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# MAJOR COMPONENTS OF "TYPICAL VILLA" IN SAUDI ARABIA FOR PRICE/COST INDEX DEVELOPMENT

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## ABSTRACT

*In spite of being the second largest industry after oil industry, the Saudi construction industry lacks the availability of proper information about its products and operations. One of the missing crucial information is this related to construction price and cost indexes for the different construction products (housing, highway, school, etc). The development of such indexes necessitates the identification of basic elements or components that need to be included in the index basket. Ingredients of villas as housing units are the elements needed for developing a housing index. This study identifies and defines the components of "The Typical Villa." The files of 200 villas that were built in the Dhahran area in the last five years were obtained from the archives of the Dhahran Municipality. These files were inspected to determine the most common building systems used in villas. This study was able to identify and define the major components of "The Typical Villa". The findings of this study set the first stone for developing a housing (residential villa) price/cost index. In addition, the study results will be of great interest to many architects, contractors, and suppliers.*

*This work belongs to the Engineering Profession and its Practice in Saudi Arabia: Role of professional societies; local and international societies; challenges and problems; codes and ethics.*

**Keywords:** *Villa, Index, Construction, Industry, Saudi Arabia.*

## الملخص

تقدم هذه الدراسة المقومات الرئيسة للفيلا السكنية التي تم تشييدها في مدينة الظهران خلال النصف الثاني من العقد الماضي واضعة بذلك اللبنات الأساسية للفيلا السكنية النموذجية. تم التعرف على هذه المقومات عن طريق فحص ومعاينة ملفات ٢٠٠ فلة سكنية تم الحصول عليها من إرشيف بلدية الظهران حيث تم تحديد الطرق والأنظمة العامة للتشييد التي تم استعمالها واتباعها في بناء هذه الفلل السكنية.

## 1. INTRODUCTION

The discovery of oil in commercial quantities in 1938 was the major catalyst in the transformation of the Kingdom of Saudi Arabia into a modern state. The huge revenues derived from the sale of oil enabled the government to undertake large-scale development programs in the early 1970s. Such programs initially focused on the development of infrastructure in the areas of transportation, telecommunications, electric power, and water. The development programs were expanded into the fields of education, health, and social welfare; the expansion and equipping of the armed forces; and the creation of petroleum-based industries. From this beginning, the government expanded its programs to drill more deep wells to tap underground aquifers and to construct desalination plants. These water sources, in turn, enabled ventures to make the country more nearly self-sufficient agriculturally. A well-developed construction industry participated in the developing the country infrastructure and the very modern buildings and residential houses. The Saudi construction industry was developed as a result of the boom in the oil industry. The Government of Saudi Arabia contributed greatly to the development of the construction industry through all the previous development plans. At that time, about 70 percent of the total construction industry was financed by the government. One of the most important elements in the development of this industry was the building of residential buildings, which constitutes almost 25 to 38% of the total industry in 1981-1985 [Ministry of Finance and National Economy Statistics]. This percentage has changed slightly over the last 15 years.

The construction industry in Saudi Arabia is the second largest industry after the oil industry. However, in spite of its importance to the economy and the survival of other industries such as steel and glass, there is not enough information available about its products and operations. One of the crucial pieces of information that is lacking is that related to construction price and cost indices for the different construction products (housing, highway, school, etc). Due to the fact that the largest output of the industry today is residential villas, this study is an attempt to set the first stone for developing a housing (residential villa) price/cost index. The development of such an index requires definition of all the elements that make up the index basket. Therefore, this study will attempt to define a typical villa to be considered as the base for the index.

### 1.1. Objective Of The Study

The objective of this study was to define “The Typical Villa" for those villas constructed in the Eastern Province of Saudi Arabia.

### 1.2. Significance Of The Study

It is strongly believed that defining "The Typical Villa" is very important for setting the foundation for the development of many economic factors such as cost indices. Also, many industries and individuals will benefit from the characteristics of “The Typical Villa” and the expected economic indicators in determining future investments.

