BACHELOR THESIS

Improving materials management at a residential project

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Preface

Honduras is an awesome country. Its landscapes are stunning. But the focus of my study was material management. I feel a little bit sorry that this report cannot reflect a sound of waterfalls of Pulapanzak, a feeling of being near to Maya kings in Copan, undergoing an earthquake, astonishing emotions running high in soccer matches, being an eye-witness of a political earthquake and far better falling in love with a beautiful Honduran girl. No it was the hammer and the nail to be highlighted in this report. Improvements in material management may make this stunning country having faced so many disasters like a devastating hurricane a little bit better equipped on the highway of technical progress. If that is the case, reading all dry information provided hereunder does not mean suffering in vain.

To complete my Bachelor Thesis of the study Civil Engineering at the Twente University, Netherlands, I have worked for three months at Grupo Williams (GW). GW is a construction and real-estate company based in Honduras, Central America. During my internship period I have done research in the company's materials procurement and codification and I designed a computer program to improve the company's materials management. The required information for the research was gathered by following the flow of the 'product' so that every department could be analyzed but also by researching literature and having discussions. Based on the acquired data and theoretical insight a computer program is designed and improvements in materials management were advized. This report contains the results of this research study.

At this point I would like to thank the persons who have supported me in realizing my project. First of all I would like to thank Jimmy Avendano Castillo. As my supervisor at the University of Twente he supported me with his advice and knowledge. He arranged a guest family for me and Grupo Williams. I felt like a Catracho (Honduran). I am also grateful to all employees at Grupo Williams who shared their knowledge with me, particularly Lilian Arriaga, Maximiliano Meza, Ibeth Raudales, Romel Zuniga and my supervisor at GW Mireya Lean who helped me to be part of GW. Finally I would like to thank David Williams and Evy Williams for giving me this opportunity.

Enschede, October 2009

Marco ten Klooster

Summary

This report presents the results of the research done at Grupo Williams. The main objective of the research was to asses and improve the materials management of Grupo Williams (GW) so that failure costs could be reduced. To realize this objective the current materials management is analyzed, a codification system is provided and a computer program is designed.

Materials management is an organizational concept in which a single manager has authority and responsibility for all activities, principally concerned with the flow of materials into an organization. This system approach has not been adopted and the various functions which are embraced by the definition are seen as separate departments. The main thrust of the materials management concept is to avoid sub-optimization and this is missing to ensure the achievement of common objectives, system efficiency and effectiveness in the organization of GW.

The factors of production are presented as inputs of process management. One of these factors is 'materials' and can be seen as the most important one because it consumes the biggest part of the total construction costs. By following the flow of the 'product' the organization of GW is analyzed. By working with all the departments concerning the materials procurement, the improvable areas per stage have become clear. Most of these areas can be assigned to 'materials' as production factor. On basis of the theory, codification and a materials management computer program have proven to resolve the biggest part of these problems.

The computer program is part of the most important function of management: planning. The planning decides which materials are needed, when they are needed and the quantity of a certain material. A special identification method pointed out that the inventory problems can be classified as 'Materials Management Planning' (MRP). MRP systems meet their objective by computing requirements for each inventory item. To find out if Materials management is applicable to the organization of GW a computer program based on the MRP characteristics is designed. All the necessary inputs will result in a constant overview of the materials inventory, the total amount of needed materials and the required materials per project. To present these outputs all the departments have to process their specific inputs into the program.

For optimum usage of the computer program codification is required. In the current situation there is no central catalogue with a identification of all the used materials. Creating this catalogue will resolve some of the organization's problems and makes it possible to use a computer program efficiently. The best codification system for the organization of GW is the Brisch system. With preliminary grouping and further subdividing the materials are described in as great detail as possible.

Ineffective inventory control is a major problem faced by companies in developing countries. Often the very basic inventory control concepts and techniques are not even used by the majority of the companies. By developing this materials management computer program and using this computer system on site at all the projects GW can be pioneer in construction efficiency.

Inhoud

List of illustrations and tables

1. Introduction

In this report the results of my research study are presented. The report contains the information about the practical problem, the research objective, the theory about the problems, current situation, the improvements and the conclusions.

In chapter 2 the practical problem will be exposed. The problem description will be coupled with the research objective and the research methodology. This methodology explains how the research is done.

Chapter 3 discusses the theoretical framework. In the theoretical framework the theories about materials management and codification are pointed out. Materials management is a management process which will be described. In the theoretical part about codification some different types of codification will be discussed.

Chapter 4 and 5 are about the current situation in the organization of Grupo Williams. In chapter 4 a detailed description will be given about GW and the practical problem will be linked with the company. A comparison will be made between the current situation about materials management and codification and the theory. Chapter 5 is also about the current situation. This chapter will actually describe the process I followed to come to my results. It will explicate the problems I discovered in the different parts of the organization.

Chapter 6 will give a detailed description about the materials management computer program I developed to bring theory into practice. The codification system I developed is presented in chapter 7.

In chapters 8 and 9 the conclusions and recommendations will be discussed.

2. Problem identification

In this chapter the problem description will be given about ineffective inventory control or materials management in practice. The problem will be researched at a construction and real – estate company and this research objective will be presented. How this research will be executed is described and presented schematically.

2.1 Problem description

Ineffective inventory control is a major problem faced by companies in developing countries. Often the very basic inventory control concepts and techniques are not even used by the majority of the companies. Therefore too much inventory and inaccurate customer service is very common.

Inventory control problems are usually the result of using poor processes and practices or no use of support systems. Inventory control requires the tracking of all parts and materials purchased, products stored and products processed. Only a sophisticated tracking system does not improve the bottom line, important is how to use the information that the system provides. Also from a financial perspective, inventory control is no small matter. Oftentimes, inventory is a big asset item on the constructor's balance sheet.

The likely result of this approach to inventory control is lots of material shortages, excessive inventories, high costs and inaccurate customer service. Worse, the construction can't be finished and the customer is not helped on time. It is a complex process of constructing the 'product' that require hundreds and maybe thousands of part numbers to be available in the right quantity, at the right place and at the right time. It is a complex network to control and the inventory management tasks must be performed with precision.

2.2 Research objective

The problem description also applies to Grupo Williams, a construction and real-estate company in San Pedro Sula, Honduras. Based on the problem description mentioned above, the main objective of the research can be formulated as:

To asses and improve the materials management of Grupo Williams so that failure costs could be reduced.

This main objective would be supported by these sub objectives:

- To analyze how the materials management is organized
- To provide a codification system for materials
- Create more overview by providing a coupling program between material flows

Each sub objective will be reached by answering the research questions.

1) To analyze how the materials management is organized

1. How is the inflow and outflow of the materials organized?
2. How is the inventory control of materials organized?
3. Which material cost control functions are being used now?
4. What areas of Grupo Williams' materials management can be improved?

2) Provide a tool which could be used for the codification of materials

1. What methods can be used to codify materials in a construction project?
2. What materials are used for this project and what are their specifications?

3) Create more overview by providing a coupling program between material flows

1. Which tool could be used to create a coupling program?
2. On what manner should the calculation of the total use of materials be presented to couple it with inflow and outflow of materials and to create a feedback circulation?
3. How could the inflow and outflow of the materials be linked to the total material use?

2.3 Research methodology

To answer the research questions and to achieve the research objective, a research methodology has been applied. In my preparatory report a research proposal was drafted that was specifically focused on the problems mentioned in the previous section. A more accurate insight in the problems is created at the start of the project. The problem description itself did not change but the nature and the complexity of the problems gave cause to improve the research methodology. The focus changed from the storehouse as main research area to the whole organization as main research area.

To be able to identify the problems of materials management a theoretical framework is created. In the theoretical framework the theory about materials management and codification is discussed. With the basic information about those theories in mind, the organization of GW was analyzed. Based on this analysis a more specific theoretical framework is created focused on the current situation.

To analyze how materials management is organized in the organization of GW, every department involved with the materials procurement is analyzed separately. With the analysis of the departments an overview of the materials management in GW could be generated. This analysis is based on information gathered from interviews, discussions and project documents.

This analysis is important for the development of the materials management program and the codification. With a clear view about the problems and the organization the basics of the materials management computer system were written. The fundamental information for the program is gathered at the different departments, to start with the list of all materials used in construction of GW. For the construction of residential area Toledo only two types of buildings are constructed. For each building a research is done to: the needed materials per building with their quantity; the stages of construction with the accompanying actions of construction and the way of use of the materials list.

The inventory problems on site are analyzed through site visits to residential project Toledo, the storehouse of the project and the central storehouse of GW. The physical distribution of materials and the documentation of all the inflows and outflows of materials is analyzed. Besides the analysis of numerical processing of materials procurements also the physical operating procedure of the materials in the storehouse is analyzed.

All the information gathered by site visits, interviews, discussions and analyses is used to create an inventory program based on the theory about materials management. The necessary ‘theoretical’ inputs for the program are compared to the necessary ‘practical’ inputs at the organization of GW. A total materials management program is designed especially for the organization of GW. It was planned to implement the program and suggested improvements into project Toledo and evaluate the results to determine the possibilities for further improvements. The circumstances did not allow this so the program is upgraded and discussed. The implementation should follow after possible improvements.

A new codification system is recommended based on the theory, experience with the current ‘codification’ and discussions with the responsible persons using the codification. The research methodology that is described in this section is schematically presented in Figure 1.

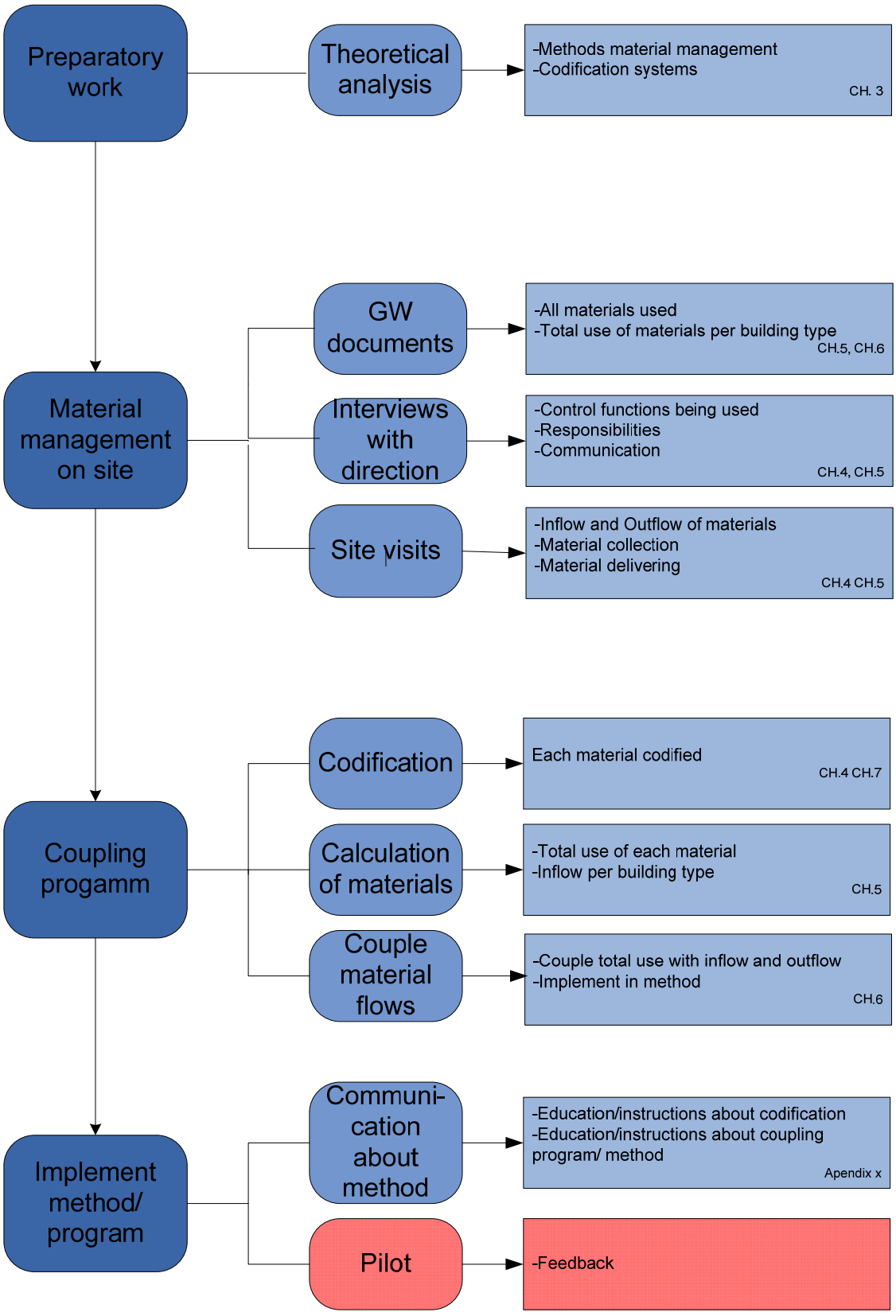


Figure 1 Research methodology schematically

3. Theoretical framework

In the theoretical framework the theory about materials management and codification will be explained. Materials management will be analyzed and every component of importance will be explained. The different systems for codification will be discussed and explained how these are applicable into an organization. The used theory is dated from the period when materials management was in development in the current developed countries. The developing countries are in the same situation right now, so that is why this theory is applicable. The most recent theory about materials management is to optimize the computer systems where developing countries still need to start implementing them.

3.1 Materials management

The definition of materials management is: a total concept involving an organizational structure unifying into a single responsibility, the systematic flow and control of material from identification of the need through customer delivery. Material functions included in this concept are planning, scheduling, buying, storing, moving and distributing. Represented by disciplines of production and inventory control, purchasing and physical distribution. (Fearon H. E., 1986)

Another definition of materials management is as follows:

> *Materials management is an organizational concept in which a single manager has authority and responsibility for all activities, principally concerned with the flow of materials into an organization. (Purchasing, production, planning and scheduling, incoming traffic, inventory control, receiving and stores normally are included* (Fearon H. E., 1986)

Materials management is a part of an organization and the relationship between materials management and the remainder of the system may be illustrated as in **Error! Reference source not found.**.

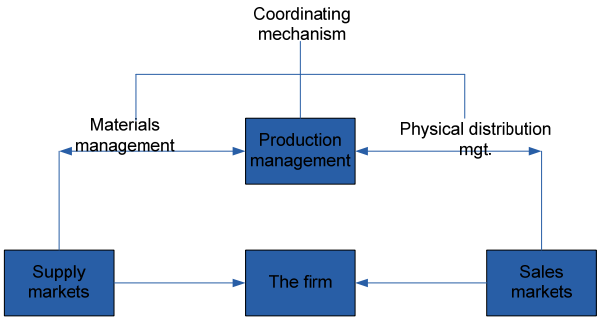


Figure 2 Baily and Farmers (1986) conceptual view of a manufacturing firm

The scope of materials management in this view embraces the management of the flow of materials from the supply market into the firm. It may be defined as:

> The concept concerned with the management of the flow of materials into an organization to the point where those materials are converted into the firm's end product. Responsibilities include collaboration with designers on material component specifications, purchasing – which includes the search for, and location of, suitable economic sources of supply, incoming traffic, goods receiving and inspection, supplier quality control, inventory control (raw materials and components and work-in-progress) and material control. In some cases internal materials handling would also be included (Farmer, 1982)

Clearly, if a systems approach has not been adopted, then the various functions which are embraced by the definition would generally be seen as separate departments, or as elements within more traditional departments.

As with all systems approaches, the main thrust of the materials management concept is to avoid sub-optimization; to look for system efficiency and effectiveness; and to help ensure the achievement of common objectives rather than those which apply to elements within the system, which may be competing one with another. (Farmer, 1982)

3.1.1 Management and materials

Management means responsibility for guiding and supervising the work of others. It is concerned with the factors; human beings, money, machines and materials in a given time frame, better known as *factors of production.* These factors can be presented as inputs of the 'Process of management' shown in Table 1 (A.K. Chitale, 2007)

Inputs	*(Resources)*	*Management process*	*Outputs*
T	Men	Planning	Goods
I	Money	Organizing	And
M	Machines	Directing	Services
E	Materials	Staffing	
		Leading	
		Communication	
		Coordinating	
		Controlling	

Table 1 Management process

From the different factors of production, 'materials' is the most important one because it is the biggest part of the cost of the end product. Construction material roughly consume at range from 40 percent to 60 percent of total construction costs[1]. Any reduction in the cost of materials results in increased profits so purchase of materials should be seen as a profit centre instead of a spending activity.

3.1.1.1 Functions of management

Planning

The most important function of management is *planning*. The planning decides which materials are needed, when they are needed and the quantity of a certain material. One of the tools for materials planning is Materials requirement planning (MRP). MRP is a tool for estimating the material requirements of components of different types which produce final assembly of finished equipment. When the demand for the end product is known through forecasting, the demand for sub-assemblies and components that go into the making of the sub-assemblies can be calculated with accuracy by the MRP approach. For using MRP the inventory problems need to be classified and match with the MRP approach. Inventory problems can be classified in many ways. They can be organized according to the repetitiveness of the inventory decision, the source of supply, the knowledge of demand, the knowledge of the lead time, and the type of inventory system. The inventory classifications contains the following subdivisions. (Tersine, 1994)

1. Repetitiveness
    a. Single order
    b. Repeat order

[1] http://professionalprojectmanagement.blogspot.com/2009/06/construction-management-practices-under.html

2. Supply source
    a. Outside supply
    b. Inside supply
3. Knowledge of demand
    a. (1) Constant demand
       (2) Variable demand
    b. (1) Independent demand
       (2) Dependent demand
4. Knowledge of lead time
    a. Constant lead time
    b. Variable lead time
5. Inventory system
    a. Perpetual
    b. Periodic
    c. Material requirements planning
    d. Distribution requirements planning
    e. Single order quantity

Organizing

Organizing is indicated on an organization chart which describes the various positions of personnel and their reporting relationship in terms of responsibility, authority and accountability. In the classical situation, the organization chart forms a pyramidal structure.

A good organization structure is essential to remove all possible ambiguity with respect to the roles and responsibilities of the managers. There is a clear flow of information from top to bottom and vice versa. (A.K. Chitale, 2007)

Directing

Directing signifies communication from top to bottom. In case of materials management the materials manager receives instructions from top management about his broad objective, for instance:

- Low price of materials
- High inventory turnover ratio
- Continuous supply of material

(A.K. Chitale, 2007)

Controlling

A materials manager acts as a spider in a web because of his central position in the sense that, he is linked with suppliers, sales persons, production department, design and development department, apart from his direct link with the top management.

Hence the materials manager is one who is in contact with all the functional areas of the organization. He is in a commanding position to control things effectively and make things happen. Thus, he carries a heavy responsibility on his shoulders (A.K. Chitale, 2007).

3.1.2 Management of material resources

Materials management is concerned with the management of material resources. It considers the cost we incur on materials and seeks to reduce this cost.

In the traditional way of thinking the price to acquire materials is their basic cost. But in the modern way of thinking, materials management takes into account not only the cost of materials, but the costs on materials as well. This means the cost of materials and cost on materials should be minimized (Menon, 1996)

These costs on materials are often hidden costs and not classified under the head 'materials'. Instead of the head 'materials' these costs go under misleading headings, like 'overheads, 'scrap', 'storage' etc. The main thrust of materials management is to attack all these hidden costs on materials wherever they may occur. (A.K. Chitale, 2007)

Some examples of costs on materials which will be added to the basic costs are:

- Cost of purchasing
- Transportation costs
- Receiving
- Inspections costs
- Materials handling costs
- Loss caused by scrap and cost of re-work
- Inventory carrying costs

All of these extra costs on the end product are controllable and variable, what means that every cost saved, will add to the profits of the company.

The most important fact about materials management is that it is a joint corporate responsibility which has to be equally shared by various interrelated functional departments of a manufacturing company such as sales, production, design, accounts, transportation, legal, maintenance, quality control and, of course, purchase and stores (A.K. Chitale, 2007)

Dean S. Ammer[2], who can be credited with writing the first ever book on materials management, has discussed the objectives of materials management in detail. In the words of Ammer: 'The manager's most basic job is to focus the efforts of his subordinates on the objectives of the enterprise. In materials management, this boils down to supplying material at lowest possible total cost. To achieve this fundamental objective, the materials manager must take into account both the long and the short-term effects of his actions he must also consider the impact of his operation on the costs of other activities within the organization.

In the opinion of Dean S. Ammer, almost every materials department has at least nine primary objectives. These are: low prices, high inventory turnover, continuity of supply, consistency of quality, low payroll costs, favorable relations with suppliers, development of personnel, good records and low cost of acquisition and possession.

3.1.3 Activities of Materials management

According to Baily & Farmer(1982) and Chitale (2007) the activities that generally come within the sphere of materials management are; Inventory control, Purchasing, Storekeeping and Distribution.

The inventory control section carries out the purchase requisitions which show the quantity to be ordered. After the requisition and purchase the section is responsible for the arrival of materials.

The function of the purchase section is placing the orders on the basis of quality, price, delivery time, after-sales-service etc. But it also has to perform chasing activity to ensure that materials do arrive on time.

[2] Ammer, Dean, *Materials Management*, 3e , Richard D. Irwin 1974

The function of the storehouses is to receive, store and issue materials. From the incoming materials the correctness of the quantity will be checked. The accuracy of the material on the computer and physical balance is verified from time to time by internal auditors.

The field of materials management covers all aspects of material costs, supply and utilization. So it is not defined what functions should include under the headship of materials manager. But the following functions MAY come under his headship:

- Materials planning and sourcing
- Purchasing
- Stores keeping
- Inventory planning
- Receiving, warehousing and transportation
- Value analysis and pre-design value analysis (staff, but not independent of materials manager)
- Standardization and variety reduction
- Production planning and production control
- Vendor development
- Material handling (staff, but not independent of materials manager)
- Disposal of scrap and surplus (familiar with market trends)

The research of different experts in materials management, mentioned before, recognized the importance of the materials management function. If the various functions of materials management, mentioned above, are separately handled there is a chance of a conflict of interests. Independently operating departments may take decisions which result in sub-optimization, where achieving optimum results for the organization as a whole is needed.

The materials manager who is responsible for all such interrelated functions, is in a position to exercise control and coordinate with an overview that ensures proper balance of the conflicting objectives of the individual functions.

3.1.4 Potential of Materials Management

The potential of materials management is examined in several studies in the time of implementing materials management. Zenz stated that materials management provides concise delegation of responsibility and authority, eliminating the possibility that departments may have overlapping responsibilities. In so doing it recognizes the importance of the management principle of accountability by providing a materials manager who is responsible for all aspects of materials decisions – a condition lacking in conventional organization. (Zenz, 1969). Ammer had previously listed the possible conflicts between objectives relating to materials in a conventional departmental organization. Ammers thesis was that effective coordination through the adoption of the materials management approach would eliminate many of the problems associated with these conflicts. (Farmer, 1982) And Fearon argues that the materials manager, placed in a position to exercise direct control over all materials functions, can maintain the necessary overview and can assure that needed balance of functions is, in fact, achieved.

Fearon goes on to argue that this balancing of functions results from two subsidiary objectives of materials management. The first of these is ‘To co-ordinate the performance of the materials function into a total materials system, in which the whole is greater than the sum of the parts’. The second objective is ‘To provide a communications network among the several materials functions that provides a quick, accurate, and comprehensive transfer of data, regarding demands occurring anywhere along the system’. (Fearon, 1973)

3.2 Codification

In an organization as Grupo Williams a large number of items are generally kept in stores. Without a proper arrangement for their identification, confusion will arise. Confusion in locating and tracking the materials and confusion between the different departments involved in the process of materials management. Each item should have a single name and each name should correspond to a single item.

The process of identifying the materials is called codification. Codification is already used in a lot of daily used cases. For instance; the library, telephones and passport numbers. By, numerical and alphabetical, identifying and codifying each material is described by individual names. To demonstrate the need of codifying a classic example of an Electric Company in the U.K. is used, where a screw with a diameter of 3/8'' and 6'' had as many as 118 names depending on the type of usage and the department using the screw. The codification of the material removed 117 names and had one individual name as result. (A.K. Chitale, 2007) (Gopalakrishnan, 1995)

3.2.1 Process of codification

As mentioned above codification is a process of representing each item by an individual number. This number consists of digits which often indicate the group, the sub-group, the type and the dimension of the item. The system of codification could be built on various aspects. It can be built on the same material types (metal, wood etc.), by the end use of the items (maintenance, spinning etc.), on the basis of source of purchasing or on alphabetical listing. Whatever may be the basis, each code should uniquely represent one item. The code should be simple/understandable for everybody. Besides this the codification should be compact, concise, consistent and flexible enough to accommodate new items. It should be meaningful and oriented towards the needs of an individual organization. The groupings should be logical, holding similar parts near to one another. (A.K. Chitale, 2007)

3.2.2 Codification systems

For codification six different systems of codification are common nowadays:

- Alphabetical system
- Numerical system
- Decimal system
- Combined alphabetical and numerical system
- Brisch system
- Kodak system

Under the alphabetical system of codification 'alphabets' are basic. Because of the limited availability of alphabets and the large storehouses this system is not applicable in the organization of GW. The decimal system will also not be implemented because of its complicated structure. Besides the complicated structure the storehouses of GW don't need the farthest limit of codes.

3.2.2.1 Numerical system

The numerical system is based on numbers. The numbers are assigned as codes to the materials and future expansion is possible. The system could further be described as divided into three sub- headings. (A.K. Chitale, 2007)

1. **Simple number:** Each item gets a number assigned. And some numbers will be kept for future expansion.

2. **Block number:** The items of similar nature are grouped under the block number system and get a number assigned which can be subdivided according to need.
3. **Dash or stroke number:** This number is an improvement of the block number system. This system describe varying characteristics of the item being codified.

Materials	Simple number	Block number	Dash or stroke number
Raw materials	**01**	**1-100**	**17**
Iron ore	**05**	**1-10**	**17-1**
Iron pig	**06**	**11-20**	**17-2**
Iron melted	**07**	**21-100**	**17-3**
Stainless steel	**08**	**200-400**	**2005**
Full plate	**09**	**281-290**	**205-3**
Glass	**10**	**291-310**	**205-4**

Table 2 Codification; numerical system

This alphabetical system is only suitable for small storehouses. It is flexible to a certain extent and it is a simple system.

3.2.2.2 Combined Alphabetical and Numerical system

This system is a combination of the alphabetical and the numerical system. The materials are first grouped and a heading is provided to each of the groups. Then the numbers will be assigned based on the block system or on the dash/stroke system.

Particulars	**CODES**		
Main	Sub1	Sub 2	Full Code
1. Sulphur	SP		
Sulphurous acid	-	11	SP-11
Sulphurc acid	-	12	SP-12
Sulphur oxide	-	13	SP-13
2. Carbon	CB		
Carbonic acid	-	56	CB-56
Carbon monoxide	-	57	CB-57
3. Manganese	MN		
Manganese dioxide	-	82	MN-82
Manganese acetate	-	83	MN-83

Table 3 Codification; Alphabetical & Numerical system combined

3.2.2.3 Brisch System

The system proceeds in the following steps:

- The materials to be coded are grouped together so as to form a major group. These groups should be accurate and unambiguous and should no overlap each other.
- After preliminary grouping the materials are further divided and subdivided. The basis of these divisions and subdivisions of the materials is described in as great detail as possible and at the same time making them relevant to the users.

- The codes assigned in three different blocks together form the total code, namely these codes together separated by decimal points

Particulars	CODES			
	Main	Sub1	Sub 2	Full Code
Stationery	63	-	-	-
Pencil	-	01	-	63.01
Pen	-	02	-	63.02
Paper	-	03	-	63.03
Ink	-	04	-	63.04
Pencil				
Black	-	-	41	63.01.41
Blue	-	-	42	63.01.42
Pen				
Ball-point	-	-	51	63.02.51
Fountain	-	-	52	63.02.52
Paper				
White	-	-	61	63.03.61
Typing	-	-	62	63.03.62

Table 4 Codification; Brisch system

3.2.2.4 Kodak System

In this system a basic classification of all the items is made. The first two digits in this system indicate the basic classification of the items and is restricted to 99 only. A basic classification of materials based on the purchase categorization could be like Table 5 Codification; First two digits Kodak systemTable 5.

First two digits	Materials
00-20	Raw Materials
21-35	Electrical products
36-49	Chemicals
50-68	Mechanical products

Table 5 Codification; First two digits Kodak system

Thereafter the categorization is further divided into subclasses (possible 10) what will be the third digit of the code and indicating the subdivision of the basic classification. The fourth and fifth digits of the code are assigned to the item in numbers 00, 10, 20, 30 and so on. These two digits enable the organization to absorb as many as ten times new kinds of materials. The sixth and seventh digits can be used for indicating the types of materials from 00 to 99. The eighth and ninth digits are given to specify even more to indicate the size etc. of the material. The last (tenth) digit is left unutilized for future changes and details.

So for instance: Painting is a chemical (36-49) classified with number 42.

Subclasses	Materials
36	Anticorrosive
…….	…….
42	Painting
…….	……..
49	glue

Table 6 subdivision Kodak system

Further sub-classification of 'Painting' is possible. The painting can be a primer or finish paint and the primer paint can be for wood or for steel. Finish paint can be flat, satin, gloss or semi gloss.

Third digit subclass	Materials
421	Primer paint
422	Finish Paint

Table 7 Further sub classification Kodak system

This means that 422 indicates the main class, 36-49 chemicals, etc. 42 sub-class painting, and 2 Finish paint. This kind may further be divided into different types of Finish paint, which may further be allotted codes in 0-9 digits as given as follows:

Finish paintings	type
11	Flat
12	Satin
13	Semi gloss
14	Gloss

Table 8 Specification Kodak system

Flat Paintings	Color
01	Red
02	White
03	Black
04	Yellow
05	Green

Table 9 Further specification Kodak system

422-1101-xxx Chemical product (36-49), Painting (42), Finish paint (2), Type flat (11), color red (01) and unutilized digits (xxx)

This process will continue. The items will be classified and further sub-classified taking minor variations into consideration. If there are no minor details, the remaining digits are possible to utilize at a later stage.

4. In practice

The problem description given in chapter 2 is also effective on Grupo Williams. In this chapter a short description of Grupo Williams will be given and the problems corresponding to the problem description will be discussed. This current situation of the company will be compared with the theory explained before.

4.1 Grupo Williams

Grupo Williams is a construction and real-estate company based in Honduras, Central America. Grupo Williams (GW) can be characterized as a developing company which is being involved from the design stage until the completion of construction of residential and commercial projects. Around 50 people work daily to run all different aspects of the business process at the head-office in San Pedro Sula. Design, marketing, construction and sale are the main components of their business process. Maintenance of the projects is not a part of GW's business process and project financing service takes place limitedly within the process. In the case of residential projects, the construction of the individual houses is financed by the clients, who take out a loan at banks with whom GW has a close business relationship. From the moment that the project is completed GW actually transfer the infrastructure ownership to the government. This means that the government is responsible for the maintenance of the infrastructure of the project.

By not financing the houses, GW strategically avoids the risk of building a house and not sell it. From the moment a buyer signed a contract for the ownership of a house the defrayment will be arranged with the bank and the construction starts. The construction and the finance is a phased process of four stages. This means that the construction will take place in four stages and the bank finances the construction per stage.

One of the projects in construction at the moment of writing is 'Toledo'. Toledo is a high value residential area in San Pedro Sula containing 345 lots (houses) with a total area of 107.982 m^2. Toledo will be used as a case study in this research.

4.2 Grupo Williams – problem description

One of the major problems of GW is controlling the project costs affected by the materials management. All the different houses use the same materials in construction because of the predesigned house types. But an efficient catalogue of all the different types of materials used is largely absent, what results in putting out orders for the wrong materials or the wrong amount of materials. GW is divided in different departments working on the same end product. Because of the missing catalogue of all the materials combined with codification a lot of materials have different names in the organization.

Besides the missing catalogue, the overview on materials on site is an improvable area. All the houses use the same materials and will be delivered in parts. The incoming materials will be stored in the central warehouse or a warehouse on site. But these materials do not have a certain codification which dedicates it to a house. The only control function in the material usage is reporting the order of the project manager by the take away of materials. This means that there is no overview of which materials are used in which house.

Any action in the process of materials management needs to be justified. This means that every receive or order of materials will be noted and signed. These notes are mainly used by the Department of Accounting to control the storehouses on the presence of materials. But the hardcopy control makes it impossible to track the materials. This tracking of materials is needed to always have a clear overview of used materials and materials in stock.

For tracking of the materials a coupling program between the total usage of materials with the inflow and outflow of the materials is also missing. Because this missing coupling program there's no overview about the stock and it's not clear what is delivered and used.

Variances in the estimated total material cost for one house occur due to price changes during construction, waste of materials because of incorrect usage or loss due to weather exposure. And when insufficient materials are available to ensure the planned progress, some resources can be redirected to other houses under construction to allow progress to be made. So there is some control but not enough or not good enough to prevent a lot of failure costs. Failure costs are quality control costs that are associated with products or services that have been found not to conform to requirements, as well as all related costs.[3]

The problems mentioned above result in extra costs for GW but also for the clients of GW who have to pay a longer period of interest on loans. These costs are part of the failure costs of a project and the problems are part of the materials management. Because Materials management includes; materials identification and materials tracking I think that the materials management on site is the foundation of these costs. So improving the materials management should result in an improvement in cost control.

In this report the main focus will be the codification of materials and the design of a coupling program.

4.3 Theory vs. reality

4.3.1 Current situation Materials management

Right now materials management is not part of the organization of Grupo Williams. The main difference between using materials management and the current situation is the allocation of responsibility and authority. Because in the current situation is no single responsibility and authority for all activities concerned with the materials procurement in the organization. According to Chitale (2007) this single responsibility is needed to look for optimum system efficiency and effectiveness.

The absent single responsibility is among other things because of the traditional way of thinking. This traditional way of thinking also implies that the costs on materials are not taken into account. The price to acquire materials is their basic cost in the materials procurement of GW. The misleading headings (cause of hidden costs) of the costs on materials are not traced. To attack the hidden costs on materials 'as one of the main thrusts of materials management' these misleading headings are in need to be allocated.

The most important factor of the 'factors of production' is 'materials' and the most important function of management is 'planning' (Chitale, Tersine). The problems of GW mentioned in the above all have to do with materials. Knowing the problems and most important managing function it is possible to come up with improvements.

The function 'planning' is related to the classification of inventory problems (Tersine, 1994). In case of Grupo Williams the following classification can be made. Repetitiveness of the inventory decision refers to the frequency of orders. In the case of projects of GW, orders are placed again and again. Many constructions of buildings are examples of *single orders* but in this case a project counts a number of the same buildings so we are dealing with *repeat orders.*

[3] http://www.allbusiness.com/glossaries/failure-costs

The supply source is outside, what means that items are obtained from approved suppliers. Purchase orders are sent to external sources for items manufactured outside the organization. The materials for the building constructions are delivered by a supplier and GW produce the end product.

Because the demand for an item is directly related to or the result of demand for higher level items, the demand is called dependent. Besides the dependency the lead time in the process is variable.

Finally, inventory problems can be classified according to the type of inventory system. Based on the repeat orders; the outside supply; dependent demand and variable lead time, the inventory problems can be classified as *'material requirements planning system'(MRP)* (Tersine, 1994)

Material requirement planning is an approach of inventory control that recognizes the realities of demand existing in a manufacturing environment. This approach is eminently suitable for the management of inventories subject to dependent demand, as it does not rely on any assumptions regarding patterns of demand and inventory depletion. The MRP approach does, however, assume certain characteristics of the product and of the process used in its manufacture (Orickly, 1975):

- A master production schedule exists and can be stated in bill of material terms – Master production schedule shows what quantities of what products are due to be completed in which periods
- All inventory items are uniquely identified
- A bill of material exists at planning time
- Inventory records containing data on the status of every item are available
- Individual item lead times are known
- Every inventory item goes into and out of stock
- All of the components of an assembly are needed at the time of the assembly order release
- Process independence of manufactured items

A computer makes the use of MRP very easy. The term MRP even came into use after computers had become commonplace for production and inventory control applications. To find out if Materials management is applicable to the organization of GW a computer program based on the MRP characteristics will be designed. The design and usage will be discussed in chapter 6.

4.3.2 Current situation codification

Codification is applied in several parts of the organization of GW. This codification however is not based on central agreements of the organization. To codify materials specific parts in the organization give their own specific code to a material.

Grupo Williams has one big central storehouse and on every project a small storehouse is located. The orders from the department of purchase will be delivered at the central storehouse and from this point the different materials will be distributed to the storehouses on site. The surplus of materials will be stored here as well. The central storehouse has a specific codification per material. The materials are split up in different departments of use and based on this split up a codification system is designed. Every department gets a number assigned as code and expansion is possible (01 tot 99). All the materials which come under the department get also a number assigned, represented as a five digit code (00001). These two subheadings, department number and material number, together represents the total code for materials in the central storehouse.

In the storehouses on site a different codification system is in use. Suppliers have a codification system for their own products of the company. These codes are written on the invoice in combination with the name of the material. In most of the projects these codes are used in the system of GW as codification system for materials.

