

DEPARTMENT OF BUILDING
FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING
UNIVERSITI TEKNOLOGI MARA
(PERAK)

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It is recommended that the report of this practical training provided

BY

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ARCH

Accepted in partial fulfillment of requirement has for obtaining diploma in building

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STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references stated herein, prepared during a practical training session that I underwent at Jabatan Kerja Raya for duration of 5 months starting from 12 May and ended 29 September 2014. It is submitted as one of the prerequisite requirements of DBN307 and accepted as a partial fulfillment of the requirements for obtaining the Diploma of Building

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ABSTRACT

Aesthetic value is important for a building despite it may seem not important. Therefore, this report will be discussing about one structure that can improve the visual appearance of a building. This report was conducted at site project of Masjid Jamek Tapah. The objective of the report is to study the function of arches in construction, to determine the method construction for an arch and to identify the advantages and disadvantages of building an arch.

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CHAPTER 1: PREFACE

1.1 INTRODUCTION

Construction industry is upgrading day by day and a lot more beautiful structure are made and without realizing that it sometime give more disadvantages more than advantages. Arches is know for it simplicity and yet it used less material.

Typical arch seemed to be unpractical as nowadays building designed is highly demand with more modern style. A religious type of building such as mosque need to be keep it originality of islamic value. The uses of arch is much better to support the load at opening compared to the standard lintol.

Arch has many types and it applied depends on the types of buildng and the needs of the client. Arch usually built using brick with the arrangement of a semi-circle. For the case study, the arch is built with the reinforced concrete. On the other hand, arch could be found in assembling method that ready built in factory and ready to be transfer to site.

1.2 OBJECTIVE

This report is prepared to provide general construction of arches;hence the following objectives are as follow:

1.2.1 to study the function of arches in construction.

1.2.2 to determine the method construction for an arches.

1.2.3 to identify the advantages and disadvantages of building an arches.

1.3 SCOPE OF STUDY

The study of the arch took place at the ground floor of the mosque. This project is under the management of JKR Batang Padang itself. Mosque can be considered as a public building because muslim people used as a place to perform their prayers. The design of it need to be more attractive and more islamic. Thus, arch is the most suitable to increase it Islamic value because arch is very synonym with Islam architecture.

An arch is a structure or element that can be found at the external of a building that come in several types either in situ or precast. However the study is focused on the construction of the arch, the process of construction is a big deal to ensure the arch specification complies with requirement enacted. Hence, workmanship must be monitored frequently.

1.4 METHOD OF STUDY

1.4.1 Interview

Interview is the main method of the study for the cases involved. Interview in fact increases theoretical knowledge directly of the exact situation. This kind of method involved more than one person, the site supervisor, site engineer and the workers who work particular field itself. The information obtained is sufficient. Interview had been done with the supervisor of the site.

1.4.2 Observation

The second method involved in this study is observing visually and physically. Observation in advance, involving keep on eye the ;workmanship, the changes occurred, monitor the progress of the work, as for the arch observation is priority for tests conducted and construction works which require abstraction of decision to be taken into account.

1.4.3 Literature Review

Literature review is published information for specific topics through several mediums of reading materials. The information might be limited to particular year of its establishment therefore; the content might be irrelevant in the future. Despite of that, literature review gives clear ideas and information as it has been patterned in organized way that acts as a summary. Materials such as journals, online resources, and books give broader information.

CHAPTER 2.0 : COMPANY BACKGROUND

2.1 INRODUCTION

JKR Batang Padang firstly establish under the name of 'PERAK SOUTH PWD' in 1895 led by Ir. Glashan. In March 1934 PB Small Office Batang Padang PWD (PWD South Perak) established in downtown.

After the second world war when the British administration regained control of the Malay land, a total of 15 engineers have interchangeable heads 'PWD SOUTH PERAK' around the year 1946 to the year 1961. Even Malaya achieved independence in 1957, only in 1961 headed by PWD South Perak Malaysians, Ir. Hooi Yeap Eng.

