



اَبُو سَيِّدِي تَيْكُو لُو كِي مَبَارَا  
UNIVERSITI  
TEKNOLOGI  
MARA

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

**OCTOBER 2012**

It is recommended that the Practical Training Report is provided

**By**

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**title**

**Preliminary Construction of Reservoir Water Level Control**

Accepted in partial fulfillment of the requirements for obtaining a Diploma in Building.

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**OCTOBER 2012**

**STUDENT'S DECLARATION**

It is with this, the work of Practical Training Report was produced entirely by me as disclosed through practical exercise that I did for five months from May 16 2012, to October 6 2012 in company Taliworks Corporation. It is also as one of the conditions of DBN307 to pass the course and received in partial fulfillment of the requirements for obtaining a Diploma in Building.

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Thank you.

## ABSTRACT

This report briefly describes the processes and methods involved in the preliminary construction of a reservoir water level control. It was developed based on the experience of a five-month detention at a construction site. This report is divided into several parts and started with the title report, objectives, company background and construction project background. The title of this report is the preliminary construction of water reservoir level control and the objective is to identify the preliminary construction methods for reservoir level control. The company background will explain some things about the company where the practical training of students placed. It will start with an introduction followed by objectives, information on companies and managers, organizational charts and concluded with a list of completed projects and undergoing projects. The construction project background will be discussed and explained in detail that describes the selected topic and all the resources only available from the project site. All information obtained from observations, questions and actions that have been made for five months. It is placed in Chapter 3 for attention. In this report, the writer will describe in more detail about the construction of a reservoir level control. Observations found that preliminary construction work for water reservoir level control is not easy as it thought. It involves many parties and complex construction processes and should have specialists in the construction. In conclusion, it is hoped that this report can be explained in more detail to the readers about the preliminary construction of water reservoirs level control.

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## **LIST OF ABBREVIATIONS**

UiTM	Universiti Teknologi MARA
SDN. BHD.	Sendirian Berhad
SEASAF	South East Asian Strategic Assets Fund
ASEAN	Association of Southeast Asian Nations
MPSC	Mengkuang Pumped Storage Scheme
KeTTHA	Kementerian Tenaga, Teknologi Hijau dan Air
NONEL	Non-Electric Detonator
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
MS Plate	Mild Steel Plate
OPC	Ordinary Portland Cement
ANFO	Ammonium Nitrate Fuel and Oil

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 INTRODUCTION**

In Malaysia, the construction sector is one of sectors that contribute to the economy. Understanding and cooperation between various parties in the industry is very important to determine the quality of construction work. Due to the increase in population in Malaysia, the water is very important to meet the needs of the people of Malaysia. To improve water resource needs, the construction of the dam is needed to increase water capacity in the country. Thereby, reservoir water level control with dams is built to control the water storage.

A reservoir, artificial lake or impoundment from a dam is used to store water. Reservoirs may or can be created in river valleys by using the construction of a dam or may be built by excavation in the ground or also by conventional construction techniques such as brickwork or cast concrete. There are 3 types of water reservoir; valley dammed reservoir, bank-side reservoir and service reservoir.

##### **1.1.1 Valley Dammed Reservoir**

A dam constructed in a valley relies on the natural topography to provide most of the basin of the reservoir and dams are typically located at a narrow part of a valley downstream of a natural basin. The valley sides act as natural walls with the dam located at the narrowest practical point to provide strength and the lowest practical cost of construction. In many reservoir construction projects people have to be transferred and re-housed, historical artifacts moved or rare environments relocated.

Construction of a reservoir in a valley will usually requires the diversion of the river during part of the build often through a temporary tunnel or by-pass channel. In hilly regions, reservoirs are often constructed by enlarging existing lakes and sometimes in such reservoirs the new top water level exceeds the watershed height on one or more of the feeder streams. Additional side dams are required to support the reservoir. A number of smaller reservoirs may be constructed in a chain if the topography is poorly suited to a single large reservoir.



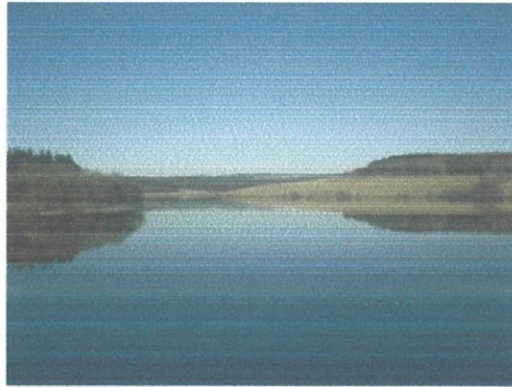
**Figure 1.1** Example of Valley Dammed Reservoir in California, US.

Source: Wikipedia

### **1.1.2 Bank-side Reservoir**

Bank-side reservoirs may be constructed to store the water pumped or siphoned from the river if the water is taken from a river of variable quality or quantity. Reservoirs are usually built partly by excavation and partly by the construction of a complete encircling bund or embankment which may exceed 6 km in circumference. Both the floor of the reservoir and the bund must have an impermeable lining or core, often made of puddle clay and the water stored in such reservoirs may have a residence time of several months during which time normal biological processes are able to substantially reduce many contaminants and almost eliminate any turbidity.

Bank-side reservoirs allows a water abstraction to be closed down for extended period at times when the river is unacceptably polluted or when flow conditions are very low due to drought.



**Figure 1.2** Example of Bank-side Reservoir in Lancashire, England.

Source: Wikipedia

### **1.1.3 Service Reservoir**

Service reservoirs store fully treated potable water close to the point of distribution and many of service reservoirs are constructed as water towers, often as elevated structures on concrete pillars where the landscape is relatively flat. Other service reservoirs are entirely underground which is especially in more hilly or mountainous country.

Service reservoirs perform several functions including ensuring sufficient head of water in the water distribution system. It is also provide hydraulic capacitance in the system to even out peak demand from consumers enabling the treatment plant to run at optimum efficiency. Large service reservoirs can also be handled to so that energy costs in pumping are minimizing by concentrating refilling activity at times of day when power costs are low.