Because of the different suppliers every project has a specific code for one type of material. For example at department of purchase, for every material is a document which presents the different codes for this material per project.

The codification system of the central bodega is comparable to the Brisch system. Because the materials to be coded are grouped together to form a major group. The big difference is the number of digits and the number of subgroups; only one subgroup is used. The strange thing of the codification of this subgroup is that also the brand of the material is codified. So a door handle of 'Kwikset' has another code than a door handle of 'Duraset'

5. Analysis of current materials management

This chapter contains a reflection on the organization of GW. A description is given about the departments being involved in the materials procurement. This will be summarized in an organization flow chart. Furthermore all the improvable areas will be enumerated and discussed.

5.1 Organization of Grupo Williams

The problems with materials management cannot be solved just by an improvement in one part of the organization. The problem needs to be solved broadly in the organization with all concerned departments together. To analyze the problems in the organization I followed the flow of the 'product' through the whole organization. My goal was to analyze the structure of the organization without knowing the organization chart. This strategy takes time but will result in knowledge about all the necessary inputs for a materials management program. Because with this strategy the working method of every department becomes clear and by following the product I discovered the main problems per department. The interaction from the 'product' with different departments also clarify the problems between different departments.

The organization of Grupo Williams is well structured and separated in different departments with their own responsibilities. From pencil to construction the most important departments which will be described are: Department of Design; Department of Engineering; Department of Budget; Department of Purchase, Department of Accounting and the administrator on site.

From the moment the project is assigned to GW, the Department of Design will create designs of the total project. In case of residential project Toledo, the area in this design is separated in different blocks and every block contents a number of lots. These lots will be developed into certain types of houses also predesigned by the department of design. For Toledo three types of buildings are designed, namely 'Utila' , 'Olivo' and 'Casa Toledo' of which 'Casa Toledo' is not in use at moment of writing. After completion and control of the designs the promotion of the project and its building types begins to attract clients.

After control of the designs the product will be send forward to the Department of engineering. For each of the various projects GW assigns a project manager. The engineer responsible for the project puts up a list of materials for each building type based on their designs. Because the construction process is divided into 4 stages, the list of materials per building type is also divided into materials needed per stage.

This list of materials will be send to the Department of Budget. In this department the list of materials from the engineer will be controlled and supplemented. The list of materials becomes more specific and is supplemented with the costs of the materials. The improved list of materials will be returned to the engineer who then sends it forward to the Department of Purchase.

Department of Purchase compares the list of materials and costs with the current prices on the market. This price is calculated by comparing the prices of three different suppliers. On basis of this information a list of materials is completed. Per stage of construction the materials will be ordered and send to the project. The order of purchase will be send to the storehouse on site so that all materials can be controlled on presence and correct quantity. At the moment of the delivery of materials at the storehouse, the delivered materials will be compared with the order of purchase and with the invoice. This control will be send to the purchase department where the data will be processed. The proof of delivery results in the payment of the invoice. Besides the order of materials per stage, there is constant communication between the Department of purchase and the project manager about the need of 'extra' materials. But just as in every stage of the process a deviation of the list of materials should be justified.

After delivering/storage of the materials the construction of a house/the houses can start. As mentioned before a house will be constructed in four separate stages. When a construction stage is completed a quality check by a representative of the bank follows. An approval will result in the finance of stage two and the cycle starts again at the Department of Purchase until stage four is finished. The organization is presented in figure 1 as an organization flow chart.

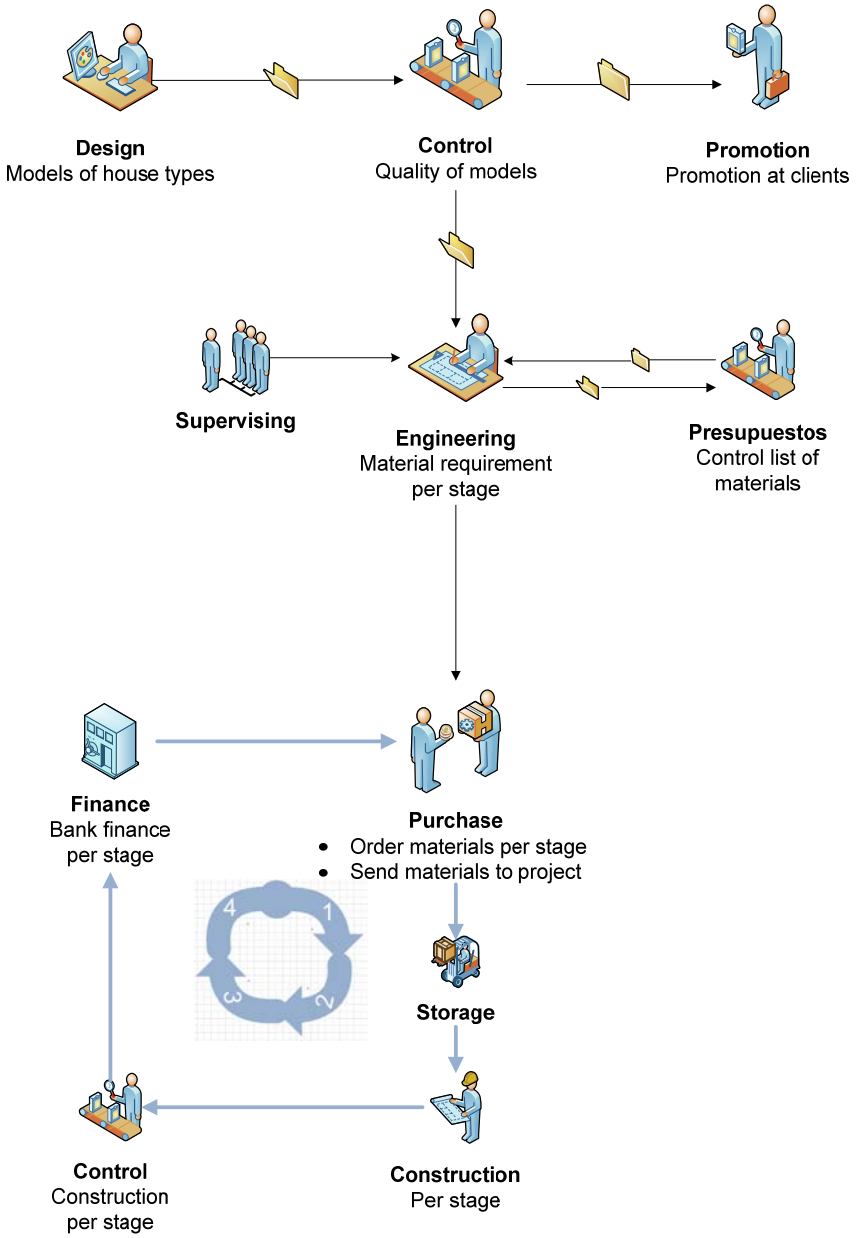


Figure 3 Organization flow chart

When stage four (from the process described above) is finished, the 'product' has reached its final form. To reach this final form two important control functions are inserted in the process. Those control functions are department of Auditory and the inventory control on site. These are the most important control functions because it is concerned with the stream of materials. The stream of materials means a stream of money so this needs to be controlled.

At storehouses one person is responsible for the control of material streams. All the in streams of materials and out streams of materials are processed on the 'cardex' (see Appendix A). This Cardex is a hardcopy paper used

per product to calculate the inventory. Until the moment of writing the usage of computers in storehouses was not common but at the central storehouse a computer is in use.

Department of Accounting controls every storehouse/project roughly 3 times a year. The security of storehouses and the correctness of inventory will be controlled onsite. To control the correctness of the inventory the materials will be counted and compared with the 'Cardex' and the information on the 'Cardex' will be compared with the purchase information.

My research about materials management will focus especially on the process onsite at the storehouses.

5.2 Determination of improvable areas of materials management

The main goal of my research is to asses and improve the materials management of Grupo Williams so that failure costs could be reduced. With the knowledge about the theory of materials management and codification I designed a program based on the theoretical inputs. By using this program in a pilot project (Toledo) I wanted to put the theory into practice and examine if this theory is applicable into the organization of Grupo Williams. Besides the theoretical input I analyzed the organization to generate practical input. As mentioned above in section 4.1 I followed the flow of the 'product' to analyze the problems in the organization.

To analyze the improvable areas of materials management I divided this process in four stages.

1. In the first stage I observed the designs and tried to produce a list of all the materials used in the organization of GW. By using this list I wanted to produce a list of all the necessary materials per building.
2. The second stage I analyzed on what manner this list of materials will be purchased and processed. Furthermore the communication between the different departments (Presupuesto, Ingeneria, Compras, On site)
3. The third stage was to observe how the storehouses are organized on site and work with the current used control program/system.
4. In the fourth stage y analyzed how the inventory control is organized.

5.2.1 From design to list of materials

The process starts with the designs of the project and the different buildings. In appendix B is the design of the urbanization plan attached. This design gives a good overview of how the project is divided into blocks and lot numbers per building. In this way every building in construction could be indicated by a specific code. The buildings in construction are 'Modelo Olivo' and 'Modelo Utila', the designs of one of these buildings is attached in appendix C. The construction designs of these models will be translated into a list of needed materials as described in section 4.1.

In my program I wanted to implement a list with all the materials used in construction of all the projects. This list was planned to be the central list of all materials with a specific code. Because of the absence of a list like this I used the list of inventory control for my pilot program. This is a list of all materials in inventory or recently been in inventory (see appendix D)

The engineer and department Presupuesto generates the list of materials needed per building as translation of the designs. This list is separated in four stages of construction with specific activities per stage. These stages are different per project, in Table 10 the stages with their activities for Toledo are reflected.

	Activity
Stage 1	Ground leveling & Excavation
	Foundation
	Walls
Stage 2	Roof
	Ceiling
	Electric Installations
Stage 3	Ceramics
Stage 4	Finishing
	Doors & Windows
	Painting work
	Finish Electrics
	Kitchen

Table 10 Stages in construction

To use these lists the information and the presentation of the information needs to be exactly the same. The comparison of the two lists of materials per building resulted in some problems and the comparison of these lists with the list of inventory as well.

- At the list of needed materials, some materials are missing what is disastrous for the process of ordering these materials. In this case the cable for the telephone and the coaxial cable are missing for model Utila. A missing material on this list means no order for this material so especially with using a program this could result in inventory problems.
- At the list of needed materials some materials are recorded which are not needed for the construction. This will result in orders for wrong/unnecessary materials.
- In all the three lists, materials are recorded without specification. The information will be used by different persons and departments so it is necessary to have always clarity about the information. For example: No 'ceramica para bano' but 'ceramica para bano 20*20 Capri Blanco J-8'
- Different names are in use on the lists for one material. That can result in wrong orders.

5.2.2 Process of purchase

The pilot program needs to be adapted to the working method of the purchase department. As supplementary to the description in section 4.1 this will be a more detailed description of the working method. The process of purchase will be activated when the memorandum and the contract with the client are provided with the needed signatures. The department receives the final plans of the building and the needed materials per stage of construction. The process of purchase will be handled per client, what is an important fact for the program. The ordered materials will be noted on the order of purchase with the product code of the supplier. Because of the different suppliers for the different projects, department of purchase is working with material names. For every material they need to note the specific product code at the different projects. The delivery of materials will be checked by the project manager. It is possible that during the construction the project manager needs additional materials to complete the stage. Only the project manager can order these additional materials directly at department of purchase. But these additional orders always need to be verified. In appendix E all the documents concerning this process are attached.

Important for the program is the order of materials per client and besides this the improvable areas are:

- All the different codes per product provide unnecessary extra work and are confusing. It is strange that GW is working with the codes of external companies as codification in their own organization.

- Department of purchase is also responsible for the transportation of materials. These materials will be send to the central storehouse before sending to the storehouses on site.

5.2.3 Organization on site

Until so far the described parts of the organization take place at the office. The real stream of materials is actually taking place on site. The delivery (in stream), storage and usage (out stream) of materials is the daily course of business at the storehouses on site. At my pilot project Toledo both the central storehouse and the Toledo storehouse are established.

For the in stream of materials the project manager is responsible to check the quantities and communicate with department of purchase. The delivery of materials will be processed on the hardcopy Cardex. At the storehouse every product is provided with a Cardex where the in streams and out streams of that material are noted. The difference between the flows represent the inventory of the material. The collection of all the Cardexes together are representing the total inventory.

In the sections before is mentioned about the documentary work for the delivery (in stream) of materials. The usage (out stream) of materials is only possible with a document signed by the project manager. This is again to verify the inventory.

The storehouse is organized per product what means that all the same products are stored together. The products are not marked so with this organization at the storehouse it is not clear which product is dedicated to which project. At the moment of my visit both inventories, of central storehouse and Toledo where mixed up in one storehouse.

At my visit on site I also worked with current inventory computer system (Toledo is the first project with computer). Working with a computer on site and with an inventory computer system is the first step towards materials management. The program is however pretty basic: every day the inventory of a product needs to be counted and filled into the program. At the moment of my visit this program was not handled correctly what resulted in an incorrect inventory overview. With this system it is nearly impossible to track the problem.

The mixed up inventory (Central storehouse and project Toledo) together with the incorrect inventory and personal problems resulted in a difficult situation about the total materials inventory. To prevent situations like this in the future improvements should be realized in the following problems.

- The incorrect inventory. By incorrect handling of the inventory program wrong inventory quantities are presented in the organization. These quantities are presented in the organization so that the surplus products could be used in future projects. But working with the wrong inventory will result in orders of insufficient quantities.
- In the comparison between the lists of ‘all materials per building’ (from the department of budget and the engineer) and the inventory computer program I discovered differences. With a lot of materials the units did not correspond between the two lists. An order of sacs (bolsas) could be made but need to be noted in inventory as units (unidades). This could easily result in mistakes.
- The current system, with a cardex per product, requires a lot of paperwork. This means automatically that controlling or searching a fault/mistake will cost considerably more work.
- At the moment of writing an amount of materials with a value of $75.000,- (LMP 1.500.000) was not dedicated to a project and unused. These could be surplus materials or wrong ordered materials but it is important to reuse these materials as soon as possible. Because without reusing the materials they will become out-dated and this will be squandered money.
- In the current situation it is not possible to track the materials. By tracking materials it is always possible to see where the material is or is used at that moment.

- At my last visit at the company one of the problems was already resolved. Storehouse Toledo and the Central storehouse are separated and the destined inventory was dedicated to the correct projects again.

5.2.4 Inventory control

The process of inventory control is provided with sufficient explanation in section 5.1. Running through the process resulted in one important area waiting for improvement. At the presentation of results from the department of accounting a remarkable fact was discovered. The results were based on information which differs from the information used by the department of purchase. The values of materials did not correspond with each other. It proves a lack of communication between those two departments.

6. Materials management system

By following the materials procurement and comparing the current situation with the theory, the practical and theoretical input for the materials management system was examined. This system is developed on basis of the theory and adapted to the practical demand. Bringing this computer system into practice should result in improved materials procurement and reduced failure costs. This chapter will describe how the materials management system is developed.

6.1 Objectives and purpose of the system

As mentioned before the theory used to build the program is Materials Requirement Planning (MRP). MRP is mainly used by manufacturing companies but in my view also applicable to construction companies because of the largely corresponding materials procurement. All MRP systems have a common objective, which is to determine requirements. These requirements means; discrete period-demands for each item of inventory order action. This action pertains to procurement (purchase orders) and to construction (Orickly, 1975).

MRP systems meet their objective by computing *net requirements* for each inventory item, time-phasing them, and determining their proper *coverage*. The basic function of MRP is the conversion of gross requirements into net requirements, so that the latter may be covered by construction orders and purchase orders. The best way to explain this is with an example:

Gross requirements		250
In inventory	50	
On order	100	150
Net requirements		100

The net requirements are related to the progress of the project; the stage of construction. The net requirements are then covered by the planned orders per stage of construction.

MRP systems are a highly effective tool for inventory management for the following reasons (Orickly, 1975):

- Inventory investment can be held to a minimum
- An MRP system is change-sensitive, reactive
- The system provides a look into the future , on an item-by-item basis
- Under material requirements planning, inventory control is action-oriented rather than clerical bookkeeping-oriented
- Order quantities are related to requirements

6.2 System inputs

To provide the desirable outputs containing valid information a properly designed program is needed. The system outputs are produced by processing inputs from different recourses. According to Orickly (1975) these recourses are:

- The master production schedule
- Orders for components originating from sources external to the plant using the system
- Forecasts for items subject to independent demand
- The inventory record file
- The bill of material file

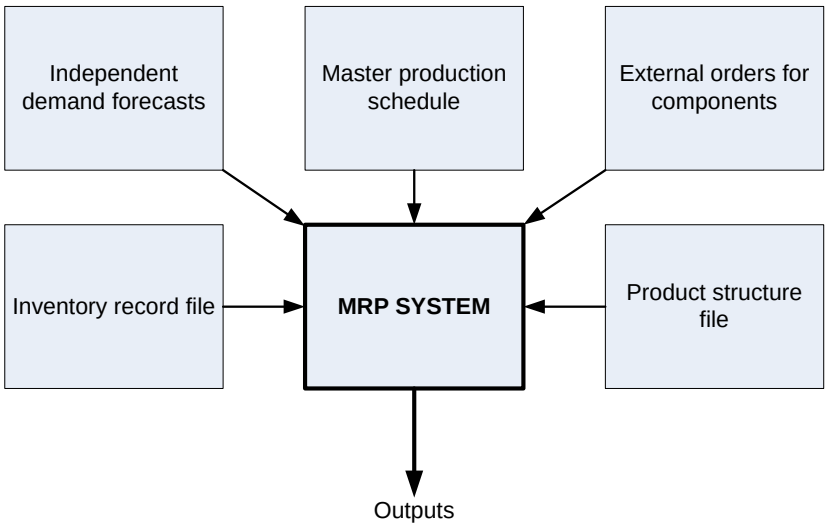


Figure 4 Inputs MRP system (Orickly, 1975)

I translated this model of Orickly into a more adopted model for construction companies and especially for Grupo Williams. The *Inventory record file* is in both cases the same: It comprises the individual item inventory records containing the status data required for the determination of net requirements. But in the materials management system this inventory record file is the output of the inventory transactions: the outflow (usage in construction) of materials and the inflow (storing is storehouses) of materials. But the file is also an important output of the program.

The *Independent demand forecasts* are not a part of the materials management program because the construction process is not dependent of forecasts. Once a contract for construction is signed the exact amount of necessary materials will be calculated. So nothing needs to be forecasted.

The *Master production schedule* expresses the overall plan of construction. In the materials management system this is definitely an input but is explicitly present. It contains the stages of construction with the accompanying activities. And besides the stages of construction the total project information is part of this overall plan. The project information consists among other things of the amount of buildings of the project and the different building types.

The *External orders for components* are interpreted different from Orickly's model. Because to implement the first stage of a materials management system It is important to start basic with only the highly necessary inputs. So the external orders are interpreted as additional orders of a client for a specific building and material orders for general construction of the project, like infrastructure.

The *Product structure file* is interpreted as a file that contains information about the materials (components) per building. All the needed materials for every predesigned building.

One important part of the system is not specific mentioned above. The identification of the materials in the form of codification. In the materials management system this is the most important input to work properly because of the relation between all the parts of the program.

The translation into the system for materials management of construction companies/Grupo Williams is shown in Figure 5

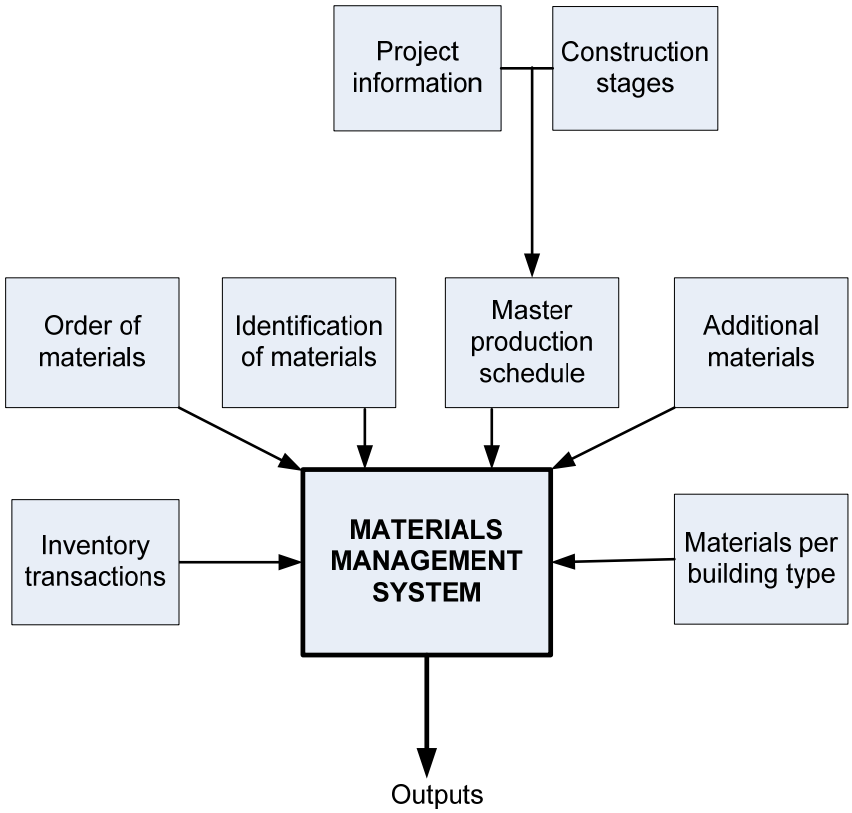


Figure 5 Inputs Materials management program

6.3 The materials management program

The status of an inventory item must be known before it can be determined what, if any, inventory management action is to be taken on that item. Inventory status is expressed by means of data that define an item's current position. Status information is intended to answer the essential questions of:

- What do we have?
- What do we need?
- What do we do?

A more elaborate expression of inventory status is provided by the classic 'perpetual inventory control' equation.

$$A + B - C = X$$

Where:

$$A = quantity\ on\ hand$$
$$B = quantity\ on\ order$$
$$C = quantity\ required$$
$$X = quantity\ available$$

Looking at figure 6 will give an impression of these variables in the program. *A* is presented as 'Total inventory' and *C* is presented as 'Total materials needed'. *B* is the quantity on order, so ordered materials but not delivered yet. This can be calculated with 'Order' minus 'IN'.

These status data can be divided into two categories: Inventory data and Requirements data. Inventory data consist of on-hand and on-order quantities. These data are reported to the system and can be verified by inspection. Requirements data consist of the quantities and timing of gross requirements, net requirements, and planned-order releases. These data are computed by the system and can be verified only through recomputing. (Orickly, 1975). The timing and planned-order releases are not taken into account in the program.

The materials management system(MMS), properly used, can provide a number of desirable outputs. The primary outputs of the MMS are:

- The total amount of materials, needed for the project
- The total amount of materials in inventory (*Inventory record file)*
- The total amount of materials required

The MMS links the inputs together to realize the desirable outputs. The relation between the inputs and the way they are linked together is explained below. In figure 6 the design of my computer program is presented and on basis of this design the program will be explained.

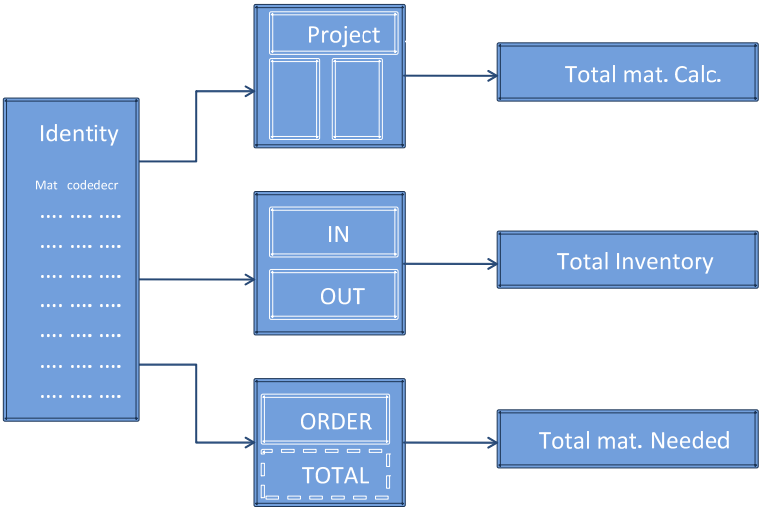


Figure 6 Design of MMS

The block 'Identity' signifies the list of all codified materials. This codification is, as mentioned before, the most important part of the computer program because the identification makes it possible to link all parts of the program together. This codification creates a list with a unique name, unit and code per material so that indistinctness will be avoided or minimized. A part of the list is presented in Figure 7.

Material name	**Units**	**Identification**	**Description**
CINTA PRECAUCION	Unidades	01-00001	Accesorios Varios
ASFALTO PLASTICO PARA TECHOS	Cajas	02-00001	Aceros y Techos
CANALETA DE 3X1 1/4	Unidades	02-00002	Aceros y Techos
CAPOTE 10 ALUCIN	Unidades	02-00003	Aceros y Techos
CAPOTE 8 ALUCIN	Unidades	02-00004	Aceros y Techos
CAPOTE FORTEC ROJO	Unidades	02-00005	Aceros y Techos

Figure 7 Materials identification of MMS

These codes are coupled to three calculation blocks: the master production schedule with materials per building; the material transactions and material orders.

The master production schedule gives the project information and overall construction plan (figure 8). The materials per building are directly linked with the identification of materials. Every project has its predesigned buildings and in the program it is necessary to note the needed materials per building and its needed amount. *The engineer* of the project is responsible to create the list of needed materials per building. For Project Toledo roughly 150 types of materials are on the list per building type and in my period around 15 buildings were in construction. The notation works on basis of the codes so that the program automatically searches the accompanying material name and unity, see Figure 89. With the project information and the materials per building, the program calculates the total needed amount of materials for the project.

Proyecto	Recidencial Toledo
Identificacion	TOL
Ubicación	San Pedro Sula
Cantidad de casas	345
Area	286.85 vrs 2
Quantity of model Utila	8
Quantity of model Olivo	2
Quantity of model C	0

Figure 8 Project information MMS

Model Utila

Codigo	**Materiales**	**Unidad**	**Cantidad**
11-00029	VARILLA 1/4 LISA	Unidades	70,00
11-00030	VARILLA 3/8 CORRUGADA	Unidades	173,00
11-00028	VARILLA 1/2 CORRUGADA	Unidades	30,00
08-00007	ADAPTADOR HEMBRA 1/2 PVC	Unidades	6,00
08-00016	ADAPTADOR MACHO 1/2 PVC	Unidades	15,00

Figure 9 Materials per building MMS

The second block linked with the identification of materials is the transaction of materials (IN, OUT). All the inflows and outflows of materials are processed in this part of the program. *The responsible 'inventory manager*' on site has to process all the transactions into the program. The program automatically calculates the total inventory (materials on hand) per material but also tracks errors in inventory, negative inventory for example.

The third block linked with the identification of materials is to calculate the net requirements of the project. In this part of the program the orders of materials have to be noted by the responsible person of the *purchasing department.* The calculated total amount of needed materials minus the ordered materials result in the net requirements per material.

The program processes the data produced by different departments. The engineer, the purchasing department and the 'inventory manager' are all responsible for the inputs to provide the desirable outputs: the total inventory; total calculation of needed materials and total required materials (need to order).

6.3.1 Details and the program reflected in an example

With a fictive situation of a project the program will be reflected and per stage of the program the more detailed information will be given. This detailed information contains the formulas used and the way the program presents the output.

The project

The project 'Residencial Playa' is located at the seaside in the Honduran city Tela. The area will be developed as a high value residential area containing 10 buildings. Two different buildings will be constructed: 6 Model A

buildings and 4 Model B buildings. The project is started 5 months ago and three buildings are already in construction, two of Model A and one of Model B. The information about the project will be processed as presented in Figure 10.

Kolom1	Kolom2
Proyecto	Recidencial Playa
Identificacion	PLA
Ubicación	Tela
Cantidad de casas	10
Area	100 vrs 2
Cantidad de modelo A	2
Cantidad de modelo B	1
Cantidad de modelo C	0

Proyecto | Etapas | Modelos de casas

Figure 10 Project information

Before the project started the architects made the designs for the models and the project area. These designs are translated into the need of materials per building by the engineers. This list of needed materials will be processed in the program as well. Because of the central identification the engineer only uses the codes of the materials to prevent any distinctness. The program is designed to present the material name and its unit when the material code is noted. The formula in the program (see below) compares the specific material code with the material codes in the central list of codification (Appendix F). The corresponding material name and unit of the matching code will be presented as output . After noting this code the required amount of this material for the specific model needs to be noted. Model A and Model B for project 'Recidencial Playa' will be processed in the program as presented in Figure 11.

Model A

Codigo	Materiales	Unidad	Cantidad
11-00029	VARILLA 1/4 LISA	Unidades	100,00
11-00030	VARILLA 3/8 CORRUGADA	Unidades	200,00
11-00028	VARILLA 1/2 CORRUGADA	Unidades	50,00
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	Unidades	10,00
07-00025	BREAKER 1X30 CUTLER HAMMER	Unidades	20,00
05-00002	BLOQUE DE 4 1/2	Unidades	300,00
07-00040	CABLE No. 10	Pies	100,00
	#N/B	#N/B	
	#N/B	#N/B	
	#N/B	#N/B	

Model B

Codigo	Materiales	Unidad	Cantidad
11-00029	VARILLA 1/4 LISA	Unidades	200,00
11-00030	VARILLA 3/8 CORRUGADA	Unidades	400,00
11-00028	VARILLA 1/2 CORRUGADA	Unidades	100,00
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	Unidades	20,00
07-00025	BREAKER 1X30 CUTLER HAMMER	Unidades	40,00
05-00002	BLOQUE DE 4 1/2	Unidades	600,00
07-00040	CABLE No. 10	Pies	200,00
04-00003	CEMENTO GRIS	Bolsas	50,00
05-00014	CERAMICA BAÑ 20X31.6 ARTICA BLANCO 2-7	Cajas	50,00
	#N/B	#N/B	

Proyecto | Etapas | Modelos de casas | Materiales adicional | # de casas | Compra de materiales | Dentro Bodega | Fuera Bodega | General

Figure 11 Required materials per model

=INDEX('Identificación de materiales'!$B$5:$E$9678;VERGELIJKEN(D24;'Identificación de materiales'!$D$5:$D$9677;0);1)

The materials shown above are the required materials of a standard model A or B. It is possible that the client wishes to adapt the design to his needs. In that case additional materials are needed in construction which will be processed in the program as presented in **Error! Reference source not found.**. This part of the program works with the same formula as above and in addition the building number of the client needs to be noted (last column). In case of the project, the client of building B10-C1 ordered two additional materials to the basic design. In Figure 13 the codification of the ten different buildings is shown.

Kolom	Kolom2	Kolom5	Kolom	Kolom6
	Modelo Utila			
	Utila			
	Materiales	Unidad	Cantidad	Casa Block n
Code				
15-00072	PINTURA PORCELANA - PROT	Galones	8	B10-C1
15-00092	ESMALTE ROJO VIVO PROTEC	Cuartos	7	B10-C1
	#N/B	#N/B		
	#N/B	#N/B		

Figure 12 Additional materials

		Casa no.					
Bloque no.							
Kolom1	Kolom2	Kc	Kc	Kc	Kc	Kc	Kc
B10		C1	C2	C3	C4	C5	C6
B20		C1	C2	C3	C4		

Figure 13 Codification of buildings

From this moment the actual flow of materials will start. The required amounts of materials for the buildings of the three different clients are clear. The two models A in construction are coded as B10-C1 and B10-C3, the model B in construction is coded as B20-C1. Their status is as follows:

- B10-C1 was the first building in construction and is almost finished. All the required materials are ordered and delivered (some materials in different deliveries) at the storehouse. Only two finishing materials are not used in construction yet.

- B10-C3 is not in construction yet. All the materials for the first stage of construction are ordered and half of these ordered materials are received at the storehouse.
- B20-C1 is a couple of months in construction. All the materials for the first stage of construction are ordered and received at the storehouse. Half of these materials are already used in construction so left the storehouse.

Because the relatively small amount of materials per stage of construction the department of purchase ordered all the materials per stage (per client) at once. In the current situation the materials for the first stages are all ordered; two of model A and one of model B. For model B10-C1 the materials for the second (and last) stage are also ordered. The purchasing part will be processed in the program as shown in Figure 14.

Kolom1	Kolom18	Kolom2	Kolom3	Kolom4	Kolom5	Kolom6	Kolom7	Kolom8	Kolom9	Kolom10	Kolom11	Kolom12	Kolom13	Kolom14	Kolom15	Kolom16	Kolom16	Kolom17
Ordenado materiales total																		
		Cantidad																
		B10-C1	B10-C2	B10-C3	B10-C4	B10-C5	B10-C6	B20-C1	B20-C2	B20-C3	B20-C4	Order 11	Order 12	Order 13	Order 14	Order 15	Total	
Codigo	Material																	Unidad
01-00001	CINTA PRECAUCION																0	Unidades
02-00001	ASFALTO PLASTICO PARA TECHOS																0	Cajas
04-00001	ASFALTO PARA PAVIMENTO																0	Unidades
04-00002	CAL CALIDRA																0	Bolsas
04-00003	CEMENTO GRIS							50									50	Bolsas
04-00004	GROUT BLANCO SIN ARENA PEGADURO																0	Bolsas
05-00001	BLOQUE DE VENTILACION DE CONCRETO 20X20																0	Unidades
05-00002	BLOQUE DE 4 1/2	300		300				600									1200	Unidades
05-00006	BLOQUE DE 6																0	Unidades
07-00024	BREAKER 1X20 TICINO																0	Unidades
07-00025	BREAKER 1X30 CUTLER HAMMER	20															20	Unidades
07-00028	BREAKER 2X20 CUTLER HAMMER																0	Unidades
07-00040	CABLE No. 10	100															100	Pies
08-00006	ADAPTADOR HEMBRA 1/2 CPVC POTABLE																0	Unidades
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	10															10	Unidades
11-00027	VARILLA 1 CORRUGADA																0	Unidades
11-00028	VARILLA 1/2 CORRUGADA	50		50				100									200	Unidades
11-00029	VARILLA 1/4 LISA	100		100				200									400	Unidades
11-00030	VARILLA 3/8 CORRUGADA	200		200				400									800	Unidades
15-00072	PINTURA PORCELANA - PROTECTO 1315	8															8	Galones
15-00092	ESMALTE ROJO VIVO PROTECTO (CUARTO)	7															7	Cuartos

Figure 14 Ordered Materials

In the fourth row the codes of the buildings are shown. In the columns beneath the amounts of ordered materials are given per specific material. Normally in the first two columns all the materials of GW are processed but for this example only a small part is selected. In the penultimate column the total amount per ordered material is presented. This is the total amount of the specific material ordered for the project. This calculation simply works with summing the horizontal values: =SOM(Tabel11[[#Deze rij];[Kolom2]:[Kolom16]]). For example material 05-00002 BLOQUE DE 4 ½. For B10-C1 300 units are ordered, for B10-C3 also 300 units are ordered and for B20-C1 600 units are ordered. The total amount of 1200 ordered units is calculated.

The transaction of materials on site at the storehouse will be processed in similar way: Notation of material flows per building, per material and the total amount will be calculated. The transaction have to be processed in two sheets: Materials receiving in the storehouse and materials leaving the storehouse. For 'Project Playa' all the materials for the first stages of B10-C1 and B20-C1 are received and half of the ordered amount for the first stage of B10-C3 is received, see Figure 15. In the figure is visible that B10-C1 is two times mentioned in the fourth row. The second column for this building is inserted (during the process) because the materials are delivered in two times.

Kolom1	Kolom2	Kolom3	Kolom32	Kolom4	Kolom5	Kolom6	Kolom7	Kolom8	Kolom9	Kolom10	Kolom11	Kolom12	Kolom13	Kolom14	Kolom15	Kolom16	Kolom17	Kolom18	Kolom19
Total materiales DENTRO bodega																			
		Cantidad																Total	
		B10-C1	B10-C1	B10-C2	B10-C3	B10-C4	B10-C5	B10-C6	B20-C1	B20-C2	B20-C3	B20-C4	Inflow 11	Inflow 12	Inflow 13	Inflow 14	Inflow 15		
Codigo	Material																		Unidad
01-00001	CINTA PRECAUCION																	0	Unidades
02-00001	ASFALTO PLASTICO PARA TECHOS																	0	Cajas
04-00003	CEMENTO GRIS								50									50	Bolsas
05-00002	BLOQUE DE 4 1/2	300			200				600									1100	Unidades
07-00025	BREAKER 1X30 CUTLER HAMMER	20																20	Unidades
07-00040	CABLE No. 10	50	50															100	Pies
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	10																10	Unidades
11-00028	VARILLA 1/2 CORRUGADA	50			50				50	50								200	Unidades
11-00029	VARILLA 1/4 LISA	100			100				200									400	Unidades
11-00030	VARILLA 3/8 CORRUGADA	100	100		100				400									700	Unidades
15-00072	PINTURA PORCELANA - PROTECTO 1315	8																8	Galones
15-00092	ESMALTE ROJO VIVO PROTECTO (CUARTO)	7																7	Cuartos

Figure 15 Materials received in storehouse on site

On site two buildings are in construction. So a big amount of the received materials left the storehouse for construction. B10-C1 is in the finishing construction stage, B10-C2 is not in construction yet and B20-C1 is in the first construction stage. The outgoing materials used for construction are processed as presented in Figure 16. And again in the fourth row similar building names show up: B10-C1 is mentioned three times and B20-C1 two times. This is because the materials are used in parts for construction so left the storehouse in parts. The (extra) columns are also inserted during the process.