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Defining the base for future research is crucial for the development of specialized construction cost and prices indices in Saudi Arabia. These indices will have many applications and will serve all government and private agencies inside and outside the construction industry. Project owners will be able to prepare more reliable budget estimates for their projects. Also, Architect/Engineer and project managers will have more confidence in preparing feasibility studies and bid evaluation. Financial institutions will have more reliable information to justify the request for funds. Vendors and suppliers will benefit from the use of specific products to estimate the market requests and purchase orders. The construction materials industry will use the output of the study to adjust their products to meet the market demands.

### 1.3. Limitations Of The Study

The study was limited to residential villas in Dhahran due to the following reasons:

1. Availability and ease of accessibility to the required data in the Dhahran Municipality.

2. The data available in the Dhahran Municipality reflect the variety of the most recently constructed villas in the Dammam Metropolitan area. Therefore, the findings can be generalized throughout the Eastern Province due to the similarity in construction practices.

3. Budget and time constraints.

## 2. RESEARCH METHODOLOGY

This section advances the steps that were taken for achieving the objective set for this study. The required data, data collection, and data analysis are presented in the following paragraphs.

### 2.1. Required Data

Defining a typical villa requires the identification of building systems, components, and their qualities, especially finishing materials. An accurate definition of "The Typical Villa" would require the measurement of the general movement of all items used in the construction of villas. The desired level of accuracy depends on the ultimate utilization of the definition of "The Typical Villa". For our study, the ultimate utilization was the development of a housing index. Therefore, defining all the items to be included in an index basket will increase the number of items in the basket and, hence, this will definitely increase the accuracy of the indices. However, for practical reasons and the difficulty in obtaining complete data, major building components, which have considerable influence on a villa construction cost, were selected. Consequently, the following data were essential in defining the typical villa.

### *2.1.1. Quality of Villas*

In Saudi Arabia, it is a common practice to classify villas into four categories based on the finishing materials. These four classes are a standard villa, a villa deluxe, complex villas, and palaces. It is also common to use the quality of the villas as a measure of the types of villas.

Eight contractors (experts) from the local construction industry were contacted and requested to provide a definition for the quality of villas. These experts indicted that villas are classified on the basis of the quality and the cost of the villa components. Villas are categorized into the following:

**Standard Villa**: This category includes villas built over an area of 500-800 $m^2$ with paint finish, low-cost toilet, aluminum windows, and a concrete structure. This type of villa comprises about 60-65% of villas.

**Deluxe Villa**: This type is similar to the standard villa with additional luxurious finishes, marble, tiles, central air conditioning, etc. This category comprises about 25-30% of villas.

**Complex Villa**: This category includes villas built over an area of 800-2000 $m^2$ with high quality finishes, and strict material specifications. This type comprises about 5-7% of villas.

**Palace**: This type is similar to the complex villa but built over 2000 $m^2$ with very high quality finishes. This category constitutes about 1-2% of villas.

### *2.1.2 Characteristics of Building Systems*

It was necessary to identify and to define all the building systems and major components that make "The Typical Villa". These systems can be identified using different work breakdown structures (WBS) which arrange the various facets of the project in a logical convenient hierarchy of macro elements that are made up of many microelements. In defining the items included in "The Typical Villa", there was a need for the use of a systematic work breakdown structure (WBS). The WBS used by the US Army Corps of Engineers for Military Construction, the WBS of the American Society of Professional Estimators, and the WBS of the Constructions Specification Institute (CSI) were considered. The latter system was used for identifying the components of "The Typical Villa", which could be defined on the basis of:

- Architectural quality: shape, built area, number of stories
- General: location and villa type.
- Structural elements: type and strength of concrete and steel.
- Slab types.
- Wall system: Masonry types.
- Types of doors, windows, and finish.

- Floor finishes and interior and exterior walls.
- Heating, Ventilating, and Air Conditioning (HVAC) systems and
- Electrical Loads.

### 2.2. Data Collection

All the necessary data were extracted and collected from the building permits existing in the archives of the Dhahran Municipality. The building permits in the archives of the municipality are organized based on the plans (areas) available in Dhahran City (i.e. Doha, Dana, 1/142, 1/360, 1/70, etc). Each issued building permit is kept in a file that contains the following documentation:

- Copy of the original permit.
- No-Objection Certificate (NOC) from other civil utilities such as electrical company, sewer & water authority, telecom company, etc.).
- Original preliminary approved drawings.
- Copy (A3 size) of the final approved drawings.