**Figure 1.3** Example of Service Reservoir at Tampines Road.

Source: Wikipedia

## 1.2 OBJECTIVE OF STUDY

- To investigate the preliminary construction works of the reservoir water level control.

## 1.3 SCOPE OF STUDY

My scope of study about dam is the preliminary construction of draw-off tower, tunnel and valve house which is these three components is connected to each other. These three components are important in dam construction as it control the reservoir water level. It is usually constructed at the end of dam embankment. Draw-off tower is a tower which is act as to control the reservoir water in case of flood or so called input. It is located at the upstream side while the valve house is located at the downstream side where the valve house is the output. They connected each other through the draw-off tunnel that has been constructed underground. The function of the valve house is to control the water flow that came from the reservoir water to be flown to the river nearby. In this report, I have collected data and information about these three preliminary constructions.

#### 1.4 METHOD OF STUDY

I have used several methods to get accurate information. The method I have been using is by internet, observation, data record and interview.

a) Internet

Besides reading books and journaling, internet is one of my methods in order to understand more about the topic that I want to focus.

b) Observation

Another method is observation where I will go and observe in project site.

c) Data record

In order not to forget from what I have learned in site, I took pictures for data record.

d) Interview

I have interviewed peoples to get the information about dam construction and reservoir water level control.

## **CHAPTER 2**

### **COMPANY BACKGROUND**

#### **2.1 INTRODUCTION**

Taliworks Corporation Berhad (“Taliworks” or the “Company”) incorporated in Malaysia on 6 August 1965 as a private limited company under the name of The Carpet Manufacturing Company (Malaysia) Limited. On 12 November 1968, its name changed to F&T Carpets (Malaysia) Sdn Bhd. and on 26 February 1974, it was renamed Carpets International Malaysia Sdn Bhd. On 23 December 1982, it was converted into a public company and assumed the name of Carpets International Malaysia Berhad (“Carpets”).

It was subsequently listed on the Second Board of the Kuala Lumpur Stock Exchange (now known as Bursa Malaysia Securities Berhad (“Bursa Securities”)) on 27 July 1992. The principal activities of Carpets were the design, manufacture, distribution and laying of carpets and rugs. These operations ceased in 2002.

On 31 July 2000, Carpets completed the acquisition of the entire equity interest in Sungai Harmoni Sdn Bhd and Taliworks (Langkawi) Sdn Bhd. These companies are involved in the management, operations and maintenance of water treatment, supply and distribution facilities and on 27 October 2000, the Company was transferred to the Main Board of Bursa Securities (which has since been merged with the Second Board into a single board known as Main Market) and subsequently on 24 November 2000, Carpets was renamed Taliworks Corporation Berhad.

Together Taliworks with its group of companies employs about 450 staff and contract workers in Malaysia and the People’s Republic of China and the company is currently listed on the Main Market of Bursa Securities under Trading / Services Sector (Name



&Code:TALIWRK& 8524) with a market capitalization of approximately RM625 million as at 31 December 2009.

In 2005, Taliworks issued 70,440,000 warrants 2005/2010 pursuant to a renounceable rights issue which entitles the holders to subscribe for new shares in Taliworks and the warrants are listed on Bursa Securities (Name & Code: TALIWRK-WA & 8524WA). Warrants not exercised will lapse and cease to be valid on 21 September 2010.

The Company then issued RM225,000,000 nominal amount of 2.25% unsecured convertible bonds 2007/2012 for business expansion, repayment of borrowings and general working capital purposes in 2007. The bonds, rated AA3 by RAM Rating Services Berhad, are not listed on any stock exchange.

Taliworks Corporation Berhad ("Taliworks") is listed on the Main Board of the Bursa Malaysia Securities Berhad under Trading / Services Sector (Name & Code: TALIWRK & 8524) with a market capitalization of about RM800 million as at 31 December 2007. (internet)

Source: <http://www.taliworks.com.my>



**Figure 2.1** Taliworks Corporation Berhad Logo

## 2.2 COMPANY PROFILE

Today, Taliworks Corporation Berhad is an established company involved in water and waste-related businesses and has expanded its core expertise to include highway management, construction and engineering, and wastewater research and technology.

Taliworks Corporation Berhad started out in the water management sector in 1987 as a pioneer in the privatization of the water supply in Malaysia. Today, the water business still leads as the main core business activity of the Group and since 2004, the Group has diversified its business interests to include the waste management segment in China and toll operations and highway management in Malaysia through a few strategic acquisitions.

Taliworks Corporation Berhad core water business is in privatized water supply sector which includes an operation and maintenance contract (expiring in 2030) for the Sungai Selangor Water Treatment Works Phase 1 (“SSP1”) that supplies to large parts of Selangor and Kuala Lumpur and a concession (expiring in 2020) for the water supply and distribution system in Langkawi, Kedah and the Group currently manages a total of 6 water treatment plants with a combined capacity of 1,039.5 million liters per day.

The Group holds a 21-year concession rights for the operation and management of the Tianjin Panlou Life Waste Transfer Station and its related assets in the city of Tianjin, China in the waste management business sector. The concession, held through a 90% owned subsidiary, Tianjin- SWM (M) Environment Ltd, Co and expiring in 2025, grants rights to this company to transport household waste deposited at the transfer station to the municipal landfills. In return, they collect tipping fees from the local city council for services provided.

Other than being involved in solid waste management, the Group is also engaged in the wastewater sector through its indirect holding of a 56% stake in Puresino

(Guanghan) Water Co. Ltd which manages and operates the 50 million liters per day Guanghan San Xin Dui wastewater treatment plant in Sichuan, China for a 30-year concession expiring in 2033, a 70% stake in a build-operate-transfer project comprising a 50 million liters per day recycled water treatment plant which is being constructed in Ningxia, a 100% stake to undertake the operation of four existing municipal waste water treatment plants with recycled water facilities with a treatment capacity of 300 million liters per day in Yinchuan, 70% stake in a wholly-owned foreign enterprise to be incorporated to undertake the design, construction, operations and maintenance of an industrial waste water treatment and recycled water plant and water piping in Ningxia, China.