In 1963, PWD South Perak, when the district engineer Ir. A. Navaratham, got its own building in the early 1980s Road. Tapah PWD name was changed to JKR Daerah Batang Padang. In 1993 Small Office Division Tanjong Malim was transferred to Slim River.

In 1998 under the District Engineer Ir. Tuan Tuan Lah Bin Mat and Ir. Hj. Yusoff Bin Abdul Hamid was planning the construction of a new building on Jalan Kelab Tapah . the building was completed in 2002 and officially opened by DYMM Paduka Seri Sultan Perak Darul Ridzuan on June 8, 2004.



Figure 2.1 the office of JKR Batang Padang

Batang Padang District is located in the South is the second largest district in the state of Perak. This area is 274.548 ha (2,712 square miles) of 13% by area of Perak.

The area is divided into the 6 District Chenderiang, Batang Padang, Bidor, Sungkai, Slim & Ulu Bernam.

Batang Padang district contains two of the District Council Majlis Daerah Tapah, Majlis Daerah Slim River & Majlis Daerah Tanjung Malim

2.2 ABOUT COMPANY



Figure 2.2 JKR logo

2.2.1 Objective

Preparing infrastructure and public utility especially road, water supply, airport, harbor and base to fulfill the nation development by giving full attention to :

- Shortest possible period of time.
- Economical cost.
- Appearance of best quality.
- JKR perak prepare to help client realize the based information.

2.2.2 Mission

- Help client realize base information and providing service by working together as strategic partner.
- Provide service in asset management also effective and innovative project.
- Working hard toward giving better environment quality for the staff.
- To stabilize the competition of engineering.
- Integrity as priority in providing service.

- keeping harmony relationship between people.
- Preserving environment in the services given.

2.2.3 Vision

- Become a world-class service provider and excellent center in asset management and engineering for development of country based on creative and innovative human capital with the help of latest technology.

2.2.4 Function

- Planning, inspecting, designing and implement of infrastructure facilities.
- Maintenance of infrastructure.
- Providing advice about technical matters to the government, local authorities and statutory bodies.
- Where the need to carry out infrastructure.

2.3 COMPANY PROFILE

Table 2.1 JKR Batang Padang company profile

Title	Description
Name of company	Jabatan Kerja Raya Daerah Batang Padang
Headquarters	Pejabat Jurutera Daerah, JKR Batang Padang, 35000 Tapah, Perak, Malaysia
District engineer	Noor Azman bin Mastor
Total employees	55 employees
Website	http://btp.jkrperak.gov.my/
Tel	
Fax	
Email	bpadang@jkr.gov.my