For effective and efficient data collection, a form was developed to aid in extracting the proper data from the source. The form consists of three parts. The first part is allocated for the description of the villa location. The second part consists of several variables regarding the description of the villa in terms of lot size, number of floors, and floor areas including basement, ground, and first floors. The third part consists of items related to the villa components and systems laid out in accordance with the CSI 16 Divisions.

Actual data collection was tedious, time-consuming, and challenging. In addition to the information contained in the building permit, it was necessary to study the building drawings thoroughly to ensure the accuracy of the information.

### 2.3. Sample Size and Selection

The municipality has issued thousands of permits over the last decade. Table 1 presents the number of permits issued by the municipality since 1416 H (1995). The emphasis on the last several years was necessary for capturing the latest type of villas.

A total of 200 villa files were selected randomly from the archive of the municipality.

The selection pattern that was followed for assuring randomness was as follows:

For proper selection, the elements of the population were arranged into classes based on the plan areas (i.e. Doha, Dana, 142, 360). And, then, classifying all villas within each planed area into different groups according to quality of the villas (design, size, etc). Finally, the latest issued permits that cover the years 1997, 1998, 1999, and 2000 were included in the population. Then, the permits were listed and villas with odd serial numbers were selected.

## 3. RESULTS AND ANALYSIS

For the purpose of consistency and accuracy in defining "The Typical Villa", the collected data were tabulated in a form of groups that cover the wide variety of building size, design specifications, and methods of construction.

A basic computer program was developed for analyzing the collected data, including the various categories of the distributions given for every criterion of the villa (i.e. foundation type: isolated, raft, mat, etc.).

The program was designed to calculate the frequency (number of occurrence) and the percentages for each category of the building components. The villa components and their distributions are shown in Table 2. On the basis of the obtained statistics, it was possible to define "The Typical Villa on the bases of the lot area, space utilization, building systems, doors and windows, quality of finishing materials, air conditioning system, and electrical loads".

### 3.1. Lot Area

The results indicated that villas are built over different lot sizes ranging from 400 $m^2$ to more than 2000 $m^2$. The majority of the villas were found to have lot areas between 400 and 900 $m^2$. About one-half of these villas were found to have a lot size of 750 $m^2$. The popularity of this lot size could be attributed to the practice used and recommended by the Department of Planning, Directorate of Municipality, in dividing lots into 600, 700, 750, 850, etc.

### 3.2. Space Utilization

The architectural utilization of space involves the area allocated for each story in the villa. It was found that some villas have a basement, a ground floor, a second floor, and extensions.

#### *3.2.1 Basement Area*

The results indicated that the majority of villas are built with basements with areas ranging from 50 $m^2$ to 300 $m^2$. The most frequent basement area was found to be between 100 and 300 $m^2$. The popularity of using basements could be explained by the need of people to have environmentally controlled entertainment areas and for shelter during crisis periods as it was experienced during the Second Gulf War.

#### *3.2.2 Ground and First Floor Area*

The results indicated that villas are built with ground and first floor areas. The square meters allocated for each floor was found to range between 100 and 500 $m^2$. The majority of areas are ranging between 200-400 $m^2$ with an average area of 300 $m^2$. This may be due to the regulation that requires set backs and the need of residence for more landscape area and the cost of electricity.

*3.2.3 Extensions*

The results indicated that almost 44 percent of the villas are built with extensions for either garage and/or second-floor extension with an average square meter area of 24 $m^2$. This may reflect the need for a car shelter and for additional spaces in the second floor.

### 3.3. Structural Elements (Foundation, Ground Beams, Columns, Slabs)

*3.3.1 Foundation*

The results indicated that a separate foundation is the most widely used type of footing in the construction of residential villas. However, raft footing was found to be the most common foundation system when a villa has a basement. Regardless of the type of foundation, the results indicated that the concrete footings are built to sustain 3,500 psi compressive strength. These footings are reinforced with uncoated steel. The wide use of separate footings may be indicative of the designers' consciousness in providing reasonably priced foundation systems.