In 2007, Taliworks acquired a 55% stake in a jointly controlled entity, Cerah Sama Sdn Bhd (“Cerah Sama”). Cerah Sama is the holding company for Grand Saga Sdn Bhd that owns and operates the Cheras - Kajang Highway concession until 2027. The acquisition was made in collaboration with the South East Asian Strategic Assets Fund (“SEASAF”) where Cerah Sama is positioned to be the flagship vehicle through which both parties will engage in the business of developing and operating toll roads in Malaysia and the ASEAN region.

Other than the above-mentioned businesses, the Group is also undertaking the construction of the Padang Terap Water Supply Scheme in Kedah. It just completed the Klang Valley Flood Mitigation-Package Sungai Damansara project in Selangor.

Currently, the water business in Malaysia accounts for the bulk of revenue and profitability of the Group and they intend to increase its revenue contribution significantly from overseas ventures to diversify its earnings base and geographical risk. The Group remains focus on its core business activities whilst seeking to acquire further strategic investments both domestically and in the foreign markets so as to re-position itself as a formidable and respected service provider for water, waste management and infrastructure businesses in the region.

Today, the Group has business presence in Selangor, Kedah, Tianjin, Sichuan, Ningxia, Shanghai and most recently in Pulau Pinang doing dam expansion project.

(Source: <http://www.taliworks.com.my>)

**Table 2.2** Company Background

<b>NO</b>	<b>MATTER</b>	<b>COMPANY INFO</b>
<b>1</b>	Company Name	Taliworks Corporation Berhad
<b>2</b>	Date of Incorporation	(6 August 1965) The Carpet Manufacturing Company (Malaysia) Limited.  (12 November 1968) F&T Carpets (Malaysia) Sdn Bhd.  (26 February 1974) Carpets International Malaysia Sdn Bhd.  (24 November 2000) Taliworks Corporation Berhad
<b>3</b>	Address	28, Jalan Wan Kadir 1, Taman Tun Dr. Ismail, 60 000, Kuala Lumpur.
<b>4</b>	Telephone No.	
<b>5</b>	Fax No.	03-77257099
<b>6</b>	Types of Work	Involves in; Water management Wastewater management Waste management Highway management Construction & Engineering

Source: Company Profile

## **2.3 GROUP CORPORATE STRUCTURE**

### **TALIWORKS CORPORATION BERHAD (6052-V)**

#### **SUBSIDIARY COMPANIES**

##### Malaysia Operations

- Air Kedah Sdn Bhd (580916-M)
- Sungai Harmoni Sdn Bhd (254154-U)
- Taliworks (Langkawi) Sdn Bhd (322951-H)
- Taliworks Technologies Sdn Bhd (622939-T)
- SWM Technologies (Malaysia) Sdn Bhd (650594-T)

##### International Operations

- Taliworks (Sichuan) Limited
- Taliworks (Shanghai) Co., Ltd.
- Taliworks International Limited
- Puresino (Guanghan) Water Co., Ltd.
- Tianjin – SWM (M) Environment Ltd., Co
- Taliworks – IBI Technologies (Xiamen) Limited
- Taliworks– IBI Technologies International Limited
- Taliworks (Xiamen) Environmental Technologies Co. Ltd.