2.4 ORGANIZATIONAL CHART

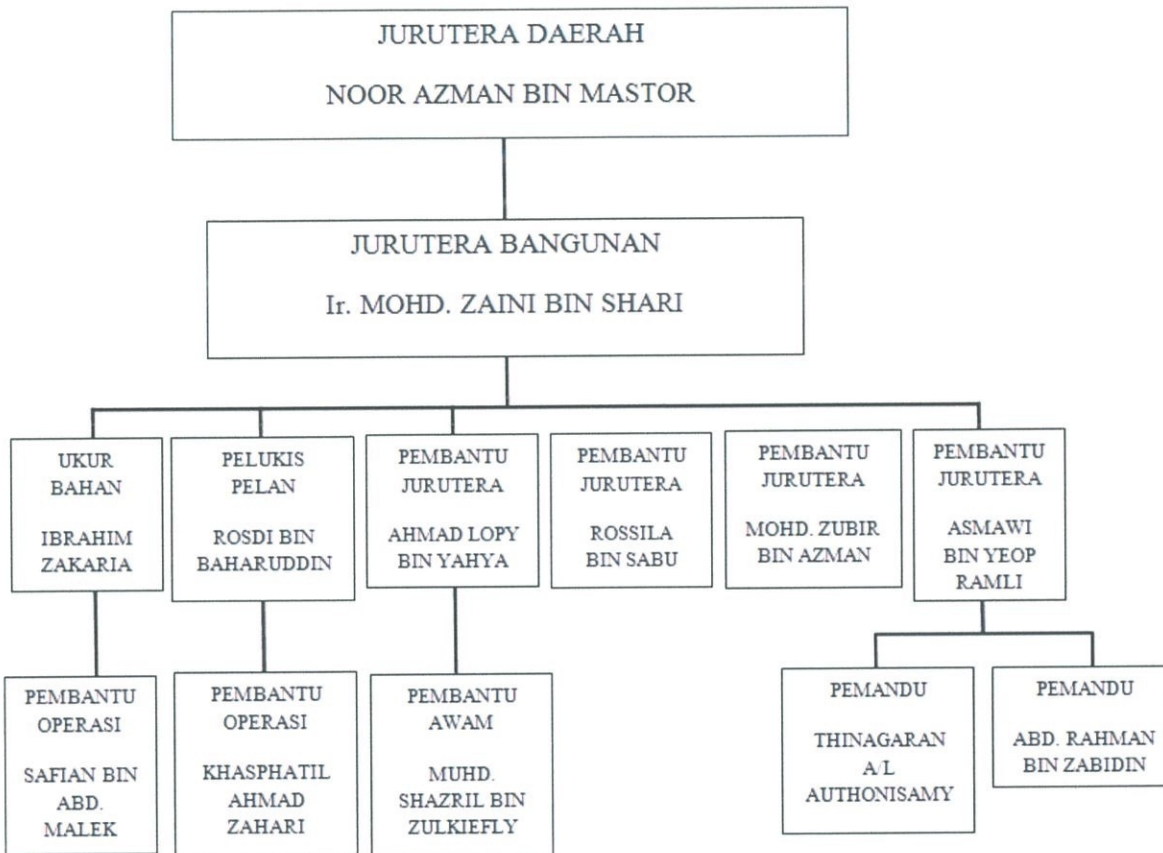



Figure 2.3 Organization chart for building department of JKR Batang Padang

Source: JKR Batang Padang (2014)

2.5 PROJECT LIST

CURRENT PROJECT

Table 2.2: Table of ongoing project

	Title	Location	Cost	Date	Owner
1	 <p>Figure 2.4 Masjid Jamek Tapah (2014)</p>	Jalan Tapah, Tapah, Perak Darul Ridzuan.	RM 55 million	Start : 8 march 2013 finish : 18 september 2014	Jabatan Kerja Raya Perak

CHAPTER 3.0 CASE STUDY

3.1 INTRODUCTION

There is various type of arches design. There are more complex arch shape which require more skill to construct but arches are only constructed when specific architectural features are required to enhance the aesthetic appearance of a building. The numerous types of arches allow a great variety of architectural models. Traditionally used to cover limited spaces, they are perfectly well-suited to build much larger spaces. Thus, they can meet the needs of any building programme, public or private, low-cost or quality housing, granaries, warehouse, shops, school, public, religious buildings, etc.

Arches can provide a good solution for covering all kind of building of all sizes. However their acceptability and suitability to genuine needs and local climatic conditions cannot always be taken for granted. This means that preliminary surveys are required. These enable one to choose the correct option and select suitable technical solutions. In order to ensure that structures are well designed and well built.

An arch is also synonyms in islamic design of building any structure. That's why with the masjid jamek project an arch is build around the building to increased its islamic characteristic. on the masjid jamek project the arch can be seen on the first floor and ground floor. on the ground floor the arch is used for opening while on the first floor it is used for the window as the element is added to the mosque it look more attractive.

3.2 ABOUT ARCHES

Uses of arches.

- To bridge an opening in a wall..
- Repeating an arches resting on pillars, one can obtain arcades, which allowe one to create very open covered spaces.
- Can be used to lighten the masonry structure or simply for decorative purposes.

Materials for arches.

With the arches is build in a building, it can highlights the ptential of the builing. A quality type of material is needed to make sure the building of an arches is at the best. It is also to ensure that the arch can last longer without damaging it appearance or collapse. With the modern technologies nowadays many new material are produce and available in the marketplace.

