessary adjustments that will most likely be required. As the project manager becomes a better planner, the adjustment will decrease. By spending the time necessary to thoroughly plan a project, the project manager can dive into the execution phase knowing that he is prepared for the work at hand.

7. EXECUTING THE CONSTRUCTION PROJECT

The project has passed through the initiation phase and most, if not all, of the planning phase. The project team has been researching different aspects of the project, analyzing potential problems, developing solutions, and is now ready to see the actual work of the project begin. Everyone is ready to see that proverbial first shovel go into the ground.

In some ways, the execution phase is the easiest and the most difficult phase of the project. It is easy in that now the project manager must simply execute the well-developed plan. But it is the most difficult because he must manage the

work. The work has been planned well; now the time comes to work the plan. This requires both discipline and flexibility. If a project manager lacks the discipline to follow the plan, he will most certainly fall short in some way. Likewise, if he is unwilling to adapt the plan to real world conditions, he will be disappointed again and again.

This chapter focuses on executing the main constructions of the typical Finnish holiday house.

The main characteristic of the construction in Finland is using the prefabricated elements. These systems provide some benefits, which are important due to the conditions in what the construction works are made. The main reasons for using prefabricated systems are:

- Climatic conditions: because of the climatic conditions, it is important to minimize the works that are made outside or in the building sites. It makes using prefabricated elements suitable, which are made on the factories and that are needed for the minimum works in the construction site.

- Quality: the prefabrication of the elements in the factory allows reach high level of quality, because of the mechanics production process on the plants.

- Economy: using the prefabricated system allows reduce the building site staff to the minimum as it is only needed to place the prefabricated elements in their places. Moreover, using these systems avoids the mistakes in the construction process.

Besides that, this kind of construction makes a faster way of building.

7.1 Basement works

Foundations are structural members used to support bearing elements and transmit their loads to the underlying soils. The most used types of foundations are:

- Shallow foundations
    - pad foundations
    - strip foundations
    - raft foundations
- Deep foundations
    - piles
    - pile walls
    - diaphragm walls
    - cessions

The type of the structure determines the type of foundation. There are different types of foundations for different types of holiday houses: the foundations-cellar, columned foundation, foundation-slab, ventilated basement foundation, combined – basement foundation with a foundation-slab, etc. The type of foundation depends on the quality of soil, the level of the slope of the construction site, the necessity of drainage of the soil of building site. Foundations made of Leca blocks will be described in this work. The selection of the foundation method is mostly affected by the quality of the building base, the shape and purpose of the building, structures to be used, and the location and elevation of the building site.

The absolute starting point in design is the flawless and reliable functionality of the foundation with regard to strength, heat insulation and damp-proofing. The basic Leca block types with different actions and structures are presented in figure 7.1. Different foundation types can be used side-by-side in a single building.

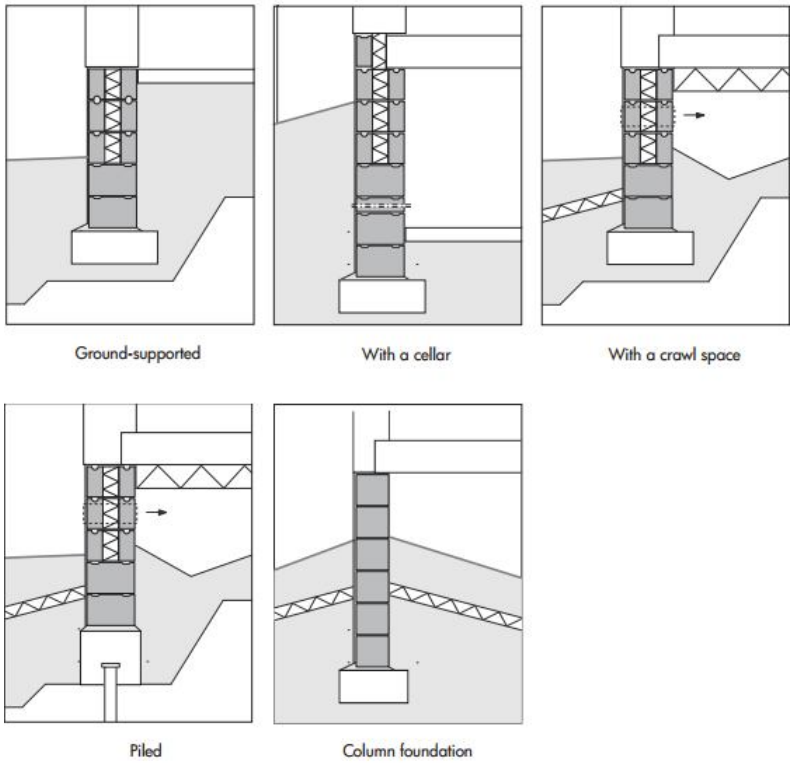


Figure 7.1. The most common Leca Block foundations

The foundation structures prevent ground moisture and surface waters that drain into the ground from penetrating the structures and interior areas.

The adverse impact of moisture can be prevented by securing the drying of the building base using drains and by building the required damp-proofing. In order for rain and melt water not to stagnate against the wall, the ground surface is shaped so that it slopes away from the building by at least 15 cm in a distance of 3 m. In order to prevent moisture from rising to the floor structures from the ground, a layer of at least 200 mm which cuts the water capillary rise is installed under the floor using Leca gravel suitable for the purpose. A layer of at least 200 mm of well-penetrable gravel is installed next to the plinth, footing beam or cellar wall. Leca Geosack acts as a drain layer and additional heat insulation next to a wall.

Wooden structures are always isolated from foundations using damp proofing. The joint between the footing timber and foundation is always sealed against air leakage. A strip of rubberized bitumen or closed cellular plastic or polyurethane foam can be used as insulation or sealant. Even though the water capillary rise height of water is low in Leca blocks, brick structures are also damp-proofed in the foundation (Maxit Oy Ab, 2008)

7.2 Frame works

For bearing structures of holiday houses timber is usually used.

Wood grows in layers and there is air tied in between these layers, which makes even structural wood a natural insulation material. When compared to modern industrial materials like steel and concrete wood has a superior insulating value and this does not yet include the thermal mass of the wood. Because of its mass, wood is able to store and release heat and humidity together these qualities transform massive timber frame into a battery, which stores extra energy and releases it when needed.

Environmental values and energy conservation have become increasingly important topics in housing industry. Massive timber frame houses are both very energy efficient and environmentally friendly. It is obvious that since wood grows on its own it does not need much energy input to be a ready product not so with steel and concrete as well as many other building materials. An added benefit with massive wood is that it functions as a carbon dioxide storage for the time of use and can be easily recycled in the end of the life cycle, which can be even hundreds of years. So building a timber frame house is saving the planet for all people.

Timber frame building is the best way to combine massive wood structures and modern architecture.

Figure 7.2. Different stages of house's production

Timber frames are manufactured in Finland and are usually made of solid pine from sustainable forests in Northern Finland. The timber frame allows for a high level of insulation. They are thermally efficient, reduce the cost of heating and produce to exceptional standards.

The timber frame is produced with high tech computer driven machinery ensuring precision cutting and jointing. The timber frame arrives at a building site pre-cut and drilled ready for slotting together and fixing. Different stages of production of the house are shown in figure 7.2.

A typical Finnish bearing frame is wooden columns with the step of 60 cm. The cross section is 50x220 mm. They are connected to the basement by anchors. For this purpose, a special block is filled with a concrete mix, which is drilled after getting hardness. The anchor is hammered through the bitumen material and it can be regulated by two nuts. Finally, the column is connected by metal shoes. Also holiday houses can be made of logs. The best log for the building is made of softwood. Exterior and interior view of the house depends on the type of the log. Different companies offer different types of logs, for example Honka Talot Company offers logs shown in figure 7.3.