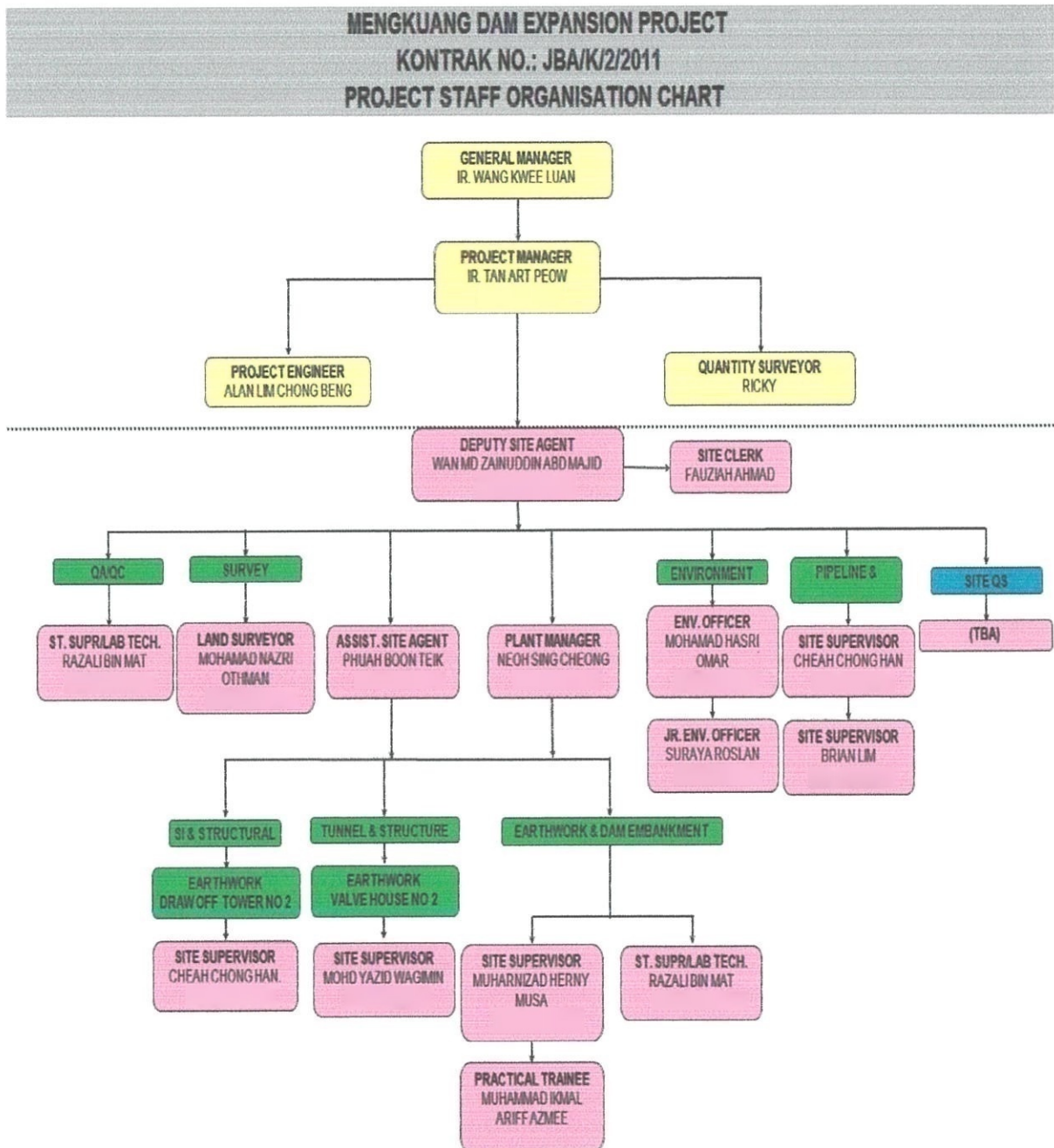
#### **ASSOCIATED COMPANIES**

- Hydrovest Sdn Bhd (482724-D)
- C.G.E. Utilities (M) Sdn Bhd (314890-D)

#### **JOINT-CONTROLLED ENTITIES**

- CerahSama Sdn Bhd (315282-P)
- Trupadu Sdn Bhd (619282-X)
- Grand Saga Sdn Bhd (221844-T)

## 2.4 ORGANISATION CHART FOR MENGGUANG DAM PROJECT



**Figure 2.3** Organization Chart

Source: Company Profile

## **2.5 LIST OF PROJECT**

### **Water Management**

- Sungai Selangor Phase 1 (SSP 1)
- Langkawi Operations
- Laboratory Services

### **Wastewater Management**

- San Xin Dui Wastewater Treatment Plant ("WWTP")

### **Waste Management**

- Tianjin Panlou Life Waste Transfer Station

### **Highway Management**

- Cheras – Kajang Highway

### **Construction & Engineering**

- Padang Terap Water Supply Project
- Central Kedah Water Supply Project
- Package Sungai Damansara
- Mengkuang Dam Expansion Project

## CHAPTER 3

### CASE STUDY

#### 3.1 INTRODUCTION

Mengkuang Dam is a dam located less than 28 km to the north-east of Butterworth town. It is the only dam situated in Province Wellesley (Penang Mainland) and the second dam built in Penang after Ayer Itam dam. It was officially opened by the former Governor; Dr. Tun Awang bin Hassan in 1985. It has the water catchment area of 3.9sq km and a gross storage capacity of 23.6 billion liters makes it the largest dam in Penang, almost 10 times the capacity of the Air Itam Dam. Mengkuang Dam will be close to the public starts on August 1<sup>st</sup> 2011 until July 31<sup>st</sup>, 2016 for enlargement and renovation.



**Figure 3.1**Existing Mengkuang Dam



## 3.2 PROJECT BACKGROUND

**Table 3.2** Project Background of Mengkuang Dam Expansion Project

3.2.1 PROJECT INFO	
<p>The Mengkuang Dam Expansion project is located at Jalan Sungai Lembu, 14000 Bukit Mertajam, Pulau Pinang. The project shall commence and complete within 60 months to meet the requirements of increasing water demand in the state and to improve water supply infrastructure for the state. The objective of the project is to increase active storage capacity of dam to 73.5 x 106 m<sup>3</sup>, to increase raw water supply capacity of Mengkuang Pumped storage Scheme (MPSC) and to meet expected raw water demand of Penang State by 2020.</p>	
Date of Commencement:	1st August 2011
Completion Date (Stage 1 - Dam 2) :	31st January 2015
Completion Date (Stage 2 - Dam 1) :	31st July 2016
3.2.2 CONTRACT INFO	
Name:	MENGGUANG DAM EXPANSION PROJECT, PULAU PINANG – CONSTRUCTION OF DAM AND ASSOCIATED WORK FOR KEMENTERIAN TENAGA, TEKNOLOGI HIJAU DAN AIR (KeTTHA)
Owner:	PENANG STATE GOVERNMENT
Implementing Agency:	KEMENTERIAN TENAGA, TEKNOLOGI HIJAU DAN AIR (KeTTHA)
No:	KeTTHA/JBA/03/11
Form of Contract:	PWD FORM 203A (Rev 2007)
Letter of Award:	KeTTHA:JBA (S) 601.400/05/1 Jld 5 (7)
Site Possession Date:	1st August 2011
Completion Date:	31st July 2016
Contract Duration:	60 months from site possession date

Defect Liability Period:	24 months from the date of CPC
LAD:	Total amount of chargeable LAD shall not exceed 10% of Contract Sum
Contract Sum:	RM 607,000,000.00
Owner's Requirements:	Performance Bond (5% of Contract Sum) or Performance Guarantee Sum whereby 10% of each interim payment shall be deducted until total amount deducted aggregate to a sum equivalent to 5% of the Contract Sum

Source: Company Profile

### 3.2.3 LIST OF SUBCONTRACTORS

**Table 3.3** Lists of Subcontractors

NO.	SUBCONTRACTOR	SCOPE OF WORKS
1	ENVIRONMENTAL SCIENCE SDN. BHD.	<ul style="list-style-type: none"> <li>River Diversion and Environment Management Plan</li> </ul>
2	CARITA SDN. BHD.	<ul style="list-style-type: none"> <li>Soil Investigation Works</li> </ul>
3	ILMIAH PERDANA SDN. BHD.	<ul style="list-style-type: none"> <li>Site Clearance, Stripping of Top Soil and Contaminated Soil</li> <li>River Diversion, Care of Water and Environmental Compliance (Earthwork Only)</li> <li>Draw Off Tower No 2</li> <li>Access Road, Reservoir Perimeter Road, Drainage and Slope Strengthening Works</li> </ul>

- Draw Off Tower No 2 (Slope Protection Work Only)
- 4 **BINAGROUT SDN. BHD.**
- Access Road, Reservoir Perimeter Road, Drainage and Slope Strengthening Works (Slope Protection Works Only)