Materials for arches can be divide into two type

Solid components : stone, adobe block, stabilize compressed earth block, plain molded cement block, fired solid brick.

Binder components : earth mortar, stabilize earth mortar, lime-sand mortar, cement-sand mortar, gypsum mortar.

Surface protection

Because arch usually can be found at the external area of a building, so the risks of it to detoriare is high. In order to avoid from it to happened it must be protected form rainwater or anyt other element that can caused it. His action can be take by either using water spouts or downpipes.

Economic considerations

The type of design, the technique used, size of the structure, type of material and the type of surface protection used can affect the cost of building an arches. Sometimes, material used for constructing an arch can cost highly. Tuhs, to balance the cost, a material with reasonable price need to be selected but at the same time need to provide the highest quality.

Arches can be built not only for high quality building but also can for low-cost housing programmes. This because for the many possibilities of forms, sizes and type of finishing that can enable the highest attraction spaces to be created.

Method of building

Although arch seem simple, but in reality it need special technique to build. The most important thing is it formwork. For building an arch, the formwork of the same size for it inner section is important. It can be build by wood or metal and should be made so that it can be easily removed.

There is a type of arch that the formwork can be removed as soon after it construction, making the arch with the same shape and size can be constructed immediately. It is more economical and strategic to build a precise and strong formwork to ensure that it can be reused more than one time.

Research and development

Arches is a usual structure that is used for a building and it also well known for it simple design yet can create a beautiful sight. Even though it is already well known, research and development programmes are still being carried out focusing on this following four ideas:

- 1- Systematic identification of models and types, and the various ways of using them;
- 2- Suitable tools to substitute for the know-how of traditional builders;
- 3- Perfecting simplified methods of calculation;
- 4- Techniques to protect it from weather element that can cause damage such as : waterproofing, runoff, surface maintenance.

Quality

With the arches is build in a building, it can highlights the potential of the building. A quality type of material is needed to make sure the building of an arches is at the best. It is also to ensure that the arch can last longer without damaging it appearance or collapse. With the modern technologies nowadays, many new material are produce and available in the marketplace.

Architectural appearance

Arches offer a very great number of architectural possibilities with a more or less typical and attractive character. These depend on the materials and models used, the methods of utilization, and finally the building techniques which arc linked to them. The architectural aspect is one of the principle vectors of cultural and social acceptability of a technology.

3.3 Background Of The Project



Figure 3.1: Image of Masjid Jamek Tapah in construction

The mosque was once already built but the size was too small. JKR took over the project with the hope of building it bigger so that more people can be fit inside it. The project strategically located at the middle of Tapah nearby the Batang Padang river and also located at the main road that can be easily seen by people passing by. This new mosque will consist of two storey space and bigger parking facilities.

Leader parties involved in this project were JKR itself and Encik Ahmad Lopy bin yahaya as the person who is fully in charge of the project and ZA (Malaysia) sdn.bhd. as the contract or involved with the project. a modern style of building is choice for the design of the building and the Islamic aspect of the building is still the main features. The design was chosen for it to stay parallel with modern world nowadays.

The Arch Applied For the Case Study

In the case study, one of the items that will be included is the details of the construction of building structure at the one of the construction site which is in Jalan Besar Tapah. The type of building structure that is used for this case study is arch. The number of worker involved is two and the construction of arch is at the opening on the ground floor and first floor of the mosque. The period of the works takes approximately 1 week.

There are several stages involved in constructing the arches which are:

- i. Bending the reinforcement bar.
- ii. Cutting and building the formwork.
- iii. The placement of the starter bar.
- iv. The placement of stands.
- v. Placing the formwork and bended reinforcement bar.
- vi. Putting another case of formwork.
- vii. Taking off all the formwork.
- viii. Final inspection.