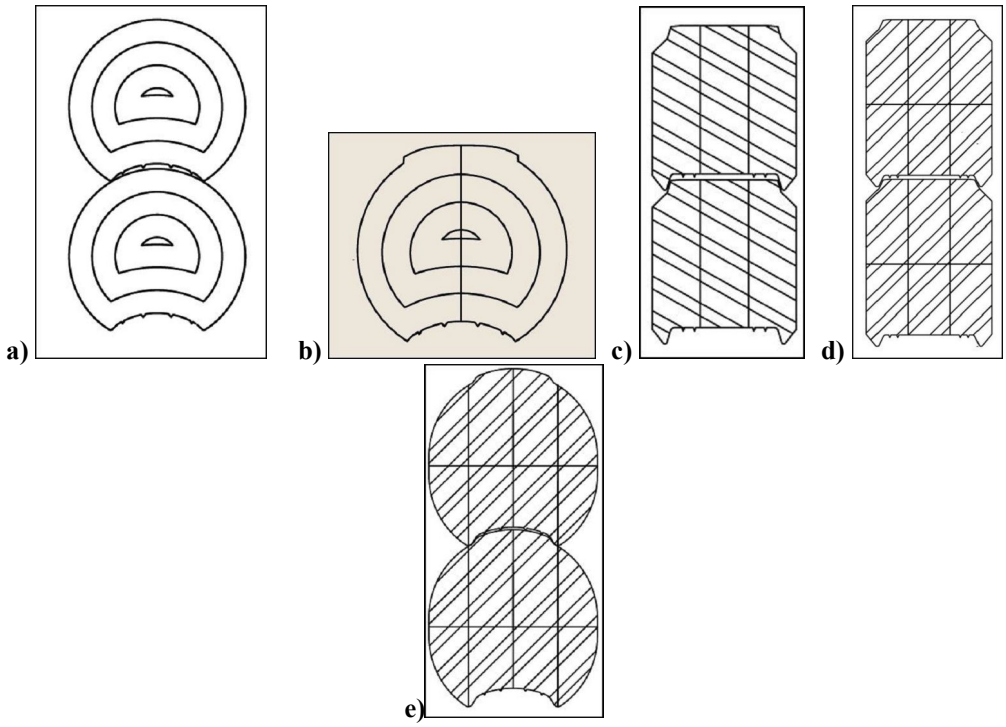


Figure 7.3 Types of logs made by Honka Company
a - the round log from the single body
b - round "HONKA Duo" log
c - vertically laminated log
d, e - rectangular multi-laminated log

7.3 Waterproofing of the roof

The roof is always perceived as the final element of the architectural appearance of the building. Every owner wants to give elegant, expressive and unique look for his house, but he must decide questions of strength, stability, fire resistance and safety of the building from adverse external influences (rain, snow, hail, lightning, etc.).

The roof of the building is the first barrier against atmospheric precipitations. Actually the comfort and coziness in the house depend on how the roof is made. To achieve comfort and coziness it is necessary to ensure its integrity, to insulate it from the precipitations, evaporation of the house and from heat losses.

Waterproofing is needed to protect the roof from precipitations and condensation which accumulate on the inner surface of the roof. In the absence of waterproofing, insulation saturated with moisture and stop to support the heat in the house, and wood and metal elements oxidized.

Integrated concept of waterproofing consists of three main elements:

- waterproofing: it protects the insulation and rafters from moisture that can condense on the roof covering, or penetrate under the roof covering during slanting rain and strong winds;

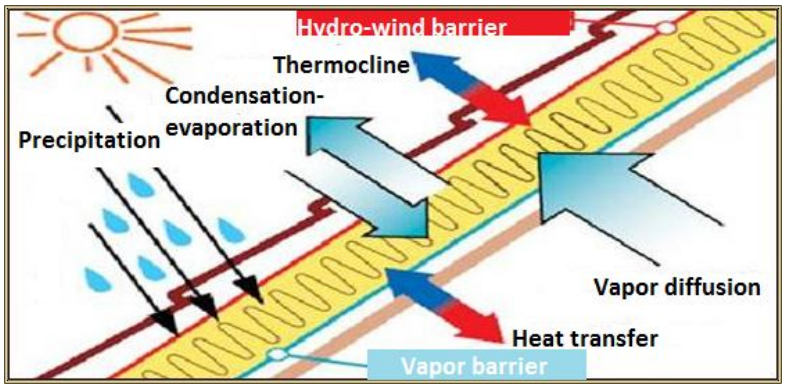


Figure 7.4 The impact of climatic factors and human activities on the condition of the roof

- vapor barrier: it prevents entry of water vapor from the interior premises to the insulation, helps to preserve its insulating properties. In addition, vapor barrier is necessary to prevent bulging of the roof elements that appears due to accumulation of steam;

- ventilation system: due to ventilation, moist air is removed from the interior space of the roof by convection or by using special devices.

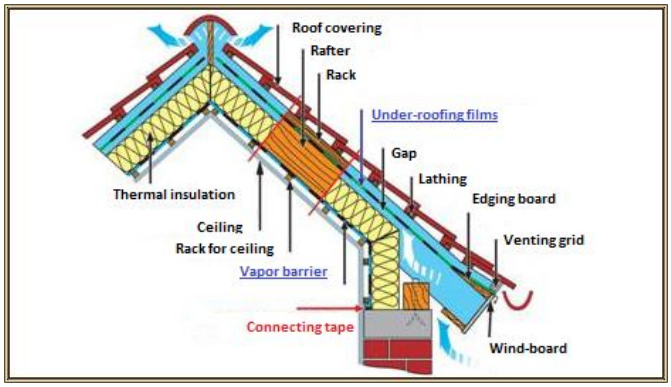


Figure 7.5 Scheme of waterproofing the roof

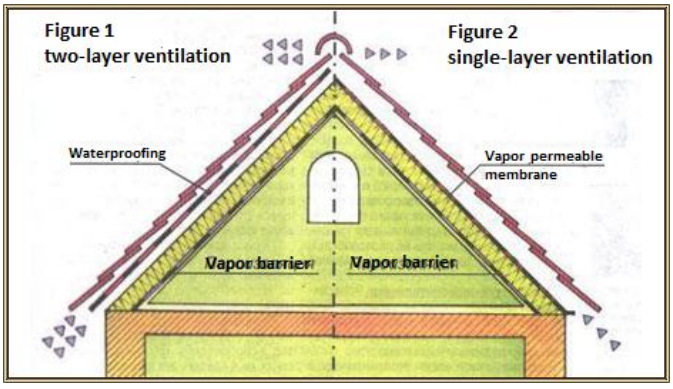


Figure 7.6 Scheme of variants of roof ventilation

A modern warm roof is a multilayered structure, so-called "roof pie." It consists of roof covering, insulation and under-roofing films. Each element of such a roof has its own purpose and inextricably links with the others. “Pie” provides the retention of heat in the premises and keeps efficiency of all elements of the roof over the long term.

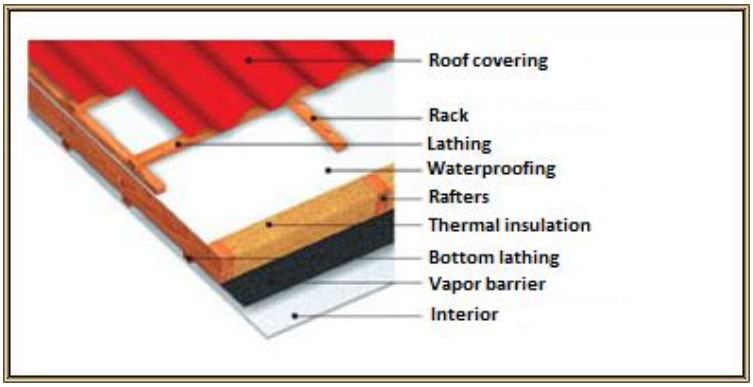


Figure 7.7 “Roof pie”

There are two classes of waterproofing materials – films and membranes.

Films are one, two or three-layer materials consisting of polypropylene fabric, which provides waterproofing of roof structure. Woven polypropylene high-strength cloth has an absorbent layer which is a combination of viscose and polypropylene.

Membranes are more complex polymeric materials based on a non-woven polyester fabric. The membranes are oriented materials, and "work" on the principle of a semiconductor; they pass steam from the premises and do not absorb moisture inside.