5	<b>MAJU ALFA SDN. BHD.</b>	<ul style="list-style-type: none"> <li>• Site Clearance, Stripping of Top Soil and Contaminated Soil</li> <li>• River Diversion and Care of Water (Temporary Works for Control of Water)</li> <li>• Spillway (Earthwork Only)</li> <li>• Draw-Off Tower No 1 (Earthwork Only)</li> <li>• Draw-Off Culvert &amp; Valve House No 1 (Earthwork Only)</li> <li>• Access Road, Reservoir Perimeter Road and Drainage</li> </ul>
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- 6 **OTA TUNNEL SQUAD SDN. BHD.**
- Draw Off Tunnel Works

7	<b>TEKNOLOGI PRIMA JAYA SDN. BHD.</b>	<ul style="list-style-type: none"> <li>• Soil Investigation Works</li> <li>• Dam Instrumentation</li> </ul>
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- 8 **TALIWORKS CORPORATION BERHAD**
- Dam Embankment
  - Valve House No. 2

9	<b>G &amp; P PROFESSIONAL SDN BHD</b>	<ul style="list-style-type: none"> <li>• Dam Break Analysis</li> </ul>
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Source: Company Profile

### **3.3 CASE STUDY**

Reservoir water level control is the main structure that controls the flow of reservoir water and controls the height of the reservoir water which is to prevent the water exceeds the peak level of dam. The reservoir water level control consists of three main parts which is the input, draw-off tower, draw-off tunnel, and valve house as the output.

These three developed separately for each part has distinct manner and the construction process itself. The parts were built simultaneously also a desire to save time and costs. In this case study, the preliminary construction for these three are isolated part by part to facilitate the learning process of the writer and reader. The preliminary construction for this reservoir water level control is explained below.

Draw-off tower, draw-off tunnel and valve house is the main structure for the reservoir water level control. These three structures are connected to each other through the draw-off tunnel located underground. Reservoir water level control is often built at the end of dam. This is because it simplifies the process of maintenance and secure from public entering the restricted area. In order to build the reservoir water level control, preliminary construction is needed.

### **3.4 DRAW-OFF TOWER**

Draw-off tower is a structure supporting water tank constructed at a desired height to pressurize a water supply system for the distribution of the reservoir water. Pressurization occurs through the hydrostatic pressure of the elevation of water, which is to operate and provide for most domestic water pressure and distribution system requirements.

Different of materials can be used to construct a draw-off tower; steel and reinforced or prestressed concrete are most often used. It is to protect the water from any referral from the lining material. The reservoir in the draw-off tower may be spherical,

cylindrical, or an ellipsoid, with a lowest required height of approximately 6m and a minimum of 4m in diameter. A standard height for draw-off tower is approximately 40m.

### **Purposes of Water Supply**

The uses of the water supply need to have water pressure to maintain the safety of the water supply. If a water supply is not pressurized sufficiently, several things can happen:

- Water may not reach the upper floors of a building
- Water may not spray from a tap with sufficient flow

The uses of the draw-off tower are to provide a reservoir of water so that the demand user and supply can be flown out. It is also to provide a constant pressure head to drive water through the system.

## Preliminary Construction Involved

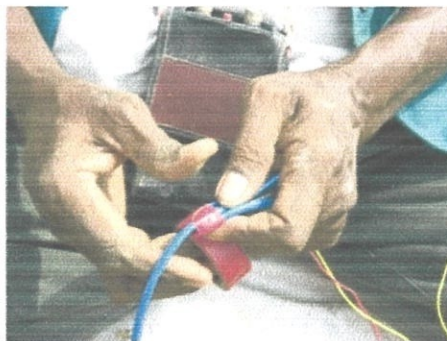
### 3.4.1 Hard rock Blasting

- 1) Take a suitable NONEL for blasting. The NONEL then is wired by competent worker. Before doing the wiring, make sure that all equipment and materials are in safe condition. Make sure that the workers are wearing proper PPE. Inspection the blasting area is done before the blasting work can be start. Make sure that the blasting work is done according to schedule that has been given.



**Figure 3.2** Worker is holding a wire for NONEL.(Draw-off tower)

- 2) The wiring is properly arranged, carefully done and safe. Before blasting commences ensure that all hoses are run tidy and neat. Tape is used where the hoses cross any walkways.



**Figure 3.3** Worker is connecting the wires.(Draw-off tower)

- 3) After that, put the explosive material into the drilled rock. This picture is showed that the explosive material is covered by cotton as it want to prevent the explosive material from wet that will cause it to misfire during blasting.



**Figure 3.4** An explosive materials attached into the rock.(Draw-off tower)

- 4) Mark the rocks that want to be blast, as for data record. The blasted rock will not be blasted again as it already have been blasted.



**Figure 3.5** A rock that marked with number.(Draw-off tower)

- 5) Joint measurement – measure the marked rocks for data record in volume/m<sup>3</sup>. The price of the blasting work is based on the total volume rocks that have been blasted.



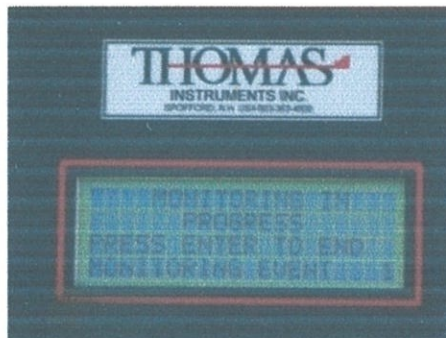
**Figure 3.6** Workers are measuring the rock.(Draw-off tower)

- 6) Setup the seismograph about 250m from the blast area. The apparatus must be heading to the blasted area.



**Figure 3.7** Seismograph is placed on the ground.(Draw-off tower)

- 7) When the blast is done, the reading will automatically take the reading of the blast. Then, the reading will be printed to be sent to the consultant for record and also for own record.



**Figure 3.8** Monitor will shows the result.(Draw-off tower)



### 3.4.2 Soil Nailing

1) Temporary staging is erected at the face of slope to provide access for the workers and portable mini drill set up to carry out the work. The physical location for soil nail is then marked on the slope surface (figure 3.4.2.2.1) according to construction drawings. All these points shall be numbered for identification and record purposes.



**Figure 3.9** Mini drill.(Draw-off tower)

2) The hole for soil nail is drilled by using rotary drill. Appropriate bit and hammer is fitted and a short test run is conducted to ensure that the equipment has been assembled correctly and secure, and the hydraulic and pneumatic power is available. The diameter of the drilled hole is 100mm and the drilled hole shall be flushed periodically and extension rods added until the drill hole has achieved the required depth by an air compressor.