Kolom1	Kolom2	Kolom3	Kolom32	Kolom33	Kolom4	Kolom5	Kolom6	Kolom7	Kolom8	Kolom82	Kolom9	Kolom10	Kolom11	Kolom12	Kolom13	Kolom14	Kolom15	Kolom16	Kolom18	Kolom19
Total materiales FUERA Bodega																				
		Cantidad																	Total	
		B10-C1	B10-C1	B10-C1	B10-C2	B10-C3	B10-C4	B10-C5	B10-C6	B20-C1	B20-C1	B20-C2	B20-C3	B20-C4	Outflow 1	Outflow 1	Outflow 1		Outflow 15	
Codigo	Material																			Unidad
01-00001	CINTA PRECAUCION																		0	Unidades
02-00001	ASFALTO PLASTICO PARA TECHOS																		0	Cajas
02-00002	CANALETA DE 3X1 1/4																		0	Unidades
04-00003	CEMENTO GRIS									25									25	Bolsas
05-00002	BLOQUE DE 4 1/2	150	100	50						200									500	Unidades
07-00025	BREAKER 1X30 CUTLER HAMMER	20																	20	Unidades
07-00040	CABLE No. 10	60	20	20															100	Pies
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	10																	10	Unidades
11-00028	VARILLA 1/2 CORRUGADA	50								20									70	Unidades
11-00029	VARILLA 1/4 LISA	50	50							50	50								200	Unidades
11-00030	VARILLA 3/8 CORRUGADA	50	100	50						100									300	Unidades

Figure 16 Materials leaving the storehouse

All these amounts processed into the program are easy to manipulate in this way. That is why at every value in the program a comment is applied. This comment contains a document number from which this value can be verified, for example the invoice number. See Figure 17.

Figure 17 Values in the program verified

All the inputs for the program are discussed. However the most important function about the program is the output presented by the program. For 'Project Playa' we want to know the total materials required for the project, the inventory at this moment, and the required materials at this moment. The program gives this exact output as presented in Figure 18.

Kolom1	Kolom2	Kolom3	Kolom4	Kolom5	Kolom6	Kolom7
Kolom1	Kolom2	Kolom22	Kolom23	Kolom3	Kolom32	Kolom4
Total materiales necesario						
Material		A	B	Aditional	TOTAL	
01-00001	CINTA PRECAUCION	0	0	0	0	Unidades
02-00001	ASFALTO PLASTICO PARA TECHOS	0	0	0	0	Cajas
02-00002	CANALETA DE 3X1 1/4	0	0	0	0	Unidades
04-00003	CEMENTO GRIS	0	50	0	50	Bolsas
05-00002	BLOQUE DE 4 1/2	600	600	0	1200	Unidades
05-00014	CERAMICA BAÑ 20X31.6 ARTICA BLANCO 2-7	0	50	0	50	Cajas
07-00025	BREAKER 1X30 CUTLER HAMMER	40	40	0	80	Unidades
07-00040	CABLE No. 10	200	200	0	400	Pies
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	20	20	0	40	Unidades
11-00028	VARILLA 1/2 CORRUGADA	100	100	0	200	Unidades
11-00029	VARILLA 1/4 LISA	200	200	0	400	Unidades
11-00030	VARILLA 3/8 CORRUGADA	400	400	0	800	Unidades
15-00072	PINTURA PORCELANA - PROTECTO 1315	0	0	8	8	Galones
15-00092	ESMALTE ROJO VIVO PROTECTO (CUARTO)	0	0	7	7	Cuartos

Kolom1	Kolom3	Kolom4
Kolom1	Kolom3	Kolom4
Total materiales en inventoria		
Material	Quantity	
01-00001	0	Unidades
02-00001	0	Cajas
02-00002	0	Unidades
04-00003	25	Bolsas
05-00002	600	Unidades
05-00014	0	Cajas
07-00025	0	Unidades
07-00040	0	Pies
08-00007	0	Unidades
11-00028	130	Unidades
11-00029	200	Unidades
11-00030	400	Unidades
15-00072	8	Galones
15-00092	7	Cuartos

Kolom1	Kolom3	Kolom4
Kolom1	Kolom3	Kolom4
Total materiales mas necesario		
Material	Quantity	
01-00001	0	Unidades
02-00001	0	Cajas
02-00002	0	Unidades
04-00003	0	Bolsas
05-00002	0	Unidades
05-00014	50	Cajas
07-00025	60	Unidades
07-00040	300	Pies
08-00007	30	Unidades
11-00028	0	Unidades
11-00029	0	Unidades
11-00030	0	Unidades
15-00072	0	Galones
15-00092	0	Cuartos

Figure 18 OVERVIEW of the project

The calculation behind this presentation will be explained. The formula that calculates the total amount of calculated materials per modal, A and B (first table column 3 and 4) is:

=ALS.FOUT((INDEX('Modelos de casas'!$D$24:$G$9675;VERGELIJKEN(A6;'Modelos de casas'!$D$24:$D$9675;0);4));0)*Proyecto!$C$10

This formula works again with the seeking method. The specific code of the material will be compared with the required materials per model (Figure 11). The required material amount of that model will be multiplied with the amount of buildings of that model in construction. In this project, for example, a model A building requires 300 units of 05-00002 BLOQUE but two buildings, B10-C1 and B10-C3, are dedicated to a client. So $300 \times 2 =$

600. The calculated materials per model are summed up and presented as total calculated need per material for ‘Project Playa’.

The second column in Figure 18 presents the inventory of ‘Project Playa’. This inventory is calculated with the following formula:

=(INDEX('Dentro Bodega'!$B$8:$U$677;VERGELIJKEN(Tabel9[[#Deze rij];[Kolom1]];'Dentro Bodega'!$B$8:$B$677;0);19))-(INDEX('Fuera Bodega'!$B$8:$W$677;VERGELIJKEN(Tabel9[[#Deze rij];[Kolom1]];'Fuera Bodega'!$B$8:$B$677;0);21))

The seeking method is used again. Based on the material code, the formula seeks the amount of a material that enters the storehouse in the first part of the formula. In the second part the formula seeks the amount of a material that leaves the storehouse. The difference between these values is the inventory. The VARILLA ¼ for example (11-00029) is a material needed in the first construction stage. For all the buildings this material is ordered. Figure 14 and 15 are showing that the needed amount of this material; 100 units for model A and 200 units for model B, are ordered and received for the three buildings. Figure 16 shows that B10-C1 used all the materials in construction, B10 C3 is not started and B20-C1 used 100 of the 200 units. So the program calculates an inventory of 200 units.

The last column in Figure 18 presents the materials for ‘Project Playa’ that still need to be ordered. The used formula is:

=(INDEX($A$6:$G$676;VERGELIJKEN(Tabel10[[#Deze rij];[Kolom1]];$A$6:$A$676;0);6))-(INDEX('Compra de materiales'!$A$7:$S$676;VERGELIJKEN(Tabel10[[#Deze rij];[Kolom1]];'Compra de materiales'!$A$7:$A$676;0);18))

This formula works again the same as the described formulas before. This formula seeks the total calculated amount of the specific material and the total purchased materials subtracted.

It is possible that values are note in a wrong way into the program. Once problems are noticed the values can be verified with the given comment. The program itself also tracks eventually mistakes of notation. For example, the site manager did noted an outgoing value for 05-00002 BLOQUE of 1000 instead of 100. This means that a negative inventory will show up. The program immediately will mark this negative value in red so that the values can be controlled. See Figure 19.

05-00001	BLOQUE DE VENTILACION	0	Unidades
05-00002	BLOQUE DE 4 1/2	-300	Unidades
05-00006	BLOQUE DE 6	0	Unidades

Figure 19 Errors: negative inventory

6.3.2 Improvements by implementation

The implementation of this program has a lot of consequences for the organization. All the departments are working with the same program so they are ‘speaking the same language’. Speaking the same language will take away a lot of misunderstandings and therefore result in less wrong orders. By using the program architects and engineers can use the surplus inventory in the designs. This will prevent situations like the current situation where a huge amount of materials, with a value of $75.000, is unused and not dedicated to a project.

For the purchasing department the use of the program will result in more overview of materials and the possibility of tracking the materials. Besides this, it is one program which could be used for all the projects so this will prevent different programs and codes between projects.

For the accounting department it is a lot easier to find errors or and control inventory with the program instead of the hardcopy ‘Cardex’. And onsite at the storehouses the different flows of materials will be matched with each other by the computer instead of writing work. And with the up to date overview of the inventory the

program makes it possible adapt the inventory to the construction process so that construction never will be interrupted because of insufficient materials.

For GW the program will have positive results for the failure costs because it will be a more controlled process. This also means that it makes it possible to find the errors in the process so that people needs to be more responsible for their job/goal.

6.3.3 Results & Feedback

Because I was not able to work with my program in a pilot project the results are limited, that is why results and feedback are discussed together.

After finishing the program I presented my work and the program to the involved people of Grupo Williams. The presentation caused a lot of discussion between those present. The presented examined problems were discussed and my computer program was provided with feedback.

The results presented in the computer program are per project what means that the program gives an overview of the total project and not per building. From different departments the comment was that the information should be presented per building. I tried to convince them about the importance of caution by implementation. So start broadly (project based), step one, find out the good and bad things of the program and adapt this into the program. With these adaptations the organization is ready for step two and so on. But the most important thing about step by step implementation is the fact that the company is developing the best fitting program together. Starting with a predesigned definitive computer program will result in adaptability problems.

For future use it is important that the results are presented per building. Because in this way it is also possible to compare the ordered amount of materials with the used amount of materials. This difference is valuable information for the engineering department but also represents the amount of materials as surplus materials in the central storehouse.

In the program the amounts of incoming and outgoing materials were simply noted. Correctly was mentioned that these amounts need to be verified with codes (invoice or order). We developed together a way of notation of these codes, simply by attach a comment to the amount.

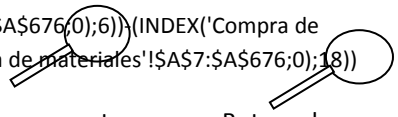
In the same part of the program (incoming and outgoing materials) we decided together that every transaction should be noted per building. Vertical are all the materials and horizontal the building codes will be noted. For extra transactions per building an extra column can be inserted easily.

There was also some indistinctness about the use of codification. Because the program is fit up with the codification it means that every department should use the codification. So the question was if everybody needs to know these codes for every material. That is something what needs to be developed, later in the report codification will be subject of discussion. But a central codification needs to be developed and implemented in all departments so everybody needs to use these codes.

After adapting the feedback (mentioned above but also some small corrections) a definitive program was handed over (Appendix F) and its manual (Appendix G). I was not able to work with the program because of the limitation of my internship time. But GW implemented the program in a new construction project what indicates the importance of a materials management program. I did not received feedback about this usage jet. For this report I wrote an fictive project and discovered one problem in the program. The formula presented before (see below) automatically adapt when an extra column is inserted during the process. But one part in the program does not change automatically and is changed for this example by hand. This part is indicated with

the magnifier in the formula: the value 6 and 18 signifying the number of the column which delivers the output. This number is not automatically adapting when a column is inserted.

=(INDEX($A$6:$G$676;VERGELIJKEN(Tabel10[[#Deze rij];[Kolom1]];$A$6:$A$676;0);6))+(INDEX('Compra de materiales'!$A$7:$S$676;VERGELIJKEN(Tabel10[[#Deze rij];[Kolom1]];'Compra de materiales'!$A$7:$A$676;0);18))



The occupation of my program indicates the importance of a materials management program. But maybe more interesting is the recognition of the problems by all the departments. By knowing and recognizing the problems the following step is to get together and find a solution together. Hopefully my presentation was the first step of the process considering the amount of discussions during and after the presentation.

7. Codification

The only codification system used in GW right now is the codification system of the central storehouse. The system is a bit comparable to the Brisch system mentioned before but the difference is the number of digits and the number of subgroups. Because of the central position of the codified materials in the computer program, a decent system of codification of big concern.

In the current codification system the materials are divided into *fifteen subgroups*:

- Diverse accessories
- steel and roofing
- Wood
- Cement and Whitening
- Ceramics and more
- Ceilings
- Electricity
- Plumber work
- Taps and Accessories
- Tools
- Iron
- Sanitary
- Machinery
- Chemicals

This sounds like a reasonable classification so this needs to be part of the codification as major group. This major group contains a lot of different materials. *Every materials dedicated to this group* gets its own number as subdivision. Until so far this is equal to the current codification but the amount of numbers for the first subdivision (five) is too much.

A very important part of the materials description is the *dimension of the materials*. In the list of materials (Appendix D) some materials have more than ten different dimensions. So there is a more detailed subdivision needed for the codification.

In the current list the *brand of the material* makes difference between materials. One material is codified more times because of the different marks. For the department of purchase these marks are not really important but for the inventory manager on site is more of importance. So this means an extra subdivision is needed as possibility.

Considering the subdivisions and the classification of a major group the Brisch system is the best suitable codification system for Grupo Williams.

The system proceeds in the following steps:

- The materials to be coded are grouped together so as to form a major group. These groups should be accurate and unambiguous and should no overlap each other.
- After preliminary grouping the materials are further divided and subdivided. The basis of these divisions and subdivisions of the materials is described in as great detail as possible and at the same time making them relevant to the users.
- The codes assigned in three different blocks together form the total code, namely these codes together separated by decimal points

Particulars	CODES				
	Main	Sub1	Sub 2	Sub 3	Full Code
Electricity	07	-	-		-
Breaker	-	01	-		63.01
Caja electricas	-	02	-		63.02
Foco	-	03	-		63.03
Interruptor	-	04	-		63.04
Breaker					
1x20	-	-	41		63.01.41
2x20	-	-	42		63.01.42
Foco					
25 Watts	-	-	61		63.03.61
50 Watts	-	-	62		63.03.62
Interruptor					
Sencillo	-	-	71		63.04.71
Triple	-	-	72		63.04.72
Breaker 1x20	-	-	-		
Ticino	-	-	-	01	63.01.41.01
Cutler Hammer	-	-	-	02	63.01.41.02

Table 11 Codification system GW

In Table 11 an example of codification is presented. The main part (electricity) and Sub 1 are discussed before and no different from the current situation. Only instead of the current 5 digit code for Sub 1 I used a 2 digit code for this subdivision. Then these materials are subdivided more detailed. For every main group this subdivision can be chosen, see the example, where three different types of detail are used (dimension, Watts, type). For the inventory manager it could be necessary to use a subdivision for the brand also, this is possible with the last subdivision.

Giving priority to the subdivisions results in more user friendliness codification. Because for an engineer it is not important to use the brand as a subdivision so they can work with the code 63.01.41. If it is necessary to distinguish the materials on site by the brand of the materials, the site manager can work with 63.01.41.01. In this way everybody is still 'talking about' the same material.

This codification system covers all the details processed in the list of materials right now. It is very important to create a central list of codification. This list needs to be created but also all the departments have to give an approval before implementation. All the departments have to work with the codes so a unanimously given material name, major group and sub classification is required.

8. Conclusions and recommendations

Based on the research done, the comparison made between theory and practice, the design made for a materials management computer program and the developed codification system, some conclusions can be drawn. These conclusions will be given in Section 8.1. The conclusions with regard to the research questions will be expanded with some more general conclusions. For future improvement in materials management some recommendations will be given in section 8.2.

8.1 Conclusions

Inventory control problems are usually the result of using poor processes and practices or no use of support systems. The materials management process is much more complex than the uninitiated understand. Only a sophisticated tracking system does not improve the bottom line, important is how to use the information that the system provides. It can be concluded that the issue of materials management is quite a complex problem because of the interweaved process into the organization of GW. GW itself is very well organized concerning the materials procurement but internal not the same 'language' is spoken. This language is about the used information but also about the used programs what means that the management tools are used on an incorrect and/or inefficient manner.

The different functions concerning materials management described in the theory are also part of GW's organization. The different functions are accommodated in different departments. The main departments involved in the materials procurement are: Design, Engineering, Budget, Purchase, Accounting and Administration. The departments are having their own responsibilities and every department has its responsible person for that responsibility. So the functions of materials management are divided into departments but there is no single manager responsibility and authority for all functions concerning with the flow of materials. This single manager responsibility and authority is however an important detail of materials management. This missing detail of materials management is one of the most important causes why the different departments do not speak the same 'language'. All the departments are using different programs for their own responsibility but also different information. By having specific goals per department, sub-optimization is being operative. The main thrust of the materials management concept is to avoid sub-optimization; to look for system efficiency and effectiveness; and to help ensure the achievement of common objectives rather than those which apply to elements within the system, which may be competing one with another. It can be concluded that the single manager responsibility is missing for an improved organization.

The inventory control system of GW does not satisfy the necessities from those who are using it. The current system does not provide the possibility to track the materials, the inventory is often not up to date and there is no overview of project necessities. These missing parts of inventory control are resulting in wrong material orders, uncertainty about material use and designs based on wrong information. But nevertheless this system is still labor-intensive because the amounts needs to be counted literally.

Material requirement planning (MRP) is an approach of inventory control that recognizes the realities of demand existing in a constructing environment. All MRP systems have a common objective, which is to determine requirements. These requirements means; discrete period-demands for each item of inventory order action. This action pertains to procurement (purchase orders) and to construction. MRP systems meet their objective by computing *net requirements* for each inventory item, time-phasing them, and determining their proper *coverage.* This computing will be done by a computer program based on specific inputs. I changed these inputs to create a special adapted program for GW. The status of an inventory item must be known before it can be determined what, if any, inventory management action is to be taken on that item. Inventory status is expressed by means of data that define an item's current position. Status information is intended to answer the essential questions of:

- What do we have?
- What do we need?
- What do we do?

This program is designed so that all the departments can work with it. The engineers can process their list of needed materials per building, department of purchase can see what is still needed for the project and can process what they have ordered, the administrator/inventory manager can process all the material transactions at the storehouse and see what is in inventory and the department of auditory can easily control the inventory. Knowing the possible improvements it can be concluded that this program or a similar program will resolve a lot of problems. From the problems summed in section 5.2 the following problems (in red) will be resolved with a materials management program:

- **The incorrect inventory**
- Different units for materials
- **A lot of paperwork**
- **$75.000,- (LMP 1.500.000) unused.**
- **Not possible to track the materials**
- Different codes between projects
- Materials transportation
- Missing materials
- Wrong materials
- No specification
- Different information between departments

The materials management computer program only works with a descent codification system. It can be concluded that from the different codification systems, the Brisch system is the best suitable codification system for GW. Using this system for identification of materials for a central catalogue of all different types of materials will also resolve some of the above mentioned problems. Because working with this central catalogue has the advantage of working with materials with just one name, one unity and specification. Based on these advantages it can be concluded that codification will resolve the following problems (in red).

- ~~The incorrect inventory~~
- **Different units for materials**
- ~~A lot of paperwork~~
- ~~$75.000,- (LMP 1.500.000) unused.~~
- ~~Not possible to track the materials~~
- **Different codes between projects**
- Materials transportation
- Missing materials
- Wrong materials
- **No specification**
- Different information between departments

8.2 Recommendations

Recommendations can be made on basis of the conclusions and on basis of the issues I discovered during my research. These recommendations aim at further improving materials management and reducing project complexity

8.2.1 Materials management computer program

As presented in the preceding chapters this theory will definitely contribute to improve the inventory control and the organization structure. The program I designed is not a program for life-time-use. The program is the first step of the implementation of materials management. By using this program the responsible persons can decide which parts of the program should be improved, deleted or attached. It is important that one person will become end responsible for the development of a computer program (materials manager). He has to arrange meetings between the different departments to discuss the program and to create recognition of the problems by all the departments. To process the results of these discussions are his responsibility. This working method will result in a final program (or gathering of inputs) designed by the total organization, all the departments together.

The program is not for life-time-use because right now it is project focused. To get better output and results the program has to be developed into product focused, product focused is in this case per

building/construction. In this way a comparison can be made between calculation of needed materials per building and usage of materials per building in construction.

Project 'Recidencial Toledo' is the first project where people are working with computers and internet. This is a very important development. For the future it is important that at all the projects a computer and (if possible) internet is available. Because with all these computers coupled together, working in a network, all the information is always up-to-date. So' Residencial Toledo' is the first computerized project but this development should be persevered in following projects.

8.2.2 Identification of materials

Identification of materials is the primary need of GW. Because of the missing central catalogue with codification there is a lot of indistinctness between the different departments what results in negative effects and failure costs. This catalogue is also a very important input of a materials management computer system so before developing a program, the identification needs to be determined. The Brisch system is in this case the best suitable codification system (see chapter 7). The catalogue should also be equipped with a searching system. This system will simplify the process of searching the codes of materials.

8.2.3 Storehouses

The storehouse on site is arranged by material. All the similar materials are stored together. This organization of the storehouse makes it impossible to refer a material to a specific project. For future research the organization of a storehouse can be examined. It is possible to organize a storehouse per project (in central storehouse) but it is also possible to give every material a specific code. Because all the orders (in the current situation) are done for every client specific. So by giving the materials this specific code it is always possible to track the materials.

8.2.4 Single responsibility

In my research I focused more at the theoretical and practical side of materials management. The organizational improvement is only discussed on small scale. But on basis of the theory it can be concluded that by adding a materials manager with single manager authority and responsibility sub-optimization will be prevented. This person will firstly be responsible for the development of a material management program and good communication between the departments. Secondly he can be responsible for a proper implementation and he can function as a materials manager described in chapter 3. How to implement this theory can be further examined.

8.2.5 Transportation

Department of purchase also arranges the transportation of the materials. The materials will be transported to the central storehouse before they will be distributed to the storehouse on site. The transportation was not part of my research so I do not know all the details but I think this could be improved. All the projects can have storehouse big enough for all the needed materials. In this way all the materials can immediately be send to the storehouse on site so that transportation costs can be reduced.

8.2.6 Hidden costs

In my report I mentioned several times the hidden costs. These hidden costs are the costs on materials (not costs of materials) like cost of purchasing, transportation costs and inspection costs. These extra costs on the end product are controllable and variable what means that every cost saved will add to the profit of the company. So it can be very interesting to have an overview of all the costs on materials separately from all the costs of materials. This can be examined to find out if some of these variable costs can be saved.

Cross reference of research questions

1) To analyze how the materials management is organized	**CH.4 & CH5**
1. How is the inflow and outflow of the materials organized?	CH.5
2. How is the inventory control of materials organized?	CH.5
3. Which material cost control functions are being used now?	CH.4 CH.5
4. What areas of Grupo Williams' materials management can be improved?	CH.5

2) Provide a tool which could be used for the codification of materials	**CH.7**
1. What methods can be used to codify materials in a construction project?	CH.3
2. What materials are used for this project and what are their specifications?	CH.6 Appendix

3) Create more overview by providing a coupling program between material flows	**CH.6**
1. Which tool could be used to create a coupling program?	CH.3
2. On what manner should the calculation of the total use of materials be presented to couple it with inflow and outflow of materials and to create a feedback circulation?	CH.6
3. How could the inflow and outflow of the materials be linked to the total material use?	CH.6

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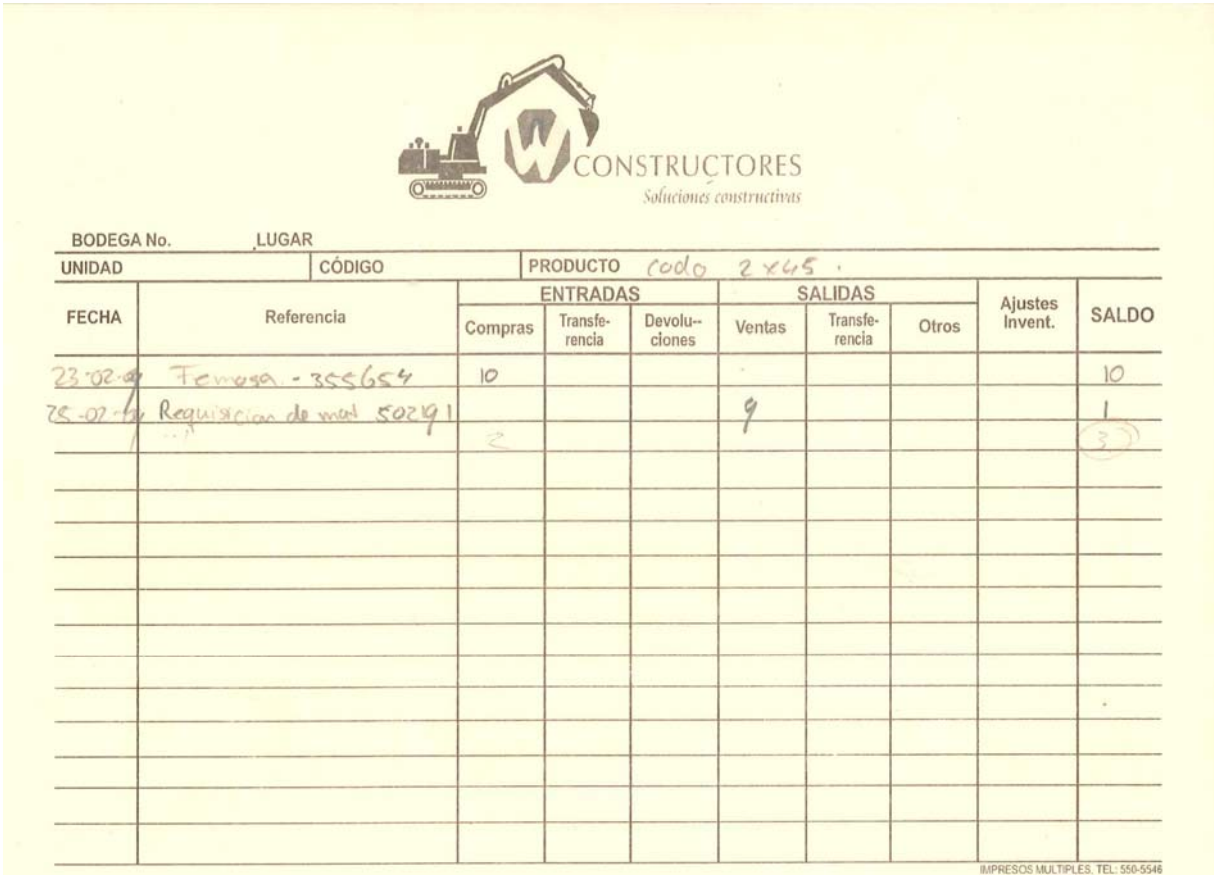
Appendix

Appendix A: Cardex



CONSTRUCTORES
Soluciones constructivas

BODEGA No. LUGAR

UNIDAD | CÓDIGO | PRODUCTO codo 2 x 45°

FECHA	Referencia	ENTRADAS			SALIDAS			Ajustes Invent.	SALDO
		Compras	Transfe-rencia	Devolu-ciones	Ventas	Transfe-rencia	Otros		
23-02	Fenaga - 355654	10							10
25-02	Requisicion de mat 502491				9				1
		2							3

IMPRESOS MULTIPLES. TEL: 550-5546

Appendix B: Urbanization plan

Appendix C: Design of model Utila

Appendix D: Inventory list

CODIGO	DESCRIPCION	CANT	UNIDAD
01-00001	CINTA PRECAUCION	6	Unidades
02-00001	ASFALTO PLASTICO PARA TECHOS	70	Cajas
02-00002	CANALETA DE 3X1 1/4	2	Unidades
02-00003	CAPOTE 10 ALUCIN	0	Unidades
02-00004	CAPOTE 8 ALUCIN	35	Unidades
02-00005	CAPOTE FORTEC ROJO	48	Unidades
02-00006	CLAVO DE 1 (ACERO)	5	Unidades
02-00007	CLAVO DE 1 1/2 (ACERO)	70	Unidades
02-00008	CLAVO DE 3 1/2 (ACERO)	324	Unidades
02-00009	CLAVO DE 4 (ACERO)	154	Unidades
02-00010	LAMINA ALUCIN 10X106	50	Unidades
02-00016	LAMINA RADAR	0	Unidades
02-00017	LAMINA DE HIERRO 8X4	1	Unidades
02-00020	TAPON FORTEC ROJO	17	Unidades
02-00021	TEJA MALOU	247	Unidades
02-00023	TEJA OVALADA	49	Unidades
02-00025	LAMINA LISA 3X12 (FLASHIN)	2	Unidades
02-00029	LAMINA ALUCIN 14X106	5	Unidades
02-00030	CAPOTE FORTEC NARANJA DE 4"	85	Unidades
02-00031	LAMINA FORTEC 36X36	62	Unidades
02-00032	LAMINA FORTEC 36X31	10	Unidades
02-00034	LAMINA ALUCIN 12X110	3	Unidades
02-00035	CAPOTE MALOU	102	Unidades
02-00040	CLAVO PARA CHINGLE DE 3/4	47	Libras
02-00041	LAMINA DE ZINC DE 10´	26	Unidades
02-00042	LAMINA DE ZINC DE 12´	44	Unidades
03-00001	ARANDELA DE HULE	16253	Unidades
03-00002	ARANDELA DE METAL	13000	Unidades
03-00003	BISAGRAS DE 2 1/2X2 1/2 PARA CLOSEP	21	Pares
03-00004	BISAGRAS DE 3 1/2	35	Pares
03-00005	BISAGRAS DE 2" PARA CLOSEP	137	Pares
03-00006	CONTRAMARCOS DE 6	13	Juegos
03-00007	ESPANSOR NO 12	825	Unidades
03-00008	ESPANSOR NO 6	300	Unidades
03-00009	ESPANSOR NO 8	38	Unidades
03-00010	LIJA # 100	0	Pliegos
03-00014	LLAMADORES	175	Unidades
03-00015	LLAVIN DE BAÑO KWIKSET SIN LLAVE	35	Unidades
03-00016	LLAVIN DE CUARTO KWIKSET CON LLAVE	3	Unidades
03-00017	LLAVIN PRINCIPAL DURASET MD (LA701)	4	Unidades
03-00018	LLAVIN PRINCIPAL KWIKSET	4	Unidades
03-00019	LLAVIN TIPO SAPO PHILLIPS	1	Unidades
03-00020	LLAVIN TIPO SAPO PARA COCINA YALE	0	Unidades
03-00022	MADERA DE 1"x10"x12' RUSTICA	0	Unidades
03-00027	MADERA DE 2"x4"x12'	0	Unidades
03-00030	MOCHETA	0	Juegos
03-00031	PERNOS PARA FORTEC 12 Pulg	4709	Unidades
03-00032	PERNOS PARA FORTEC DE 14 Pulg	3495	Unidades
03-00033	PUERTA 1/2 LUNA 35 1/2 X 80 1/2	6	Unidades
03-00034	PUERTA DE 1/2 LUNA 36X80	1	Unidades
03-00036	LIJA # 220	0	Pliegos

03-00038	PUERTA METALICA 36X80	10	Unidades
03-00039	PUERTA PARA CLOSEP DE PINO (juegos)	25	Unidades
03-00040	PUERTA PRINCIPAL 1/2 LUNA 36X80	1	Unidades
03-00041	PUERTA TERMOFORMADA BOSTANIA 28X80	6	Unidades
03-00042	PUERTA TERMOFORMADA BOSTANIA 30X80	9	Unidades
03-00043	PUERTA TERMOFORMADA CANDEN 28X80	11	Unidades
03-00044	PUERTA TERMOFORMADA CANDEN 30X80	4	Unidades
03-00045	PUERTA TERMOFORMADA PROVINCIAL 28X80	0	Unidades
03-00046	PUERTA TERMOFORMADA PROVINCIAL 30X80	5	Unidades
03-00047	SHORES PLASTICOS 14 1/2X52 Y 14 1/2X39 J	2	Unidades
03-00049	TUERCA DE TORNILLO PARA FORTEC	7104	Unidades
03-00051	BOSEL DE 1x1x10	7	Unidades
03-00052	CORREJILLA PARA GABETAS	105	Unidades
03-00055	MADERA DE 1"x8"x10' Rustica	45	Unidades
03-00056	MADERA DE 1"x3"x10' Rustica	15	Unidades
03-00057	LLAVIN DE BAÑO MASTER SIN LLAVE	0	Unidades
03-00058	LLAVIN DE BAÑO TABULAR LOCK YALE CA5282	2	Unidades
03-00059	LLAVIN TIPO SAPO P/COCINA PHILIPS	0	Unidades
03-00060	ESPANSOR NO 10	8	Unidades
03-00061	MADERA 1X4X12	0	Unidades
03-00062	PUERTA 32X80 CANDE	1	Unidades
03-00063	SHORES PLASTICOS 14.75 X 39	2	Unidades
03-00064	PLYWOOD	0	Unidades
03-00069	CONTRAMARCOS DE 4	25	Juegos
04-00001	ASFALTO PARA PAVIMENTO	17	Unidades
04-00002	CAL CALIDRA	658	Bolsas
04-00003	CEMENTO GRIS	70	Bolsas
04-00004	GROUT BLANCO SIN ARENA PEGADURO	63	Bolsas
04-00005	GROUT BEIGE CLARO CON ARENA PEGADURO	95	Bolsas
04-00006	GROUT CAFE CLARO UNIBLOCK	83	Bolsas
04-00007	GROUT CHAMPAGNE	7	Bolsas
04-00008	GROUT BLANCO SIN ARENA UNIBLOCK	20	Bolsas
04-00009	JAMO BLEND	12	Bolsas
04-00010	GROUT BLANCO SIN ARENA ULTRA-COLOR	2	Bolsas
04-00011	GROUT ARENA UNIBLOCK	2	Bolsas
04-00012	PULIDO TBA	2	Bolsas
04-00013	GROUT CAFE CLARO CEMIX SIN ARENA	25	Bolsas
04-00014	GROUT BLANCO CEMIX SIN ARENA	12	Bolsas
04-00015	SEPARADORES PARA CERAMICA DE 5 mm	550	Unidades
04-00016	SEPARADORES PARA CERAMICA DE 3 mm	100	Unidades
05-00001	BLOQUE DE VENTILACION DE CONCRETO 20X20	255	Unidades
05-00002	BLOQUE DE 4 1/2	100	Unidades
05-00006	BLOQUE DE 6	97	Unidades
05-00007	BLOQUE DE 4	82	Unidades
05-00013	CERAMICA BAÑO CLASSIC WHITE A1416 ELIANE	16	Cajas
05-00014	CERAMICA BAÑ 20X31.6 ARTICA BLANCO 2-7	13	Cajas
05-00015	CERAMIC BAÑ 20x20 CAPRI BLANCO J-8	69	Cajas
05-00016	CERAMIC BAÑ 20x20 MOSAICO BEIGE 6-4	2	Cajas
05-00017	CERAMIC BAÑ 20x20 MOSAICO BEIGE 7-5	107	Cajas
05-00019	CERAMICA BAÑO 20x20 MOSAICO BLANCO	175	Cajas
05-00022	CERAMICA BAÑO 20x20 NAPOLI BLANCO	146	Cajas
05-00025	CERAMIC 600*600 mm OVERLAND	2	Cajas
05-00026	CERAMIC PIS 31x31 BRASILIA GRIS 510 1-5	0	Cajas
05-00027	CERAMIC PIS 31.6x31.6 BRASLIA BEIGE 43-4	28	Cajas