*3.3.2 Ground Beams*

The results indicated that ground beams of 20x50 cm or 20x60 cm and a concrete strength of 3500 psi with uncoated reinforcing steel are the most commonly used in villa construction. This may reflect the standard of walls used and work operations since most of the walls used are 20 cm thick concrete hollow blocks, as it will be shown in the walling system.

*3.3.3 Columns*

The majority of villas are built with columns of different sizes and shapes. Rectangular columns with sizes of *20x50* cm or *20x60* cm and concrete of 4000 psi with the use of uncoated reinforcing steel are commonly used. This is a design element that may require the thickness of columns to match the thickness of the internal and external walls, which are made with a 20-cm thick block.

*3.3.4 Slabs*

The results indicated that almost all the villas (99% of the villas) are built with Hordi slabs with thickness ranging between *26* cm and 32 cm. The most commonly used thickness was found to be 30 cm with a concrete strength of 3500 psi and uncoated reinforcing steel. The popularity of the Hordi slabs could be attributed to their thermal insulation quality and flexibility to changes in partition walls.

### 3.4. Wall Systems

The results indicated that the block unit is the ingredient of internal and external walls in villas. Almost all the partition walls of villas were found to be made of a concrete hollow

block measuring 20 cm x 20 x 40 cm. The use of this block size could be related to its reasonable quality and price, suitability for the columns width, and its appropriate thickness for insulation.

The *20* cm x *20* cm x 40 cm concrete hollow blocks were also found in the external walls of quite a few villas. However, the results indicated that the majority of the villas (almost 60% of the villas) were using 20 cm x 20 cm x 40 cm concrete insulated blocks in their external walls. It is expected that this type of blocks will be widely used in future villas because of their energy-savings characteristics and the requirements set by official service providers such as the electrical company.

### 3.5. Doors and Windows

Most of the villas were found to have all their internal doors made of wood and oak or other materials. Also, the villas were found to use steel materials for external doors. The use of steel in external doors is common and preferred by many villa owners due to its prolong durability in an environment that is characterized as harsh. It is also preferred for aesthetic reasons where steel could be formed into decorative shapes.

The results indicated that 65 percent of the villas are using double glass 18 mm (6 mm glass, 6 mm air, 6 mm glass) windows. This window system complements the insulated external wall system in creating an envelop for the villa that achieves the desired energy-saving objective.

### 3.6. Wall, Floor and Ceiling Finishes

The results indicated that most of the internal and external walls are paint finished. The paint may be used for its reasonable and acceptable material and installation prices.

The use of concrete screed and marble was found to be the most common floor finish system where it is used in almost 92 percent of the villas. It seems that many owners use carpeting materials for finishing most of the floor spaces in the villas.

#### *3.6.1. AC System and Electrical Loads*

The results indicated that almost 50 percent of the air-conditioning system used in villas is the split-unit type. It seems that owners prefer this type for its quietness, efficiency, initial purchasing price, and its decorative look. The results also indicate that most of the electrical load used in villas was 300 Amp with 3 panel boards in the average. The electrical company calculates the loads on the basis of the constructed living area.

### 3.7. Considered Items

In the definition of "The Typical Villa", specific items are to be considered. These items contain the following characteristics:

- Items with high quantities (example: concrete, steel, blocks, air conditioning)
- Items with high prices (example: finishes, special constructions, electrical, etc.)
- The criteria for selecting the items to be considered and the option selected will depend mainly on the frequency of occurrences, as reported in the results.

Table 3 presents the items that are selected to be the basic elements for "The Typical Villa" together with the justification for selection according to the survey results. These items are selected because they are the most repetitive items in the construction of residential villas. Figure 1 is an architectural visualization of "The Typical Villa". Engineering drawings (plans and specifications) that define the items and characteristics stated in Table 2 were developed.

## 4. CONCLUSIONS AND RECOMMENDATIONS

This study was able to identify and define the major components of "The Typical Villa" constructed in the Eastern Province of Saudi Arabia. The files of 200 villas that were built in the Dhahran area in the last five years were obtained from the archives of the Dhahran Municipality. These files were inspected to determine the most common building systems used in villas.