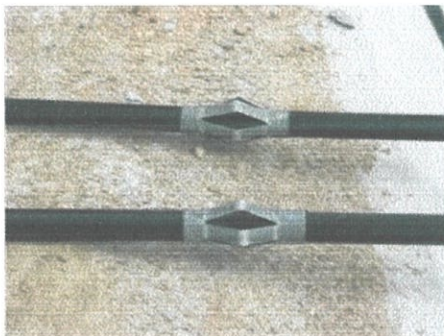


**Figure 3.10** Drilling is in progress.(Draw-off tower)

3) The soil nail components are inserted into the drilled hole at the same day as drilling operation. The soil nail is fitted with PVC centralizers before insertion. The soil nail bar shall be inserted into the drilled hole until only the threaded end of the bar is protruded.



**Figure 3.11** Workers are putting a soil nail components. (Draw-off tower)

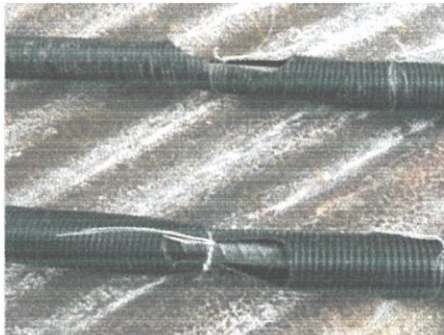


**Figure 3.12** Centralisers located at the soil nail components. (Draw-off tower)

4) The grouting operations are carried out within the same day after insertion of the soil nail reinforcement. Hydraulic grout mixers shall be used to mix and prepare the grouts until a uniform consistency is obtained. The grout is pumped into the drill hole through a grouting hose using the tremie method. The grouting operation will continue until the fresh grout emerges from the annular gap between the steel bar and the drilled hole.



**Figure 3.13** Grouted cement came out from the drilled hole.(Draw-off tower)



**Figure 3.14** Reinforced bar act as soil nail. (Draw-off tower)

### 3.4.3 Soil Nailing Pull-Out Test

1) Pull out test is carried out using hydraulic stressing jacks, soil nail must be capable of withstanding a pull-out load to 1.5 Time of Working Load after being installed for every 100 grouted bars in presence of engineer.



**Figure 3.15** Soil nail for testing. (Draw-off tower)

2) The M.S. Plate size 200mm x 200mm x 20mm is slotted onto the soil nail bar through its center hole. The M.S. plate is placed on top of the BRC A6. The soil nail then locked using torque wrench.



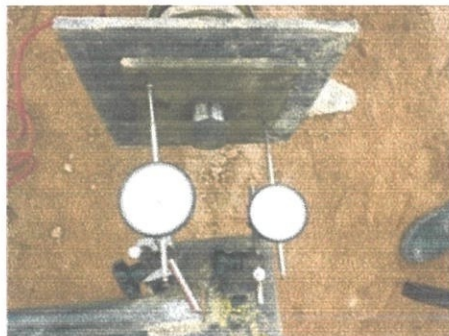
**Figure 3.16** Soil nail pull-out test equipment. (Draw-off tower)

3) The soil nail is tensioned by the stressing jack. The stressing force is increased in stages until the maximum test load (1.5 times working load) and maintained. After that, unload until it reaches 0 kN.



**Figure 3.17** Worker jacking the stressing jack by stages. (Draw-off tower)

4) The displacement at each increment or decrement load is recorded with 2 nos of dial gauges and then uses the average value. The load displacement is plotted out for submission comment. The acceptable displacement is limited to only 25mm.



**Figure 3.18** 2 nos of dial gauges used for displacement point.(Draw-off tower)

### 3.4.4 Guniting

- 1) Guniting is carried out using Ordinary Portland Cement (OPC), sand and steel reinforcement BRC sized A6. One layer of BRC mesh is laid on the slope surface with minimum of 2 complete mesh overlapping. Under the BRC mesh, spacer block must be used to provide concrete cover to the mesh at 2m c/c. The mesh must not touch the ground surface. Pin marker is also used for maintaining the thickness of the concrete throughout the slope.



**3.19 Wire mesh works.(Draw-off tower)**

- 2) The overlapping mesh must be tied with wire together to ensure good grip. PVC weepholes are installed prior to shotcrete. The 50mm OD PVC pipe is set in place as weepholes at 1.5m c/c both ways.



**Figure 3.20 Pipe installation works.(Draw-off tower)**

- 3) The shotcrete layer shall be laid starting from the top and proceed downward. The shotcrete are sprayed perpendicular to the slope at the distance 0.6 to 1.5m. The shotcrete sprayed onto the slope in a circular manner. Sprayed concrete are applied in layers not exceed 40mm thick. If rains, the newly shotcreted surface must be covered by a layer of plastic sheet to prevent direct hit by the rain and caused the shotcrete to being washed out problem.



**Figure 3.21** Guniting works.(Draw-off tower)

### **3.5 DRAW-OFF TUNNEL**

Draw-off tunnel is an underground passageway, completely enclosed except for openings for inlet and outlet, which is commonly at each end. It may be foot or vehicular road traffic, or for a canal. Some tunnels are to supply water for consumption or for hydroelectric stations or are sewers. Other functions are including routing power or telecommunication cables.

Before draw-off tunnel can be constructed, it is needed to conduct investigation of ground conditions by collecting soil for samples. Investigation of ground will reduce the risk of encountering unforeseen ground conditions such as blocky nature of rocks, the exact location of fault zones, or the stand-up times of soft ground.

#### **Preliminary Construction Involved**

##### **3.5.1 Blasting**

1) Make sure that all equipment and compressor are located within the safe area, make sure that all hoses are run tidy. Ensure that the blaster has the correct PPE with no defects. Drill the marked point with the drilling machine.