05-00030	CERAMIC PIS 31.6x31.6 BRASILIA GRIS 16-5	8	Cajas
05-00031	CERAMIC PIS 31.6x31.6 BRASILIA GRIS 19-5	2	Cajas
05-00032	CERAMIC PIS 31.6x31.6 BRASILIA GRIS 20-6	19	Cajas
05-00033	CERAMIC PIS 31.6x31.6 BRASILIA GRIS 4-5	9	Cajas
05-00034	CERAMIC PIS 31.6x31.6 BRASILIA GRIS 7-5	4	Cajas
05-00035	CERAMIC PIS 31.6x31.6 BRASILIA GRIS 7-6	10	Cajas
05-00036	CERAMIC PIS 31.6x31.6 BRASILIA GRIS 8-5	3	Cajas
05-00037	CERAMIC PIS 37x37 LEF CAFÉ (3772) 190	20	Cajas
05-00038	CERAMIC PIS 37x37 LEF CAFÉ (3772) 210	10	Cajas
05-00039	CERAMIC PIS 37x37 LEF CAFE (3772) 250	28	Cajas
05-00040	CERAMIC PIS 37x37 LEF CREMA (3771) 190	24	Cajas
05-00041	CERAMIC PIS 37x37 LEF CREMA (3771) 230	32	Cajas
05-00042	CERAMIC PIS 37x37 LEF CREMA (3783) 150	8	Cajas
05-00043	CERAMIC PIS 37x37 LEF CREMA (3783) 160	23	Cajas
05-00101	LADRILLO RAFON	8900	Unidades
05-00118	LISTELO PARA BAÑO 8X25 DAINOR	2350	Unidades
05-00120	LISTELO PARA BAÑO 6X20 JADE MARENGO	4001	Unidades
05-00125	LISTELO PARA COCINA 5X20 TONO 30 (SF-26)	218	Unidades
05-00126	LISTELO PARA COCINA 6X20 TONO 5 (V-619)	1226	Unidades
05-00127	LISTELO PARA COCINA 8X25 (SF-182)	67	Unidades
05-00128	LISTELO PARA COCINA 8X25 (SF-187)	800	Unidades
05-00131	LISTELO PARA COCINA 8X25 BRENDA	6300	Unidades
06-00001	AISLANTE DE CALOR DE 4 PIES	3	Unidades
06-00002	AISLANTE DE CALOR DE 6 PIES	10	Unidades
06-00003	AISLANTE R-19	11	Unidades
06-00004	ALAMBRE GALVANIZADO No. 16	198	Libras
06-00005	CROSS TEE DE 12	3	Unidades
06-00013	ANGULO LISO DE 1X1X10	77	Unidades
06-00015	CANALETA DE CARGA	366	Unidades
06-00017	CINTA PAPEL PARA TABLA YESO (JT-2342)	322	Unidades
06-00018	CINTA PARA TABLA YESO (COD. 207A-72)	2	Unidades
06-00019	FURRIN CHANEL	12	Unidades
06-00020	LAMINA DURROCK	2	Unidades
06-00022	LAMINA TABLA YESO	8	Unidades
06-00023	FLEJE PASTICO	3	Unidades
06-00024	LIJA No.100	0	Pliegos
06-00025	CROSS TEE DE 2	68	Unidades
06-00026	CROSS TEE DE 4	100	Unidades
06-00027	TORNILLO DE 1 1/4 PUNTA FINA	0	Unidades
06-00028	TORNILLO DE 7/16 PUNTA FINA	2900	Unidades
06-00029	TORNILLO DE 7/16 PUNTA BROCA	2750	Unidades
06-00030	TORNILLO DE 1 1/4 PUNTA BROCA	0	Unidades
07-00001	ABRAZADERA 1 1/2 EMT METAL	23	Unidades
07-00003	ABRAZADERA 2 METAL	2	Unidades
07-00004	ABRAZADERA 3/4 EMT METAL	14	Unidades
07-00005	ADAPTADOR MACHO ELECTRONAY 1 EMT	1	Unidades
07-00006	ADAPTADOR MACHO ELECTRONAY 1 1/2 EMT	7	Unidades
07-00007	ADAPTADOR MACHO ELECTRONAY 1 1/4 EMT	3	Unidades
07-00012	ADAPTADOR MACHO ELECTRONAY 2 EMT	16	Unidades
07-00016	BASE PARA CONTADOR 200 AMP.	2	Unidades
07-00017	BASE PARA CONTADOR SENCILLO	1	Unidades
07-00018	CAJA OCTAGONAL ELECTRICA DE METAL	871	Unidades
07-00019	BREAKER 1X30 GENERAL ELECTRIC	7	Unidades
07-00020	BREAKER 2X60 CUTLER HAMMER	1	Unidades

07-00021	BREAKER 1X15 TICINO	4	Unidades
07-00022	BREAKER 1X20 CUTLER HAMMER	1	Unidades
07-00023	BREAKER 1X20 GENERAL ELECTRIC	1	Unidades
07-00024	BREAKER 1X20 TICINO	4	Unidades
07-00025	BREAKER 1X30 CUTLER HAMMER	0	Unidades
07-00028	BREAKER 2X20 CUTLER HAMMER	24	Unidades
07-00029	BREAKER 2X20 SQUAR D	3	Unidades
07-00030	BREAKER 2X30 CUTLER HAMMER	4	Unidades
07-00032	BREAKER 2X30 TICINO	5	Unidades
07-00033	BREAKER 2X40 CUTLER HAMMER	11	Unidades
07-00035	BREAKER 2X40 TICINO	1	Unidades
07-00036	BREAKER 3X30 SQUAR D	3	Unidades
07-00037	CABLE COAXIAL	2900	Pies
07-00038	CABLE DE ACOMETIDA 2X3	100	Pies
07-00039	CABLE #00	536	Pies
07-00040	CABLE No. 10	0	Pies
07-00041	CABLE No. 12	1312	Pies
07-00042	CABLE No. 14	4900	Pies
07-00043	CABLE No. 4	428	Pies
07-00044	CABLE No. 6	280	Pies
07-00045	CABLE No. 8	500	Pies
07-00046	CABLE PARA TELEFONO 4 HILOS	1400	Pies
07-00047	CABLE TELEFONICO 8 HILOS	0	Pies
07-00048	CAJA ELECTRICAS 2X4	144	Unidades
07-00049	CAJA ELECTRICAS 6X6X4	66	Unidades
07-00050	CAJA ELECTRICAS 6X6X6	2	Unidades
07-00051	CAJA METALICA 4X4	7	Unidades
07-00052	CAJA OCTAGONAL ELECTRICA PLASTICA	3	Unidades
07-00053	CAJA PARA CANDELA 4 1/2X2	3	Unidades
07-00054	CAJAS PLASTICAS 4X4	9	Unidades
07-00055	CABEL No. 2	0	Pies
07-00064	PEDESTAL PARA LAMPARA	5	Unidades
07-00065	CINTA AISLANTE	42	Unidades
07-00072	CONECTOR ELECTRONAY 1 1/2 EMT	7	Unidades
07-00074	CONECTOR ELECTRONAY 1 EMT	2	Unidades
07-00076	CONECTOR ELECTRONAY 3/4 EMT	44	Unidades
07-00077	CONECTOR ELECTRONAY 2 EMT	11	Unidades
07-00078	CONECTOR PARA TV	547	Unidades
07-00079	CURVA CONDUIT 3/4	9	Unidades
07-00085	FOCO PARA BAÑO 25 WATS 03118A (CLARO)	113	Unidades
07-00086	FOCO PARA BAÑO 25 WATS 03121-A (BLANCO)	100	Unidades
07-00088	FOCO PARA BAÑO 50 WATS INCANDECENTE	46	Unidades
07-00089	FOCO PARA BAÑO 60 WATS INCANDECENTE	11	Unidades
07-00090	FOCO PARA BAÑO 40 WATS INCANDECENTE	4	Unidades
07-00091	INTERRUPTOR DOBLE TICINO	1	Unidades
07-00092	INTERRUPTOR SENCILLO TICINO	16	Unidades
07-00093	INTERRUPTOR TRIPLE TICINO	0	Unidades
07-00094	INTERRUPTOR BAI-BEN 3 VIAS	0	Unidades
07-00095	LAMPARA COLGANTE (4041H) GENOVA	1	Unidades
07-00096	LAMPARA DE PARED 6041 ACISA	10	Unidades
07-00097	LAMPARA DE PARED 6091	6	Unidades
07-00099	LAMPARA EMPOTRABLE 4041 W	0	Unidades
07-00101	LAMPARA EXTERIOR DE PARED EMPOTRABLE (52	6	Unidades
07-00103	LAMPARA EXTERIOR PARED 67866 WESTINGHOUS	1	Unidades

07-00104	LAMPARA MODELO (4665B)	1	Unidades
07-00105	LAMPARA PARA BAÑO 3 FOCOS (66406)	7	Unidades
07-00106	LAMPARA PARA BAÑO 3 FOCOS CON VIDRIO (66	4	Unidades
07-00107	LAMPARA PARA BAÑO 4 FOCOS CON VIDRIO (66	2	Unidades
07-00108	MUFA 1 1/4	0	Unidades
07-00109	MUFA 3/4	5	Unidades
07-00110	MUFA DE 1	3	Unidades
07-00111	MUFA DE 2	1	Unidades
07-00136	PANEL DE 24 ESPACIOS GENERAL ELECTRIC	4	Unidades
07-00137	PANEL DE 42 ESPACIOS SQUARDI	0	Unidades
07-00138	PANEL DE 30 ESPACIOS CUTLER HAMMER	0	Unidades
07-00142	POLIDUCTO 1	1	Rollos
07-00143	POLIDUCTO 1/2	54	Rollos
07-00144	POLIDUCTO 3/4	0	Rollos
07-00145	PORTALAMPARA TICINO DE 21MB	18	Unidades
07-00148	PULSOR PARA TIMBRE	3	Unidades
07-00149	PROTECTOR PARA LAMPARA PLASTICA	5	Unidades
07-00152	SPLITER DE 4 SALIDAS	0	Unidades
07-00153	REFLECTORES PARA JARDIN # 3956 GENOVA	6	Unidades
07-00154	ROSETA NORMAL TICINO	0	Unidades
07-00155	ROSETA OVALADA TICINO	32	Unidades
07-00156	SPLITER 2 SALIDAS	173	Unidades
07-00157	SPLITER 3 SALIDAS	166	Unidades
07-00158	TAPADERA 110	12	Unidades
07-00159	TAPADERA O PLACA METALICA CIEGA 2X4	0	Unidades
07-00160	TAPADERA O TAPADERA PLASTICA CIEGA 2X4	2	Unidades
07-00162	TAPADERA PARA CAJA OCTAGONAL	4	Unidades
07-00163	TAPADERA P/TOMACORRIENTE TIPO CHINO	11	Unidades
07-00178	TIMBRE TICINO PARA PUERTA 737	0	Unidades
07-00179	TOMA 110 TICINO 1228 mab	12	Unidades
07-00180	TOMACORRIENTE P/ T.V. LEVERON	0	Unidades
07-00181	TOMACORRIENTE P/ T.V. TICINO	24	Unidades
07-00182	TOMACORRIENTE P/ TELEFONO LEVERON	8	Unidades
07-00183	TOMACORRIENTE P/ TELEFONO TICINO	-12	Unidades
07-00184	TOMACORRIENTE PARA ESTUFA LEVERON	6	Unidades
07-00185	TOMACORRIENTE PARA ESTUFA NPT 32	51	Unidades
07-00186	TOMACORRIENTE TIPO CHINO 816V	5	Unidades
07-00187	TOMACORRIENTE ELECTRICAL	17	Unidades
07-00189	TUBO EMT 1 1/4	15	Unidades
07-00190	TUBO EMT 1/2	1	Unidades
07-00191	TUBO EMT 3/4	9	Unidades
07-00195	GRAPA POLO TIERRA	1	Unidades
07-00196	VARILLA POLO TIERRA	13	Unidades
07-00197	TIMBRE PARA PUERTA 60 HZ	2	Unidades
08-00001	ABRAZADERA 4X1/2 PVC POTABLE	1	Unidades
08-00002	ABRAZADERA 4X3/4 PVC POTABLE	1	Unidades
08-00003	ADAPTADOR HEMBRA 1 1/2 PVC POTABLE	16	Unidades
08-00004	ADAPTADOR HEMBRA 1 1/4 PVC POTABLE	2	Unidades
08-00005	ADAPTADOR HEMBRA 1 POTABLE	9	Unidades
08-00006	ADAPTADOR HEMBRA 1/2 CPVC POTABLE	1	Unidades
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	27	Unidades
08-00008	ADAPTADOR HEMBRA 2 PVC POTABLE	0	Unidades
08-00009	ADAPTADOR HEMBRA 3 PVC POTABLE	7	Unidades
08-00010	ADAPTADOR HEMBRA 3/4 PVC POTABLE	8	Unidades

08-00011	ADAPTADOR HEMBRA 4 POTABLE	0	Unidades
08-00012	ADAPTADOR MACHO 1 1/2 PVC POTABLE	34	Unidades
08-00013	ADAPTADOR MACHO 1 1/4 PVC POTABLE	13	Unidades
08-00014	ADAPTADOR MACHO 1 PVC POTABLE	32	Unidades
08-00015	ADAPTADOR MACHO 1/2 CPVC	875	Unidades
08-00016	ADAPTADOR MACHO 1/2 PVC POTABLE	2	Unidades
08-00017	ADAPTADOR MACHO 2 1/2 PVC POTABLE	6	Unidades
08-00018	ADAPTADOR MACHO 2 PVC POTABLE	0	Unidades
08-00019	ADAPTADOR MACHO 3 PVC POTABLE	4	Unidades
08-00020	ADAPTADOR MACHO 3/4 CPVC POTABLE	7	Unidades
08-00021	ADAPTADOR MACHO 3/4 PVC POTABLE	12	Unidades
08-00022	ADAPTADOR MACHO 4 PVC POTABLE	18	Unidades
08-00023	ADAPTADOR MACHO 6 PVC POTABLE	4	Unidades
08-00024	ADAPTADOR MACHO 6" CON REDUCTOR A 4" PVC	2	Unidades
08-00025	TUBO NOVALOC ALCANTARIA P/ DRENAGE 36X36	1	Unidades
08-00026	CAMISA 1 1/2 PVC POTABLE	2	Unidades
08-00027	CAMISA 1 1/4 PVC POTABLE	3	Unidades
08-00028	CAMISA 1 PVC POTABLE	7	Unidades
08-00029	CAMISA 1/2 CPVC AGUA CALIENTE	23	Unidades
08-00030	CAMISA 1/2 PVC POTABLE LISA	0	Unidades
08-00031	CAMISA 2 PVC POTABLE	0	Unidades
08-00032	CAMISA 3 PVC POTABLE	5	Unidades
08-00033	CAMISA 3/4 CPVC AGUA CALIENTE	5	Unidades
08-00034	CAMISA 3/4 PVC POTABLE	11	Unidades
08-00035	CAMISA 4 PVC POTABLE	0	Unidades
08-00036	CAMISA 6 PVC POTABLE	3	Unidades
08-00037	CODO 2X45 PVC INYECTADO POTABLE	3	Unidades
08-00038	CODO 1 1/2X45 PVC POTABLE	7	Unidades
08-00039	CODO 1 1/2X90 PVC POTABLE	34	Unidades
08-00040	CODO 1/2 X45 PVC POTABLE LISO	14	Unidades
08-00041	CODO 1/2X 90 PVC POTABLE CON ROSCA	205	Unidades
08-00042	CODO 1/2X45 CPVC AGUA CALIENTE	54	Unidades
08-00043	CODO 1/2X90 CPVC AGUA CALIENTE	42	Unidades
08-00044	CODO 1/2X90 PVC POTABLE LISO	22	Unidades
08-00045	CODO 1X90 PVC POTABLE	51	Unidades
08-00046	CODO 1X90 PVC POTABLE CON ROSCA	0	Unidades
08-00047	CODO 2 1/2X90 PVC POTABLE	7	Unidades
08-00048	CODO 2X45 PVC INYECTADO DRENAGE	16	Unidades
08-00049	CODO 2X45 PVC POTABLE	14	Unidades
08-00051	CODO 2X90 PVC HECHIZO DRENAJE	0	Unidades
08-00052	CODO 2X90 PVC INYECTADO DRENAJE	0	Unidades
08-00053	CODO 2X90 PVC POTABLE	5	Unidades
08-00055	CODO 3/4X45 PVC POTABLE	9	Unidades
08-00056	CODO 3/4X90 PVC LISO POTABLE	19	Unidades
08-00057	CODO 3/4X90 PVC POTABLE CON ROSCA	3	Unidades
08-00058	CODO 3X45 PVC INYECTADO DRENAJE	15	Unidades
08-00059	CODO 3X45 PVC POTABLE	10	Unidades
08-00060	CODO 3X90 PVC HECHIZO DRENAJE	1	Unidades
08-00061	CODO 3X90 PVC INYECTADO DRENAJE	20	Unidades
08-00063	CODO 4X45 PVC HECHIZO DRENAJE	18	Unidades
08-00064	CODO 4X45 PVC INYECTADO DRENAJE	5	Unidades
08-00065	CODO 4X45 PVC POTABLE	20	Unidades
08-00066	CODO 4X90 PVC INYECTADO DRENAJE	12	Unidades
08-00067	CODO 4X90 PVC POTABLE	-4	Unidades

08-00069	CODO 6X45 PVC POTABLE	7	Unidades
08-00070	CODO 6X90 PVC HECHIZO DRENAJE	0	Unidades
08-00071	CODO 6X90 PVC POTABLE	7	Unidades
08-00072	CONECTOR DE 1/2 PVC	69	Unidades
08-00073	COPLIN DE 1 PVC	26	Unidades
08-00074	COPLIN DE 1/2 PVC	94	Unidades
08-00075	COPLIN DE 3/4 PVC	29	Unidades
08-00076	CRUZ DE 1 1/2 PVC POTABLE	2	Unidades
08-00077	CRUZ DE 1 PVC POTABLE	3	Unidades
08-00078	CRUZ DE 2 PVC POTABLE	8	Unidades
08-00079	CRUZ DE 4 PVC POTABLE	2	Unidades
08-00080	CURVA DE 1 1/2 PVC	1	Unidades
08-00081	CURVA DE 1/2 PVC	227	Unidades
08-00082	CURVA DE 1/2 PVC EMP	226	Unidades
08-00083	CURVA DE 3 PVC	4	Unidades
08-00085	CURVA DE 3/4 CONDOR	0	Unidades
08-00087	CURVA DE 4 PVC	1	Unidades
08-00088	GUIAS PLASTICA 4 DE DESAGUE LAVATRASTOS	84	Unidades
08-00089	GUIAS PLASTICAS PARA LAVATRASTOS	1	Unidades
08-00090	PASCON DE DESAGUE DE 4	6	Unidades
08-00091	REDUCTOR 1 1/2X1 PVC POTABLE	0	Unidades
08-00092	REDUCTOR 1 1/2X1/2 PVC POTABLE	18	Unidades
08-00095	REDUCTOR 1 1/2X3/4 PVC POTABLE	15	Unidades
08-00096	REDUCTOR 1 1/4X1 PVC POTABLE	8	Unidades
08-00097	REDUCTOR 1 1/4X1/2 PVC POTABLE	1	Unidades
08-00099	REDUCTOR 1X1/2 PVC POTABLE	12	Unidades
08-00100	REDUCTOR 1X3/4 PVC POTABLE	19	Unidades
08-00101	REDUCTOR 2 1/2X1 PVC POTABLE	1	Unidades
08-00102	REDUCTOR 2X1 1/2 PVC POTABLE	8	Unidades
08-00103	REDUCTOR 2X1 PVC POTABLE	15	Unidades
08-00104	REDUCTOR 2X1/2 PVC POTABLE	0	Unidades
08-00106	REDUCTOR 2X2 1/2 PVC POTABLE	1	Unidades
08-00108	REDUCTOR 2X3/4 PVC POTABLE	0	Unidades
08-00109	REDUCTOR 3/4X1/2 CPVC POTABLE	0	Unidades
08-00110	REDUCTOR 3/4X1/2 PVC POTABLE	66	Unidades
08-00112	REDUCTOR 3X1/2 PVC POTABLE	11	Unidades
08-00113	REDUCTOR 3X2 DRENAJE	8	Unidades
08-00114	REDUCTOR 3X2 PVC HECHIZO DRENAJE	5	Unidades
08-00115	REDUCTOR 3X3/4 PVC POTABLE	2	Unidades
08-00116	REDUCTOR 4X2 PVC HECHIZO DRENAJE	16	Unidades
08-00117	REDUCTOR 4X2 PVC POTABLE	5	Unidades
08-00118	REDUCTOR 4X3 PVC POTABLE	9	Unidades
08-00119	REDUCTOR 6X2 PVC HECHIZO DRENAJE	0	Unidades
08-00121	REDUCTOR 6X4 PVC HECHIZO DRENAJE	6	Unidades
08-00122	REDUCTOR 6X4 PVC POTABLE	5	Unidades
08-00123	REDUCTOR 8X4 PVC POTABLE	1	Unidades
08-00124	REDUCTOR 8X4 PVC HECHIZO DRENAJE	14	Unidades
08-00125	REDUCTOR 8X6 PVC POTABLE	1	Unidades
08-00126	SIFON 2 PVC HECHIZO DRENAJE	6	Unidades
08-00128	UNION NOVALOC PVC 26X26 (2710)	3	Unidades
08-00129	TUBO DE 2 HG PESADO	0	Unidades
08-00131	CAMISA DE 2 HG DOBLE ROSCA	0	Unidades
08-00134	YEE 2X2 PVC POTABLE	0	Unidades
08-00135	UNION/ABRAZADERA NOVALOC DE 36"	3	Unidades

08-00136	VALVULA COMPUERTA DE 1	16	Unidades
08-00137	VALVULA COMPUERTA DE 2	0	Unidades
08-00138	VALVULA COMPUERTA DE 4	1	Unidades
08-00140	TAPON 2 HECHIZO	7	Unidades
08-00141	TAPON 4 HECHIZO	1	Unidades
08-00228	SIFON 2 PVC DRENAJE	4	Unidades
08-00229	SIFON 3 PVC INYECTABLE DRENAJE	17	Unidades
08-00230	SIFON 4 PVC INYECTABLE DRENAJE	9	Unidades
08-00231	SIFON PARA LAVATRASTOS DOBLE	54	Unidades
08-00232	SIFON PARA LAVATRASTOS SENCILLO	12	Unidades
08-00233	DESAGUE PARA LAVATRASTOS	5	Unidades
08-00234	SIFON TIPO CACHO DOBLE PARA LAVATRASTOS	6	Unidades
08-00235	TAPON 1 PVC LISO POTABLE	4	Unidades
08-00236	TAPON 1 PVC POTABLE CON ROSCA	6	Unidades
08-00237	TAPON 1/2 CPVC AGUA CALIENTE	27	Unidades
08-00238	TAPON 1/2 PVC LISO POTABLE	0	Unidades
08-00239	TAPON 1/2 PVC POTABLE CON ROSCA	0	Unidades
08-00240	TAPON 2 PVC LISO POTABLE	0	Unidades
08-00241	TAPON 3 PVC HECHIZO DRENAJE	7	Unidades
08-00242	TAPON 3 PVC LISO POTABLE	1	Unidades
08-00243	TAPON 3/4 PVC LISO POTABLE	6	Unidades
08-00244	TAPON 3/4 PVC POTABLE CON ROSCA	3	Unidades
08-00247	TAPON DESAGUE 4	0	Unidades
08-00250	TEE 1 1/2 PVC POTABLE	6	Unidades
08-00251	TEE 1 1/2 PVC POTABLE CON ROSCA	0	Unidades
08-00252	TEE 1 1/2 X1/2 PVC POTABLE	0	Unidades
08-00253	TEE 1 1/4 PVC POTABLE	6	Unidades
08-00254	TEE 1 PVC POTABLE	34	Unidades
08-00255	TEE 1/2 CPVC AGUA CALIENTE	0	Unidades
08-00256	TEE 1/2 PVC POTABLE	469	Unidades
08-00257	TEE 2 1/2 PVC POTABLE	17	Unidades
08-00259	TEE 2 PVC DRENAJE	404	Unidades
08-00260	TEE 2 PVC HECHIZA DRENAJE	16	Unidades
08-00261	TEE 2 PVC INYECTADA DRENAJE	6	Unidades
08-00262	TEE 2 PVC POTABLE	6	Unidades
08-00264	TEE 3 PVC INYECTADA DRENAJE	13	Unidades
08-00265	TEE 3 PVC POTABLE	4	Unidades
08-00266	TEE 3/4 CPVC AGUA CALIENTE	7	Unidades
08-00267	TEE 3/4 PVC POTABLE	25	Unidades
08-00268	TEE 3/4 PVC POTABLE CON ROSCA	4	Unidades
08-00269	TEE 4 PVC DRENAJE	3	Unidades
08-00270	TEE 4 PVC POTABLE	4	Unidades
08-00271	TEE 4X4 PVC HECHIZA DRENAJE	5	Unidades
08-00272	TEE 6X4 PVC HECHIZA DRENAJE	4	Unidades
08-00273	TEE 6X6 PVC HECHIZA DRENAJE	1	Unidades
08-00274	TEE 8X4 PVC HECHIZA DRENAJE	2	Unidades
08-00276	TEFLON 3/4	2	Rollos
08-00278	TUBO DE 1/2 CPVC	540	Unidades
08-00279	TUBO DE 1/2 PVC POTABLE	94	Unidades
08-00281	TUBO DE 2 PVC POTABLE	31	Unidades
08-00282	TUBO DE 3 PVC DRENAJE	15	Unidades
08-00283	TUBO DE 3/4 CPVC	0	Unidades
08-00284	TUBO DE 3/4 PVC	36	Unidades
08-00285	TUBO DE 4 DRENAJE	3	Unidades

08-00286	TUBO DE 4 PVC POTABLE	0	Unidades
08-00287	TUBO DE 6 DRENAJE	41	Unidades
08-00289	TUBO DE 8 DRENAJE	8	Unidades
08-00293	UNION UNIVERSAL 1 PVC POTABLE	1	Unidades
08-00294	UNION UNIVERSAL 2 PVC POTABLE	3	Unidades
08-00295	YEE 2X2 PVC HECHIZO DRENAJE	22	Unidades
08-00296	YEE 2X2 PVC INYECTABLE DRENAJE	11	Unidades
08-00297	YEE 3X3 PVC INYECTABLE DRENAJE	2	Unidades
08-00298	YEE 4X3 PVC INYECTABLE DRENAJE	15	Unidades
08-00299	YEE 4X4 PVC HECHIZA DRENAJE	19	Unidades
08-00300	YEE 4X4 PVC INYECTABLE DRENAJE	9	Unidades
08-00302	YEE 6X4 PVC INYECTABLE DRENAJE	6	Unidades
08-00303	YEE 6X6 PVC HECHIZA DRENAJE	17	Unidades
08-00304	YEE 8X4 PVC HECHIZA DRENAJE	5	Unidades
08-00310	VALVULA 1/2X3/8 ESCUADRA	0	Unidades
08-00312	VALVULA 2" EUROPEA (105)	0	Unidades
08-00316	VALVULA COMPUERTA DE 3	0	Unidades
08-00317	VALVULA PARA DUCHA SENCILLA DOCOL	1	Unidades
08-00318	VALVULA DE ENTRADA (DE CONTROL DE 1/2)	0	Unidades
08-00319	CODO DE 1 1/4X90 PVC LISO	0	Unidades
08-00320	CODO DE 3/4X90 CPVC LISO	3	Unidades
08-00321	CODO DE 8X45 PVC DRENAJE	0	Unidades
08-00322	CURVA DE 2"	2	Unidades
08-00323	REDUCTOR 2 1/2X2 PVC POTABLE	0	Unidades
08-00324	REDUCTOR 3/4X1/2 PVC CON ROSCA	0	Unidades
08-00325	REDUCTOR 3X2 PVC POTABLE	1	Unidades
08-00327	REDUCTOR 4X2 PVC DRENAJE	0	Unidades
08-00328	REDUCTOR 4X3 PVC DRENAJE	0	Unidades
08-00329	TAPON 4 PVC LISO	1	Unidades
08-00330	TAPON 6 PVC LISO	2	Unidades
08-00331	TEE DE 6X6 PVC DRENAJE	2	Unidades
08-00332	TEE DE 6X6 PVC POTABLE	0	Unidades
08-00333	TEE DE 8X8 PVC HECHIZA	0	Unidades
08-00334	TEFLON 1/2	0	Unidades
08-00343	CAMISA 1 1/4 H-G	6	Unidades
08-00344	CAMISA 1 H-G	14	Unidades
08-00345	CAMISA 1/2 H-G	2	Unidades
08-00346	CAMISA 2 H-G	5	Unidades
08-00347	CAMISA 3 H-G	3	Unidades
08-00348	CAMISA 3/4 H-G	12	Unidades
08-00349	CAMISA 4 H-G	8	Unidades
08-00350	CAMISA 6 H-G	1	Unidades
08-00351	CODO 1 1/2X90 H-G	6	Unidades
08-00352	CODO 1/2X90 H-G	63	Unidades
08-00353	CODO 1X90 H-G	12	Unidades
08-00354	CODO 2X90 H-G	7	Unidades
08-00355	CODO 3/4X90 H-G	15	Unidades
08-00356	CODO 4X90 H-G	3	Unidades
08-00381	REDUCTOR 3/4X1/2 H-G	1	Unidades
08-00384	REDUCTOR 2X1/2 H-G	6	Unidades
08-00390	TAPON MACHO 1 H-G	1	Unidades
08-00394	TEE 1 1/2 H-G	1	Unidades
08-00395	TEE 1 H-G	1	Unidades
08-00396	TEE 1/2 H-G	1	Unidades

08-00397	TEE 2 H-G	2	Unidades
08-00398	TEE 3/4 H-G	1	Unidades
08-00400	UNION UNIVERSAL 1 1/4 H-G	2	Unidades
08-00404	TUBO DE 10 PVC	2	Unidades
08-00405	CODO 4X90 HECHIZA	2	Unidades
08-00406	CODO 8X45 POTABLE	2	Unidades
08-00407	CURVA DE 1 PVC	1	Unidades
08-00409	CHEQ DE 1	1	Unidades
08-00410	CHEQ DE 2	1	Unidades
08-00411	TAPON MACHO DE 2 H-G	1	Unidades
08-00412	TEE 6X4 PVC POTABLE	1	Unidades
08-00413	YEE 6X6 PVC INYECTABLE DRENAJE	2	Unidades
08-00414	YEE 8X4 PVC INYECTABLE DRENAJE	0	Unidades
09-00003	ACCESORIO PARA BAÑO FRANKLIN BRASS	1	Unidades
09-00004	ACCESORIO PARA BAÑO JACKWAL KIT ESTÁNDAR	26	Unidades
09-00005	ACCESORIO PARA BAÑO MARALLUI	51	Unidades
09-00006	ACCESORIO PARA BAÑO TP 8220	6	Unidades
09-00007	ACCESORIO PARA BAÑO TCM	1	Unidades
09-00010	BELTRAP PARA BAÑO DE METAL 2"	8	Unidades
09-00012	BELTRAP PARA BAÑO ALUMINIO DE 2	2	Unidades
09-00013	CANASTA 4 1/2 INOX PARA LAVATRASTOS	11	Unidades
09-00014	GRIFO COLONY CROMO LAVAVO 2275505-IN002	1	Unidades
09-00016	CONTADOR PARA AGUA DE 3M 3/H	12	Unidades
09-00017	DUCHA PARA BAÑO PRICE PFISTER (WT2-110C)	3	Unidades
09-00018	DUCHA PARA BAÑO COLONY (3275501 IN 002)	1	Unidades
09-00019	CORREJILLA PARA BAÑO T- 4X2	16	Unidades
09-00020	DESAGUE DOBLE LAVATRASTOS	24	Unidades
09-00026	GRIFO PARA BAÑERA SUNRISE	3	Unidades
09-00029	GRIFO LAVATRASTOS DOBLE CLASSIC CROMADO	4	Unidades
09-00032	GRIFO LAVATRASTO PRICE PFISTER CLASSIC 4	0	Unidades
09-00033	GRIFO LAVATRASTOS DOBLES AMERICAN ESTÁND	3	Unidades
09-00034	GRIFO LAVATRASTOSDOBLE H-8001	16	Unidades
09-00035	GRIFO LAVATRASTO PRICE PFISTER CLASSIC W	0	Unidades
09-00036	GRIFO LAVATRASTO SENCILLO INCESA STANDAR	196	Unidades
09-00039	GUIA PARA LAVATRASTOS PLASTICOS SENCILLO	82	Unidades
09-00040	GRIFO LAVATRASTO CROMO A.S. 4275500IN002	3	Unidades
09-00041	GRIFO LAVATRASTOS SENCILLO H-1001	30	Unidades
09-00042	LAVATRASTOS SENCILLO CON ESCURRIDOR IZQ	3	Unidades
09-00043	LAVATRASTOS DOBLE CON ESCURRIDOR DERECHO	4	Unidades
09-00044	LAVATRASTOS DOBLE SIN ESCURRIDOR	3	Unidades
09-00051	LLAVE DE PATIO 1/2	5	Unidades
09-00052	LLAVE DE PATIO 1/2 ABRE FACIL	11	Unidades
09-00058	MANGUERA ABASTO PARA INODORO 7/8 X 3/8	42	Unidades
09-00059	MANGUERA ABASTO PARA LAVAVO 1/2 X 3/8	38	Unidades
09-00070	RIVAL PARA PILA ALUMINIO 10X12	2	Unidades
09-00071	RIVAL PARA PILA ALUMINIO 12X14	6	Unidades
09-00072	SIFONN CACHO PARA LAVATRASTOS	11	Unidades
09-00073	UÑAS LARGAS PARA LAVADO	0	Unidades
09-00075	GRIFO SUNRISE PARA DUCHA	2	Unidades
10-00016	VALANZA	6	Unidades
10-00017	SEÑORITAS PARA CARGA	2	Unidades
10-00018	DISCO PARA CONCRETO 7X5/16X7/8	4	Unidades
11-00001	ALAMBRE DE AMARRE	116	Libras
11-00002	ALAMBRE DE PUAS	1	Rollos

11-00003	ANGULO DE 1 1/2X1/8	14	Unidades
11-00004	ANGULO DE 1 X1/8	3	Unidades
11-00005	ANGULO DE 2 1/2X1/2	2	Unidades
11-00006	ANGULO DE 2 1/4X3/16	9	Unidades
11-00007	ANGULO DE 2X1/8	0	Unidades
11-00009	ANGULO DE 4X1/8	1	Unidades
11-00010	ANGULO ACUSTICO	79	Unidades
11-00012	CLAVO DE 1	2353	Libras
11-00013	CLAVO DE 1 1/2	303	Libras
11-00014	CLAVO DE 2	312	Libras
11-00015	CLAVO DE 2 1/2	164	Libras
11-00016	CLAVO DE 3	0	Libras
11-00017	CLAVO DE 4	83	Libras
11-00018	TELA ZARANDA DE 1/4X24X100	2	Pies
11-00019	TORNILLO DE 1/2 PUNTA BROCA	21	Unidades
11-00020	TORNILLO 1 PUNTA BROCA	555	Unidades
11-00021	TORNILLO DE 2 PUNTA BROCA	109	Unidades
11-00022	TORNILLO GOLOSO DE 1/2	114	Unidades
11-00023	TORNILLO DE 2 1/2 PARA LAMINA DE ALUCIN	374	Unidades
11-00024	TORNILLO DE 2 GOLOSO	8	Unidades
11-00026	TORNILLO TIRAFONDO 4 1/2	11970	Unidades
11-00027	VARILLA 1 CORRUGADA	29	Unidades
11-00028	VARILLA 1/2 CORRUGADA	329	Unidades
11-00029	VARILLA 1/4 LISA	-1	Unidades
11-00030	VARILLA 3/8 CORRUGADA	48	Unidades
11-00031	VARILLA 5/8 CORRUGADA	65	Unidades
11-00032	VARILLA 3/4	4	Unidades
11-00034	CLAVO CABEZON PARA TABLAYESO	90	Unidades
11-00035	CERPENTINA GALVANIZADA	22	Rollos
11-00036	TORNILLO 8 CON ESPANSOR	70	Unidades
11-00037	TUBO INDUSTRIAL # 21 1X2 RECTANGULAR	0	Unidades
11-00038	ESQUINERO METALICO 10 ft	0	Unidades
11-00039	MAYA ELECTROSOLDADA 18´x90"x5´	10	Unidades
12-00001	INODORO BLANCO (ECOLINE / HABITAT)	2	Unidades
12-00002	BAÑERA DE LIC. EVY	1	Unidades
12-00003	BAÑERA	1	Unidades
12-00005	INODORO ELONGADO NOSTALGIA BONE	1	Unidades
12-00006	INODORO OLIMPO BONE	0	Unidades
12-00007	LAVAMANOS HABITAT BLANCO	3	Unidades
12-00008	LAVAMANOS PEDESTAL SORRENTO (452DA)	2	Unidades
12-00010	LAVAMANOS SATURNO BONE BLANCO OVALADO	1	Unidades
12-00011	LAVAMANOS SATURNO BONE SENCILLO	20	Unidades
12-00012	LAVAMANOS SATURNO DOBLE LLAVE	8	Unidades
12-00015	LAVATRASTO ESCURRIDOR SENCILLO IZQUIERDO	4	Unidades
12-00019	TAPADERA DE TANQUE OLIMPO CREMA	1	Unidades
12-00021	LAVATRASTO ESCURRIDOR DOBLE DERECHO	0	Unidades
12-00022	LAVATRASTO ESCURRIDOR DOBLE IZQUIERDO	2	Unidades
12-00023	LAVATRASTO SIN ESCURRIDOR DOBLE	3	Unidades
12-00024	PEDESTAL SATURNO BLANCO	1	Unidades
12-00025	PEDESTAL SATURNO BONE	0	Unidades
12-00027	PEDESTAL SORENTO BONE	7	Unidades
12-00030	LAVAMANOS STD ECOLINE BLANCO	0	Unidades
12-00031	INODORO STD HYDRA BONE	0	Unidades
12-00033	BAÑERA STD HIDRO SCANDA	0	Unidades