7.4 Materials

The modern market of building materials is so great that it allows achieve exceptional results and the most fantastic effects during construction and finishing works. During construction and finishing works all the wishes of the client, specific facilities and the budget of the project are taken into account. The main principle is an individual approach to each client.

7.4.1 Outside materials

For finishing outside materials, wooden panels are usually used (see figure 7.8).

Figure 7.8 Outside wooden panels

These panels may be painted in any color. However, it is necessary to keep in mind that there are strict laws on environmental protection and construction in Finland. The number of storeys, the color of roof, and the material and color of the facades of the house are regulated. Thanks to these and similar measures,

it is possible to preserve nature almost intact, also this provides the external beauty, the aesthetics of the construction.

The next layer in outer wall is air layer. In winter, the air masses, which include water vapor, will pass through the permeable structure of the outer wall from the inside out. The temperature of the air mass will decrease as it approaches the outer surface of the wall. The presence of the air gap can divert water from accumulating structure.

The following layer is wind stop layer, hard thermal isolation materials are usually used for wind barrier, the most common materials are XPS (eXtruded PolyStyrene) and EPS (Expanded PolyStyrene).

As it has been mentioned above a typical Finnish bearing frame is wooden columns with the step of 60 cm. There is thermal isolation between these columns. Thermal insulation is the element of construction that reduces heat transfer. The most common materials for insulation are inorganic – mineral wool and its products (for example, mineral plates).

As a finishing material for the socle plaster is commonly used, also stone (natural or artificial) can be applied.

7.4.2 Inside materials

After the erection of a house the final step is always interior decoration. By the end of finishing works the house gets lived-in appearance. How nice it would be depends on the quality of interior finishes. First of all, the most common materials used for interior walls are considered.

Interior wall paneling (see figure 7.9). The advantage of the wooden lining is that it is environmentally friendly, vapor permeable and easy to install. A room with wooden clapboard looks warm and cozy. The disadvantage is that it requires staining or impregnation.

Gypsum plasterboard. These are panels of different sizes (thickness is 9-15 mm) with gypsum content, pasted on both sides of a special board or fiberglass. Their use allows obtaining smooth wall of a small weight. In addition, gypsum has increased the measure of fire resistance. Joints of panels are stuck with a

special tape, after this the entire surface is puttied, primed and then painted or glued with wallpaper according to the client's wishes.

Figure 7.9 Interior wall paneling

Wall tiles (see figure 7.10). Wear-resistant tiles offer a luxurious variety of shapes, colors and textures, decorative combines with functionality. Tile is usually used in bathrooms and other "wet" rooms. An additional possibility of ceramic tile is a space for creativity, for example, paint it with oil paints.

Figure 7.10 Wall tiles

Textile wall coverings (see figure 7.11). Textiles are often used to decorate the walls of rooms: bedroom, living room, cabinet, nursery. This covering is elegant and practical.

The ceiling is often the last thing to pay attention to in a room, but without a good ceiling the interior is risked to look not stylish and elegant. With properly chosen colors and finishing materials for the ceiling, the space of the room can be visually enlarged, a small dark room can be a spacious and light, giving the interior a finished look.

The choice of finishing materials for the ceiling is determined in accordance with the planned type: suspended ceiling (consisting of tiles), stretch (a leaf) or colored (or covered with wallpaper).

Figure 7.11 Textile wall coverings

Suspended ceiling made of gypsum plasterboard (see figure 7.12). This is the perfect solution for a house. It is smooth and plain, lights can be effectively placed on it, and if it is necessary it can be easily repainted in any color. Plasterboard ceilings have several advantages:

- multifunctionality;
- environmental friendly;
- non-combustible;
- excellent sound insulation.

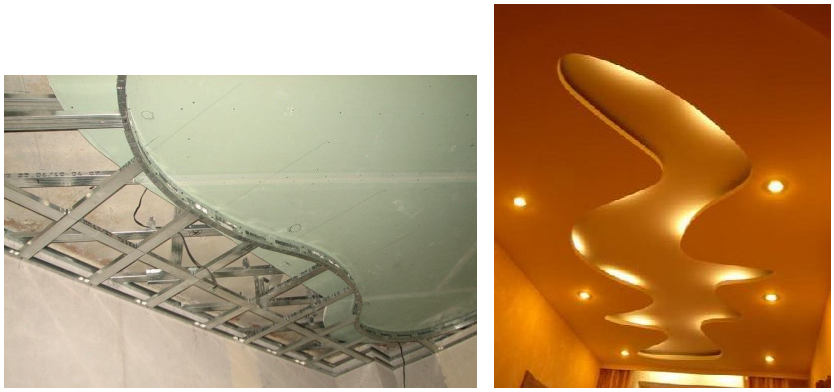


Figure 7.12 Suspended ceiling made of gypsum plasterboard

Cassette suspended ceiling (see figure 7.13). Cassette ceilings combine an attractive appearance, functionality and durability. In addition, they are characterized by high water resistant and fire safety. The cassette ceiling

consists of the square or rectangular panels and the suspension system. Cassette suspended ceilings are characterized by the following advantages:

- durability;
- the possibility of a combination of models;
- hygiene;
- moisture resistance;
- fire resistance;
- the possibility of embedding lighting and climate systems;
- quick installation.

Figure 7.13 Cassette suspended ceiling

Rack suspended ceiling (see figure 7.14). It is a fast, convenient and aesthetically pleasing variant. Due to its high strength, durability, moisture resistance, a wide choice of colors, textures, as well as their combined rack, suspended ceilings are used extensively to create a modern interior. Rack ceilings are composed of long, narrow panels and specially designed suspension system. The benefits of rack suspended ceilings are:

- versatility;
- durability;
- variety of models and their possible combinations;
- environmentally friendly;
- hygiene;
- moisture resistance;
- fire resistance;
- the possibility of embedding lighting and climate systems;
- light reflection
- sound absorption;
- quick installation

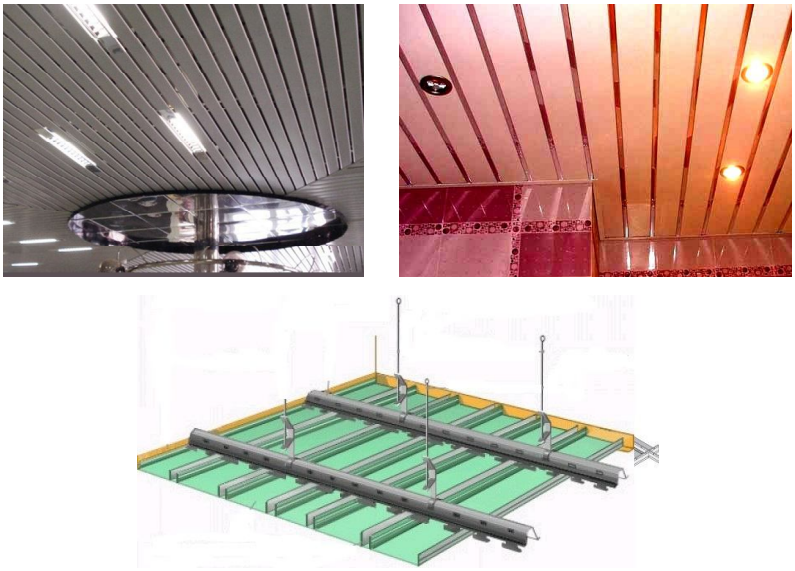


Figure 7.14 Rack suspended ceiling

Sretch ceilings (see figure 7.15). Stretched ceiling is a perfect opportunity to quickly and easily create a smooth surface of the ceiling. Material for suspended ceilings is available in several textures of surfaces and can have a varied color scheme. Stretch ceilings have a number of advantages:

- environmentally friendly;
- water-resistant;
- strength;
- preservation of height of the room;
- variety of forms;
- lighting;
- variety of colors and textures;
- easy installation;
- “clean" installation and removal.

Figure 7.15 Strech ceilings

Traditional ceiling decoration. Traditional ceiling decoration includes whitewashing, painting, or gluing ceiling surface with the wallpaper. But such a

decoration does not suit all rooms. The kitchen ceiling is invariably contaminated with soot and grease vapors, and in the bathroom it can be destroyed by moisture.