**Figure 3.22** Workers are checking the equipment. (Draw-off tunnel)

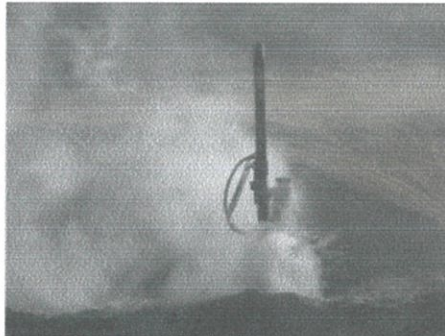


2) Drill the designated area as in the proposed drilling drawing. The depth must at least 3m for each point. The drilling machine must be in good condition in order to do this drilling works. The driller must wear proper PPE.



**Figure 3.23** Drill machine.(Draw-off tunnel)

3) When drilling, make sure to blow the drilled hole using air blow compressor. It is to remove dust such as rock dust and soil dust as to make sure that the drilled hole is in good condition for blasting purpose. It is also to ensure that there is no misfire and flying rock during blasting.



**Figure 3.24** Air blow compressor is removing the dust from inside the hole.(Draw-off tunnel)

4) As for blasting material, ammonium nitrate fuel and oil (ANFO), detonating cord, non-electric detonator (NONEL) and Emulex are examples of material that are used for blasting work. ANFO and Emulex is combined together to form explosive material. The Emulex are putted in the ANFO tube. After that, the tube is tied with the NONEL. NONEL is a shock tube detonator designed to initiate explosions. The reaction travels at approximately 6500 ft/s (2000m/s) along the length of the tubing with minimal disturbance outside of the tube.



**Figure 3.25** Types of explosive materials for blasting works.(Draw-off tunnel)

5) The tube then is putted in the hole with 2 tubes for each hole. The tube is tied with each other using the detonator cord as for ignition. These wiring will be done by shot firer and competent worker. The designated hole is done because they want to reduce the rock flying as it can cause danger to people surrounding the area. After all the wiring is done carefully, there will be siren for the last 30 minutes before blasting. Then, the second siren will be triggered 10 minutes before the blasting.



**Figure 3.26** Worker installing the explosive material.(Draw-off tunnel)

6) The supervisor will set up the reading apparatus (Seismograph). The Seismograph must be away from the blast area about 250m to ensure safety to the reader and other people. The arrow of the Seismograph instrument must be headed to the blast point where the arrow must point towards the blast area. The Seismograph will automatically take the reading after the explosion. The record is printed and kept for record.



**Figure 3.27** Seismograph being carried out. (Draw-off tunnel)



**Figure 3.28** The worker analyze the data record. (Draw-off tunnel)

### **3.6 VALVE HOUSE**

Valve house (stilling basin) is a structure used to provide the release of flows from a dam into a downstream area, typically being the river that was dammed. Valve house releases water so that the reservoir water do not overtop and damaging or destroy the dam. Reservoir water normally flows over a valve house. In other word, an intake (valve house) is a structure used to release water on a regular basis for water supply. Floodgates or valve chamber may be designed into valve house to regulate water flow and dam height.

#### **Preliminary Construction Involved**

##### **3.6.1 Shotcrete**

1) Before the shotcrete is carried out, the assigned shotcrete surfaces must be clean first. The surfaces are cleaned using sprayed water onto the surfaces to remove unwanted sources such as sand or broken rocks as to prevent the shotcrete from cracking during the shotcrete works.



**3.29** Workers remove unwanted materials using water. (Valve House)

2) Temporary staging also need to be built for the workers to do their shotcrete works more efficiently and safe. The temporary staging is inspected to ensure that the temporary staging is safe to use by the workers.



**Figure 3.30** Temporary staging for safety. (Valve House)

3) The shotcrete is mixed with steel fiber instead of using with wire mesh. Steel fiber improves the crack resistance of shotcrete. Steel fiber is used as it is useful for multidirectional applying with the reinforcement bar. The steel fiber will be weighted to get a weight of 2.5 kg.



**3.31** Measuring weight of steel fiber. (Valve House)

4) The steel fiber then will be putted into the water for it to become separated steel fiber. Then the steel fiber will be weighted again until it reaches 2.5 kg. It is then putted together with the cement mixer for grout.



**Figure 3.32** Separated steel fiber. (Valve House)

5) After all of it has been done, the operator will put the mixed concrete into the machine to distribute it to the shotcreter. The steel fiber and the concrete mix must be mixed evenly to avoid failure in shotcreting.



**Figure 3.33** mixed concrete for shotcreting. (Valve House)

6) The mixed concrete with steel fiber will go through hose. At this time, the shotcreter will spray the mixed concrete onto the ground surface. The sprayed mixed concrete must be at least about 4 inches thickness on the surface. The thickness is also varies depending on the proposed drawing.



**Figure 3.34** workers splaying the shotcrete (Valve House)

7) As like the other cement, curing is necessary to prevent the cement from cracking. Every 2-3 hours, they need to spray the water on the cement for the curing process. The time is varies depending on the situation. Some curing may need every 1 hour to spray on cement. The curing process is to make the cement not easily to dry.



**Figure 3.35** curing process. (Valve House)

## CHAPTER 4

### CONCLUSIONS AND RECOMMENDATIONS

Detailed and more specifically to the conclusions contained in the report written by the author, the author found that the construction of a water reservoir in a dam is very important to ensure that the water reservoir can be passed on to residents in order to get a clean and adequate supply. To the objectives shown in chapter 1, the authors found that the objectives that are to be investigated have been largely achieved.

Preliminary work of construction of the water reservoir is not as easy as it looks by the author. It involves members of relevant professional in building a dam and reservoir construction. This work began with constructing the safety statistics to facilitate the employees to do the work that has been given by his superiors. This is to ensure the safety and security of workers can reduce exposure to volume risk threats.

Implementation of works for the construction of a water reservoir in place of a dam construction is a must, so that the water in the dam catchment could be sent to the user in a more systematic and safe. Preliminary work is also important that a major structure built to be stronger and more durable. This initial work can also facilitate maintenance work during the construction of the main structure.

Recommendations can be put forward by the authors for improvement is the work of the initial construction of the water reservoir is to be done with better quality so that the construction of major structures in the construction of more dams and fast environment, in line with the vision 2020 that emphasizes professional attitude among workers in Malaysia.