15-00005	ADITIVO NIVELADOR PARA PISOS	7	Galones
15-00007	ANTICORROSIVO NEGRO	1	Galones
15-00008	ANTICORROSIVO ROJO BRILLANTE SHERWIN 1/4	2	Cuartos
15-00009	ANTICORROSIVO ROJO PROTECTO 10111	5	Galones
15-00010	ANTICORROSIVO ROJO SUR	-2	Galones
15-00013	BASE BLANCA PROTECTO 1300	3	Galones
15-00014	BASE TRASPARENTE SUR LATEX 3000	41	Galones
15-00016	COMEGENOL GL	3	Galones
15-00017	CORRO EPOXY 720	8	Galones
15-00018	CORRO EPOXY 721	8	Galones
15-00019	DESENGRASANTE LIQUIDO BIO-DEGRADABLE	19	Galones
15-00020	DILUYENTE 630	15	Galones
15-00021	DILUYENTE SUR	5	Galones
15-00022	ESMALTE AMARILLO VIVO PROTECTO 1/4	2	Cuartos
15-00023	ESMALTE BLANCO PROTECTO 400 (CUARTOS)	0	Cuartos
15-00025	FASTIL SUR ROJO 1/4	0	Cuartos
15-00026	FASTIL SUR ROJO TEJA (545-321-06) CUARTO	0	Galones
15-00027	GRASA	1	Galones
15-00029	IMPERMEABILIZANTE PARA CONCRETO	0	Galones
15-00030	INSECTOL	4	Galones
15-00032	MASILLA PLASTICA EXTERIOR / INTERIOR PRO	4	Galones
15-00034	MASILLA PARA TABLAYESO SHEET ROCK	0	Galones
15-00037	MASILLA R 1500	2	Galones
15-00039	MACILLA O PASTA LISA P/EXTERIORES SUR	54	Galones
15-00040	MACILLA O PASTA LISA P/INTERIORES SUR	5	Galones
15-00041	PEGAMENTO CPVC	6	Galones
15-00042	PEGAMENTO PVC EN CUARTOS	22	Galones
15-00043	PEGAMENTO TANGIF PVC 1/4	0	Cuartos
15-00044	PINTURA AMARILLO CLARO - PROTECTO 1352	7	Galones
15-00045	PINTURA AMARILLO CLARO - SUR 2010P (BANA	29	Galones
15-00048	PINTURA BEIGE - PROTECTO 1316	1	Galones
15-00049	PINTURA BEIGE - SUR 2739T (FINCH)	0	Galones
15-00050	PINTURA BLANCO ANTIGUO - PROTECTO 1322	1	Galones
15-00051	PINTURA BLANCO ANTIGUO - SUR 2036 (HONEY	4	Galones
15-00052	PINTURA BLANCO CIELO - PROTECTO 1325	3	Galones
15-00053	PINTURA BLANCO CIELO - SUR	0	Galones
15-00055	PINTURA BLANCO DOVER - SUR 2887P (FRENCH	16	Galones
15-00056	PINTURA BLANCO HUESO - PROTECTO 1312	6	Galones
15-00057	PINTURA BLANCO HUESO - SUR 4724P (SEA OA	13	Galones
15-00060	PINTURA BLANCO OSTRA - PROTECTO 1310	2	Galones
15-00061	PINTURA BLANCO OSTRA - SUR 2926P (WHITE	12	Galones
15-00062	PINTURA CORAL - PROTECTO 1356	9	Galones
15-00063	PINTURA CORAL - SUR 2844T (HAPPY TRAILS)	12	Galones
15-00065	PINTURA DE ACEITE BLANCO SUR 2900	1	Galones
15-00066	PINTURA HIERVA DE LA PALMA - PROTECTO 13	9	Galones
15-00067	PINTURA HIERVA DE LA PALMA - SUR 2571T (	10	Galones
15-00069	PINTURA MARFIL - PROTECTO 1353	2	Galones
15-00070	PINTURA MARFIL - SUR 2766P (EXPRESSO CRE	10	Galones
15-00071	PINTURA CELESTE CLARO SUR 2387-P	2	Galones
15-00072	PINTURA PORCELANA - PROTECTO 1315	3	Galones
15-00073	PINTURA PORCELANA - SUR 2673P (HINT OF O	0	Galones
15-00074	PINTURA TERRACOTA - PROTECTO 1357	5	Galones
15-00075	PINTURA TERRACOTA - SUR 2805C (HAZEL NUT	11	Galones
15-00076	POWER MIX 100 EDECON	9	Galones

15-00077	REMOVEDOR PARA CONCRETO	8	Galones
15-00078	SELLADOR 522	0	Galones
15-00080	SILICONE BLANCO PINTABLE	1	Galones
15-00081	SILICONE POTABLE ULTRA GLASE	1	Galones
15-00082	SILICONE TRANSPARENTE TUBO	12	Galones
15-00086	SILICONE EN PASTA PARA FONTANERIA	17	Galones
15-00087	ANTICORROSIVO ROJO OXIDO	13	Galones
15-00088	ANTICORROSIVO ROJO BRILLANTE SHERWIN WIL	1	Galones
15-00089	ANTICORROSIVO GRIS BRILLANTE	4	Galones
15-00090	CURADOR DE CONCRETO	50	Galones
15-00091	ESMALTE LADRILLO	2	Galones
15-00092	ESMALTE ROJO VIVO PROTECTO (CUARTO)	2	Cuartos
15-00093	PINTURA BLANCA CORONA	1	Galones
15-00094	PINTURA SATINADA	1	Galones
15-00095	PINTURA DE ACEITE AMARILLO CLARO 2010-P	4	Galones
15-00096	PRIMITALIZANTE BLANCO 7715	1	Galones
15-00097	FASTIL / TAPAGOTERA PROTECTO (623)	1	Galones
15-00098	SELLADOR ACRILICO PIGMENTADO (288110)	1	Galones
15-00099	STUCCO SILICA ROJO	2	Galones
15-00100	STUCCO SILICA VERDE	6	Galones
15-00101	STUCCO SILICO BLANCO	3	Galones
15-00102	PINTURA LATEX APRICOT TAN 2746-T	0	Galones
15-00103	EDECON/ENDURECEDOR DE CONCRETO	110	Galones
15-00104	EPOXI P/CONSTRUCCION REZI-WELD 1000	8	Galones
16-00030	SOLERA DE 2 1/2 X 10	0	Galones

Appendix E: Book of purchase

DEPARTAMENTO DE COMPRAS

2009

- ACTIVIDADES DEL DEPARTAMENTO:
  - Compras de crédito = purchase in credits
  - Compras de contado = purchase in ~~secuse~~ cash.
  - Licitación de Proyectos = tender for projects / contesting

Integrantes del departamento:

Ing. Lizette Miranda (gerente del Depto)
Gabriel Ayala
Lilian Arriaga
Donato Membreño

Departamento de Compras

We give an introduction step by step in each function the department has

Daremos una introducción de paso a paso de cada función que desempeñamos en El departamento.

1. Memorando de Inicio start memorandum.
2. Hoja de presupuesto de materiales Run through / control the budget of materials.
3. Especificación por parte del depto. De Diseño Specification per part of dept. design.
4. Solicitud de Materiales por el ing. Residente Application of materials by ing. Resident.
5. Cotización de materiales quote of materials
6. Compra de materiales por medio de crédito purchase of materials by means of credit.
   - Elaboración de orden de compra. preparation of purchase oxdex.
   - Revisión y autorización x el depto. de presupuestos review / authorization - dept. budgeting
   - Enviar orden de compra autorizada al Proveedor y confirmarla send purchase order. approved to prod. dev and confirm
   - Enviar la orden de compra a bodega central y proyectos send order (appr.) to central warehouse on project
   - Enviar al motorista a retirar el producto send the driver to take away the product,
   - Confirmar con el encargado de bodega que recibe el producto según o/c y factura para el ingreso en kardex Confirm with e.d.b. the receive of products with order / bill
   - Informar al ing. residente de la entrega del producto. Inform ing. about delivery of prod.
   - Archivo de orden de compra con su factura y/o comprobante de entrega file the purchase order with the bill and/or proof of delivery.
   - Reporte semanal o mensual x proyecto y x cliente Report weekly or monthly - projects - clients
7. Compra de materiales de contado
   - Cotizar los materiales 3 cotizaciones para comparativo de precios quote materials at 3 quotes to comparative prices
   - Hacer solicitud de cheque una vez autorizado el valor por presupuestos Make request of cheque once approved the value of budgets
   - Enviar la orden de compra al encargado de proyecto send purchase order of proj. manager
   - Enviar al motorista a retirar el producto
   - Confirmar con el encargado de bodega que recibe el producto conforme a o/c y/o factura
   - Informar al ing. residente de la entrega del producto.
   - Archivar la factura o comprobante de entrega por cliente Bill / proof of delivery

8. Licitación de Proyectos

A.-

- Se cotiza a tres proveedores para comparativo de precios List 3 providers to compare
- Se elabora cuadro de precios con todos los proveedores para depto de presupuesto Price table is prepared with all suppliers to dept. pres
- Esperamos confirmación de la licitación Waite for confirmation of tender.
- Si es aprobada se hace lo siguiente: After approval, as follows:

B.-

- Se compra al proveedor que ofrece mejor precio o se elabora orden de compra (crédito) Purchase from the supplier offering the best price or purchase order is ma
- Elaboramos solicitud de cheque si fuera contado Work out application cheque if it's
- Entrega de orden de compra al encargado del proyecto (en bodega)
- Retiramos el producto y se entrega en proyecto delivery of purchase order to the storehouse. the project and entering in project.
- Confirmar con el encargado de bodega que recibe el producto conforme o/c y/o factura. Confirm with ed.b. the receive of materials conform the bill.
- Archivo orden de compra con su factura o comprobante de entrega Archive de purchase order with bill or proof of delivery
- Reporte semanal o mensual x proyecto y x cliente Report weekly / monthly project client.

Take out

Memorandum de Inicio

Start of memo

MEMORANDUM

Este documento es Interno, no para cliente.
NO se aceptan cambios, ni obras adicionales, una vez enviado el memo de inicio.

Copia

PARA: Ing. Angel Salinas / Residente Residencial Toledo ✓

CC: Lic. Karen Guevara / Jefe de Ventas SPS ✓

DE: Lic. Evy de Williams / Gerente General ✓

FECHA: 15 de Octubre del 2008

ASUNTO: Inicio de Construccion de CASA MODELO en Residencial TOLEDO -SPS

POR ESTE MEDIO SE LE SOLICITA PROCEDER A DAR INICIO DE CONSTRUCCION DE LA SIGUIENTE VIVIENDA EN RESIDENCIAL TOLEDO EN SPS:

#	Nombre /cliente	ubicación bloque	lote	Modelo/Casa	Mts/Const.	tipo de compra	fecha/liquidacion	Fecha Entrega	Mejoras
1	Allan Enrique Rapalo	15	2	Olivo	87.66	Financiado	Pendiente	Martes, 05 de Abril de 2009	Si tiene
	Silvia Lorena Avila				Mts/Const.	HSBC		(6-meses control interno)	Adjunto Orden Aprobada
									Según planos
							Se envia memo	Al cliente se le da un plazo de	firmados por el
							con autorizacion	8-meses despues del	cliente con Orden #
	Promotor: Sinthya Barahona						Depto Finanzas	descuento en banco.	2215
							Credito Aprobado		el 15/5/08
						VB:			

Para evitar futuros contratiempos se le solicita al promotor de ventas, pedir al cliente que firme los planos tanto de planta como de fachada, adjunto y devolver la copia firmada a la oficina principal y dar copia tambien firmada por el cliente al ing. Residente y guardar en archivo.

Favor realizar los tramites respectivos como permiso de construccion para dar inicio inmediato a la construccion.

Atentamente.

Recibido por:

Ing. Angel Salinas Residente	Arq. Mireya Lean Jefe-Depto. Diseño	Depto. De Compras Ing. Lizeth Miranda	Lic. Karen Guevara Jefe/ Zona SPS

CC: Expediente-Cliente
CC: Inicios de Construccion SPS

Reviso: 15/10/08

contract.
client.

San Pedro Sula
07 de Mayo del 2008

Cliente: **Allan Rapalo/Silvia Avila**
Proyecto: **Residencial Toledo**
Ciudad: **San Pedro Sula**

Respuesta a orden
2215
Del 28 Abril /08

Estimado señor (a): Allan Rapalo/Silvia Avila

Por este medio le detallamos el costo adicional para realizar los cambios solicitados por usted que incluye:

Cotizacion Incluye: a) Mover area de Lavanderia atrás del dormitorio 2
b) Colocar ventana en pared trasera del dormitorio principal
c) Adicional ventana en el comedor

El costo total de lo anterior es de:

Modelo	ubicacion	Detalle	Costo obra adicional
Olivo	Lote 02	Lo descrito en todo el items a)	$760.00
87.66 mts	Bloque 15	b) y c)	
		Diferencia a pagar por el cliente (Contado)	$760.00

Los cambios se trabajaron de acuerdo a las politicas y criterios del depto. De Diseño de la empresa.

De ser aceptada la presente cotizacion, le agradeceremos firmar la presente junto con los planos adjuntos, y devolver los originales a SPS, junto con el pago por el monto arriba indicado, ya que toda obra adicional debe cancelarse por adelantado para que pueda proceder.

En espera de su respuesta.

Atentamente.

Lic. Alba de Young

Copia

POSTEADO C X COBRAR
FECHA: 15/05/08
FIRMA

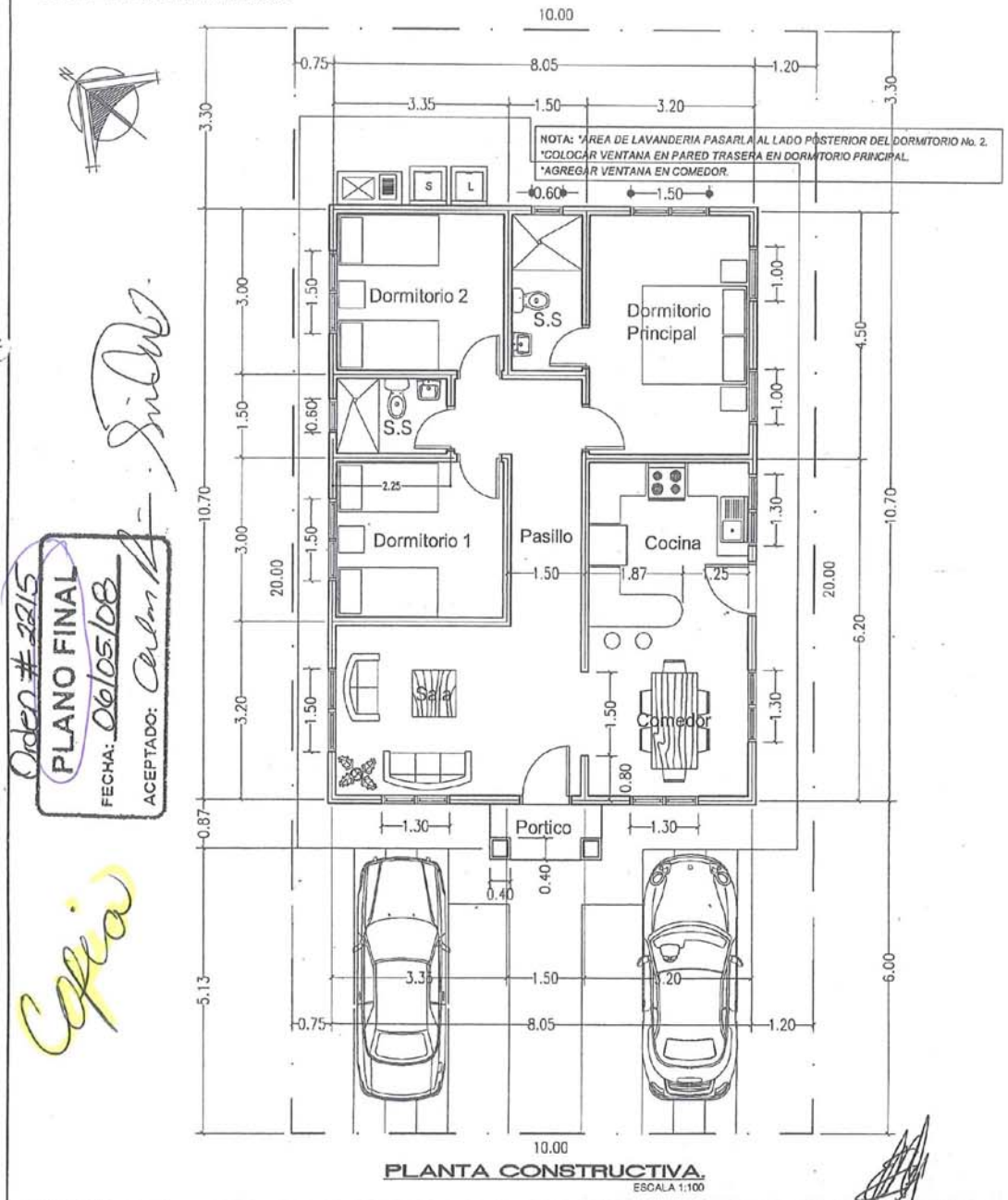
Aceptado Cliente

Fecha: 15-Mayo-08
Pagado con Recibo #11685
Obra adicional de Orden No. 2215

Nota Importante:
Si esta cotizacion no es recibida en un termino de 3 dias, se dara por no aceptada, y se seguira el curso normal en la construccion. **NO ACEPTAN CAMBIOS NI OBRAS ADICIONALES una vez ingresado su expediente al banco y firmados los planos de la vivienda.**

RESIDENCIAL TOLEDO

CASA *MODELO OLIVO*
CLIENTE *ALLAN ENRIQUE RAPALO IRAHETA / SILVIA LORENA AVILA VALLADARES*
AREA CONSTRUCCION: *87.66m²*
LOTE 2 - BLOQUE 15, AREA: 286.85v²



PLANO FINAL
FECHA: 06/05/08
ACEPTADO:

Orden #2215

Copia

PLANTA CONSTRUCTIVA.

ESCALA 1:100

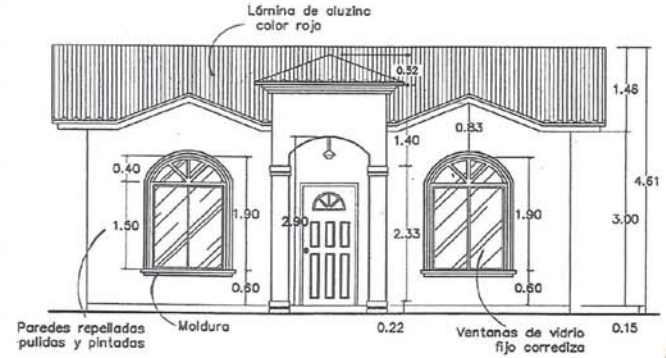
GRUPO W	PROYECTO: *RESIDENCIAL TOLEDO MODELO OLIVO, SAN PEDRO SULA*	CLIENTE: ALLAN ENRIQUE RAPALO / SILVIA LORENA AVILA.	HOJA: 1/2
		FECHA: 29/ABRIL/2008.	
	CONTENIDO: *PLANTA CONSTRUCTIVA.*	DISEÑO: ARQ. MIREYA LEAN C.A.H. #239	
		DIBUJO: TVC.	

RESIDENCIAL TOLEDO

CASA *MODELO OLIVO*
CLIENTE *ALLAN ENRIQUE RAPALO IRAHETA / SILVIA LORENA AVILA VALLADARES*
AREA CONSTRUCCION: *87.66m²*
LOTE 2 - BLOQUE 15, AREA: 286.85v²

Orden #2215

PLANO FINAL
FECHA: 06/05/08
ACEPTADO:



FACHADA FRONTAL
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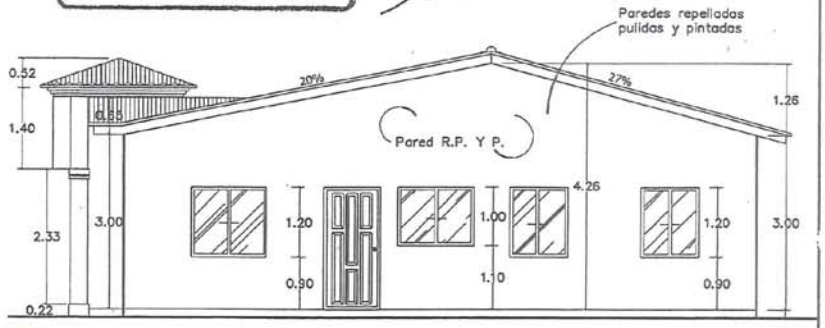
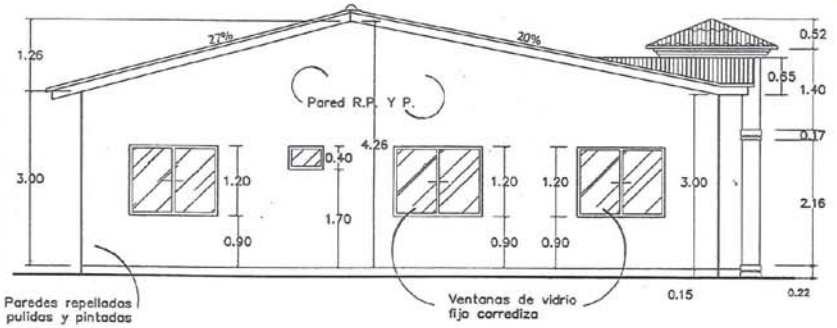
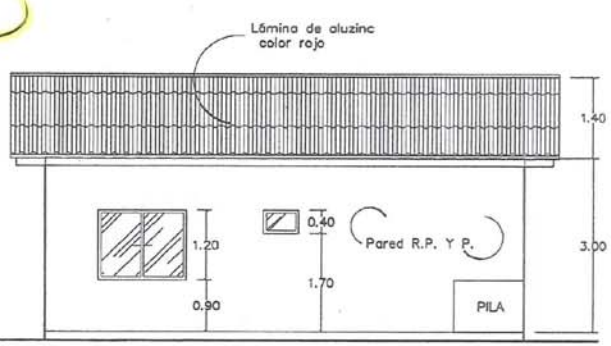


FACHADA LATERAL DERECHA
ESCALA 1:100

Copia



FACHADA LATERAL IZQUIERDA
ESCALA 1:100



FACHADA POSTERIOR
ESCALA 1:100

GRUPO W	PROYECTO: *RESIDENCIAL TOLEDO MODELO OLIVO, SAN PEDRO SULA*	CLIENTE: ALLAN ENRIQUE RAPALO / SILVIA LORENA AVILA.	HOJA: 2/2
	CONTENIDO: *ELEVACIONES.*	FECHA: 29/ABRIL/2008.	
		DISEÑO: ARQ. MIREYA LEAN C.A.H. 9236	
		DIBUJO: TVC.	

Presupuesto de materiales

WILLIAMS & ASOCIADOS

Proyecto:Villas Mallorca

Materiales x Etapa

ITEM	DESCRIPCION	UNIDAD	CANTIDAD
	ETAPA I		
1	**Acero No 4 (1/2)**	Unid	38.00
			46.00
2	**Acero No 3 (3/8)**		
	Total		**263.00**
3	**Acero No. 2 (1/4)**	Unid	
	Total		**157.00**
4	Bloque 6"	Unid	-
5	Bloque 4 1/2"	Unid	3,000.00
6	Alambre de Amarre	Lbs	150.00
7	Madera Rustica 1x4x10	Unid	60.00
8	Madera Rustica 1x10x12	Unid	200.00
9	Madera Rustica 2x4x12	Unid	80.00
10	Madera Rustica 2x6x12	Unid	72.00
11	Cemento Gris	Bolsa	600.00
12	Arena	m3	75.00
13	Grava	m3	45.00
14	Cal Hidratada	Bolsa	70.00
15	Clavos 1 Pulgada	Caja	-
16	Clavos 2 1/2 Pulgados	Caja	1.00
17	Clavos 3 Pulgadas	Lbs	1.00
18	Tubo 4" pvc Drenaje	Unid	8.00
19	Tubo 1/2" pvc AP	Unid	16.00
20	Tubo 1/2" cpvc AP	Unid	16.00
21	Tubo 2" pvc Drenaje	Unid	5.00
22	Codo 4" PVC Drenaje inyectado	Unid	3.00
23	Codo 2" PVC Drenaje inyectado	Unid	15.00
24	Codo 1/2" PVC AP inyectado	Unid	25.00
25	Tee 2 x 2" Inyectada Drenaje	Unid	6.00
26	Tee 1/2 x 1/2" PVC Inyectada Potable	Unid	20.00
27	Tee 1/2 x 1/2" CPVC Inyectada Potable	Unid	20.00
28	Codo 1/2 x 90 CPVC Inyectada Potable	Unid	20.00
29	Tee 1/2 x 1/2" PVC Inyectada Potable	Unid	-
27	Codo con rosca PVC 1/2"	Unid	6.00
28	Beltrac para baño	Unid	3.00
29	Valvula escuadra para sanitario	Unid	3.00
25	Valvula escuadra para lavamanos	Unid	5.00
26	Valvula escuadra para Lavatrastos	Unid	2.00
27	Lija No 80	Unid	5.00
28	Teflon	Rollos	5.00
29	Valvulas de baño para duchas Agua Caliente Helada	Unid	2.00
30	Valvula para agua helada con regadera	Unid	1.00
31	Tee 4"x4" Drenaje inyectada PVC	Unid	3.00
32	Valcula de entrada 1/2" o de control	Unid	1.00
33	Sifones de 2" PVC	Unid	3.00
34	Tapones lisos de 1/2" PVC	Unid	12.00
35	Adaptadores Machos 1/2 PVC	Unid	18.00
	Adaptadores Machos 1/2 CPVC	Unid	18.00
36	Adaptadores Hembras 1/2 PVC	Unid	6.00
37	Pegamento PVC	Galon	0.50
38	Llaves de Jardin	Unid	6.00
39	Poliducto 3/4	Rollos	8.00

Copia

WILLIAMS & ASOCIADOS

Proyecto:Villas Mallorca
Materiales de 2da. Etapa

ITEM	DESCRIPCION	UNIDAD	CANTIDAD
	ETAPA II		
42	Canaleta	Lance	55.00
43	Anticorrosivo	Gal	5.00
44	Electrodo 6011	Lbs	22.00
45	Gasolina Regular	Gal	2.00
46	Lamina de zic según especificacion 16 pies	Unid	17.00
47	Lamina de zic según especificacion 12 pies	Unid	26.00
48	Lamina de zic según especificacion 10 pies	Unid	14.00
49	Capote de zinc 8 pies	Unid	13.00
50	Tornillos 1 plg para zinc sobre calaleta	Unid	30.00
51	Tornillos 2 plg para zinc	Unid	475.00
52	Lamina durrot	Unid	1.00
53	Lamina lisa de zinc de 6 ´pies	Unid	1.00
	Electrico		
54	Cable # 4	Pies	200.00
55	Cable # 6	Pies	200.00
56	Cable # 8	Pies	1,050.00
57	Cable # 10	Pies	1,000.00
58	Cable # 12	Pies	1,950.00
59	Cable # 14	Pies	2,000.00
60	Cable Coaxial	Pies	500.00
61	Cable Telefono	Pies	500.00
62	Cinta aislante	Rollo	4.00
63	-1 mufa de 1 1/4	Unidad	1.00
64	-1 mufa de 3/4	Unidad	1.00
65	-1 tubo EMT DE 1 1/4	Unidad	1.00
66	-1 tubo EMT DE 3/4	Unidad	1.00
67	57 cajas electricas de 2*4	Unidad	57.00
68	22 cajas octagonales	Unidad	22.00
69	1 cajas de 4*6 registro	Unidad	1.00
70	1 base de contador	Unidad	1.00
71	1 panel de 24 espacios	Unidad	1.00
	Cielo		
72	98 angulos metalicos	Lances	98.00
73	78 furrin chanel	Lances	78.00
74	50 unidades de lamina tabla yeso	Lamina	50.00
75	8 unidades de lamina panelit	Lamina	8.00
76	1500 tornillos 7/16 punta fina	Unidad	1,500.00
77	1500 tonillos 7/16 punta broca	Unidad	1,500.00
78	550 clavos de acero de 1"	Unidad	550.00
79	2400 tornillos de 1/4 punta fina	Unidad	2,400.00
80	8 cubetas de masilla	Cubeta	8.00
81	9 rollos de papel	Rollo	9.00
82	28 pliegos de lija 100 para hierro	Pliego	28.00
83	10 libras de alambre galvanizado	Lbs	10.00
84	24 canaletas de carga	Lance	24.00

WILLIAMS & ASOCIADOS

Proyecto:Villas Mallorca
Materiales 3ra. Etapa

ITEM	DESCRIPCION	UNIDAD	CANTIDAD
	ETAPA III		
85	Ceramica de Piso	m2	108.00
86	ceramica para baño privado	m2	15.00
87	Listelo para baño privado	ml	8.00
88	ceramica de pared para baño compartido	m2	15.00
89	Listelo para baño compartido	ml	8.00
90	Ceraminca de pared para baño servidumbre	m2	15.00
91	Piso de ducha para baño privado	m2	2.00
92	Piso de ducha para baño Compartido	m2	2.00
93	Piso de ducha para servidumbre	m2	2.00
94	ceramica para pared de cocina	m2	11.00
95	Listelo de cocina	ml	9.00
96	ceremica antiderrapante para garje	m2	37.50
97	grount para piso saco de 22 lbs	saco	15.00
98	grount para baño privado saco de 22 lbs	saco	2.00
99	grount para baño conpartido de 22 lbs	saco	2.00
100	grount para servidumbre saco de 22 lbs	saco	2.00
101	grount para mueble de cocian saco 22 lbs	saco	1.00
102	grount para garaje saco 22 lbs	saco	5.00
103	separadores de 5mm	unidad	100.00
104	separadores de 2mm	unidad	100.00

Copia

Proyecto:Villas Mallorca
Materiales x Etapa

WILLIAMS & ASOCIADOS

DESCRIPCION	UNIDAD	CANTIDAD
FONTANERIA		
2 Inodoro Nostalgia Bone	Unidad	2.00
2 Lavamanos Sorrento de pedestal	Unidad	2.00
2 Grifos de lujo para lavado sorrento	Unidad	2.00
2 Grifos de lujo para ducha	Unidad	2.00
1 Inodora Habitat blanco	Unidad	1.00
1 lavamano habita blanco	Unidad	1.00
1 lavatrastos para mueble de cocina	Unidad	1.00
2 rollos de teflon de 3/4	Rollo	3.00
3 uñas dobles	Unidad	3.00
9 tornillos golosos de 1 1/2	Unidad	9.00
9 expansores de #8	Unidad	9.00
Valvulas ecuadra 1/2 a 3/8	Unidad	10.00
7 mangueras de 1/2 a 3/8 para lavados	Unidad	7.00
3 mangueras de 1/2 a 3/8 para sanitarios	Unidad	3.00
3 codos pvc 1/2 x 45	Unidad	3.00
2 codos de cpvc 1/2 x 45	Unidad	2.00
2 adaptadores pvc 1/2 hembra	Unidad	2.00
2 adaptadores cpvc 1/2 hembra	Unidad	2.00
2 jugos de accesorios de baño	Unidad	2.00
ELECTRICO		
Breaker de 2x30	Unidad	5.00
Breaker de 2x40	Unidad	2.00
Breaker de 110 voltios 1x20	Unidad	7.00
Tomacorrientes de 110 voltios polarisados	Unidad	28.00
Tomacorrientes para 220 voltios tipo chino	Unidad	5.00
Tomas para telefono	Unidad	4.00
Tomas para estufa	Unidad	4.00
Interruptores dobles	Unidad	7.00
interruptores sencillos	Unidad	3.00
Tomas para los cables coaxial TV	Unidad	4.00
Rosetas o portalamparas	Unidad	16.00
lamparas de baño	Unidad	2.00
una caja 2x6x6 para registro	Unidad	1.00
timbre	Unidad	1.00
interruptor para tiembre	Unidad	1.00
spliter de 1 a 3	Unidad	3.00
spliter de 1 a 2	Unidad	3.00
21 conectores para cable	Unidad	21.00
4 rollos de cinta aislante	Unidad	4.00
PUERTAS		
2 Puertas termo formadas de 28"*80" incluyendo contramarcos y mochetas para	Unidad	2.00
3 Puerta Termoformada de 30"*80" incluye contramarcos y mochetas para cuartos	Unidad	3.00
2 Puerta metalica 36"*80" cocina y servidumbre incluye contramarcos y mochetas	Unidad	2.00
1 Puerta metalica 1/2 luna 36"*80" principal incluye contramarcos y mochetas	Unidad	1.00
llamador	Unidad	2.00
1 llavin Principal doble	Unidad	1.00
1 llavin sapo para cocina	Unidad	1.00
1 llavin sapo para servidumbre	Unidad	1.00
3 llavines para cuartos interiores tipo pelota con llave	Unidad	3.00
2 llavines para baño tipo pelota sin llave	Unidad	2.00
24 visagras de 3" con todo y tornillos	PAR	12.00
Ventaneria	GBL	1.00
PINTURA		
3 cubetas para exterior	Cubeta	3.00
3 cubetas para interior	Cubeta	3.00
4 gln para interior	gln	3.00
Diluyente	gln	2.00
2 cubetas para cielo falso	Cubeta	2.00
3 galones para cielo falso	Galoes	3.00
2 galones para pintura en resaltes	Galoes	2.00
2 galones y 1/4 para pintura de puertas y mochetas	Galoes	2.25
2 cuberas de masilla R1500	Cubeta	2.00
20 pliegos de lija # 80	Pliego	20.00

Copia

Especificacion

Especificaciones para acabados de construccion para modelos de viviendas

Proyecto	**Residencial San Fernando II ETAPA**
Modelo / Casa	**San Fernando I**
Mts de Construccion	**75.25 m²**
Varas de lote	206.53 v²

Acabados de vivienda	Descripcion	Donde
Tipo de paredes	Bloque de 4 1/2"	repellado, pulido y pintado
Tipo de piso	Cerámica 0.37x 0.37, beige clara	toda la casa, liga 5mm.
Tipo de Ventanas	corrediza francesa, alum. Natural	frontales, el resto de la casa celosias.
Lleva batientes en ventanas	Si, de una grada pulido.	ventanas frontales
Lleva molduras en las ventanas	no	
Tipo de cielo Falso	Tabla yeso, inclinado	con flejeria metalica
Cubierta de techo	Lámina de Aluzinc rojo	
Estructura de techo	canaleta metalica 3"x1 1/4"	
Tendra instalacion de lavadora	Si	parte trasera de la casa
Tendra instalacion de Secadora	Si	parte trasera de la casa
Tendra timbre	No	
tomas para Aire Acondicionado	Si	solo dormitorio principal
Instalación Cable T.V. y teléfono	Si	solo en sala
Instalación electroduchas	Si	Ambos baños
Instalacion de agua Caliente	No	
Lámparas de techo Interiores	No	
Lámparas de Techo Exteriores	No	
Lámparas de pared exteriores	no	
Lámparas de pared en baños	sí	sobre el lavamanos ambos baños.
Llevara listelo en baños	si	altura de 1.20 m. perimetralmente
Llevara ceramica en baños	Si, ceramica blanca de 20x30, liga 2mm.	piso de ducha antiderrapante blanco
Tipo de Sanitarios	Habitat blanco	Todos los baños
Tipo de Lavabos	Habitat blanco	Todos los baños
Accesorios de baños	si, portapapel, toallero, porta jabón, porta cepillo	Ambos baños.
Tendra Closet	no	
Tipo de closet	n/a	
Tipo de mueble de cocina	Concreto enchapado en cerámica blanca	de 0.20 x 0.20, liga 2mm con fleje plastico
Llevara listelo en cocina	si	altura de 0.40 sobre mueble de cocina
Tipo de lavatrastos	Un hoyo, un escurridor	
Instalacion extractor de humo (Cocina)	No	
Tipo de pintura	Pintura Sur, Latex en exterior	Linea Koral para interiores
Tipo de puertas exteriores	Termoformada de media luna en color blanco	
Tipo de puertas interiores	Termoformadas esmaltadas color blanco	30"en dormitorios 28" en baños
Tipo de puertas cocina	Metalica esmaltadas 6 tableros en blanco	
Tipo de llavín puerta principal	Doble, marca Master o similar, color bronce.	
Tipo de llavín puerta cocina	Tipo sapo marca Fanal o similar, con llamador	
Tipo de llavín puertas interiores	De pelota con llave, color bronce.	Dormitorios
Tipo de llavín puertas interiores	De pelota sin llave, color bronce.	Baños
Aceras laterales	si	
Huellas para carro	si	
Huellas para entrada principal	si	
Tendra base para contador de energia	Si, segun especificaciones de la ENEE	Poste el limite derecho de propiedad.
Tipo de pila de lavar	construida en el sitio	

Preparado por: Arq. Mireya Leal

Aprobado por: Lic. Evy de Williams

DOCUMENTO FINAL
DEPTO. DE DISEÑO GRUPO W
Elaborado:
Fecha: 8/Dic/08

Recibido inmobiliaria:

Fecha: 08 Diciembre 2008

Copia

Especificaciones para acabados de construccion para nuevos modelos de viviendas

Proyecto	**Residencial San Fernando II ETAPA**
Modelo / Casa	**San Fernando II**
Mts de Construccion	**64.75 m2**
Varas de lote	206.53 v²

Acabados de vivienda	Descripcion	Donde
Tipo de paredes	Bloque de 4 1/2"	repellado, pulido y pintado
Tipo de piso	Cerámica 0.37x 0.37, beige clara	toda la casa, liga 5mm.
Tipo de Ventanas	Corredizas francesa, alum. natural	frontales, el resto de la casa celosias.
Lleva batientes en ventanas	Si, de una grada pulido.	ventanas frontales
Lleva molduras en las ventanas	no	
Tipo de cielo Falso	Tabla yeso, inclinado	fijeria metalica
Cubierta de techo	Lámina de Aluzinc rojo	
Estructura de techo	canaletas metalicas 3 x 1 1/4"	
Tendra instalacion de lavadora	Si	parte trasera de la casa
Tendra instalacion de Secadora	Si	parte trasera de la casa
Tendra timbre	No	
Tendra tomas para Aire Acondicionado	Si	solo dormitorio principal
Instalación Cable T.V. y teléfono	Si	solo en sala
Instalación electroduchas	Si	Ambos baños
Instalacion de agua Caliente	No	
Lámparas de techo Interiores	No	
Lámparas de Techo Exteriores	No	
Lámparas de pared exteriores	no	
Lámparas de pared en baños	si	sobre el lavamanos ambos baños.
Llevara listelo en baños	si	altura de 1.20 m. perimetralmente
Llevara ceramica en baños	Si, ceramica blanca de 20x30, liga 2mm.	piso de ducha antiderrapante blanco
Tipo de Sanitarios	Habitat blanco	Todos los baños
Tipo de Lavabos	Habitat blanco	Todos los baños
Accesorios de baños	si, portapapel, toallero, porta jabón, portacepillo	Ambos baños.
Mueble de baño	no	
Tendra Closet	no	
Tipo de closet	n/a	
Tipo de mueble de cocina	Concreto enchapado en cerámica blanca	de 0.20 x 0.20, liga 2mm.con fleje plastico
Llevara listelo en cocina	si	altura de 0.40 sobre mueble de cocina
Tipo de lavatrastos	Un hoyo, un escurridor	
Instalacion extractor de humo (Cocina)	No	
Tipo de pintura	Pintura Sur, Latex en exterior	Linea Koral para interiores
Tipo de puertas exteriores	Termoformada de media luna en color blanco	
Tipo de puertas interiores	Termoformadas esmaltadas color blanco	30"en dormitorios 28" en baños
Tipo de puertas cocina	Metalica esmaltadas 6 tableros en blanco	
Tipo de llavín puerta principal	Doble, marca Master o similar, color bronce.	
Tipo de llavín puerta cocina	Tipo sapo marca Fanal o similar, con llamador	
Tipo de llavín puertas interiores	De pelota con llave, color bronce.	Dormitorios
Tipo de llavín puertas interiores	De pelota sin llave, color bronce.	Baños
Aceras laterales	si	
Huellas para carro	si	
Huellas para entrada principal	si	
Tendra base para contador de energia	Si, segun especificaciones de la ENEE	Poste el limite derecho de propiedad.
Tipo de pila de lavar	construida en el sitio	

Preparado por: Arq. Mirel [illegible] Aprobado por: Lic. Evy de Williams

DOCUMENTO FINAL
DEPTO. DE DISEÑO GRUPO W
Elaborado:
Fecha: 8/Dic/08

Recibido inmobiliaria: Fecha: 08 Diciembre 2008

Copia

Solicitud de Materiales

Ing.