Ceilings with decorative painting (see figure 7.16). Art painting ceilings can create a special atmosphere in any room. Each interior is individual, but the painted ceilings in the apartment will emphasize this individuality.

Figure 7.16 Ceilings with decorative paintings

The internal floor finish is usually done last. Parquet, laminate, linoleum, stone or ceramic tiles are the most common finishing materials. High-grade interior floor will provide comfort and convenience for years to come.

Parquet (see figure 7.17). A key feature of this material is that parquet is environmental friendly. In addition, it provides excellent level of heat and sound insulation.

Figure 7.17 Parquet floor

Laminate (see figure 7.18). This modern and extremely relevant in recent years material for interior decoration offers homeowners a high strength, moreover the laminate is very convenient to wash, and it is resistant to contamination. The service life of the laminate can vary greatly depending on the class of material and operating conditions. In some cases it may be 20-25 years.

Figure 7.18 Laminate floor

Linoleum floors (see figure 7.19, a) are widely used as flooring in homes. This material is cheap, hygienic, easy in operating. Also a very popular material is carpeting *(see figure 7.19, b)*. Floor covered with carpet is warm, soft and non slippery. The disadvantage of a linoleum and carpeting floors is short life cycle (5-10 years). But it also means that the boldest color options can be chosen, which will suit the planned color of the walls, doors and furniture.

a)  b) 

Figure 7.19 a – Linoleum, b - carpeting

Floor tiles (see figure 7.20). As a material for interior decoration ceramic granite can be used in almost any room. Its main features are to provide exceptional strength, low permeability to water and frost.

Figure 7.20 Floor tiles

Karjalan Rakennus ja Maalaus OY choose subcontractors and material suppliers carefully, the selection takes into account their ability to deliver flawless products and services. All construction works are done by

professionals. The most modern and most environmentally friendly building materials are used for construction.

7.6 Transitioning to the controlling phase

The project must be not only executed, but as the work progresses it should be monitored so that deviations from the project plan may be corrected when they arise. The next chapter will cover the fourth phase of the project lifecycle – controlling the construction project.

8. CONTROLLING THE CONSTRUCTION PROJECT

The first three phases of a project lifecycle (initiating, planning and executing the construction project) progress in a rather linear manner. Once the project is initiated, then it is planned; once it has been planned, it is time to execute the plan. While the execution phase progresses, there is another phase also in process – the controlling phase.

The controlling phase contains processes that are necessary to carry out two tasks. First, processes ensure that the plan was being followed in the execution phase. In this case, the controlling phase is concerned primarily with monitoring both the quality of the work and the quality of project manager's performance. In order to monitor the work, a number of performance evaluation techniques and inspections, which compare the actual work of the project to the planned work of the project, are used. The comparison provides data for informed decisions about the execution of the project. The data is used to correct any problems or deviations that occur during the execution phase.

The second aspect of the controlling phase is integrated change control. Sometimes it becomes necessary to modify the project plan, usually there are two reasons to do this. First, the client may modify the construction plan, this would be in the form of the construction change order that specifies the work the customer would like to have modified. A second aspect of integrated change

control concerns how the project plan is actually changed. The project manager will have in place a process for modifying the project plan and informing those parties who need to be aware of the modification. If this is not done, then problems, that can threaten the success of the project, can arise.

The controlling phase works in close tandem with the execution phase of the project. While the project is being executed, the project is being monitored and controlled. Each phase informs and interacts with the other, which means that certain activities are not easily distinguishable as execution processes and controlling processes, but sometimes blur together. The point is that while the work is being executed, it also is being controlled as a means of making certain that the work being executed is the work that was planned.

Therefore, controlling phase is a rather broad field. In this work the aspects of quality control will be discussed as this part of controlling process is the most interesting and important for the customer.

8.1 Quality control

The quality of the work is a major area of the project that must be controlled. Two main aspects of quality control are involved. Firstly, quality control concerns to the quality of the craftsmanship of the house. Secondary, quality control can refer to the skill with which the project is being managed. The project manager is concerned with both these aspects. He must make certain that the actual work of the construction project is performed according to the standards set in the contract and the building specifications. He must also make sure that the way the project is managed does not lead to mistakes, schedule delays, or cost overruns.

The quality of the workmanship is controlled through inspections. Project manager should inspect the work as it is done to ensure that it meets the specifications set out in the project plan. The objective is to reinforce the idea that one should work the plan and inspect the work – the key to success in construction management. One of the tools that project manager can use to inspect the work is a checklist. Checklists should be done for each construction

project, as each project has its own design and challenges. The purpose of the checklist is to make certain that the work is performed in conformity with the specifications found in the project plan. Checklists can be created rather easily and offer a great tool for ensuring quality craftsmanship.

The project manager is also concerned with making sure the project management meets a high standard. Regardless of the quality of the plan, if the project is poorly managed and executed, the project is destined for delays, cost overruns, and various amounts of rework. The project manager can avoid this by ensuring that the procedures for ordering materials, scheduling subcontractors, issuing payment, and all the other aspects of the project are followed as outlined in the project plan. Poor management typically shows itself in poor workmanship; a project that is poorly managed will be poorly executed. (Griffin, 2010, p189)

8.1.1 Supervision during construction

The local building supervision authority, based on the public interest, supervises building and ensures that the provisions and regulations are observed in building activities (Land Use and Building Act §124).

Supervision takes place at the stages of work and on the scale decided by the authorities, and focuses on aspects that are significant to achieving a satisfactory end-result (Land Use and Building Act §149). The quantity of inspections is indicated in the building permit. In practice, the scale of supervision depends on local building supervision authority, degree of difficulty of the building project, professional skill of people responsible for the planning and implementation, area of a house and other factors influencing the need for supervision. The most general inspections during the construction are inspections of plot, foundation, frame and networks.

After the inspection of reinforcement and foundation works, the correct location of a building on the site and its height position are checked in accordance with the project. Drainage system, derivation of ground and surface water are also examined. The inspection of the frame is carried out right after its erection before loading structures will be hidden. As the works on the installation of

engineering systems advances, the responsible site manager invites the inspector for the formal acceptance of water and waste water systems.

The results of the inspection of water and waste water systems are written in the protocol, which is presented to the building inspector during the final inspection. The testing of electrical equipment is performed by a skilled electrician. He makes the report of inspection and the final drawings. The inspection of pipes is carried out for testing the fire safety of the building. The check-up is executed by representatives of fire supervision authority only or often together with the building inspector.

The local building supervision authority also takes charge of general steering of the building and related advisory services needed in the municipality (Land Use and Building Act §124).

When approving a supervision plan, the building supervision authority decides where supervision by the authorities is not required (Land Use and Building Act §151).

An independent municipal inspector comes after every ready phase to approve the work.

The customer can see the results off all tests when it is necessary for him. The most common tests are:

- soils inspection
- moisture in floors
- infrared camera analysis
- air tightness measurements

For further consideration these inspections have been chosen. Selected issues are the most common for Finnish building sites and rather easy for client's understanding.

8.1.2 Soils inspection

The most typical tests that are done in building sites for quality are: sieve analysis, plate-bearing test, balloon density apparatus and proctor compaction test.

The Proctor test is a test that is used in geotechnical engineering to find out the maximum density that can be practically achieved for a soil or similar substance. The Proctor soil compaction test is performed by measuring the density, or dry unit weight, of the soil being tested at different moisture content points. The aim of the soil test is usually to determine the optimum moisture content for the soil. In addition to soils, other substances, such as aggregate, gravel, or sand, may be measured.

Soil testing equipment used for the Proctor test usually consists of a mold of a standard shape and size, and a device, such as a hammer, for compacting the soil into the mold. When soil testing machines are used, they must be able to measure how much force is applied to the soil in the mold. The hammer or other compacting tool is used to compact the soil or aggregate in the mold. In this scenario, compacting the soil means increasing its density by forcing air out of the soil. Different stages of the proctor compaction test are shown in figure 8.1.