3.4 Method of Arch Construction


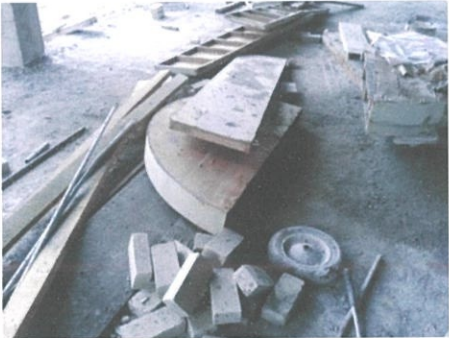
PICTURE	DESCRIPTION
 <p data-bbox="151 869 670 958">Photo 3.1 The bending of reinforcement bars.</p>	<ul style="list-style-type: none"> • Reinforcement bar is needed in the making of arches so that it can support the load that is being transferred from upper level. • The bar need to be bent according to the specification of the drawing. • Reinforcement bar also help to reinforce the concrete.
 <p data-bbox="194 1426 633 1460">Photo 3.2 The formworks is built.</p>	<ul style="list-style-type: none"> • Formwork is needed to keep the shape of arches when the concrete is ready to be poured. • Important component in the building of the arch.



Photo 3.3 The placement of starter bars.

- Before any work is begin, starter bar is needed at specific location of the building according to drawing.
- The starter bar must be installed during the process of building the column.



Photo 3.4 The stands being placed.

- A few stand need to be prepared for the placement of the formwork.
- The purpose of the stand is to support the formwork during the pouring of concrete to make sure that the size, shape and the dimension of the arch is according to specification of drawing.



Photo 3.5 The reinforcement bars and formworks is place together.

- After all of the early work has already finished , all the formwork and the bended reinforcement bar need to be place neatly on top of that.
- The reinforcement bar need to be tied neatly so that it can provide greater strength in supporting the load that will be transmitted.



Photo 3.6 Another case of formworks for the concrete pouring.

- When the formwork is firmly placed and all the reinforced bar has been tied another case of formwork is placed which later a concrete is poured into it.



Photo 3.8 Left for several days.

- The formwork will be left for 3 days until it completely dry and a certain degree of strength is achieved.



Photo 3.8 Took off the formworks.

- After 3 days, one by one of the formwork is took off. This process is important because some of the nail sometime stuck to the finished arch and if being pulled forcefully it can caused a damage.



Photo 3.9 Final inspection.

- After that, a final inspection is done to check the arch condition if it got any crack or other defects.

3.5 Advantages and Disadvantages

3.5.1 Advantages

1. Strongest shape with the least amount of material.
2. Can use single individual modules of materials like brick and stone.
3. Used to span a distance that straight stone spans could never do.
4. Uses the compressive strength of stone and gravity to allow it to bridge large expanses without the tensile limit presented by the material itself.
5. Great aesthetical potential.

3.5.2 Disadvantages

1. Curve makes it difficult to erect and also if you are using steel or concrete you have to form the pieces to fit the curve.
2. High cost for labour.

The techniques must be mastered and the technology need to be study carefully and also need to be update with modern construction industry to make sure that the arches can be still be used with more advances building.

CHAPTER 4.0 SUMMARY AND RECOMMENDATION

In conclusion, the objective of an arch is only to be used as an aesthetic factor to make the building look more attractive and also it can save from the overused of material. The arches in advance come in various types either in situ or precast. Arch is commonly built at mosque so that it can increase the Islamic value.

Next, even the arches look like it can be simply built but it consists of several stages before it took shapes. It begin with making the arch-shaped reinforcement bar, the arch formwork, the installation of the starter bar at designated location for the arch, the placement of the stand to provide support for all the component, the tying of the reinforcement bar with the formwork, covering it with another case of formwork for pouring of concrete and taking off the formwork and also final inspection.

Problem always happened in construction industry. Mistakes can be caused by environmental factor, miscalculation and poor planning. For example, a crack can be seen at a few of the arches as the cause of wrong grade of concrete is used. It might be small problem but it can cause serious damage toward the structure as it can collapsed along with the member that it support on the above. It also can cause great loss for the construction.

It is recommended that every building should use arch because of it low material usage and the high aesthetic value as mentioned throughout the report. It will make the building more unique instead of typical rectangular opening.

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