FLUJO DE INSUMOS

Casa 5 Bloque Anexo Olga Corea **Casa Modelo Lima II**
Modelo Milan Modificada **Area de construccion 162.42 m2**

Fase # 1 Obra gris y fontaneria y material electrico 1era etapa.

No	DESCRIPCION	UNIDAD	Cantidad	Solicitado	Recibido	Observaciones
	OBRA GRIS					
1	Varilla de Acero No.2	Lance	**293.00**	293.00		Para toda la casa
2	Varilla de Acero No.3	Lance	**419.00**	419.00		Para toda la casa
3	Varilla de Acero No.4	Lance	**168.00**	168.00		Para toda la casa
4	Alambre de Amarre	Lbs	**150.00**	150.00		Para toda la casa
5	Madera Rustica Sin Curar	pt	15 Reglas 2X2x14, 35 1X3X14, 35 1X10X14			
	FONTANERIA 1era. ETAPA					
6	Tuberia 1/2" CPVC	Lance	**15.00**	15.00		
7	Tuberia PVC 1/2" x 20'	Lance	**18.00**	18.00		
8	Tuberia Drenaje 2" x 20'	Lance	**8.00**	8.00		
9	Tuberia Drenaje 4" x 20'	Lance	**16.00**	16.00		
10	Codo CPVC 1/2	Unidad	**22.00**	22.00		
11	Codo PVC 1/2"	Unidad	**35.00**	35.00		
12	Tee PVC 1/2"	Unidad	**15.00**	15.00		
13	Tee de CPVC de 1/2	Unidad	**13.00**	13.00		
14	Adaptador Macho PVC 1/2"	Unidad	**28.00**	28.00		
15	Adaptador Macho CPVC 1/2"	Unidad	**28.00**	28.00		
16	Adaptador Hembra PVC 1/2"	Unidad	**28.00**	28.00		
17	Adaptador hembra de CPVC 1/2	Unidad	**28.00**	28.00		
18	Codo PVC Drenaje 2" x 90	Unidad	**18.00**	18.00		
19	Codo PVC Drenaje 2" x 45	Unidad	**16.00**	16.00		
20	Reductor PVC Drenaje 4" x 2"	Unidad	**6.00**	6.00		
21	Reductor 1 x 2	Unidad	**6.00**	6.00		
22	Sifon PVC 2"	Unidad	**6.00**	6.00		
23	Codo 4 x 90	Unidad	**6.00**	6.00		
24	Tee 2	Unidad	**8.00**	8.00		
25	Tee 4	Unidad	**8.00**	8.00		
26	Trampa de drenaje	Unidad	**8.00**	8.00		
27	Valvula 1/2 compuerta	Unidad	**6.00**	6.00		
28	Valvula 1/2 check	Unidad	**2.00**	2.00		
29	Flotador 1/2"	Unidad	**2.00**	2.00		
30	Grifo exteriores 1/2 (Llaves de Jardin)	Unidad	**6.00**	6.00		
31	Teflon	Rollo	**20.00**	20.00		
32	Pegamento PVC	Galon	**2.00**	2.00		
33	Pegamento CPVC	Galon	**2.00**	2.00		
	MATERIAL ELECTRICO 1era. ETAPA					
34	Poliducto 1/2	Pies	**2,300.00**	1,800.00		Para los 2 pisos
35	Poliducto 3/4	Pies	**2,800.00**	2,200.00		Para los 2 pisos
36	Base para Contador 200 amperios	Unidad	**1.00**	1.00		
37	Cajas 2 x 4	Unidad	**75.00**	75.00		
38	Caja 4 x 4	Unidad	**2.00**	2.00		
39	Cajas Octogonales	Unidad	**30.00**	30.00		
40	Conectores 1 1/4	Unidad	**3.00**	3.00		
41	Tubo emt 3/4	Unidad	**1.00**	1.00		
42	Tubo emt 1 1/4	Unidad	**1.00**	1.00		
43	Mufa 3/4	Unidad	**1.00**	1.00		
44	Mufa 1 1/4	Unidad	**1.00**	1.00		
45	Panel 32 espacios	Unidad	**1.00**	1.00		
46	Varilla polo a tierra incluye abrazaderas	Unidad	**1.00**	1.00		

Copia

FLUJO DE INSUMOS

Casa 5 Bloque Anexo Olga Corea **Casa Modelo Milan**
Modelo Milan Modificada **Area de construccion 162.42 m2**

Fase # 2 Estructura de techo, lamina de techo

No	DESCRIPCION	UNIDAD	Cantidad	Solicitado	Recibido	Observaciones
1	Lamina Aluzinc 18'	UNIDAD	10.00	10.00		
2	Lamina Aluzinc 12'	UNIDAD	3.00	3.00		
3	Lamina Aluzinc 10'	UNIDAD	9.00	9.00		
4	Lamina Aluzinc 8	Unidad	8.00	8.00		
5	Caballete de 4'	UNIDAD	10.00	10.00		
6	Fastyl	galon	1.00	1.00		
7	Tela para fastyl	Yarda	2.00	2.00		
8	Tornillos punta broca de 2 1/2"	Unidad	600.00	600.00		
9	Canaletas de 3"	Unidad	68.00	68.00		
10	Electrodos 6011	lbs	44.00	44.00		
11	Pintura Anticorrosiva	Galon	6.00	6.00		
12	Diluyente para Pintura	Galon	6.00	6.00		
13	Lamina Lisa 3 x 10 cal,28	Unidad	3.00	3.00		
14	tapagoteras	galon	1.00	1.00		

Copia

Modelo Milan, Olga Idalia Corea

Fase # 3 Pedido de Ceramicas

No	DESCRIPCION	UNIDAD	Cantidad	Solicitado	Recibido	Observaciones
	Ceramica					
1	Ceramica para Piso 44*44	m2	**215.00**	215.00		incluye zocalos
2	Ceramica Piso Garaje	m2	**65.00**	65.00		incluye zocalos, garaje, portico, lavanderia y terraza
3	Ceramica Piso de duchas	m2	**5.00**	5.00		
4	Ceramica para Paredes 20 X 30 (Baños)	m2	**36.00**	36.00		
5	Ceramica 20 X 20 (Cocinas y Desayunador)	m2	**9.00**	9.00		
6	Grout para Piso	Bolsa	**14.00**	14.00		
7	Grout para piso de duchas	Bolsa	**2.00**	2.00		
8	Grout para pared	Bolsa	**6.00**	6.00		
9	Listelo Decorativo Baños	ml	**24.00**	24.00		
10	Listelo Decorativo cocina	ml	**5.00**	5.00		
11	Separadores (Bolsa 100 unid)	Bolsa	**5.00**	5.00		

Copia

FLUJO DE INSUMOS

Casa 5 Bloque Anexo Olga Corea — Casa Modelo Milan
Modelo Milan Modificada — Area de construccion 162.42 m2

Fase # 2 Estructura de techo, lamina de techo, estructura de cielo falso y cielo falso

No	DESCRIPCION	UNIDAD	Cantidad	Solicitado	Recibido	Observaciones
1	Lamina Tabla Yeso 4 x 8	Lamina	86.00	86.00		
2	Lamina Aluzinc 8	Unidad	162.00	162.00		
3	Lamina Aluzinc 6	Unidad	111.00	111.00		
4	Capotes liso 2'*4'	Unidad	44.00	44.00		
5	Tornillos	Unidad	1,200.00	1,200.00		
6	Canaletas de 3"	Unidad	110.00	110.00		
7	Electrodos 6011	Cajas	8.00	8.00		
8	Pintura Anticorrosiva	Galon	7.00	7.00		
9	Diluyente para Pintura	Galon	7.00	7.00		
10	Angulos Galvanizados (Cielo)	Unidad	121.00	121.00		
11	Fiurin	Unidad	205.00	205.00		
12	Clavos de 1" de Acero	Unidad	900.00	900.00		
13	Tornillos Punta Fina 1 1/4 Tornado	Unidad	4,100.00	4,100.00		
14	Col Rolle	Unidad	32.00	32.00		
15	Tornillos Punta Broca 7/16	Unidad	1,800.00	1,800.00		
16	Masilla Tabla yeso	Unidad	15.00	15.00		
17	Cinta papel 2 1/2	Unidad	15.00	15.00		
18	Lija Para madera No. 120	Unidad	100.00	100.00		
19	Trac o Soleras	Unidad	6.00	6.00		
20	Esquinero Metalicos	Unidad	6.00	6.00		
21	Lamina Lisa 3 x 10 cal,28	Unidad	5.00	5.00		
22	Lamina Panelit 4X8X8mm (Fasia)	Laminas	15.00	15.00		

Copia

Modelo Milan, Olga Idalia Corea **Rancho Lima**

Casa 5 Bloque anexo **Fase # 4**

No	DESCRIPCION	UNIDAD	Cantidad	Solicitado	Recibido	Observaciones	
	Juegos de contramarcos y puertas y llavines						
1	Puerta Metalica Decorada (36" x 80") con oval de vidrio al centro	Unidad	1.00	1.00			
2	Puerta Metalica (36" x 80")	Unidad	1.00	2.00			
3	Puerta Termoformada (30" x 80")	Unidad	3.00	3.00			
4	Puerta Termoformada (28" x 80")	Unidad	3.00	3.00			
5	Juego de contramarcos y mochetas	Unidad	9.00	9.00		Favor solicitar cheque a nombre de Jacobo menjivar	800Lps/jgo
6	Llavin Puerta principal	Unidad	1.00	1.00			
7	Llavin con pelota	Unidad	3.00	3.00			
8	Llavin sin llave	Unidad	3.00	3.00			
9	Llavin de sapo	Unidad	2.00	2.00			
10	Bisagra 3 1/2"	Unidad	22.00	22.00			
11	Tornillos de 4"	Unidad	140.00	140.00			
12	Taco expansor No. 10	Unidad	140.00	140.00			
	Material Electrico 2da. Etapa						
13	Tomacorrientes dobles 110 v	Unidad		35.00			
14	Tomacorrientes 220 para aire acondicionado y d	Unidad		8.00			
15	Tomacorrientes para estufa y secadora	Unidad		3.00			
16	Interruptor sencillo	Unidad		4.00			
17	Interruptor doble	Unidad		8.00			
18	Interruptor Triple	Unidad		7.00			
19	Rosetas	Unidad		18.00			
20	Lamparas para baño	Unidad		2.00			
21	Lamparas exteriores	Unidad		2.00			
22	Cable # 14 (rollo de 500 pies)	Pies		1,200.00			
23	Cable #12 (rollo de 500 pies)	Pies		4,000.00			
24	Cable # 10 (rollo de 500 pies)	Pies		1,500.00			
25	Cable # 8 (rollo de 500 pies)	Pies		1,200.00			
26	Cable #2 (rollo de 500 pies)	Pies		250.00			
27	Cable # 4 (rollo de 500 pies)	Pies		250.00			
28	Cable Telefono rollo de 500 pies	Pies		328.00			
29	Cable coaxial rollo de 500 bpies	Pies		600.00			
30	Toma para telefono	Unidad		6.00			
31	Toma para cable	Unidad		6.00			
32	Conector cable coaxial	Unidad		25.00			
33	Caja 6*6*4	und		1.00			
34	spliter de 1 entrada y 5 salidas	und		1.00			
35	spliter de 1 entrada y 3 salidas	und		1.00			
36	Breaker 20 amp 110 vac	Unidad		8.00			
37	Breaker 30 amp 110 vac	Unidad		9.00			
38	Breaker 30 amp 220 vac	Unidad		8.00			
39	Breaker 40 amp 220 vac	Unidad		3.00			
40	Panel de 32 espacios	und		1.00			
41	Tape Negro 3 M	Cinta		6.00			

Solicitar orden de compra de ventaneria de casa modelo Lima

	Fontaneria					
53	Inodoro Incesa Standard Olympus	Unidad	3.00	3.00		
54	Lavamanos Sorrento con Pedestal Bone	Unidad	3.00	3.00		
55	Lavatrastos Acero inoxidable un hoyo lado izquie	Unidad	1.00	1.00		
56	Valvula para Ducha 2 valvulas	Unidad	2.00	2.00		Para agua caliente
57	Tubo de abasto sanitario	Unidad	3.00	3.00		
58	Tubo de abasto lavamanos	Unidad	8.00	8.00		Incluye el lavatrastos
59	Valvula 1/2 inodoro	Unidad	3.00	3.00		
60	vlavula 1/2 lavamanos y Lavatrastos	Unidad	8.00	8.00		
61	Regaderas de baño	Unidad	2.00	2.00		
62	Pascones de baño 2"	Unidad	2.00	2.00		
63	tapon de pila	Unidad	1.00	1.00		
64	Rival de pila	Unidad	1.00	1.00		
65	Teflon 3/4"	Unidad	5.00	5.00		

copia

Fase # 5 Pintura, Ventaneria y Inst. Hidraulicas

No	DESCRIPCION	UNIDAD	Cantidad	Solicitado	Recibido	Observaciones
	Pintura					
42	Pintura Exterior paredes	Cubeta	4.00			Café Claro 2746-T
43	PinTura Exteriores detalles	Galon	4.00			french vainilla 2687-P
44	Pintura Interiores	Cubeta	5.00			Color Porcelana 2673-P
45	Pintura de cielos(Todo)	Cubeta	5.00			Color Blanco agua
46	Pintura Aceite (Contr. Prts)	Galon	5.00			Color Blanco aceite
47	Masilla exteriores	Galon	5.00			
48	Masilla interiores	Galon	5.00			
49	Lija # 120	unds	120.00			Lijado paredes y contramarcos
50	Tape 3/4"	unds	6.00			
51	Felpas	und	8.00			
52	Brochas	und	3.00			
	Ventaneria					

Copia

Cotizaciones

AMANCO HONDURAS

COTIZACION

No.	ZN - RA - 4 - 04 - 07 - A
Fecha:	jueves, 14 de mayo de 2009

AMANCO HONDURAS
Km. 1 Boulevard del Sur, Atrás del Hotel Copantl,
San Pedro Sula, Cortes, Honduras CA.
Tel: 556-8646, Fax: 556-8083
email: Scliente@amanco.com

CLIENTE	WILLIAMS Y ASOCIADOS	TEL/FAX	
		ATENCION	GABRIEL AYALA
e-mail		PROYECTO	RES, SAN FERNANDO
Tipo de Transporte con Acceso al Sitio de Entrega			CAMION DOBLE RODAJE (13 Tm)
DIRECCION DE ENTREGA	SAN PEDRO SULA		

Emitir el Pago y Orden de Compra a Nombre de:
AMANCO TUBOSISTEMAS HONDURAS S.A.

CANTIDAD	UND.	DESCRIPCION DEL ARTICULO	TIPO	P.U.	TOTAL
6	Unidad	Lamina Prepintado Rojo Super Techo 0.35mm de 19´ x 1mt ancho	A	L. 697.30	L. 4,183.80
9	Unidad	Lamina Prepintado Rojo Super Techo 0.35mm de 20´ x 1mt ancho	A	L. 734.00	L. 6,606.00
4	Unidad	Lamina Prepintado Rojo Super Techo 0.35mm de 6´ x 1mt ancho	A	L. 220.20	L. 880.80
7	Unidad	Capote Prepintado Rojo de 8´ pies	A	L. 215.00	L. 1,505.00
295	Unidad	Tornillo autotaladrante cabeza Hexagonal de 2 1/2"	A	L. 0.90	L. 265.50
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Copia

TIEMPO DE ENTREGA CONSIDERANDO CARGA CONSOLIDADA			TERMINOS DE PAGO	DURACION	EXCENTO DEL ISV		
						SUB-TOTAL	L. 13,441.10
						ISV 12%	L. 1,612.93
PRODUCTOS ABC	4	DÍAS	Crédito 45 dias	10 dias	NO	FLETE	L. 86.02
PRODUCTOS MTO		DÍAS				TOTAL	L. 15,140.05

TIEMPOS DE ENTREGA:

Nuestro tiempo de entrega oscila entre 3 a 7 dias para los productos tipo ABC dependo de la ubicación geográfica de la entrega, tipo de producto y monto de la orden, en el caso de los productos MTO este tiempo será negociado con el cliente previo la aceptación de la oferta; si por razones ajenas a Amanco Honduras o de fuerza mayor no se pudiese cumplir con la fecha de entrega pactada, esta podrá ser ampliada previa notificación y acuerdo con el cliente.

PRECIOS DE VENTA:

Los precios en esta cotización incluyen el valor del producto FOB, Villanueva, Cortés. El valor de FLETE incluye el costo del transporte y descarga del producto, en el destino estipulado, siempre y cuando este en tierra firme dentro del territorio nacional y que este sea accesible con la unidad de transporte requerido

TÉRMINOS DE PAGO:

En el caso de los clientes de cartera se regirá por el plazo de crédito previamente aprobado, para ventas a clientes particulares el mismo se negociara con el cliente.

TÉRMINOS DE VENTA PRODUCTOS TIPO M

Plycem Construsistemas Honduras, proveerá al cliente en base a las medidas y especificaciones detalladas en esta cotización, por ningún motivo se aceptarán cancelaciones, modificaciones en los productos detallados como MTO. En caso extremo se aceptarán poro con un recargo al cliente del 30% por concepto de manejo y almacenaje.

Plycem Construsistemas Honduras, se compromete a entregar en los sitios que consigne el cliente en la DIRECCION DE ENTREGA en esta cotizacion; aclarando que los mismos tengan acceso a las unidades destinadas para la entrega, los caminos y sitios esten en condiciones transitables.

Con nuestra firma aceptamos la compra a los precios, términos y condiciones de los productos y servicios de la presente cotización arriba.

ROGER ALEMAN CEL.3390-8221 / 9979-0416	
POR: AMANCO TUBOSISTEMAS HONDURAS	POR : EL CLIENTE

FSIG PO 7.2.1.0.8

Orden de Compra

GRUPO

CONSTRUCTORES

D orden

1

FECHA: 02/13/09

ORDEN DE COMPRA #: 27009

PROVEEDOR:
SOCIEDAD GENERAL DE ACERO S
ROSIBETH
SAN PEDRO SULA,CORTES
HONDURAS
SAN PEDRO SULA

PARA:
PROYECTO RESIDENCIAL TOLEDO
ING. ERIK CASTILLO
DAVID PADILLA C#/15
VARILLA
SAN PEDRO SULA

CODIGO DE PROYECTO:
TOLEDO

DESCRIPCION	UNIDAD	CANTIDAD	P.U.	TOTAL
VARILLA 1/2 CORRUGADA	LANCE	38.0	133.21	5061.98
VARILLA 1/4 LISA	LANCE	227.0	74.78	16976.85
VARILLA 3/8 CORRUGADA	LANCE	102.0	36.15	3688.01

Copia

SUBTOTAL:	25726.84
12% ISV:	3087.22
TOTAL:	28814.06

Presupesto

WILLIAMS Y ASOCIADOS
CONSTRUCTORES
DEPARTAMENTO DE COMPRAS
TEL. 552-2324 / 552-1[illegible]
SAN PEDRO SULA, HONDURAS

ELABORADA POR

REVISADA POR

FIRMA AUTORIZADA

Oficina Principal: 8vo piso Torre Centro Comercial Megaplaza, 1era calle,salida a La Lima, San Pedro Sula, Honduras C.A
Telefax: 552-2324 552-1132 552-1195
e-mail: winmobiliaria@grupowilliams.com Webside: www.grupowilliams.com

En Bodega.
Rec.

→ control list. bill. send compras.

WILLIAMS & ASOCIADOS

PROYECTO: TOLEDO
CLIENTE: David Padilla
C01- Bq.15
RESPONSABLE: Ing. Erik Castillo
FECHA: 03-Feb-09

Modelo Olivo

FASE I. PRELIMINARES-MODELO OLIVO

ITEM	DESCRIPCION	UNIDAD	CANTIDAD	DESTINO	OBSERVACION
1	Acero No 4 1/2	Unid	38.00	Viga de cimentacion	
			38.00	132.21	
2	Acero No 3				
		Unid	22.00	Viga de cimentacion	
		Unid	40.00	Castillos	
		Unid	40.00	Solera Cargador	
		Unid	20.00	Solera de Remate	
		Unid	18.00	Silera de ventanas	
		Unid	20.00	Jambas	
		Unid	7.00	Marcos bajo ventanas	
		Unid	55.00	Losa	
		Unid	5.00	Columna de fachada	
	Total		227.00	74.7879	
3	Acero No. 2 1/4	Unid	18.00	Anillos de castillos	
		Unid	24.00	Anillos de solera superior	
		Unid	14.00	Solera de ventanas	
		Unid	8.00	Anillos de Jambas	
		Unid	28.00	Anillos de solera de remate	
		Unid	8.00	Anillos Marcos de ventanas	
		Unid	2.00	Anillos Columnas en fachada	
	Total		102.00	36.1570	
4	Bloque 4 1/2"	Unid	2,400.00	Paredes	
5	Alambre de Amarre	Lbs	150.00	Amarre de acero.General	
6	Cemento Gris	Bolsas	265.00	Cemento General	
7	Madera Rustica 1x4x10 15.00	Unid	14.00	Marcado	
	Madera Rustica 2x4x12 15.00	Unid	8.00	Andamios	
8	Madera Rustica 1x10x12 17.10	Unid	20.00	Encofrados	
	Tubo Industrial de 1x2	Unid	6.00		
9	Clavos 1 Pulgada	Caja	-		
10	Clavos 2 1/2 Pulgadas 835.00	Caja	2.00		
11	Clavos 3 Pulgadas 835.00	Lbs	2.00		
	ELECTRICIDAD				
12	Poliducto 3/4 185.00	Rollo	4.00		
13	Poliducto 1/2	Rollo	2.00		
	HIDROSANITARIOS				
14	Tubo 4" pvc Drenaje	Unid	8.00		
15	Tubo 1/2" pvc AP	Unid	13.00		
16	Tubo 2" pvc Drenaje	Unid	4.00		
17	Codo 4" PVC Drenaje Inyectado 65.00	Unid	2.00		
18	Codo 2" PVC Drenaje Inyectado	Unid	15.00		
19	Codo 1/2" PVC AP Inyectado	Unid	32.00		
20	Tee 2 x 2" Inyectada Drenaje	Unid	2.00		
21	Tee 1/2 x 1/2" PVC Inyectada Potable	Unid	13.00		
22	Codo con rosca PVC 1/2"	Unid	8.00		
23	Beltrac para baño	Unid	2.00		
24	Valvulas de escuadra 3/8 a 1/2"	Unid	5.00	compra.	
25	Lija No 80	Unid	5.00		
26	Teflon 5.00	Rollos	5.00		
27	Valvulas de baño para duchas	Unid	2.00		
28	Tee 4 x 4" Drenaje Inyectado PVC	Unid	2.00		
29	Valvula de entrada 1/2" o de control	Unid	1.00		
30	Sifones de 2" PVC	Unid	2.00		
31	Tapones lisos de 1/2" PVC 5.00	Unid	10.00		
32	Adaptadores Machos 1/2 PVC	UNID	12.00		
33	Adaptadores Hembras 1/2 PVC	Unid	8.00		
34	Pegamento PVC	Galon	0.50		
36	Llaves de Jardin	Unid	6.00		

diff

Copia

Conf

e Kec.
proof of delivery
+ order of compras
con. bill

SOGESA
Sociedad General de Acero, S.A.

SAN PEDRO SULA

Nº 6988

COMPROBANTE DE ENTREGA

Lugar y Fecha: SPS, Feb/12/09

Cliente: Grupo Williams.

Dirección: SPS.

Vehiculo: Marca Hino Color

Placa Cabezal No. PCK 6350 Placa Rastra No.

Nombre del Conductor: Hermogenes Duron Ident. No.

Orden de Carga No. 27009 - 27011 Factura No.

CANTIDAD	DESCRIPCION
264	Varillas de 1/4" (1/4)
228	" " 3/8"
103	" " 1/2"
25	Varillas de 1/2 Corrug. Jos Prado.
126	Varillas de 3/8 " " O/C: 27011
42	Varillas de 1/4 Liso ✗ Roberto Carlos Ortega
38	Varillas de 1/2 Corrug. Toledo.
227	Varillas Liso 1/4 Liso O/C-27009.
102	Varillas Corrug. 3/8 ✗ Helen Dominguez

Tel. PBX: (504) 556-8493 * Fax: (504) 556-7848 * Apdo. Postal No. 3095 * San Pedro Sula * Tel. PBX: (504) 234-0075 * Fax: (504) 234-6660 * Tegucigalpa, A.M.D.C. Honduras, C.A.
E-mail: matuty@sogesa.hn

SOGESA
BODEGA
S.P.S.

NOMBRE Y FIRMA DE QUIEN ENTREGA

[illegible]

NOMBRE Y FIRMA DEL TRANSPORTISTA

NOMBRE, FIRMA Y SELLO DE QUIEN RECIBE

HE RECIBIDO EN BUEN ESTADO LAS MERCADERIAS Y DOCUMENTOS ARRIBA INDICADAS.

Copia

SOGESA
Sociedad General de Acero, S.A.

TEL/PBX: (504) 556-8493 • FAX: (504) 556-7040 • APDO. POSTAL No. 3095,
SAN PEDRO SULA, HONDURAS, C.A.
email: rmatuty@sogesa.hn

TEL/PBX: (504) 234-0075 • FAX: (504) 234-6660
TEGUCIGALPA, M.D.C., HONDURAS, S.A.

FACTURA
No. 08869

R.T.N.: 08019002276608

CLIENTE: **Grupo Williams**
DIRECCION SAN PEDRO SULA , HN

FECHA: 17 / 2S / 2009

O/C 27009 - C/E 6988

CONTADO ☐
CREDITO ☒

CANT.	DESCRIPCION	PRECIO UNIT.	TOTAL US$
38	VARILLA CORRUGADA 1/2 X 9 MTS.	7.0001	266.0038
227	VARILLA LISA 1/4 X 9MTS.	1.9002	431.3454
102	VARILLA CORRUGADA 3/8 X 9 MTS.	3.9305	400.9110
	Elaboro: Nataly Alcerro		

NOTA: Toda factura que exceda el plazo establecido, estará sujeta a un recargo mensual sin que ésto signifique prórroga. El precio en dólares es una referencia. El pago se hará en lempiras, utilizando la tasa de cambio vigente el día de pago.

SUB-TOTAL	1,098.2602
FLETE	0.0000
IMPTO. S/V	131.7912
TOTAL	1,230.0514

FIRMA Y SELLO DEL CLIENTE

HECHO POR 01

LA FACTURA ES BENEFICIO DE TODOS, "EXIJALA"

Copia

Reporte de ordenes de compra de Proyecto Monte Carlo

	# Casa Bloque	Cliente	Fecha de entrga de la vivienda	Modelo	Inicio		Madera		Estructura		Techo	Cielo Falso		ELectrico 1ra.		Ventaneria		2da. Electrico		Ceramica		losa sanitaria		Puertas		Pi	
					O/C	Factura	O/C	C/E	O/C	Factura	O/C	O/C	Factura	O/C	Factura	O/C	Factura	O/C	Factura	O/C	C/E	O/C	Factura	O/C	Factura	O/C	Fa
1		Casa Modelo																									
2	8-C	Sandra Guardado	24-oct-08	Olivo	22590/22647		22928	3618	23670	376051	23333	23754	96339	23878	128820	compra de contado		compra de contado		24276		25026	425058			24888	12
3	5-D	Mirna Carcacmo	3-dic-08	Olivo	22938	105068	22942	3617	23670	376051	23332	23756	96341	23771	134226	compra de contado		compra de contado		24279		25027	411878			25128	12
4	5-E	Suany Argueta	3-dic-08	Olivo	22935	105072	22942	3617	23670	376051	23331	23758	96342	23789	134257			compra de contado		24278		25028	425060			24887	va
5	2-B	Rosa ventura	11-dic-08	Olivo	22940	105077	22942	3617	23670	376051	23330	23759	96343	23790	128653			compra de contado		24277		25072	382397			24839	12
6	6-D	Diana Garcia	17-dic-08	Olivo	23467	106413	23469	3683	24405	28584	C/Contdo	25455	2032	24515	140084	1236		26160	2078			26122	412316	25551	2639	26155	14
7	3-D	Jesus Villalobos	17-dic-08	Olivo	23466	106408	23468	3682	24405	28584	C/Contdo	25455	2031	24513	140085	1235		26160	2078			26122	412316	25551	2639	26466	14
8	10-E	Maria Lopez	17-dic-08	Olivo	23465	106403	23465	3684	24405	28584	C/Contdo	25455	2030	25075	382394	1237		26160	2078			26122	412316	25551	2639	26159	14
9	10-D	Martha Pavon	23-ene-09	Lirio I	24231	108588	24236	Inv.	24787	29048	C/Contdo	25455	2030	25075	382394	24514	139994					26724	443382			26154	10
10	3-A	Matin Enao	2-feb-09	Olivo	24232	105640	24237	3838	24787	29048	2444	25455		25075	382394			26504	02435			26430	460777			26810	13
11	7-I	Francisco Galo	23/03/09	Olivo	24487	109414	24493	38563	24787	29048	Inv.	25455		25075	382394			26504	02435			26429	460779			26821	10
12	4-I	Justa Rivera	05/05/09	Olivo	25334	111791	25325	4360	26016		C/Contdo	26285	108771														
13	4-F	Carlos Portillo	05/05/09	Olivo	25319	111745	25325	4360	26016		C/Contdo	26285	108771														
17	11-E	Geffry Trejo	05/05/09	Olivo	25318	111748	25325	4360	26016		C/Contdo	26285	108771														
15	12-D	Carlos Bonilla	01/06/09	Olivo	25433	112228	25435	4182	26882		C/Contdo																
16	3-B	Oscar Avila	10/05/09	Olivo	25612	112843			26882		C/Contdo																
18	11-D	Marvin Pavon	14/06/09	Lirio I	25726	113140			26882		C/Contdo																
19	3-E	Ysmile Hernandez	27/07/09	Olivo	26589		26890							25075	382394												
20	2-F	Bella Iris Romero	12-nov-09	Salamanca																							
21	1-I	Maria Navarro	14-nov-09																								

#1
#2 } Detalle x leitz
#3

B3,D12,D11

Compras de Contado

Lilian Arriaga

From: ERIK CASTILLO GARCIA [erik11_civilnet@hotmail.com]
Sent: Miércoles, 20 de Mayo de 2009 09:21 a.m.
To: Compras
Subject: Re: pintura para reparaciones

A41,F12 y G3 solo hay en mallorca
Enviado desde mi terminal BlackBerry® de Digicel

-----Original Message-----
From: Lilian Arriaga <wcomprasl@grupowilliams.com>

Date: Wed, 20 May 2009 15:04:28
To: <erik11_civilnet@hotmail.com>; <wcompras@grupowilliams.com>
Subject: RE: pintura para reparaciones

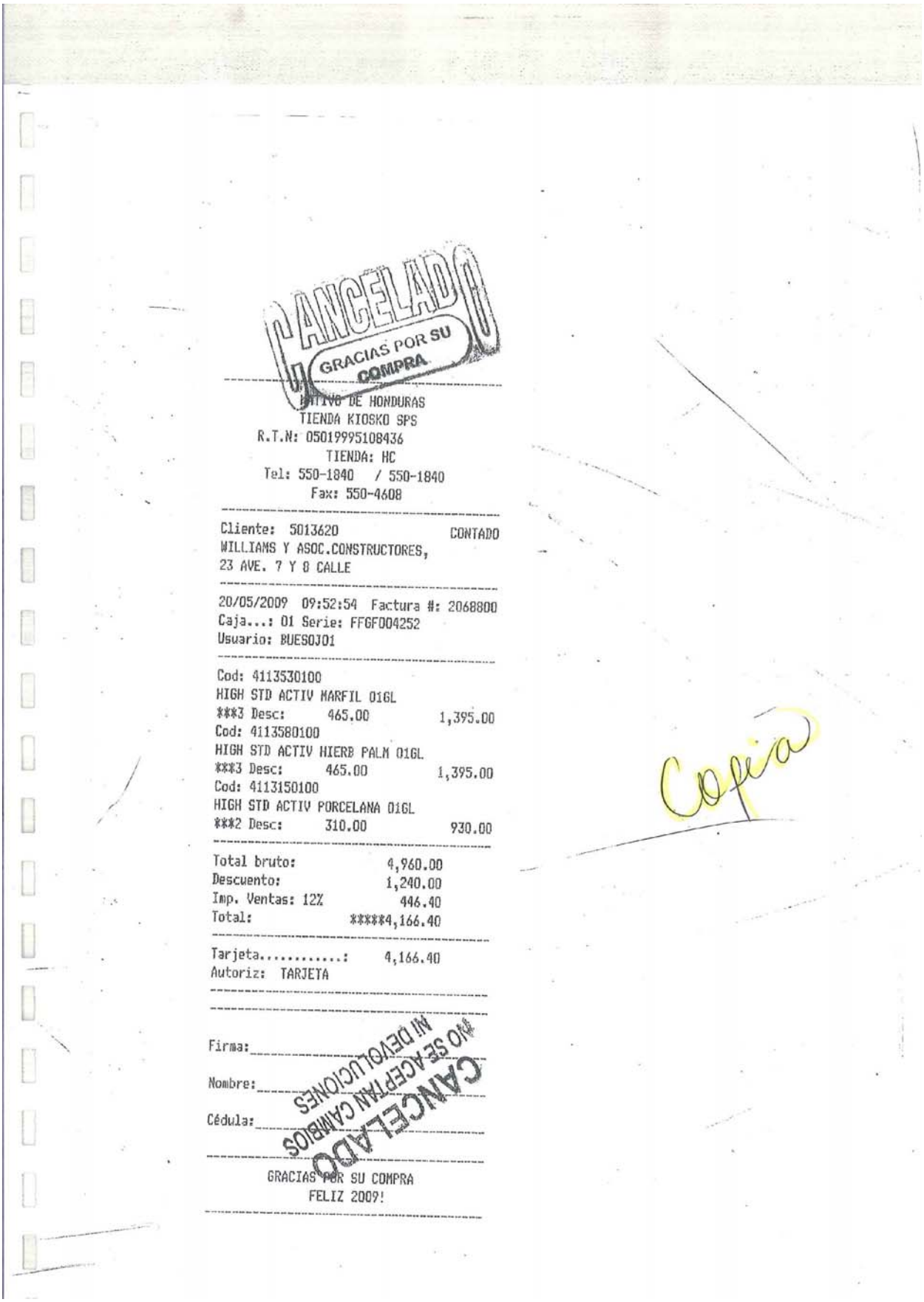
De que proyecto es esta reparacion?