Figure 8.1. Differet staged of the proctor compaction test

By compacting the soil or aggregate at different moisture contents, an engineer can determine what is the optimum moisture content and compaction level of the soil or aggregate for a specific use in a particular engineering or construction project. As such, the Proctor test is an important tool in the field of geotechnical engineering, as it is a crucial test that can help in determining what the risks are in engineering or construction projects. It can also help determine

how these risks may be mitigated by making optimum use of aggregates and other physical materials. An example of where the Proctor test may be used in a construction project might be in the selection of which aggregate to use in the foundation of a building (Martin, 2012).

8.1.3 Moisture in floor

Moisture encourages biological pollutants, including allergens such as mold, mildew, dust mites and cockroaches. Slab moisture is a significant problem which can be either temporary, caused by the original construction procedures or can be a continuing problem, caused by ground moisture travelling up through the slab on grade. Soil moisture below the slab determines the continuing water available to pass through the slab and potentially cause a long term problem. Slabs on dry, granular soils rarely have long or even short term problems. Slabs on damp fire grained soils, such as silts and clays, with a shallow ground water table often do. Project specific soils reports usually identify soil conditions which might cause moisture problems and when present the report will generally recommend a damp proofing membrane below the slab.
The determination of moisture content is an essential part of quality control especially within the flooring installation process. Flooring installers should know the dryness of not only the wood flooring, but its subfloor and the concrete slab beneath it, if one exists. It is equally important to check the relative humidity of the area of the floor installation as well as the storage space. Hand-held electrical tools, called moisture meters, are used for measuring moisture in wooden or concrete subfloors and in the wood floor materials.
For example, GANN HYDROMETTE RTU 600 may be used. It is an electronic four-in-one meter designed for measurement of wood moisture, structural moisture, air humidity and temperature, with digital LCD readout, automatic temperature compensation for wood temperatures between –10 °C and 80 °C and very precise correction facility for all species of wood. This equipment has different scales for different materials. The process of working is shown in figure 8.2.

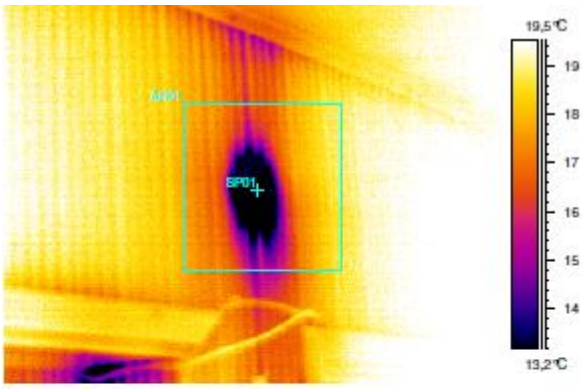
Figure 8.2. The process of working Gann Hydromette

8.1.4 Infrared camera analysis

Infrared thermography is the easiest and quickest method to detect energy waste, moisture and electrical issues in buildings. An infrared camera analysis shows exactly where the problems are and helps to focus attention allowing to properly diagnose areas with energy loss. Much like digital cameras, thermal imagers capture pictures. Instead of seeing visible light like digital cameras, thermal imagers use a detector to measure infrared energy. These measurements are then used to create a thermal image by assigning colors to correspond with certain temperatures. In these pictures reds, yellows and orange represent heat. The shades of blue represent cold air intrusion. Different areas of the house can be viewed through the infrared camera to find specific areas of air leakage.

For example, the principles of work FLIR ThermaCAM 695 will be considered. This camera makes thermal images. Based on these thermal images, accurate temperature measurements can be made to detect even the smallest temperature differences. Numerous researchers, active either in product development, applied or fundamental research, have discovered that infrared is a reliable and quick non-destructive method to help them in their daily work.

The camera makes two photos: thermal image and normal image. Thermal image allows determining surface temperature. This makes infrared camera analysis rather demonstrative. There is an example of thermal images made by FLIR ThermaCAM 695 in figure 8.3.



Electricity system

Label	Value
SP01	13,0°C
AR01 : max	19,2°C
AR01 : min	11,2°C
AR01 : avg	16,8°C

Figure 8.3. Example of thermal images

An analysis can be done with special programs, for example, ThermaCAM Reporter 2000 Professional. Using the results of this report, thermal indexes may be calculated and estimated.

8.1.5 Air tightness measurements

To determine air tightness, or the amount of air leakage in a house air barrier a blower door test is used. The Blower Door (see fig. 8.4) is a diagnostic tool designed to measure the air tightness of buildings and to help locate air leakage sites. While using the blower door, the main goal is to measure air leaks of the building. The Blower Door consists of a powerful, calibrated fan that is temporarily sealed into an exterior doorway. The fan blows air into or out of the building to create a slight pressure difference between inside and outside. This pressure difference forces air through all holes and penetrations in the exterior

envelope. By simultaneously measuring the airflow through the fan and its effect on the air pressure in the building, the Blower Door system measures the air tightness of the entire building envelope.

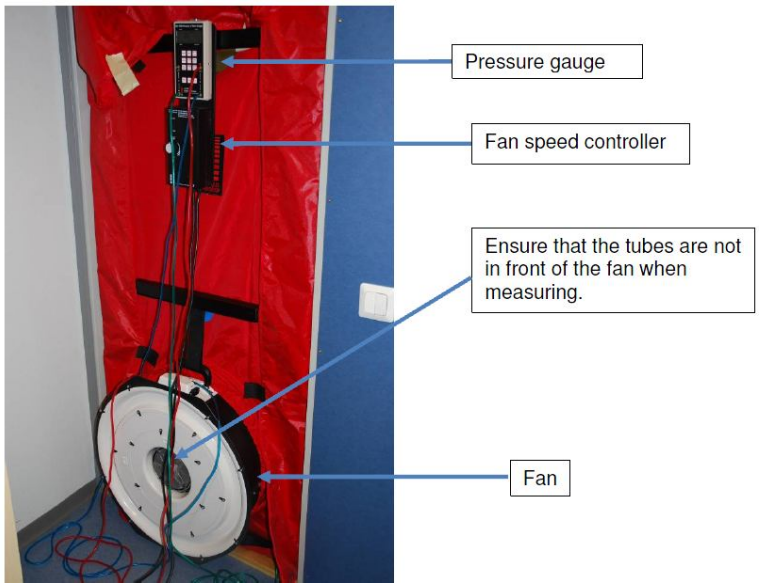


Figure 8.4. Blower Door

The results of measurements are processed by a special computer program. For example, after processing the results the air leakage coefficient becomes known. If air changes per hour are less than 2 (1/h), the results of inspection are considered to be good and air leakages exist but they are not significant.

9. CLOSING THE CONSTRUCTION PROJECT

The closing phase is the last phase in a construction project lifecycle. First the project was initiated, then it was planned, then it was executed, while it was executed it was controlled, and now it is time to close the project.

In general, closing the project involves assuring completion of every aspect of the project, not only for the project manager but also for various stakeholders of the project. Everyone has his or her own list of completion requirements before the project will be closed. The closing procedures primarily focus on the tasks involving the project manager and the client but will also possibly include subcontractors, vendors, team members, financial institutions, attorneys, surveyors, engineers, building inspectors, and any other stakeholders. During

the planning phase, the project manager developed a preliminary plan for closing the project, but that plan must be revisited and updated with any new information that might have come to light during the execution of the project.
Closing procedures cover a wide range of both topics and stakeholders. At minimum, closing procedures will cover the following areas:

- Client
- Building site
- Construction stakeholders – vendors, subcontractors, inspectors, etc.
- Project file
- Project team
- Audit procedures

By thinking through the closing phase categorically as presented above, the project manager creates a higher possibility of ensuring that all relevant issues are covered and closed during this phase. In this work special attention is paid to closing procedures that are covering client's area (Griffin, 2008, pp 247-248).