These results, which are the first in the Saudi construction industry, could form the basis for the development of a specialized construction cost and price indices. Therefore, it is recommended to select a proper method for developing the desired indices. It is also recommended that similar studies be conducted in various parts of the Kingdom in order to develop the local indices.

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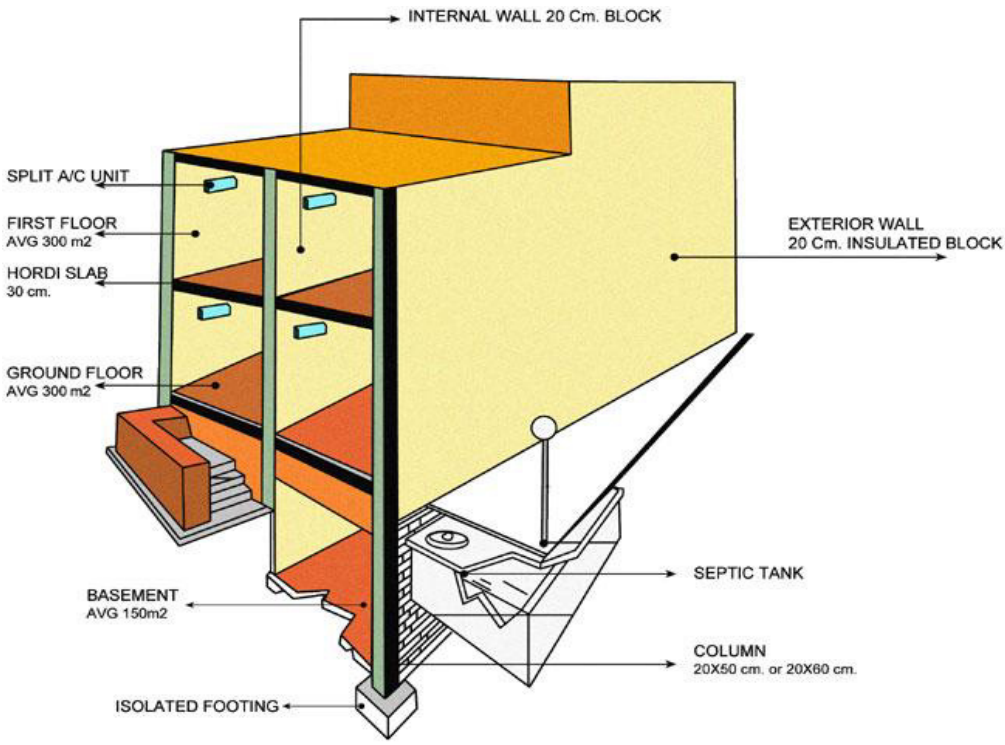


**Figure 1: Architectural Visualization for the "Typical Villa"**

Table 1: Number of Residential/Commercial Permits Issued in 1996, 1997, 1998, 1999 & 2000.

| YEAR | NUMBER OF PERMITS ISSUED |
|---|---|
| 1996 (1/2 year) | 272 |
| 1997 | 358 |
| 1998 | 340 |
| 1999 | 355 |
| 2000 (½ year) | 172 |
| TOTAL | *1,497* |

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Table 2: Building Components of Villas Built in Dhahran Area.