From: ERIK CASTILLO GARCIA [mailto:erik11_civilnet@hotmail.com]
Sent: Martes, 19 de Mayo de 2009 11:49 a.m.
To: lilian ORTIZ; Gabriel Ayala
Subject: pintura para reparaciones

Compras

para reparaciones
-A41 2 Galones de hierva de la palma (protecto)
-F123Galones de marfil (Portecto)
-A41 2 Galones de porcelana (protecto)
-G3 1 galon de hierva de la palma protectol

atte erik


CANCELADO
GRACIAS POR SU COMPRA

ATIVO DE HONDURAS
TIENDA KIOSKO SPS
R.T.N: 05019995108436
TIENDA: HC
Tel: 550-1840 / 550-1840
Fax: 550-4608

Cliente: 5013620 CONTADO
WILLIAMS Y ASOC.CONSTRUCTORES,
23 AVE. 7 Y 8 CALLE

20/05/2009 09:52:54 Factura #: 2068800
Caja...: 01 Serie: FFGF004252
Usuario: BUESOJ01

Cod: 4113530100
HIGH STD ACTIV MARFIL 016L
***3 Desc: 465.00 1,395.00
Cod: 4113580100
HIGH STD ACTIV HIERB PALM 016L
***3 Desc: 465.00 1,395.00
Cod: 4113150100
HIGH STD ACTIV PORCELANA 016L
***2 Desc: 310.00 930.00

Total bruto: 4,960.00
Descuento: 1,240.00
Imp. Ventas: 12% 446.40
Total: *****4,166.40

Tarjeta.....: 4,166.40
Autoriz: TARJETA

Firma:_____

Nombre:_____

Cédula:_____

CANCELADO
NO SE ACEPTAN CAMBIOS
NI DEVOLUCIONES

GRACIAS POR SU COMPRA
FELIZ 2009!

Copia

Licitaciones

Comparativo de Angulos Ofibodegas Pacific

				Imferra		Sogesa		Monterroso	
Item	Descripcion	Unidad	Cantidad	P.u	Total	P.u	Total	P.u	Total
1	Angulo 2x2x3/16	Lance	116	480.00	55,680.00	426.84	49,513.78	488.00	56,608.00
2	Angulo 3x3x1/4	Lance	98	1,330.00	130,340.00	1,330.00	130,340.00	1,400.00	137,200.00
3	Angulo 2 1/2x2 1/2x3/16	Lance	100	770.00	77,000.00	580.42	58,041.50	493.40	49,340.00
4	Angulo 2x2x1/8	Lance	102	340.00	34,680.00	302.39	30,843.44	346.00	35,292.00
5	Angulo 2x2x1/4	Lance	22	690.00	15,180.00	607.44	13,363.63	703.00	15,466.00
6	Angulo 1 1/2x1 1/2x1/8	Lance	20	266.00	5,320.00	211.80	4,236.08	243.00	4,860.00
7	Canaleta 2x6x1/16	Lance	310	345.00	106,950.00	345.00	106,950.00	261.00	80,910.00
8	Canaleta 2x7x1/16	Lance	30	386.00	11,580.00	386.00	11,580.00	297.15	8,914.50
				Sub-total	436,730.00		404,868.43		388,590.50
				Isv	52,407.60		48,584.21		46,630.86
				Total	**489,137.60**		**453,452.64**		**435,221.36**

WILLIAMS ASOCIADOS CONSTRUCTORES S.A. DE C.V.

COMPROBANTE 00011005

Paid bill.

Fecha : 11 de Mayo de 2009

Beneficiario : **Incehsa**

Monto : **145,030.38**

Detalle : 2 Rastras de Cemento Equv.a 1,110 Bolsas Proy.San Francisco

Cheque No. **2866**

Banco : **Banco Ficohsa**

Cuenta : **281012851**

Codigo	Descripcion	Debitos	Creditos
1-1-1-02-023	Banco Ficohsa		145,030.38
5-1-1-01	Materiales	145,030.38	

HSBC

DEPOSITO CUENTA DE CHEQUES

Depósito Regular-Cuenta Corriente

☐ MONEDA NACIONAL
☐ MONEDA EXTRANJERA

A NOMBRE DE: INCEHSA.

ABIERTA EN: CUENTA : 5011393006 FECHA: 11/MAY/2009

CUENTA No. 5011393006

CHEQUE/No.	EFECTIVO	BANCO GIRADO	PLAZA	VALOR
2866	CHEQUES : LPS145,030.38			L145,030.38
	CANTIDAD : LPS145,030.38			
	CIENTO CUARENTA Y CINCO MIL TREINTA LEMPIRAS CON 38/100			
	Sello Electronico (sustituye firma y sello manual del cajero)			
	HSBC Age/Cajero:222 2233		Fec Posteo	11-05-09 17:29:33
	Secuencia :550		Fec Proceso	11-05-09
			Supervisor	

DESCRIPCION	VALOR
EFECTIVO	
CHEQUES DE ESTE BANCO	CIENTA J EMP
CHEQUES OTROS BANCOS NACIONALES	L145,030.38
CHEQUES BANCOS DEL EXTERIOR	
TOTAL	L145,030.38

TOTAL EN LETRAS

Ciento Cuarenta y Cinco Mil Treinta con 38/100 Lempiras

FIRMA DEL DEPOSITANTE

FIRMA DEL DEPOSITANTE

- COPIA - CLIENTE -

11/5/09 2:40pm
Grupo W
Departamento de Auditoria Interna

Copia

Totales ...	145,030.38	145,030.38	

Elaborado por | Revisado por | Aprobado por | Recibido por

payment.

WAC

SOLICITUD DE CHEQUES

SAN PEDRO SULA 09 DE MAYO 2009

Elaborado por : LILIAN ARRIAGA

Departamento de COMPRAS

Solicita al Departamento de Administración el pago por la cantidad de

145,030.38

A favor de : INCEHSA

Por Concepto de: COMPRA DE 2 RASTRAS DE CEMENTO PLUS EQUIVALE A 1110 BOLSAS CON UN VALOR X BOLSA DE 117.32 CON IMPUESTO Y FLETE UNCLUIDO

PAGO INMEDIATO

PROYECTO	COL. SAN FRANCISCO	145,030.38
PROYECTO		
PROYECTO		
PROYECTO		
PROYECTO		
	TOTAL	**145,030.38**

Copia

Este pago se realizará en el siguiente Banco

BANCO BCOAS

CUENTA No. _____

Solicitante | Vo. Bo. Gerencia | Recibí conforme

Cheque # Operador de Computo

GRUPO W

CONSTRUCTORES , tender?

1

FECHA: 08/05/2009

ORDEN COMPRA : 0008

PROVEEDOR:
INCEHSA
TULIO ROMERO

PARA:
PROYECTO COL. SAN FRANCISCO
LIC. HECTOR ANDINO
PEDIDO CEMENTO PLUS
FAVOR ENTREGAR EN VENECIA

CODIGO DE PROYECTO:
TEGUCIGALPA

DESCRIPCION	UND	CANTIDAD	P.U	P. TOTAL
Cemento Plus	Bolsas	1,110	111.15	123,376.50

Copia

Sub-Total	L.	123,376.50
ISV 12%	L.	14,805.18
Felete	L.	6,848.70
TOTAL	**L.**	**145,030.38**

ELABORADO REVISADO AUTORIZADO

Oficina Principal: 8vo piso Torre Centro Comercial Megaplaza, 1era calle,salida a La Lima, San Pedro Sula, Honduras C.A
Telefax: 552-2324 552-1132 552-1195
e-mail: winmobiliaria@grupowillimas.com Wedside: www.grupowilliams.com

Needed.

Lilian Arriaga what stage? extra?

From: Sandra Sanches [wcontawac@grupowilliams.com]
Sent: Viernes, 08 de Mayo de 2009 11:20 a.m.
To: 'Lilian Arriaga'
Cc: wgcompras@grupowilliams.com
Subject: RV: RE: cheque de calonas

Adjunto información con el detalles de los insumos para el proyectos san francisco fundición , para que me ayude con las solicitudes ya tengo los fondos

-----Mensaje original-----
De: hector andino [mailto:hector_andino@yahoo.com] Enviado el: Viernes, 08 de Mayo de 2009 11:36 a.m.
Para: Sandra Sanches
Asunto: Fw: RE: cheque de calonas

Buenaos dias

le envio correo y el deposito en Ficohsa es de L. 294,450.00

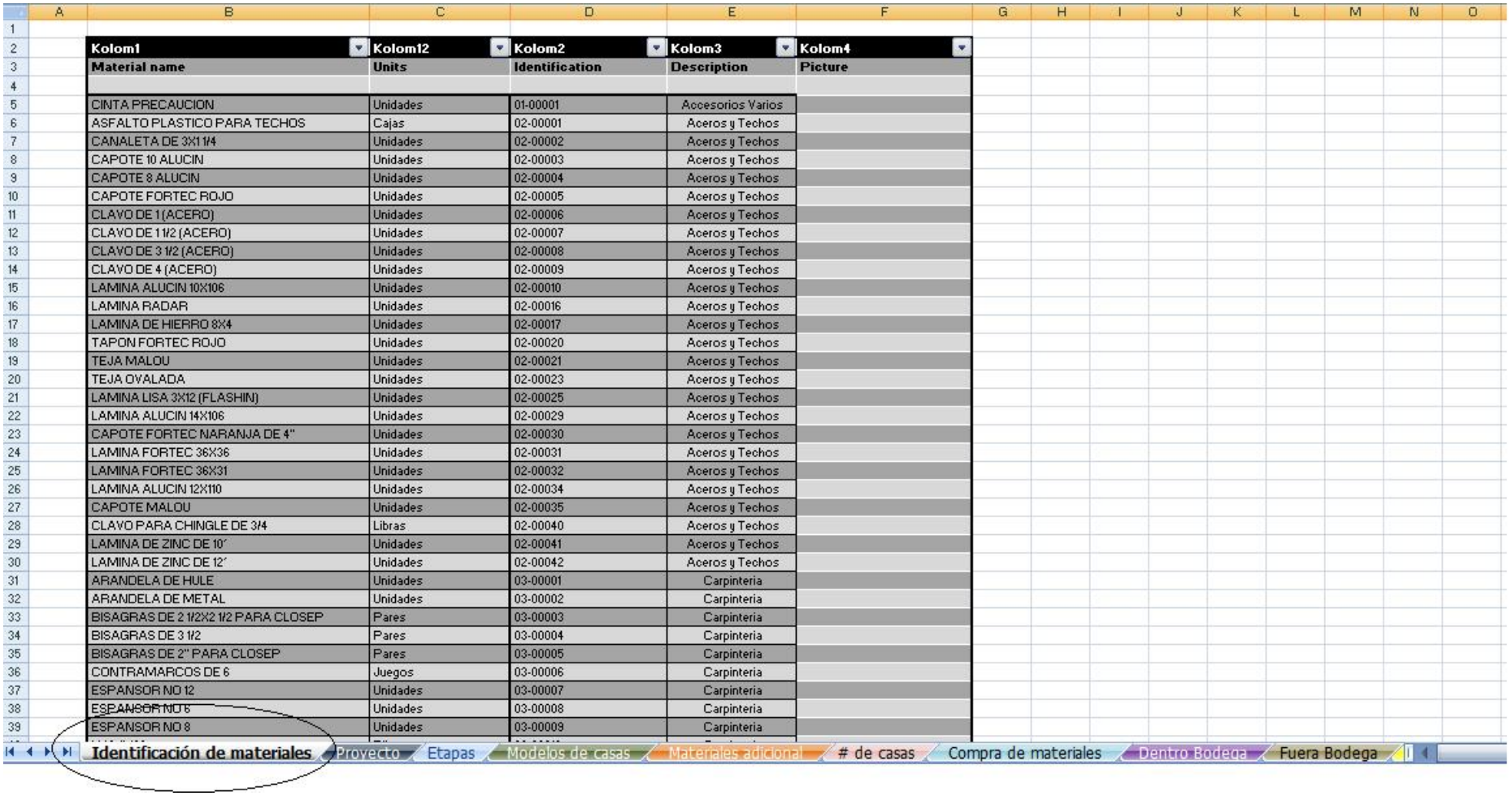
--- On Tue, 4/28/09, hector andino <hector_andino@yahoo.com> wrote:

> From: hector andino <hector_andino@yahoo.com>
> Subject: RE: cheque de calonas
> To: "'Carlos Enrique Torres Ramos'" <wgnovacentro@grupowilliams.com>, "'david wiliams'" <dwilliams@grupowilliams.com>, "Ing. Lizette Miranda" <wgcompras@grupowilliams.com>
> Cc: "'Alex Donato'" <wcompras3@grupowilliams.com>
> Date: Tuesday, April 28, 2009, 2:56 AM
> Buenas
>
> Los fondos que se necesitan para este proyecto SAN
> FRANCISCO VI ETAPA segun detalle:
>
> GRAVA 102 M2 X L. 350.00 L. 35,700.00
> ARENA 102 M2 X L. 350.00 35,700.00
> ----------
> SUB TOTAL 71,400.00
> ESTO LO PUEDEN COMPRAR CON O/C
> DIESEL 90 GL X L. 44.92 4,042.80
> CEMENTO 1120 B X L. 117.32 131,398.40 ← other page.
> ----------
> TOTAL L.206,841.20
>
> A la espera de lom solicitado
>
> ATTE,
>
> ANDINO

Copia

Appendix F: Program

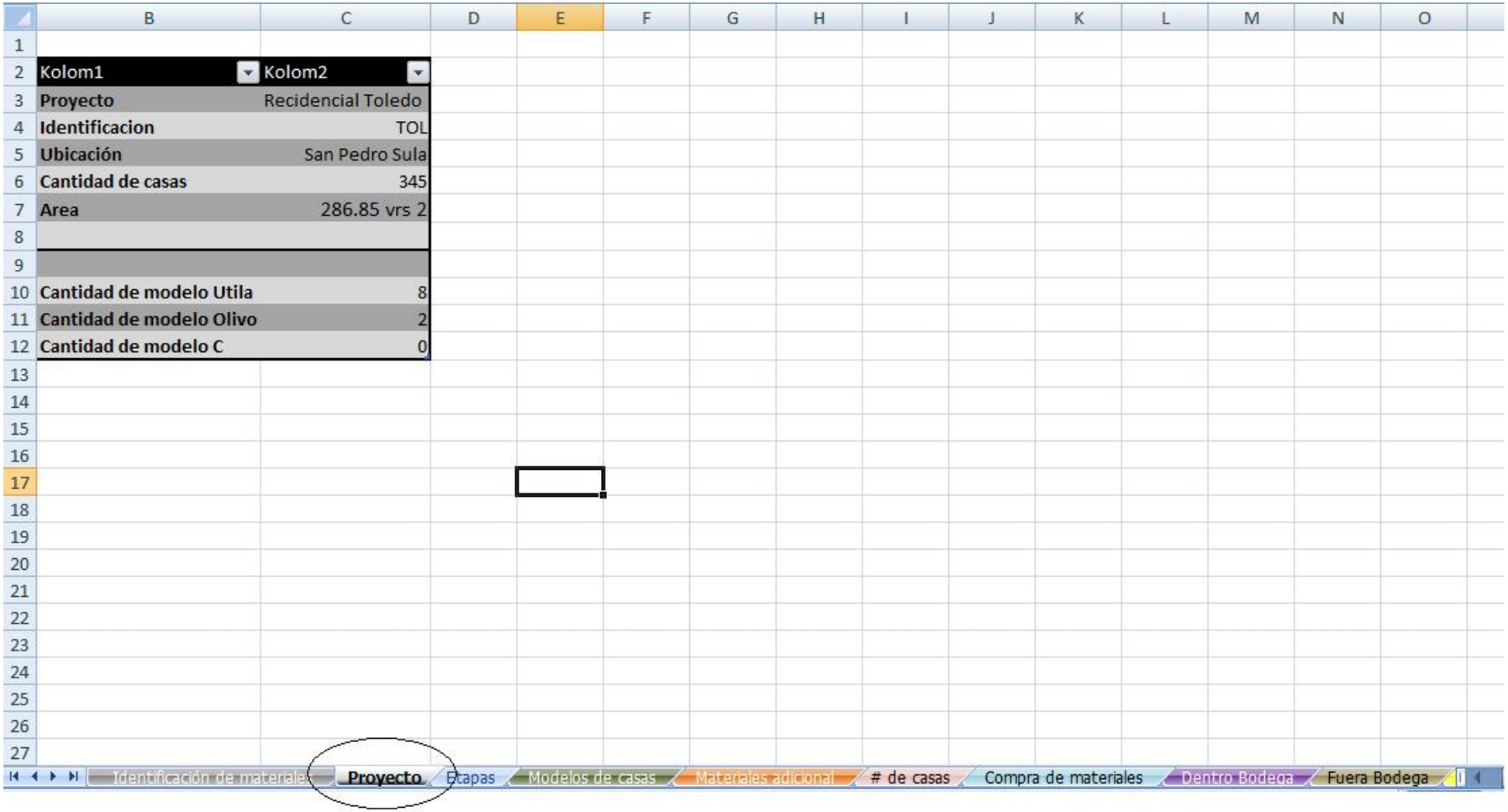
Materials Identification



Kolom1	Kolom12	Kolom2	Kolom3	Kolom4
Material name	Units	Identification	Description	Picture
CINTA PRECAUCION	Unidades	01-00001	Accesorios Varios	
ASFALTO PLASTICO PARA TECHOS	Cajas	02-00001	Aceros y Techos	
CANALETA DE 3X1 1/4	Unidades	02-00002	Aceros y Techos	
CAPOTE 10 ALUCIN	Unidades	02-00003	Aceros y Techos	
CAPOTE 8 ALUCIN	Unidades	02-00004	Aceros y Techos	
CAPOTE FORTEC ROJO	Unidades	02-00005	Aceros y Techos	
CLAVO DE 1 (ACERO)	Unidades	02-00006	Aceros y Techos	
CLAVO DE 1 1/2 (ACERO)	Unidades	02-00007	Aceros y Techos	
CLAVO DE 3 1/2 (ACERO)	Unidades	02-00008	Aceros y Techos	
CLAVO DE 4 (ACERO)	Unidades	02-00009	Aceros y Techos	
LAMINA ALUCIN 10X106	Unidades	02-00010	Aceros y Techos	
LAMINA RADAR	Unidades	02-00016	Aceros y Techos	
LAMINA DE HIERRO 8X4	Unidades	02-00017	Aceros y Techos	
TAPON FORTEC ROJO	Unidades	02-00020	Aceros y Techos	
TEJA MALOU	Unidades	02-00021	Aceros y Techos	
TEJA OVALADA	Unidades	02-00023	Aceros y Techos	
LAMINA LISA 3X12 (FLASHIN)	Unidades	02-00025	Aceros y Techos	
LAMINA ALUCIN 14X106	Unidades	02-00029	Aceros y Techos	
CAPOTE FORTEC NARANJA DE 4"	Unidades	02-00030	Aceros y Techos	
LAMINA FORTEC 36X36	Unidades	02-00031	Aceros y Techos	
LAMINA FORTEC 36X31	Unidades	02-00032	Aceros y Techos	
LAMINA ALUCIN 12X110	Unidades	02-00034	Aceros y Techos	
CAPOTE MALOU	Unidades	02-00035	Aceros y Techos	
CLAVO PARA CHINGLE DE 3/4	Libras	02-00040	Aceros y Techos	
LAMINA DE ZINC DE 10´	Unidades	02-00041	Aceros y Techos	
LAMINA DE ZINC DE 12´	Unidades	02-00042	Aceros y Techos	
ARANDELA DE HULE	Unidades	03-00001	Carpinteria	
ARANDELA DE METAL	Unidades	03-00002	Carpinteria	
BISAGRAS DE 2 1/2X2 1/2 PARA CLOSEP	Pares	03-00003	Carpinteria	
BISAGRAS DE 3 1/2	Pares	03-00004	Carpinteria	
BISAGRAS DE 2" PARA CLOSEP	Pares	03-00005	Carpinteria	
CONTRAMARCOS DE 6	Juegos	03-00006	Carpinteria	
ESPANSOR NO 12	Unidades	03-00007	Carpinteria	
ESPANSOR NO 6	Unidades	03-00008	Carpinteria	
ESPANSOR NO 8	Unidades	03-00009	Carpinteria	

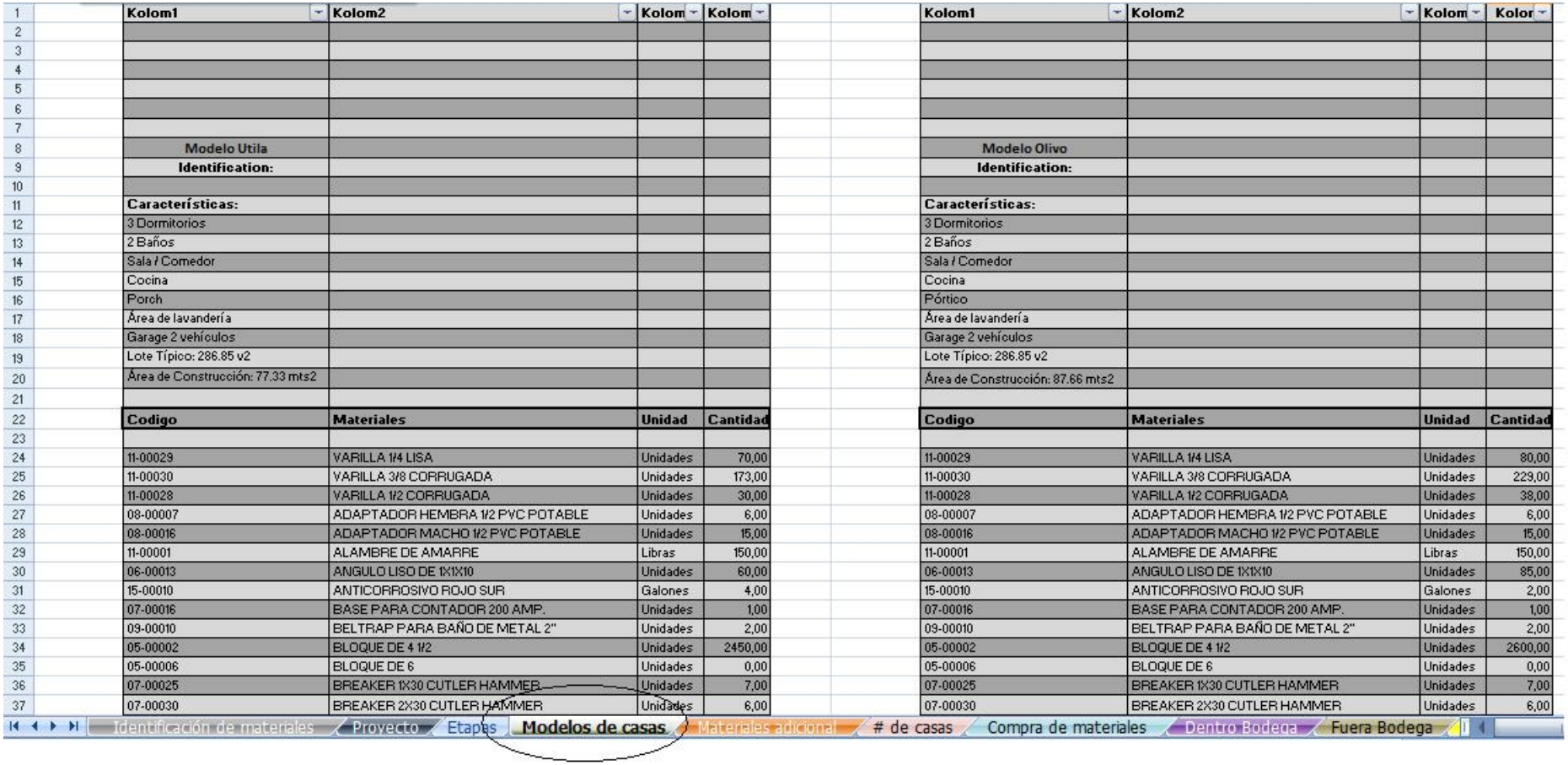
Identificación de materiales | Proyecto | Etapas | Modelos de casas | Materiales adicional | # de casas | Compra de materiales | Dentro Bodega | Fuera Bodega

Program – Project information



Kolom1	Kolom2
Proyecto	Recidencial Toledo
Identificacion	TOL
Ubicación	San Pedro Sula
Cantidad de casas	345
Area	286.85 vrs 2
Cantidad de modelo Utila	8
Cantidad de modelo Olivo	2
Cantidad de modelo C	0

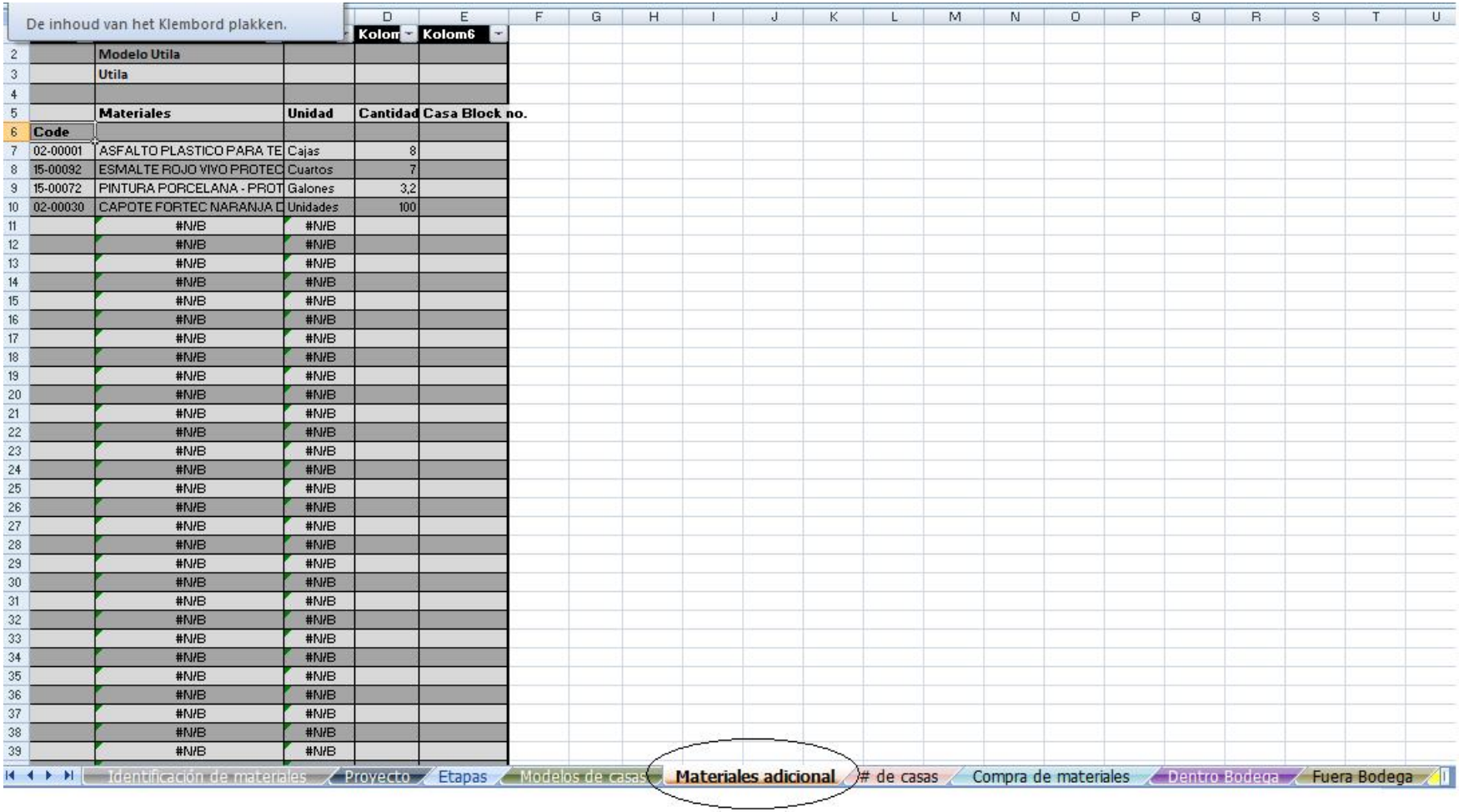
Building types



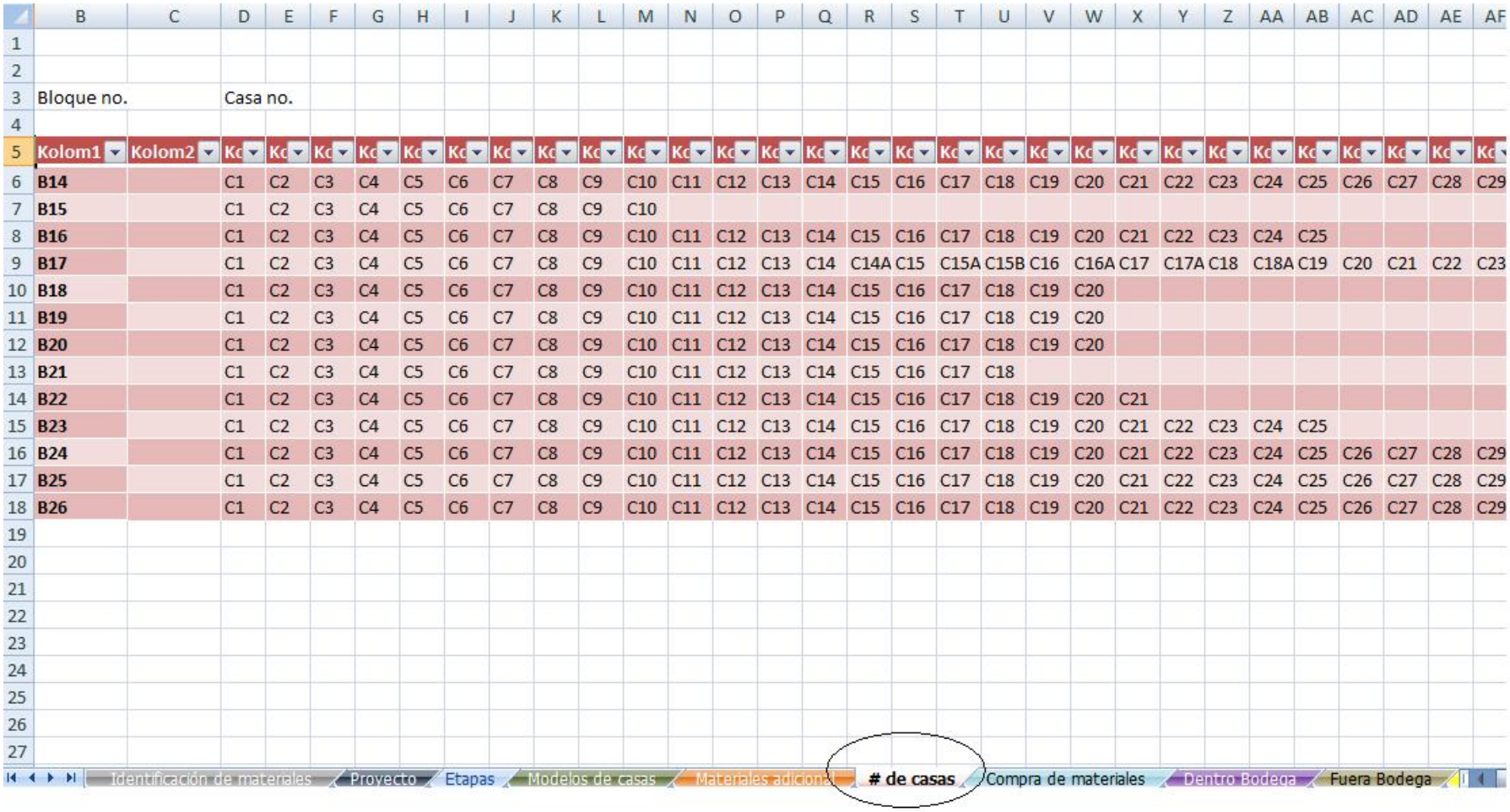
Kolom1	Kolom2	Kolom	Kolom
Modelo Utila			
Identification:			
Características:			
3 Dormitorios			
2 Baños			
Sala / Comedor			
Cocina			
Porch			
Área de lavandería			
Garage 2 vehículos			
Lote Típico: 286.85 v2			
Área de Construcción: 77.33 mts2			
Codigo	**Materiales**	**Unidad**	**Cantidad**
11-00029	VARILLA 1/4 LISA	Unidades	70,00
11-00030	VARILLA 3/8 CORRUGADA	Unidades	173,00
11-00028	VARILLA 1/2 CORRUGADA	Unidades	30,00
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	Unidades	6,00
08-00016	ADAPTADOR MACHO 1/2 PVC POTABLE	Unidades	15,00
11-00001	ALAMBRE DE AMARRE	Libras	150,00
06-00013	ANGULO LISO DE 1X1X10	Unidades	60,00
15-00010	ANTICORROSIVO ROJO SUR	Galones	4,00
07-00016	BASE PARA CONTADOR 200 AMP.	Unidades	1,00
09-00010	BELTRAP PARA BAÑO DE METAL 2"	Unidades	2,00
05-00002	BLOQUE DE 4 1/2	Unidades	2450,00
05-00006	BLOQUE DE 6	Unidades	0,00
07-00025	BREAKER 1X30 CUTLER HAMMER	Unidades	7,00
07-00030	BREAKER 2X30 CUTLER HAMMER	Unidades	6,00

Kolom1	Kolom2	Kolom	Kolor
Modelo Olivo			
Identification:			
Características:			
3 Dormitorios			
2 Baños			
Sala / Comedor			
Cocina			
Pórtico			
Área de lavandería			
Garage 2 vehículos			
Lote Típico: 286.85 v2			
Área de Construcción: 87.66 mts2			
Codigo	**Materiales**	**Unidad**	**Cantidad**
11-00029	VARILLA 1/4 LISA	Unidades	80,00
11-00030	VARILLA 3/8 CORRUGADA	Unidades	229,00
11-00028	VARILLA 1/2 CORRUGADA	Unidades	38,00
08-00007	ADAPTADOR HEMBRA 1/2 PVC POTABLE	Unidades	6,00
08-00016	ADAPTADOR MACHO 1/2 PVC POTABLE	Unidades	15,00
11-00001	ALAMBRE DE AMARRE	Libras	150,00
06-00013	ANGULO LISO DE 1X1X10	Unidades	85,00
15-00010	ANTICORROSIVO ROJO SUR	Galones	2,00
07-00016	BASE PARA CONTADOR 200 AMP.	Unidades	1,00
09-00010	BELTRAP PARA BAÑO DE METAL 2"	Unidades	2,00
05-00002	BLOQUE DE 4 1/2	Unidades	2600,00
05-00006	BLOQUE DE 6	Unidades	0,00
07-00025	BREAKER 1X30 CUTLER HAMMER	Unidades	7,00
07-00030	BREAKER 2X30 CUTLER HAMMER	Unidades	6,00

Additional materials



Building numbers



	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1																															
2																															
3	Bloque no.		Casa no.																												
4																															
5	Kolom1	Kolom2	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko	Ko
6	B14		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29
7	B15		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10																			
8	B16		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25				
9	B17		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C14A	C15	C15A	C15B	C16	C16A	C17	C17A	C18	C18A	C19	C20	C21	C22	C23
10	B18		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20									
11	B19		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20									
12	B20		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20									
13	B21		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18											
14	B22		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21								
15	B23		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25				
16	B24		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29
17	B25		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29
18	B26		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29
19																															
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24																															
25																															
26																															
27																															