9.1 Client

Most project managers are quite familiar with procedures and issues involved in closing the aspects of the project directly related to the client. The focus on the client-related issues is appropriate, as these issues are the most critical aspect of the closing phase. If the project manager can successfully close with the client, the rest of the closing is typically merely a matter of paperwork.
Typically, when closing and construction are uttered in the same sentence, one thinks of the closing that takes place at the attorney's office or at the bank, when the title is transferred to the client, and the seller or builder receives payment for the property. Although this is an important and integral part of the closing phase, it is only one part. There is much work that must be done to get to this point, and there is some work to be done after this point. Because,

however, the closing transaction is such an integral part of the closing proceedings related to the client, it will be treated as a hinge or reference point for this section of the chapter. The information will be presented in a linear manner, starting with some of the steps that are part of the construction WBS, which lead into these final closing procedures.

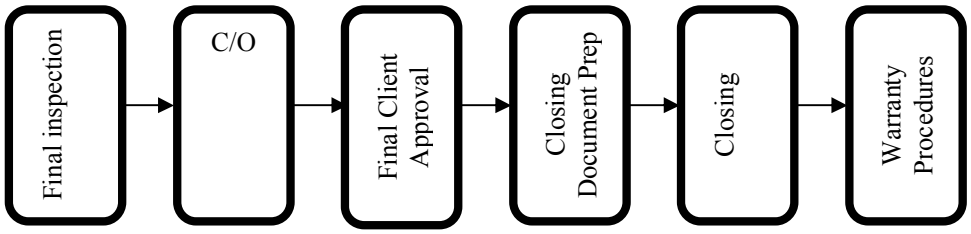


Figure 9.1 Client related closing procedures

As can be seen from figure 9.1, there are a few steps that lead to the official closing with the client, and there are a couple of steps that follow.

9.1.1 The final inspection

The final inspection is performed by the local building inspection office to ensure that all work that has been completed on the home is in compliance with the applicable building codes and zoning ordinances. Depending on the area and guidelines applicable, this may be a one-time inspection, or it may require a couple of phases. Regardless of the process, it is required before the builder can acquire a Certificate of Occupancy, which is the authorization from the local regulatory board stating that the home can now be occupied by a resident.

9.1.2 Issuance of certificate of occupancy

The certificate of occupancy (C/O) is one of the most important documents that the builder acquires, because it states that the home meets the applicable building and zoning codes. With this document, the client can have the power turned on, the water turned on, and obtain insurance with a homeowner's insurance policy.

9.1.3 Final client approval

After the final inspection is completed, the WBS calls for a series of inspections to be performed by the client or the client's agent. Often times, the client will hire an independent home inspector, or an architect associated with the project, or an engineering firm to perform the final inspection with the client. Typically, these inspections focus on more cosmetic issues than structural or mechanical, but the latter may also be included.

Receiving the final approval from the client may take a couple of inspections and re-inspections. Regardless of the process, the project manager must receive final approval if he hopes to close on the project. Sometimes, legitimate disagreements will arise as to whether some aspect of the work is in compliance with the construction contract. When these types of disputes arise, the only party that can interpret what exactly the contract states is the courts. Arbitration may work, but arbitration simply tries to get the parties to reach an agreement through varying degrees of compromise. Only the courts can provide a definitive determination as to what is and is not in compliance with the terms of the construction contract.

After the client has given final approval, the project manager is almost ready to meet the client at the closing table in order to sign all the final documents and receive final payment. Typically, the closing date will have been set by the client and the client's financier at a time beyond the final inspection, to allow time for the punch list items to be addressed. During this interim period, the builder gathers certain documents that are required for the closing.

9.1.4 Builder-provided closing documents and final financial statement

During construction, the project manager compiles a project file filled with various documents. Included in this file are various reports and records, which will be pertinent and necessary for the closing. Items such as the soil inspection report, any engineering reports, surveys, inspection reports, wood-destroying

insect treatment reports, lien-waivers, and any other documents that were obtained during construction are included.

Another document that needs to be prepared is the final financial statement for the project. Invariably, the client will have made changes during construction, which will most likely lead to an increase in the cost of the project. If there are overages, the project manager ensures that all costs are included and that documentation is available to support those extra charges. In preparing this financial statement, the project manager must be both detailed and clear. The client should be able to read the document without much trouble; it should not be so detailed as to make it overly confusing. Typically, the financial statement is in summary form, and the project manager will be able to provide supporting documentation if a request is made.

Once the documents required for the closing have been compiled, the project manager or the representative from the construction company is ready to attend closing to receive the final payment for the project.

9.1.5 Property closing

Construction projects and construction contracts come in all types and forms. Because of this, the role the builder takes at closing can vary.

There is, however, one thing that the builder is always seeking, regardless of the actual closing process - final payment. The builder might have been receiving payments throughout construction, or very few to no payments. At closing, the builder always expects to receive a check.

In addition, it is a good idea for the builder to provide a packet to the client that includes copies of all the documents discussed in the previous section. This way, the client will not call in a few years looking for a document that the builder has long ago archived.

9.1.6 Warranty procedures

Quality assurance in construction means that the contractor guarantees the customer the desired level of quality. The quality of work performed by the contractor is determined by the contract, or requirements that are usually imposed on the work of the relevant kind.

Warranty period is the period during which the contractor has confirmed that the building will comply with the terms of the contract

Unless otherwise noted in the contractor agreement, warranty for contract's works, according to the law of Finland, is 24 months from the date of acceptance of all contract works. The warranty applies to the additional work associated with additions and changes. The warranty period of construction should be valid during the execution of contract work and during 3 months after their acceptance. The guarantee period for hidden works is 3 years.

Karjalan Rakennus ja Maalaus OY offers the client 2 year and 10 year guarantee systems. The 2 year warranty applies to all interior works: painting and decorating materials, kitchen furniture, interior doors, etc. The 10 year warranty applies to all external works – frame and insulation materials.

Checking period is 1 year. After one year there is the first check point. The list of defects is made and then company fixes all mistakes. The next check point is after two years, the company also fixes all errors.

Karjalan Rakennus ja Maalaus OY does not fix mistakes associated with the incorrect maintenance of the building.

9.2 Building site

The centrality of the building site through the construction project means that a number of items will be stored and misplaced there. After the final inspection has been completed, and the client has approved any items that were noted in the inspection reports, the building site must be transformed to a home for the client. A thorough cleanup is performed first. The interior and exterior of the home are combed through to remove any remaining items associated with

construction. This way when the client arrives, he will be ready to begin moving into the property.

Depending on the project, there may be some unused materials that must be returned. Whatever is done with the unused materials, the accounts must be reconciled with the client to make certain that he is reimbursed for any returned items. If any tools or other equipment have been rented for the project, it will need to be returned as well.

After the materials have been returned or transferred, the equipment has been returned, and the job site has received a final cleaning, the project manager will be ready to close this aspect of the closing phase.

9.3 Construction stakeholders

Every construction project has a diverse group of stakeholders ranging from inspectors, vendors, subcontractors, and others. Just as the aspects of the project are being closed from the perspective of the project manager, so too must these various stakeholders close the project from their perspective.

In general, there are four areas of focus in closing out issues related to construction stakeholders:

- Work contracts
- Accounts payable
- Lien waivers
- Performance reviews

Closing work contracts simply involves reviewing the contracts related to each stakeholder and ensuring that each party has met the contractual obligations. Without question, the stakeholder will have already performed the work contracted for, but the contract may call for additional services, such as a follow up inspection report or a warranty document. Whatever the terms may be, the project manager is responsible for ensuring that both parties have met the terms of the contract before closing out the project. If a stakeholder has not met

his obligation, the project manager will be responsible for taking steps necessary to ensure that the terms are met.

As part of the contract review, the project manager reviews the accounts payable to make certain that all payments have been made to those who participated in the work of the project. The next item the project manager must acquire is a signed lien waiver from all subcontractors stating that they have received payment in full for any and all work performed on the project.

The last item related to construction stakeholders is performance reviews. Often project managers do not think to provide performance reviews for stakeholders, because these individuals or companies are not direct employees. It is unlikely that the stakeholder would receive criticism well. However, this should not hinder the project manager from doing performance reviews, even if they are only used internally. For a construction company that wants to develop a reliable base of vendors and subcontractors, this will prove to be a very helpful tool.