| Building Components | Categories | % of Villas | Building Components | Categories | %of Villas |
|---|---|---|---|---|---|
| **Lot Area** | 400 - 600 $m^2$ | 19% | **Extensions** | Garage 24-40 $m^2$ | 23% |
| | 601 - 900 $m^2$ | 49% | | Garage+GF Extension | 9% |
| | 901 - 1100 $m^2$ | 19% | | Garage+GF Extension+SF Extension | 44% |
| | 1101 – 2000 $m^2$ | 10% | | No Extension | 13% |
| | More than 200 $m^2$ | 4% | | SF Extension 20-5O $m^2$ | 11% |
| **Basement** | 0 – 50 $m^2$ | 19% | **Fence and Parapet** | Fence (70-100 L.M.) Parapet (50-70 L.M.). | 20% |
| | 51 – 100 $m^2$ | 16% | | Fence (70-100 L.M.) Parapet (70-100 L.M.) | 16% |
| | 101 - 300 $m^2$ | 24% | | Fence (100-150 L.M.) Parapet (70-100 L.M.) | 61% |
| | More than 301 $m^2$ | 2% | | Fence (More than 150 L.M.) | 3% |
| | ***No Basement*** | ***39%*** | **Foundation Type** | Separate | 57% |
| **Ground Floor Area** | 0 - 100 $m^2$ | 0 | | Combined | 0 |
| | 101 - 300 $m^2$ | 36% | | Raft | 0 |
| | 301 - 500 $m^2$ | 62% | | Separate + Raft (for basement) | 44% |
| | More than 501 $m^2$ | 2% | **Foundation Concrete** | 3000 psi | 0 |
| **First Floor Area** | 0 - 100 $m^2$ | 4% | | 3500 psi | 99% |
| | 101 - 300 $m^2$ | 34% | | 4000 psi | 1% |
| | 301 - 500 $m^2$ | 60% | | Others | 0 |
| | More than 501 $m^2$ | 2% | **Foundation Steel** | Uncoated steel | 98% |
| | | | | Coated steel | 2% |

Table 2 (continued)

| Building Components | Categories | % of Villas | Building Components | Categories | %of Villas |
|---|---|---|---|---|---|
| **Ground Beam Size** | 20 x 50 cm | 36% | **Column Concrete** | 3500 psi | 2% |
| | 20 x 60 cm | 33% | | 4000 psi | 98% |
| | 25 x 50 cm | 11% | | 4500 psi | 0 |
| | 30 x 60 cm | 14%. | | Others | 0 |
| | 25 x 60 cm | 6% | **Column Steel** | Uncoated | 99% |
| **Ground Beam Concrete** | 3000 psi | 1% | | Coated | 1% |
| | 3500 psi | 99% | **Type of Slabs** | Hordi slab | 99% |
| | 4000 psi | 0 | | Two-way slab | 1% |
| | Others | 0 | | Waffle slab | 0 |
| **Ground Beam Steel** | Normal steel | 97% | **Foundation Type** | Separate | 57% |
| | Coated steel | 3% | | Combined | 0 |
| **Flooring Concrete** | 2000 psi | 0 | | Raft | 0 |
| | 2500 psi | 100% | | Separate + Raft (for basement) | 44% |
| | 3000 psi | 0 | **Slab Concrete** | 3000 psi | 0 |
| | 3500 psi | 0 | | 3500 psi | 100% |
| **Flooring Steel (Wiremesh)** | 15 cm x 15 cm Uncoated | 35% | | 4000 psi | 1% |
| | 20 cm x 20 cm Uncoated | 65% | | Others | 0 |
| | 15 cm x 15 cm coated | 0 | **Steel Slab** | Uncoated | 99% |
| | 20 cm x 20 cm coated | 0 | | Coated | 1% |

Table 2 (continued)

| Building Components | Categories | % of Villas | Building Components | Categories | %of Villas |
|---|---|---|---|---|---|
| **Slab Thickness** | 26 cm | 27% | **External Doors** | Wood | 0 |
| | 27 cm | 22% | | Aluminum | 3% |
| | 28 cm | 14% | | Wood+Steel | 57% |
| | 30 cm | 33% | | Wood + Aluminum | 41% |
| | 32 cm | 4% | **Windows** | Single glass | 35% |
| **Internal Wall Type** | Hollow block | 100% | | Double glass | 65% |
| | Partitions | 0 | **Wall Finishes** | Painting | 100% |
| | Others | 0 | | Cladding | 0 |
| **Internal Block Size** | 15 cm | 0 | | Others | 0 |
| | 20 cm | 100% | **Floor Finishes** | Screed + Marble | 92% |
| | Others | 0 | | Marble + Ceramic | 7% |
| **External Wall Type** | Hollow block (20cm) | 30 | | Ceramic | 1% |
| | Insulated (20cm) | 34 | | Tiles | |
| | Cavity walls (30cm) | 32 | **Ceiling Finishes** | Paint on plaster only | 76% |
| | Insulated (25cm) | 5 | | Suspended ceiling + Paint on plaster | 24% |
| **Internal Doors** | Wood | 88% | | Others | 0 |
| | Aluminum | 0 | **External Finishes** | Painting | 55% |
| | Wood + Aluminum | 12% | | Stone cladding | 1% |
| | | | | Marble | 3% |
| | | | | Painting +Sloped Roof | 31% |
| | | | | Painting + Stone Cladding | 10% |