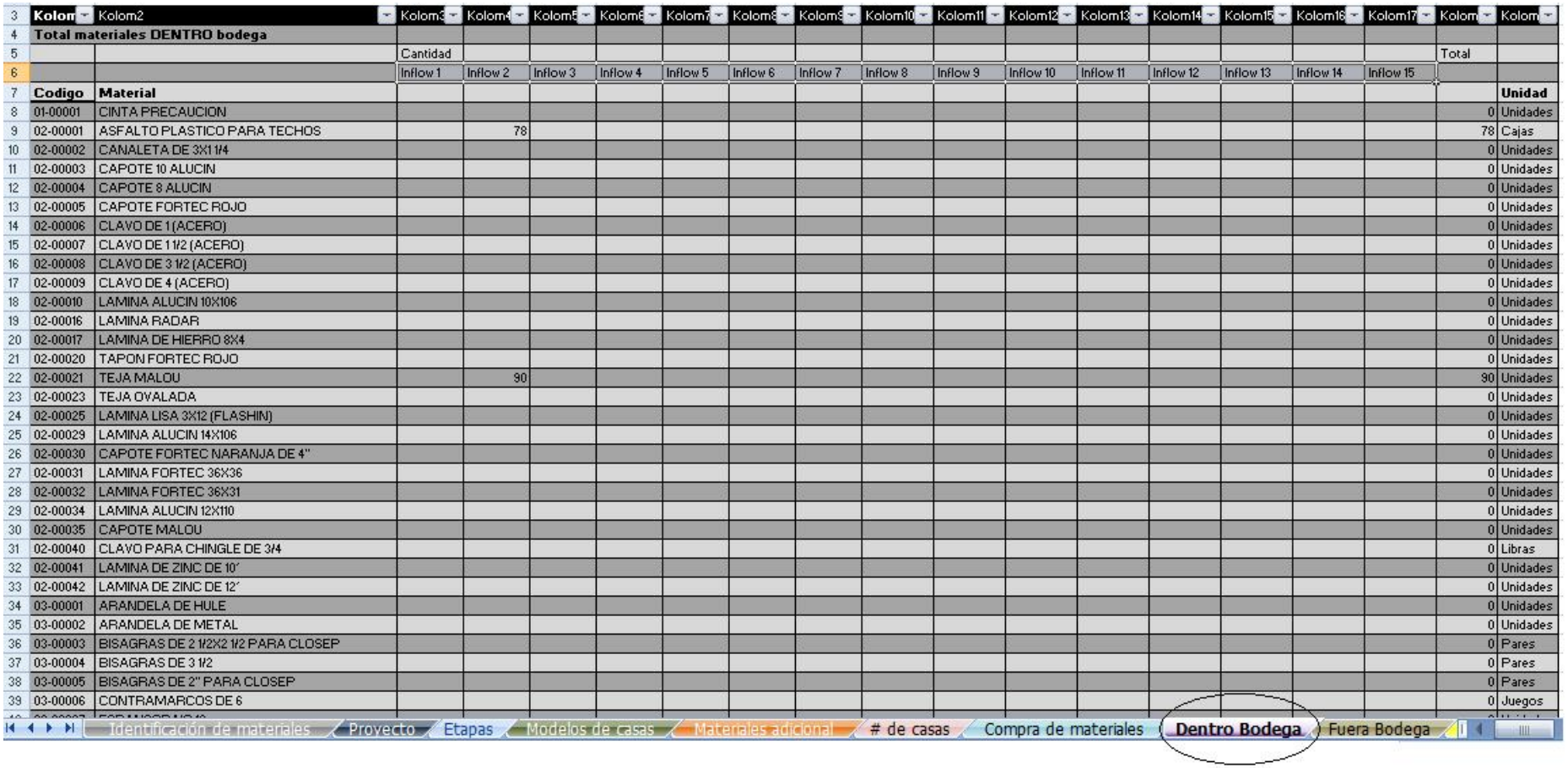
Identificación de materiales | Proyecto | Etapas | Modelos de casas | Materiales adicion | **# de casas** | Compra de materiales | Dentro Bodega | Fuera Bodega

Purchase of materials

Kolom	Kolom18	Kolom2	Kolom3	Kolom4	Kolom5	Kolom6	Kolom7	Kolom8	Kolom9	Kolom10	Kolom11	Kolom12	Kolom13	Kolom14	Kolom15	Kolom16	Kolom17
Ordenado materiales total																	
		Cantidad															
		Order 1	Order 2	Order 3	Order 4	Order 5	Order 6	Order 7	Order 8	Order 9	Order 10	Order 11	Order 12	Order 13	Order 14	Order 15	Total	
Codigo	Material																	Unidad
01-00001	CINTA PRECAUCION	2															2	Unidades
02-00001	ASFALTO PLASTICO PARA TECHOS	4															4	Cajas
02-00002	CANALETA DE 3X1 1/4	567															567	Unidades
02-00003	CAPOTE 10 ALUCIN	89				56											145	Unidades
02-00004	CAPOTE 8 ALUCIN	345		45		678											1068	Unidades
02-00005	CAPOTE FORTEC ROJO	78		546													624	Unidades
02-00006	CLAVO DE 1 (ACERO)	56		76													132	Unidades
02-00007	CLAVO DE 1 1/2 (ACERO)		456														456	Unidades
02-00008	CLAVO DE 3 1/2 (ACERO)		34		78	67	678										857	Unidades
02-00009	CLAVO DE 4 (ACERO)		67				90										157	Unidades
02-00010	LAMINA ALUCIN 10X106		789			87	60										936	Unidades
02-00016	LAMINA RADAR		45		678		50										773	Unidades
02-00017	LAMINA DE HIERRO 8X4		234		67	678	25										1004	Unidades
02-00020	TAPON FORTEC ROJO		78			6787	456										7321	Unidades
02-00021	TEJA MALOU				78		78										156	Unidades
02-00023	TEJA OVALADA						890										890	Unidades
02-00025	LAMINA LISA 3X12 (FLASHIN)																0	Unidades
02-00029	LAMINA ALUCIN 14X106																0	Unidades
02-00030	CAPOTE FORTEC NARANJA DE 4"																0	Unidades
02-00031	LAMINA FORTEC 36X36																0	Unidades
02-00032	LAMINA FORTEC 36X31																0	Unidades
02-00034	LAMINA ALUCIN 12X110																0	Unidades
02-00035	CAPOTE MALOU																0	Unidades
02-00040	CLAVO PARA CHINGLE DE 3/4																0	Libras
02-00041	LAMINA DE ZINC DE 10´																0	Unidades
02-00042	LAMINA DE ZINC DE 12´																0	Unidades
03-00001	ARANDELA DE HULE																0	Unidades
03-00002	ARANDELA DE METAL																0	Unidades
03-00003	BISAGRAS DE 2 1/2X2 1/2 PARA CLOSEP																0	Pares
03-00004	BISAGRAS DE 3 1/2																0	Pares
03-00005	BISAGRAS DE 2" PARA CLOSEP																0	Pares
03-00006	CONTRAMARCOS DE 6																0	Juegos
03-00007	ESPANSOR NO 12																0	Unidades

Identificación de materiales | Proyecto | Etapas | Modelos de casas | Materiales adicional | # de casas | Compra de materiales | Dentro Bodega | Fuera Bodega

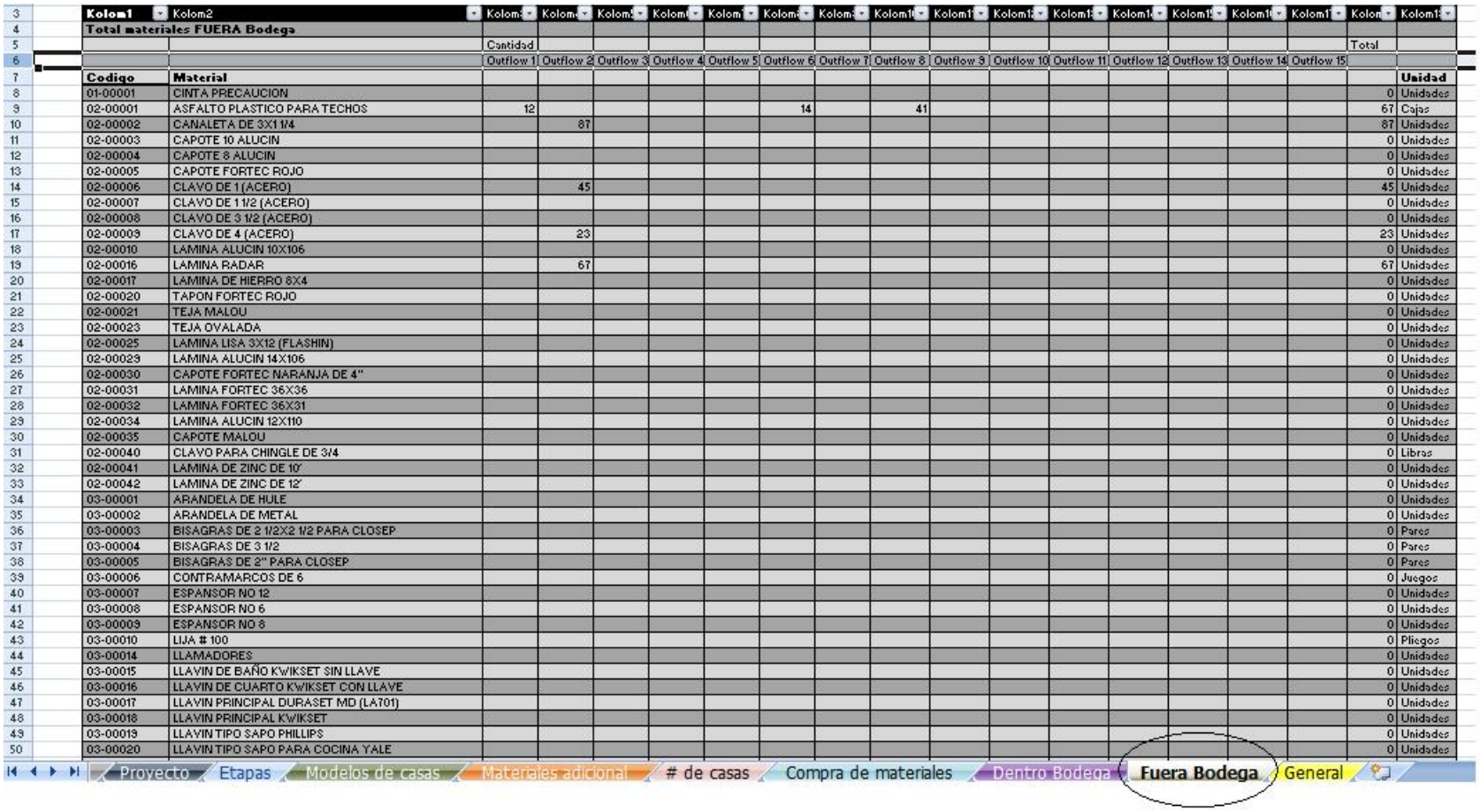
Inflow materials



	Kolom	Kolom2	Kolom3	Kolom4	Kolom5	Kolom6	Kolom7	Kolom8	Kolom9	Kolom10	Kolom11	Kolom12	Kolom13	Kolom14	Kolom15	Kolom16	Kolom17	Kolom	Kolom
4	**Total materiales DENTRO bodega**																		
5			Cantidad															Total	
6			Inflow 1	Inflow 2	Inflow 3	Inflow 4	Inflow 5	Inflow 6	Inflow 7	Inflow 8	Inflow 9	Inflow 10	Inflow 11	Inflow 12	Inflow 13	Inflow 14	Inflow 15		
7	**Codigo**	**Material**																	**Unidad**
8	01-00001	CINTA PRECAUCION																0	Unidades
9	02-00001	ASFALTO PLASTICO PARA TECHOS		78														78	Cajas
10	02-00002	CANALETA DE 3X1 1/4																0	Unidades
11	02-00003	CAPOTE 10 ALUCIN																0	Unidades
12	02-00004	CAPOTE 8 ALUCIN																0	Unidades
13	02-00005	CAPOTE FORTEC ROJO																0	Unidades
14	02-00006	CLAVO DE 1 (ACERO)																0	Unidades
15	02-00007	CLAVO DE 1 1/2 (ACERO)																0	Unidades
16	02-00008	CLAVO DE 3 1/2 (ACERO)																0	Unidades
17	02-00009	CLAVO DE 4 (ACERO)																0	Unidades
18	02-00010	LAMINA ALUCIN 10X106																0	Unidades
19	02-00016	LAMINA RADAR																0	Unidades
20	02-00017	LAMINA DE HIERRO 8X4																0	Unidades
21	02-00020	TAPON FORTEC ROJO																0	Unidades
22	02-00021	TEJA MALOU		90														90	Unidades
23	02-00023	TEJA OVALADA																0	Unidades
24	02-00025	LAMINA LISA 3X12 (FLASHIN)																0	Unidades
25	02-00029	LAMINA ALUCIN 14X106																0	Unidades
26	02-00030	CAPOTE FORTEC NARANJA DE 4"																0	Unidades
27	02-00031	LAMINA FORTEC 36X36																0	Unidades
28	02-00032	LAMINA FORTEC 36X31																0	Unidades
29	02-00034	LAMINA ALUCIN 12X110																0	Unidades
30	02-00035	CAPOTE MALOU																0	Unidades
31	02-00040	CLAVO PARA CHINGLE DE 3/4																0	Libras
32	02-00041	LAMINA DE ZINC DE 10´																0	Unidades
33	02-00042	LAMINA DE ZINC DE 12´																0	Unidades
34	03-00001	ARANDELA DE HULE																0	Unidades
35	03-00002	ARANDELA DE METAL																0	Unidades
36	03-00003	BISAGRAS DE 2 1/2X2 1/2 PARA CLOSEP																0	Pares
37	03-00004	BISAGRAS DE 3 1/2																0	Pares
38	03-00005	BISAGRAS DE 2" PARA CLOSEP																0	Pares
39	03-00006	CONTRAMARCOS DE 6																0	Juegos

Identificación de materiales | Proyecto | Etapas | Modelos de casas | Materiales adicional | # de casas | Compra de materiales | **Dentro Bodega** | Fuera Bodega

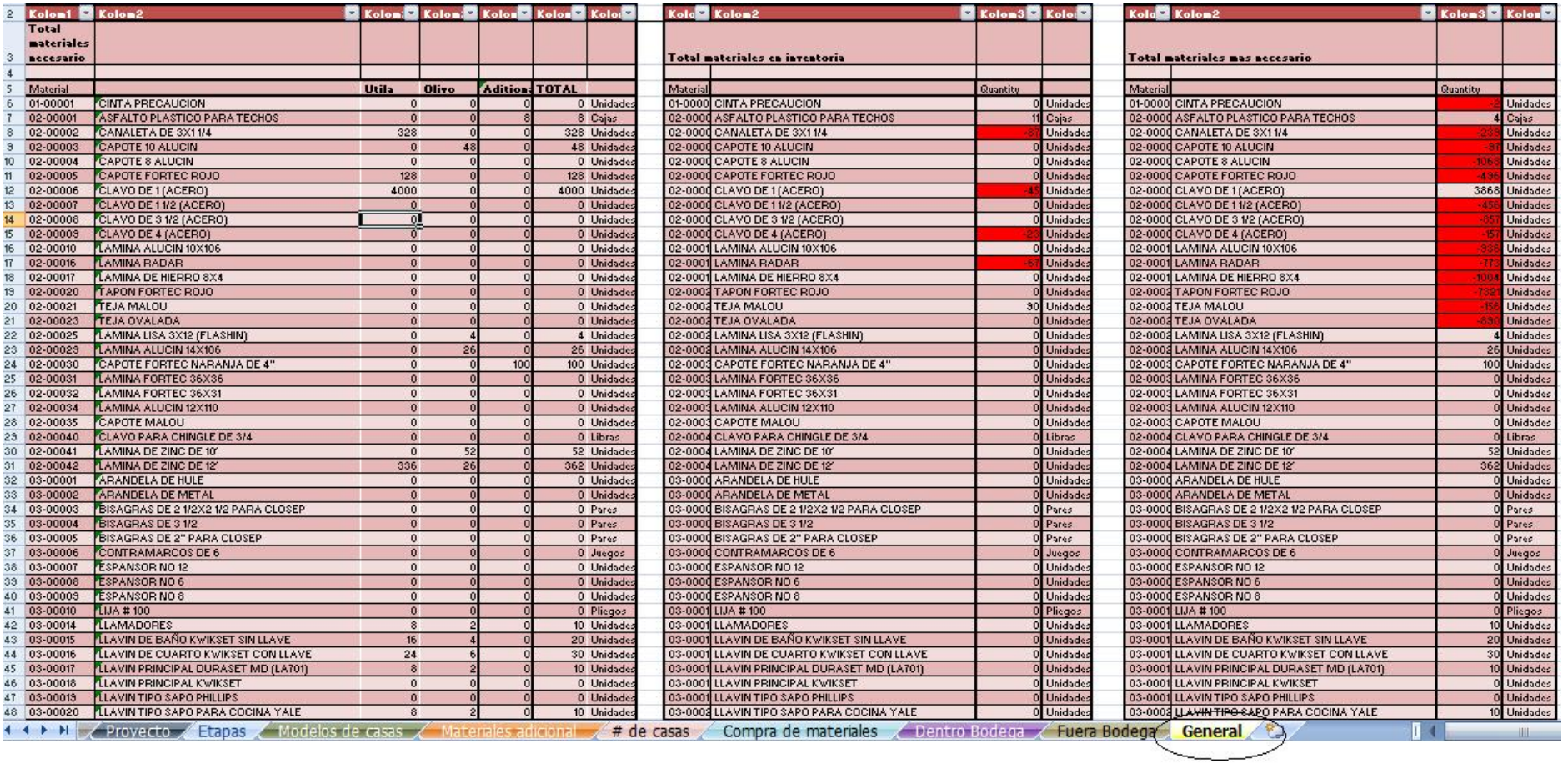
Outflow materials



Kolom1	Kolom2	Kolom3	Kolom4	Kolom5	Kolom6	Kolom7	Kolom8	Kolom9	Kolom10	Kolom11	Kolom12	Kolom13	Kolom14	Kolom15	Kolom16	Kolom17	Kolom18	Kolom19
Total materiales FUERA Bodega																		
		Cantidad															Total	
		Outflow 1	Outflow 2	Outflow 3	Outflow 4	Outflow 5	Outflow 6	Outflow 7	Outflow 8	Outflow 9	Outflow 10	Outflow 11	Outflow 12	Outflow 13	Outflow 14	Outflow 15		
Codigo	Material																	Unidad
01-00001	CINTA PRECAUCION																0	Unidades
02-00001	ASFALTO PLASTICO PARA TECHOS	12					14		41								67	Cajas
02-00002	CANALETA DE 3X1 1/4		87														87	Unidades
02-00003	CAPOTE 10 ALUCIN																0	Unidades
02-00004	CAPOTE 8 ALUCIN																0	Unidades
02-00005	CAPOTE FORTEC ROJO																0	Unidades
02-00006	CLAVO DE 1 (ACERO)		45														45	Unidades
02-00007	CLAVO DE 1 1/2 (ACERO)																0	Unidades
02-00008	CLAVO DE 3 1/2 (ACERO)																0	Unidades
02-00009	CLAVO DE 4 (ACERO)		23														23	Unidades
02-00010	LAMINA ALUCIN 10X106																0	Unidades
02-00016	LAMINA RADAR		67														67	Unidades
02-00017	LAMINA DE HIERRO 8X4																0	Unidades
02-00020	TAPON FORTEC ROJO																0	Unidades
02-00021	TEJA MALOU																0	Unidades
02-00023	TEJA OVALADA																0	Unidades
02-00025	LAMINA LISA 3X12 (FLASHIN)																0	Unidades
02-00029	LAMINA ALUCIN 14X106																0	Unidades
02-00030	CAPOTE FORTEC NARANJA DE 4"																0	Unidades
02-00031	LAMINA FORTEC 36X36																0	Unidades
02-00032	LAMINA FORTEC 36X31																0	Unidades
02-00034	LAMINA ALUCIN 12X110																0	Unidades
02-00035	CAPOTE MALOU																0	Unidades
02-00040	CLAVO PARA CHINGLE DE 3/4																0	Libras
02-00041	LAMINA DE ZINC DE 10'																0	Unidades
02-00042	LAMINA DE ZINC DE 12'																0	Unidades
03-00001	ARANDELA DE HULE																0	Unidades
03-00002	ARANDELA DE METAL																0	Unidades
03-00003	BISAGRAS DE 2 1/2X2 1/2 PARA CLOSEP																0	Pares
03-00004	BISAGRAS DE 3 1/2																0	Pares
03-00005	BISAGRAS DE 2" PARA CLOSEP																0	Pares
03-00006	CONTRAMARCOS DE 6																0	Juegos
03-00007	ESPANSOR NO 12																0	Unidades
03-00008	ESPANSOR NO 6																0	Unidades
03-00009	ESPANSOR NO 8																0	Unidades
03-00010	LIJA # 100																0	Pliegos
03-00014	LLAMADORES																0	Unidades
03-00015	LLAVIN DE BAÑO KWIKSET SIN LLAVE																0	Unidades
03-00016	LLAVIN DE CUARTO KWIKSET CON LLAVE																0	Unidades
03-00017	LLAVIN PRINCIPAL DURASET MD (LA701)																0	Unidades
03-00018	LLAVIN PRINCIPAL KWIKSET																0	Unidades
03-00019	LLAVIN TIPO SAPO PHILLIPS																0	Unidades
03-00020	LLAVIN TIPO SAPO PARA COCINA YALE																0	Unidades

Proyecto | Etapas | Modelos de casas | Materiales adicional | # de casas | Compra de materiales | Dentro Bodega | Fuera Bodega | General

OVERVIEW



Material		Utila	Olivo	Aditions	TOTAL	
01-00001	CINTA PRECAUCION	0	0	0	0	Unidades
02-00001	ASFALTO PLASTICO PARA TECHOS	0	0	8	8	Cajas
02-00002	CANALETA DE 3X1 1/4	328	0	0	328	Unidades
02-00003	CAPOTE 10 ALUCIN	0	48	0	48	Unidades
02-00004	CAPOTE 8 ALUCIN	0	0	0	0	Unidades
02-00005	CAPOTE FORTEC ROJO	128	0	0	128	Unidades
02-00006	CLAVO DE 1 (ACERO)	4000	0	0	4000	Unidades
02-00007	CLAVO DE 1 1/2 (ACERO)	0	0	0	0	Unidades
02-00008	CLAVO DE 3 1/2 (ACERO)	0	0	0	0	Unidades
02-00009	CLAVO DE 4 (ACERO)	0	0	0	0	Unidades
02-00010	LAMINA ALUCIN 10X106	0	0	0	0	Unidades
02-00016	LAMINA RADAR	0	0	0	0	Unidades
02-00017	LAMINA DE HIERRO 8X4	0	0	0	0	Unidades
02-00020	TAPON FORTEC ROJO	0	0	0	0	Unidades
02-00021	TEJA MALOU	0	0	0	0	Unidades
02-00023	TEJA OVALADA	0	0	0	0	Unidades
02-00025	LAMINA LISA 3X12 (FLASHIN)	0	4	0	4	Unidades
02-00029	LAMINA ALUCIN 14X106	0	26	0	26	Unidades
02-00030	CAPOTE FORTEC NARANJA DE 4"	0	0	100	100	Unidades
02-00031	LAMINA FORTEC 36X36	0	0	0	0	Unidades
02-00032	LAMINA FORTEC 36X31	0	0	0	0	Unidades
02-00034	LAMINA ALUCIN 12X110	0	0	0	0	Unidades
02-00035	CAPOTE MALOU	0	0	0	0	Unidades
02-00040	CLAVO PARA CHINGLE DE 3/4	0	0	0	0	Libras
02-00041	LAMINA DE ZINC DE 10'	0	52	0	52	Unidades
02-00042	LAMINA DE ZINC DE 12'	336	26	0	362	Unidades
03-00001	ARANDELA DE HULE	0	0	0	0	Unidades
03-00002	ARANDELA DE METAL	0	0	0	0	Unidades
03-00003	BISAGRAS DE 2 1/2X2 1/2 PARA CLOSEP	0	0	0	0	Pares
03-00004	BISAGRAS DE 3 1/2	0	0	0	0	Pares
03-00005	BISAGRAS DE 2" PARA CLOSEP	0	0	0	0	Pares
03-00006	CONTRAMARCOS DE 6	0	0	0	0	Juegos
03-00007	ESPANSOR NO 12	0	0	0	0	Unidades
03-00008	ESPANSOR NO 6	0	0	0	0	Unidades
03-00009	ESPANSOR NO 8	0	0	0	0	Unidades
03-00010	LIJA # 100	0	0	0	0	Pliegos
03-00014	LLAMADORES	8	2	0	10	Unidades
03-00015	LLAVIN DE BAÑO KWIKSET SIN LLAVE	16	4	0	20	Unidades
03-00016	LLAVIN DE CUARTO KWIKSET CON LLAVE	24	6	0	30	Unidades
03-00017	LLAVIN PRINCIPAL DURASET MD (LA701)	8	2	0	10	Unidades
03-00018	LLAVIN PRINCIPAL KWIKSET	0	0	0	0	Unidades
03-00019	LLAVIN TIPO SAPO PHILLIPS	0	0	0	0	Unidades
03-00020	LLAVIN TIPO SAPO PARA COCINA YALE	8	2	0	10	Unidades

Total materiales en inventoria

Material		Quantity	
01-0000	CINTA PRECAUCION	0	Unidades
02-0000	ASFALTO PLASTICO PARA TECHOS	11	Cajas
02-0000	CANALETA DE 3X1 1/4	-81	Unidades
02-0000	CAPOTE 10 ALUCIN	0	Unidades
02-0000	CAPOTE 8 ALUCIN	0	Unidades
02-0000	CAPOTE FORTEC ROJO	0	Unidades
02-0000	CLAVO DE 1 (ACERO)	-43	Unidades
02-0000	CLAVO DE 1 1/2 (ACERO)	0	Unidades
02-0000	CLAVO DE 3 1/2 (ACERO)	0	Unidades
02-0000	CLAVO DE 4 (ACERO)	-23	Unidades
02-0001	LAMINA ALUCIN 10X106	0	Unidades
02-0001	LAMINA RADAR	-67	Unidades
02-0001	LAMINA DE HIERRO 8X4	0	Unidades
02-0002	TAPON FORTEC ROJO	0	Unidades
02-0002	TEJA MALOU	30	Unidades
02-0002	TEJA OVALADA	0	Unidades
02-0002	LAMINA LISA 3X12 (FLASHIN)	0	Unidades
02-0002	LAMINA ALUCIN 14X106	0	Unidades
02-0003	CAPOTE FORTEC NARANJA DE 4"	0	Unidades
02-0003	LAMINA FORTEC 36X36	0	Unidades
02-0003	LAMINA FORTEC 36X31	0	Unidades
02-0003	LAMINA ALUCIN 12X110	0	Unidades
02-0003	CAPOTE MALOU	0	Unidades
02-0004	CLAVO PARA CHINGLE DE 3/4	0	Libras
02-0004	LAMINA DE ZINC DE 10'	0	Unidades
02-0004	LAMINA DE ZINC DE 12'	0	Unidades
03-0000	ARANDELA DE HULE	0	Unidades
03-0000	ARANDELA DE METAL	0	Unidades
03-0000	BISAGRAS DE 2 1/2X2 1/2 PARA CLOSEP	0	Pares
03-0000	BISAGRAS DE 3 1/2	0	Pares
03-0000	BISAGRAS DE 2" PARA CLOSEP	0	Pares
03-0000	CONTRAMARCOS DE 6	0	Juegos
03-0000	ESPANSOR NO 12	0	Unidades
03-0000	ESPANSOR NO 6	0	Unidades
03-0000	ESPANSOR NO 8	0	Unidades
03-0001	LIJA # 100	0	Pliegos
03-0001	LLAMADORES	0	Unidades
03-0001	LLAVIN DE BAÑO KWIKSET SIN LLAVE	0	Unidades
03-0001	LLAVIN DE CUARTO KWIKSET CON LLAVE	0	Unidades
03-0001	LLAVIN PRINCIPAL DURASET MD (LA701)	0	Unidades
03-0001	LLAVIN PRINCIPAL KWIKSET	0	Unidades
03-0001	LLAVIN TIPO SAPO PHILLIPS	0	Unidades
03-0002	LLAVIN TIPO SAPO PARA COCINA YALE	0	Unidades

Total materiales mas necesario

Material		Quantity	
01-0000	CINTA PRECAUCION	-2	Unidades
02-0000	ASFALTO PLASTICO PARA TECHOS	4	Cajas
02-0000	CANALETA DE 3X1 1/4	-233	Unidades
02-0000	CAPOTE 10 ALUCIN	-97	Unidades
02-0000	CAPOTE 8 ALUCIN	-1068	Unidades
02-0000	CAPOTE FORTEC ROJO	-496	Unidades
02-0000	CLAVO DE 1 (ACERO)	3868	Unidades
02-0000	CLAVO DE 1 1/2 (ACERO)	-456	Unidades
02-0000	CLAVO DE 3 1/2 (ACERO)	-857	Unidades
02-0000	CLAVO DE 4 (ACERO)	-157	Unidades
02-0001	LAMINA ALUCIN 10X106	-938	Unidades
02-0001	LAMINA RADAR	-773	Unidades
02-0001	LAMINA DE HIERRO 8X4	-1004	Unidades
02-0002	TAPON FORTEC ROJO	-7321	Unidades
02-0002	TEJA MALOU	-156	Unidades
02-0002	TEJA OVALADA	-830	Unidades
02-0002	LAMINA LISA 3X12 (FLASHIN)	4	Unidades
02-0002	LAMINA ALUCIN 14X106	26	Unidades
02-0003	CAPOTE FORTEC NARANJA DE 4"	100	Unidades
02-0003	LAMINA FORTEC 36X36	0	Unidades
02-0003	LAMINA FORTEC 36X31	0	Unidades
02-0003	LAMINA ALUCIN 12X110	0	Unidades
02-0003	CAPOTE MALOU	0	Unidades
02-0004	CLAVO PARA CHINGLE DE 3/4	0	Libras
02-0004	LAMINA DE ZINC DE 10'	52	Unidades
02-0004	LAMINA DE ZINC DE 12'	362	Unidades
03-0000	ARANDELA DE HULE	0	Unidades
03-0000	ARANDELA DE METAL	0	Unidades
03-0000	BISAGRAS DE 2 1/2X2 1/2 PARA CLOSEP	0	Pares
03-0000	BISAGRAS DE 3 1/2	0	Pares
03-0000	BISAGRAS DE 2" PARA CLOSEP	0	Pares
03-0000	CONTRAMARCOS DE 6	0	Juegos
03-0000	ESPANSOR NO 12	0	Unidades
03-0000	ESPANSOR NO 6	0	Unidades
03-0000	ESPANSOR NO 8	0	Unidades
03-0001	LIJA # 100	0	Pliegos
03-0001	LLAMADORES	10	Unidades
03-0001	LLAVIN DE BAÑO KWIKSET SIN LLAVE	20	Unidades
03-0001	LLAVIN DE CUARTO KWIKSET CON LLAVE	30	Unidades
03-0001	LLAVIN PRINCIPAL DURASET MD (LA701)	10	Unidades
03-0001	LLAVIN PRINCIPAL KWIKSET	0	Unidades
03-0001	LLAVIN TIPO SAPO PHILLIPS	0	Unidades
03-0002	LLAVIN TIPO SAPO PARA COCINA YALE	10	Unidades

Proyecto | Etapas | Modelos de casas | Materiales adicional | # de casas | Compra de materiales | Dentro Bodega | Fuera Bodega | General

Appendix G: Program – Program manual

MODO DE EMPLEO DE ADMINISTRACION DE MATERIALES

En la programa de 'administración de materiales' la liste de materiales, unidad y código es el fundamento del programa. La programa siempre buscar el código en la lista central y la identidad. Asi muy importante esta una lista central en organización de Grupo Williams con todos materiales con único nombre, único código y unidad.

IDENTIFICACION DE MATERIALES

IDENTIFICACION DE MATERIALES esta el fundamento del programo. Esta es muy importante. Escriben aquí todos los materiales con código y unidad. Ahora todos los materiales de 'Disponible en bodega central al 10 de junio 2009' se anotan en la programa. Es posible rellenar la liste o cambiar los nombres de materiales, unidades o códigos. Escriban abajo los materiales pero mejor es: insertar un fila: Boton derecho del ratón a una fila y insertar

Recomendación
1) Creen un total lista con todos materiales primera, con todos los departamentos juntos. Porque conformidad entre todos los departamentos cerca del nombre de materiales y unidad es necesario.

2) Escriban un nuevo código por todos los materiales. Por ejemplo XX-XXX-XX. En mi reporte es escribí más cerca codificación. Importante es: No codifiquen la marcas en la lista central.

PROYECTO

En 'PROYECTO' escribir la información del proyecto. Importante por la programa es la cantidad de casas/edificios en construcción. Cuando tienes un nuevo cliente y anotas una extra casa en cantidad, la programa calcula automático los materiales necesario.

MODELOS DE CASAS

En 'MODELOS DE CASAS' es solo necesario escriben el código de un material y la cantidad de este material. Esta parte del programa es por Departamento Ingeniería y Departamento Presupuesto. Cuando escriban aquí los códigos de las materiales necesario, la programa va a buscar el correspondiente nombre y unidad. La cantidad de las casas escribí en 'PROYECTO' multiplicando con todos los materiales necesario por casa, esta la total cantidad necesario por el proyecto. La programa solo busca una vez por un código. Asi en este lista anotan un código solo una vez y suman las cantidades.

Recomendación
1) Reevaluar calculo teórico. Sin errores (faltan, duplicidad, materiales no necesario) de materiales.

2) Cuando dos casas no es suficiente investigan cuanto casas son necesario y decirme. (m.tenklooster@student.utwente.nl o kloosterboer26@hotmail.com)

MATERIALES ADICIONAL

Es posible que un cliente quiera una adición al diseño. Anota los materiales adicionales necesario por construcción aquí. Escriban el código del material, la cantidad y el numero de casa de cliente.

DE CASAS

Es naturalmente

COMPRA DE MATERIALES

COMPRA DE MATERIALES esta es la parte del Departamento de compras. Cuando los materiales están ordenados escriban las cantidades aquí. Siempre un orden es por cliente asi anotan las ordenes por casa/cliente. Cuando son insuficientas columnas, insertar una columna: Boton derecho del ratón a una columna y insertan.

Recomendación
1) Con la lista central de los códigos, solo usar un código por un material. No diferente códigos por material por proyecto.

DENTRO/FUERA BODEGA

Todos los materiales que entran en/salir de la bodega anotan aquí. Con la cantidad de materiales Fuera y Dentro bodega la programa calcula el inventario. Cuando son insuficiente columnas, insertar una columna: Botón derecho del ratón en una columna y insertan.

Recomendación
1) El primero tiempo trabajando con la programa usan la CARDEX también. Usan la programa al lado de trabajo por escrito con una cantidad limitada de casas. Por probar.

2) Para añadir un numero a la cantidad es fácil de insertar comentarios sin afectar el cálculo.

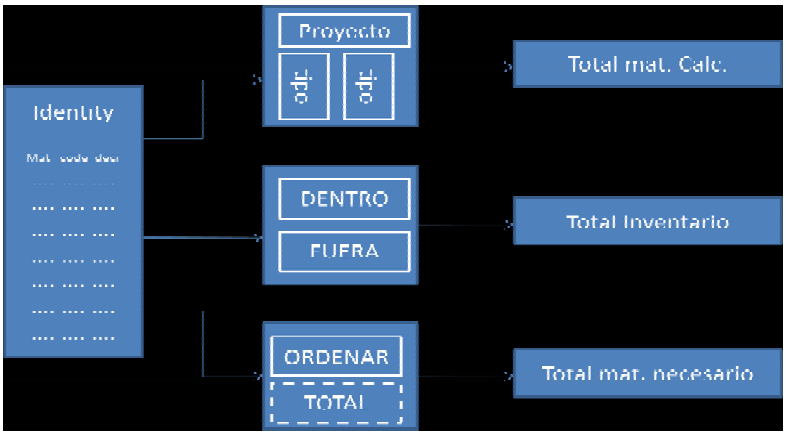
GENERAL

En 'GENERAL' son 3 tablas visible. La primera tabla presenta el total de la cantidad de materiales necesario por el **Proyecto.** La segunda tabla presenta el total cantidad de materiales en inventario. Y la tercer tabla presenta la cantidad de materiales de la necesario.

La primera tabla, Total de materiales necesario por el proyecto, es calculado con la cantidad de casas(PREYECTO) multiplicado con todos los materiales por modelo de casa (MODELOS DE CASAS). La cantidad por casa y la cantidad de materiales adicional se presentan. La columna Total presentan el total cantidad de la necesario por el proyecto.

La segunda tabla, Total inventario, es calculado con la total cantidad ENTRAN a la bodega menos el total cantidad de la que sale de la bodega. Esta cantidad es la cantidad total en inventario.

La tercer tabla, Total materiales de las necesario, es calculado con la cantidad total necesario por proyecto (Tabla 1) menos todos materiales comprado.



En las tablas de inventario (Tabla 2) y el Total de materiales necesario (Tabla 3) es una función de control. Si se convierte en una cantidad negativa, el programa automáticamente se marca el de células rojas. Porque no es posible que mas materiales salgan de la bodega que los que entran. Y no es posible que mas materiales ordenado de total materiales necesario.

Recomendaciones

1) Arreglan una reunión con todos departamentos. En la reunión van a explicar el método de trabajo por departamento. Y discuten antedicho recomendaciones y la posibilidad de usar la programa.

2) Implementar un programa de 'administración de materiales' en etapas. Es mejor empezar con un programa básico y expandir este programa a su gusto.

3) En la próximo etapa calcula la diferencia de teórico versus real. Porque esta diferencia será en la bodega después de proyecto y estos materiales deben reutilizarse en otros proyectos.

- List of materials per building