9.4 Project file

Project file is a broad term that can cover any number of documents associated with the project: baselines, planning documents, work and purchase orders, and work contracts. In this part of the closing phase, the project file is closed out and prepared as a future reference document. The first step is to review the information and update any documents to reflect actual results. This way when someone looks back at the project, he will see information that reflects the actual results of the project, not the results that materialized at various points in the project.

The second step to closing the project file is completing any project lessons learned reports. In general, a lesson learned is exactly what it sounds like - a lesson that the project manager or project team learned during the project. It might, for example, refer to a lesson learned in planning the project or executing the project. It might relate to a certain type of material or building technique, or a lesson associated with a certain vendor or subcontractor.

The final step in closing out the project file is to prepare it for archiving. This typically involves two steps. First, it involves making certain that all the parts of the project file are present in final form and properly ordered. Second, the project manager creates a summary and table of contents for the project file. The summary should include the highlights of the project, such as the parties involved, the type of home built, the construction time, the budget, as well as a comparison chart showing the performance of the project. The table of contents acts as a guide showing the reader what documents are available in the project file, so that he will not waste time seeking something that is not present to begin with. On a secondary note, the person performing this job should make certain there is no personal information present in the file that could compromise the identity of a party involved. This information should be blacked out or shredded as a safeguard.

Another option that is becoming more popular is to keep a paper file for a couple of years but to create a digital file for long-term storage. This is a great help when preparing for future projects, as one can simply open parts of the file and update it to reflect the realities of the new project. This is a solution that should be considered seriously by any builder who wants to use past files in a meaningful and productive manner.

9.5 Project team

The project team is also one of the aspects of the closing phase that needs special attention. Depending on the size of the organization, the project team may only be the project manager, or it may comprise a number of people performing the various tasks of the project. If the project team is the project manager, this is a fairly easy step. The purpose of this step is to provide performance reviews of the members of the project team and to reassign project team members to new projects.

9.6 Audit procedures

While all the previous work is going on, the project manager or an assigned team member must oversee all of it to ensure that it is done properly. Making certain that the project closes well is an important aspect of project success. Typically, the person assigned to oversee the closing is merely working through the closing plan that was developed during the planning phase of the project.

9.7 Closing process in Karjalan Rakennus ja Maalaus OY

In this section closing procedures concerning the client will be discussed. First, the company makes its own inspection, they have one week to fix all mistakes. Then it is time to authoritiy checking. Authorities monitor that the quality of work done by the contractor is determined by the contract, or demands that are usually imposed on the work of these kind. Authorities can give the certificate of occupancy. The company presents to the client the results of the final inspection. Moreover, the customer can hire an independent home inspector, or an architect associated with the project, or an engineering firm to perform the final inspection to the client. After this final inspection the client makes a list of mistakes, the company fixes the mistakes during 1 week. The customer may take a couple of inspections or re-inspections before giving the final approval. The warranty period is started from the date when the approval is received.

10. CONCLUSIONS

The purpose of my thesis was to give a clear vision of a project for the customer, to find and tell the most important technical things of a construction process, which are interesting for customers and influence on the purchase decision. The terms “project” and “project lifecycle” were explained in this work. The phases of the project lifecycle were looked through from initiation to closing the construction project. After reviewing these phases it was found out, that the

construction process is rather complicated for foreigners in Finland. A person, who starts the construction of a house, is required to ensure the compliance of Finnish building rules and regulations, as well as the conditions for obtaining a building permit. The planning of the construction process is a precondition for a successful completion of a project. The planning should be carried out at all stages of the construction process. Each step should be approved by local authorities. During construction and controlling phases, the developer has to solve a lot of problems, such as obtaining permits, making applications, sending requests, inviting tenders for a contract, communicating with officials and observing the laws and regulations. Also the construction of a house requires time and the customers who have not a permanent place of living in Finland will have some problems with the monitoring of the construction. Closing phase is also difficult for a foreign client, because all closing documents should be prepared, the final inspection should be completed, all contracts with subcontractors should be closed, etc. These procedures are rather complicated for inexperienced foreign people.

Thus, building a house in Finland is a very difficult process and the best solution for the customer is to trust the professionals. The easiest way is to choose a turnkey construction project system – from obtaining a building permit in Finland to equipping furniture and built-in appliances. Karjalan Rakennus ja Maalaus OY offers this system to the client. The company will do everything to protect the customer from all possible problems, which he even does not know. At each stage the construction is under the watchful eye of professionals, which allows build objects without the presence of the customer. To make a turnkey construction project system in Karjalan Rakennus ja Maalaus OY more clear and usable for international and Russian customers a technical brochure was created, text for this brochure in English is attached in Appendix 1 and in Russian in Appendix 2.

The main target of the thesis was to offer the company some new developments, which can attract more international and Russian customers.

First of all, it is important to pay attention to client feedback. A survey should be developed individually for each client and sent to him, as well as some type of present for completing the survey, such as a gift card to home improvement store or local restaurant, branded pen or calendar, etc. The received feedback

should be analyzed and discussed among the members of the project team. Both positive and negative feedback provide the opportunity for the company to improve its performance and correct any past mistakes.

Currently, only rich Russian people can buy real estate in Finland, the middle class does not have this opportunity yet. Mortgage credit lending is very popular in Russia nowadays especially among middle class. Foreigners can apply for a loan for the construction or purchase of real estate (houses, villas, cottages, land). The laws of Finland do not preclude it. The client only needs to understand that, as in any other country, he should have a logical and convincing motive and explain the purpose of his request for credit. The average term of the mortgage loans for foreign people is about 10-12 years. The real interest rate on mortgage is about 3.5-6% nowadays, it is less than in Russia where the rate is about 9-14%. That is why, it will be good for the company to connect with one of the Finnish banks and help the client to get a loan. Thus, the company is expanding its consumer market.

Another problem for foreign and Russian customers, that requires a solution, is the so-called "language barrier". Language barrier is a figurative phrase used primarily to indicate the difficulties faced when people who have no language in common attempt to communicate with each other. To overcome this barrier and to attract new clients, firstly an English version (or even English and Russian) of the website of the company should be made, as rather a small amount of foreign customers know Finnish, and the search for a construction company abroad almost always occurs through the Internet in modern life. Also it will be useful if the company has an employee who speaks English and can answer all customer questions. In addition, despite the fact that knowledge of English is necessary for life in the modern world, there is a possibility that a foreign client may not know it. In this case the company can help the client and provide an interpreter for him. Speaking in his native language, the client will not only feel more confident but also be able to express more accurately his preferences and wishes, which will undoubtedly benefit the company.

FIGURES

The technical brochure

Turnkey construction project system

Contracting process

The contracting process in Karjalan Rakennus ja Maalaus OY is very easy for the client. In this stage new or changed space needs of the customer are stated and various alternatives aimed at satisfying the needs are discussed. The contracting process consists of two steps. The first step includes a start-up meeting, on which customer's needs are discussed. Presentation includes project background, size and location. After this, preliminary plans are sent to the customer, the company makes some changes if it is needed and gets the permission from the customer. A first contract on obtaining building permit is developed. The next step is to get a building permit from the authorities. After obtaining the building permit a new contract is developed. During this process triple-constraint components are defined: scope, time and cost. Environmental management plan may also be integrated into contract documents. If construction work is to proceed, the decision to start project planning is made. The company prepares all necessary documents to start the project and the customer just needs to sign. Rakennusurakan yleiset sopimusehdot YSE 1998 is used as basis for the drawing up the constructing of the contracts in Karjalan Rakennus ja Maalaus OY

Designing and planning process

In general there are two ways of house planning and construction in Finland. The first way is that a customer can choose a ready-made house (standard house kit). The second way is an individual project; the client may bring his own drawings made by himself or another architect. The next step in the designing process is to choose the way of the construction of the house. The houses can be turnkey or not turnkey, the client can choose everything that suits him. Karjalan Rakennus ja Maalaus OY works with best Finnish designers. The company has to handle with rather a big amount of people (architects, designers of HVAC-system, designers of low current, etc), even so it manages with every designer and works together as one system.