Table 2 (continued)

| Building Components | Categories | % of Villas | Building Components | Categories | %of Villas |
|---|---|---|---|---|---|
| **Specialties** | Septic tank | 91% | **Excavation** | By shovel | 97% |
| | Others | 9% | | By Rock Breaker + shovel | 3% |
| **Special Construction** | Swimming pool | 18% | | By Backhoe | 0 |
| | No swimming pool | 82% | | By Others | 0 |
| | Others | | **Backfilling** | Use Excavated Materials | 32% |
| **Air conditioning System** | Window type | 16% | | Use Outside Selected Materials | 69% |
| | Split Unit type | 35% | | | |
| | Split central | 15% | | | |
| | Package | 14% | | | |
| | Window Type + Split Unit Type .... | 20% | | | |
| | Others | 0 | | | |
| **Electrical Loads** | 100 - 200 amp | | | | |
| | 201 - 250 amp ! | 8% | | | |
| | 251 - 350 amp | 43% | | | |
| | 351 - 400 amp | 27% | | | |
| | More than 400 amp | 0 | | | |

Table 3: Components of the Typical Villa

| No. | Components | Dimensions/Specifications | Justifications (refer to the results) |
|---|---|---|---|
| 1. | Lot Area | 750 M2 | 1. Range 600-900 M2<br>2. Covers almost 68% of the built villas.<br>3. Recommended by Department of Planning for new areas. |
| 2. | Ground Floor Area | 300 M2 | 1. Range 200-400 m2<br>2. Covers almost 90% of the ground floor built area for residential buildings |
| 3. | First Floor Area | 300 M2 | 1. Range 200-400 M2<br>2. Covers almost 90% of the ground floor built area for residential buildings |
| 4. | Extensions | Garage + Ground Floor + Second Floor Extensions.<br>24 M2 for each extension | Covers almost 44% of the survey |
| 5. | Foundation:<br>Type:<br>Concrete<br>Steel | <br>Separate Footing<br>3500 psi<br>Uncoated steel | <br>All villas use separate foundation<br>Almost all the Villas use this psi<br>Almost all villas use this type of steel |
| 6. | Ground beams<br>Size<br>Concrete<br>Steel | <br>20x5O or 20 x 60<br>3500 psi<br>Uncoated steel | |
| 7. | Flooring:<br>Concrete<br>Steel | <br>2500 psi<br>20cm x 20cm | |
| 8. | Columns:<br>Size<br>Concrete<br>Steel | <br>20x50 or 20x60 cm<br>4000 psi<br>Uncoated steel | |

Table 3 (continued)

| | | | |
|---|---|---|---|
| 9. | Slabs:<br>Type<br>Concrete<br>Steel | <br>Hordi slab (30 cm)<br>3500 psi<br>Uncoated steel | |
| 10. | Internal walls<br>Type<br>Size | <br>Hollow masonry blocks<br>20 cm x 20 cm x 40 cm | |
| 11 | External walls<br>Type<br>Size | <br>Insulated masonry blocks<br>20 cm | **City Building Code** |
| 12. | Internal Doors | Wooden Doors | **The majority of villas are with wooden doors** |
| 13. | External Doors | Steel Doors | **The majority of villas are with steel doors**<br>**Environmental Factor** |
| 14. | Windows | Double Glass (6mm x 6mm x 6mm) | **The majority of villas are with these type of windows**<br>**Environmental Factor** |
| 15. | Wall Finish | Paint | **All Villas are painted** |
| 16. | Floor Finish | Screed & Marble | **Almost all the villas are using this type** |
| 17. | Ceiling Finish | Paint | **All villas have painted ceiling** |
| 18. | External Finish | Paint | **The majority of villas are painted** |
| 19. | Air Conditioning System | Split Units | |
| 20. | Electrical Loads | 300 Amp with 3 panel boards | |