Planning phase is one of the most important steps of project. During planning process project plan is developed. The project plan is the document that both guides the construction project and is used to determine whether or not the project is managed successfully. The project plan is a comprehensive document that seeks to provide guidance to every area of the construction project. It provides and ensures the implementation of the project on time within budget successful. The principles of environment management are applied in this stage:

minimizing the land acquisition,

minimizing tree-cutting, etc.

Construction process and quality control

- After the project has been planned, the time arrives for the actual work of the project to be done. Karjalan Rakennus ja Maalaus OY choose subcontractors and material suppliers carefully, the selection takes into account their ability to deliver flawless products and services. All construction works are done by professionals. The most modern and most environmentally friendly building materials are used for construction.

- The controlling phase of the project is concerned with making certain that the work being performed during the execution phase is acceptable. The controlling phase is concerned primarily with monitoring both the quality of the work and the quality of project manager's performance. In order to monitor the work, certain processes and control measures are put in place to both inspect and test project performance. The most common tests are: soils inspection, moisture in floors, infrared camera analysis, air tightness measurements. Customer can see the results when it is necessary for him. The controlling phase works in tandem with the execution phase of the project. While the project is being executed, the project is being monitored and controlled.

Customer reception and approval process

The company presents to the client the results of the final inspection, which is performed by the local building inspection office to ensure that all work that has completed on the home is in compliance with the applicable building codes. Moreover, the customer can hire an independent home inspector, or an architect associated with the project, or an engineering firm to perform the final inspection to the client. After this final inspection the client makes a list of mistakes, the company fixes the mistakes during 1 week. The customer may take a couple of inspections or re-inspections before giving the final approval.

The warranty period is started from the date when the approval is received.

Guarantee systems

Warranty period is the period during which the contractor has confirmed that the building will comply with the terms of the contract.

Unless otherwise noted in the contractor agreement, warranty for contract's works, according to the law of Finland, is 24 months from the date of acceptance of all contract works. The warranty applies to the additional work associated with additions and changes. The warranty period of construction should be valid during the execution of contract work and during 3 months after their acceptance. The guarantee period for hidden works is 3 years.

Karjalan Rakennus ja Maalaus OY offers the client 2 year and 10 year guarantee systems. The 2 year warranty applies to all interior works: painting and decorating materials, kitchen furniture, interior doors, etc. The 10 year warranty applies to all external works – frame and insulation materials.

Checking period is 1 year. After one year there is the first check point. The list of defects is made and the company fixes all mistakes. The next check point is after two years, the company also fixes all errors.

The contractor responsible for the warranty period 1 and 2 during the year is determined solely by § 29 of the General Terms & Conditions.

Karjalan Rakennus ja Maalaus OY does not fix mistakes associated with the incorrect maintenance of the building.

Техническая брошюра

Строительство «под ключ»

Процесс заключения контракта

Процесс заключения договора в Karjalan Rakennus JA Maalaus OY прост и максимально удобен для заказчика. Мы стараемся подобрать различные варианты архитектурно-строительных решений с учетом всех потребностей и фантазий клиента. Процесс заключения договора состоит из двух этапов. Первый этап включает в себя непосредственно обсуждение различных вариантов строительства. На презентации представляется проект, в котором учтены желаемые варианты объемно-планировочных решений, подбирается цветовая гамма и функциональные особенности помещений. Предварительные проектные решения отправляются клиенту для рассмотрения, затем, при необходимости, компания вносит изменения в проект, согласовав их с заказчиком. Первый этап-получение положительного решения от заказчика - завершен. Следующий шаг - получить разрешение на строительство со стороны властей. После получения разрешения на строительство определяются самые важные составляющие контракта - объем, сроки и стоимость. Обязательно учитывается экологичность проекта и охрана окружающей среды, Эти решения отражены в контрактных документах. Если согласие достигнуто, то принимается решение о начале проектирования. Компания готовит все необходимые документы для запуска проекта, и заказчику просто нужно поставить подпись. В качестве основы для составления построения контрактов Rakennusurakan yleiset sopimusehdot YSE 1998 используется в Karjalan Rakennus JA Maalaus OY

Проектирование и процесс планирования

В целом, существует два способа проектирования и строительства собственного дома в Финляндии. Первый – клиент может выбрать готовый дом (стандартный проект). Второй способ – разработка индивидуального проекта, клиент может принести свои рисунки, сделанные им самим или другим архитектором. Следующим шагом в процессе проектирования является выбор способа строительства дома. Строительство может быть выполнено «под ключ», а может, по желанию клиента, быть завершено на любом этапе. Karjalan Rakennus JA Maalaus OY работает с лучшими финскими дизайнерами. Компания управляет большим количеством специалистов (архитекторы, инженеры санитарно-технических систем и вентиляции, специалисты- слаботочники, электрики и т.п.), при этом, все работает согласовано, как одна единая система.

Фаза планирования является одним из наиболее важных этапов проекта. В процессе планирования разрабатывается План Проекта. Он представляет собой всеобъемлющий документ, который служит руководством для каждой области строительства, и гарантирует успешную реализацию проекта в срок и в рамках бюджета.

На данном этапе также применяются принципы экологического менеджмента: минимизируется вырубка деревьев, объем земляных работ и пр.

Процесс строительства и контроль качества

- После того, как проект был согласован, приходит время для реальной работы. Karjalan Rakennus JA Maalaus OY тщательно выбирает субподрядчиков и поставщиков материалов, выбор учитывает их способность обеспечивать безупречное качество продуктов и услуг. Все работы выполняются профессионалами. Для строительства используются самые современные и экологически чистые материалы.

- В ходе строительных работ выполняется контроль качества. В процессе контроля определяется как качество производимых работ, так и качество работы руководителя проекта. Для того, чтобы следить за производством работ, существуют различные способы проверки и тестирования. Наиболее распространенные тесты: проверка почвы, определение влажности полов, исследования помещений с помощью инфракрасной камеры, измерения герметичности в помещениях. Результаты тестирования могут быть предоставлены клиенту в любое удобное время. Контроль качества работ проходит в тандеме с процессом строительства, во время возведения здания ведется постоянный мониторинг.

Приемка выполненных работ

Компания представляет клиенту результаты проверки, которая осуществляется местным муниципалитетом. Цель проверки – убедиться, чтобы вся выполненная работа была произведена в соответствии с действующими строительными нормами. Кроме того, клиент может нанять независимого инспектора или архитектора, или строительную компанию, которые выполнят проверку качества. После этого производится осмотр здания, клиент составляет список недочетов, компания исправляет данные замечания в течение 1 недели.

Заказчик может сделать несколько проверок или провести повторное инспектирование, прежде чем дать окончательное согласие. Гарантийный срок начинается с той даты, когда было получено одобрение клиента.

Гарантийные системы

Гарантийный срок - это срок, в течение которого подрядчик гарантирует, что здание будет соответствовать условиям контракта.

Если иное не отмечено в подрядном договоре, гарантийный срок подряда, согласно законодательству Финляндии, составляет 24 месяца с момента приема всех подрядных работ. Гарантия, к тому же, распространяется на работы, связанные с дополнениями и изменениями. Гарантия на период возведения должна быть действительна в течение выполнения подрядных работ и в течение 3-хмесяцев после их приемки. Гарантийный срок на скрытые работы составляет 3 года.

Karjalan Rakennus JA Maalaus OY предлагает клиентам 2-х годичную и 10-летнюю гарантии. 2-х годичная гарантия распространяется на все внутренние работы, отделочные материалы, кухонную мебель, межкомнатные двери, и т.д.; 10-летняя гарантия распространяется на все внешние работы, несущие конструкции и изоляционные материалы.

Периоды проверки составляют 1 год. Через год производится первый контроль. Составляется перечень дефектов, и компания исправляет все замечания. Следующий контроль здания производится по истечении двух лет, если обнаруживаются дефекты компания также исправляет их.

Ответственность подрядчика за гарантийные сроки определяется «Общими положениями и условиями» (§ 29 General Terms & Conditions).

Karjalan Rakennus JA Maalaus OY не несет ответственности за неправильную эксплуатацию здания. За все повреждения, полученные зданием в процессе эксплуатации, отвечает клиент.

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