Generally, as one of the university student, the author has to undergo industrial training for five months, from May 16, 2012 until October 6, 2012. The author chose to do practical training at one of the big and famous, Taliworks Corporation Berhad. The author is a student of the Department of Building and he was briefed and introduced to the various types of work site.

Writer learn and understand the ways or methods in theory building entirely, but this is the first time the author spent time at the building site to observe construction methods and maintenance to complete a project. Writer begins to understand the various levels or methods for the construction of the dam. Writer is given the opportunity to perform assigned tasks such as supervision of concrete work, earthwork and blasting work.

During the co-author of the practical training Taliworks Corporation, the author learned a lot from the professionals whether they are working in these companies or other companies with experience working at a construction site along with those who will not get from a book or a theory. The time spent not in use and will be a waste after the author realized that the construction is really interesting and challenging.

Throughout the construction industry in Malaysia, will continue to thrive because there are many potential areas for development and has yet to be explored. With practical training in the field of construction, the author was exposed to experience working on a construction site that will surely be used by the authors in their future career. Writer also learns about how to deal with employees and how to make sure the work is done smoothly. The author has observed professional workers solve problems efficiently and fast. Writer also learns the importance of discipline in an organization and the importance of punctuality at work in the construction sector.

In conclusion, the writer gets a lot of views, knowledge and experience of industry training. The author wishes to emphasize the importance of practical training to complement and reinforce the theory taught in the classroom. The author also hopes

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## APPENDICES



IBU PEJABAT POLIS DAERAH  
POLIS DIRAJA MALAYSIA  
SEBERANG PERAI TENGAH  
JALAN PERDA TIMUR  
14000 BUKIT MERTAJAM  
PULAU PINANG

TEL :

Rujukan: SPT/EXP/29  
DLM (PR) 61/5/1  
Tarikh : Mei 2012

Pengurus,  
Ota Tunnel Squad Sdn Bhd,  
No. 245-2<sup>nd</sup> Floor,  
Jalan Perkasa 1, Tmn maluri,  
55100 Cheras, Kuala Lumpur

### KELULUSAN MENJALANKAN KERJA-KERJA LETUPAN UTK PEMBINAAN TEREWONG BAGI PROJEK PEMBESARAN EMPANGAN MENGKUANG, KUBANG SEMANG -- BAGI BULAN MEI 2012

Surat tuan bertarikh 12/4/2011 adalah dirujuk.

2. Pihak polis tidak mempunyai sebarang halangan terhadap permohonan tuan untuk memecah batu-batu besar seperti tajuk di atas pada 2hb, 3hb, 4hb, 7hb, 8hb, 9hb, 10hb, 11hb, 14hb, 15hb, 16hb, 17hb, 18hb, 21hb, 22hb, 23hb, 24hb, 25hb, 28hb, 29hb, 30hb dan 31hb MEI 2012 – kecuali hari Sabtu, Ahad dan kelepasan am dengan syarat semua syarat-syarat dalam Lampiran 'A' yang dikembalikan dipatuhi dengan sepenuhnya. Sila kembalikan Lampiran 'A' (salinan) tersebut selepas ditandatangani oleh Encik Arumugam a/l Rasiah, kpt :

3. Tugas meletup hendaklah dibuat oleh Encik Abdul Hamid Bin Mohamed Yusoff, kpt :  
dan En. Rosli Bin Nordin, kpt :

4. Untuk makluman tuan, pihak Polis tidak menyediakan sebarang eskot sebaliknya tugas eskot hendaklah diperolehi daripada Agensi Kawalan Keselamatan.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

(ACP AZMAN BIN ABD. LAH)  
KETUA POLIS DAERAH  
SEBERANG PERAI TENGAH  
14000 BUKIT MERTAJAM

s.k : Ketua Polis Balai K/semang

Pastikan kawasan/pekerja selamat.  
Sila patuhi arahan -- arahan yang sedia ada.

**LESEN**

Borang E

**LESEN MENJUAL, MEMILIK, MEMBELI  
LETUPAN DAN PELURU**

[Di bawah Peraturan 74, Enakmen Letupan (Bab 200)]

Memegang di bawah (15077-05-595) beralamat di Tasek Sempadan  
No. 112 dan 113, Jalan Perak, Tan Malau, dengan ini dibenarkan dalam  
Cawangan KL masa satu bulan daripada tarikh ini {Menjual / Memiliki / Membeli} di premisesnya di.....  
3/5/12

Letupan dan Peluru daripada jenis dan sebanyak yang ditetapkan di bawah:

Betiras Letupan dan Peluru	Bayak	Catatan
① High explosive	70 kg	Tongki kimia semul Bhd. Johor Perak
② D dynamite	70 batu	Batu Arang, Selangor
③ Detonating Cord	40 meter	

Bertarikh pada 7 haribulan Mei 2012  
di Seberang Perai Tengah  
Bayaran RM 100

**ACRAZMIN ABD. LAM**  
KETUA PUSAT PERAI  
SEBERANG PERAI TENGAH

Apabila kebenaran adalah untuk memiliki, perkataan-perkataan "dalam masa satu bulan dari tarikh ini" hendaklah dipotong. Bila kebenaran adalah untuk menjual atau membeli, perkataan-perkataan "di premisesnya di" hendaklah dipotong.

FORM  
ENCE

POLIS DI RAJA MALAYSIA  
ROYAL MALAYSIAN POLICE

A No 26832

Form C  
Form C

**LESEN MEMBAWA MASUK, MEMBAWA KELUAR ATAU MEMBAWA BAHAN LETUPAN**  
**LICENCE TO IMPORT, EXPORT OR REMOVE EXPLOSIVES**

[Di bawah Paragraf 58 Undang-undang Letupan (Cap 200)]  
[Under Rule 58 of the Explosives Act (Cap 200)]

1. ditunjukkan kepada /  
is hereby given to Perumahan all rumah (4077 - 08 1962) bernilai /  
value address to

2. untuk /  
for the Tan Sri Seng Lee dan isteri /  
Mrs. Tan Sri Seng Lee Perumahan /  
Perumahan Cheras, KL untuk /  
for the

Membawa masuk / Import	Bahasa / of the
Membawa keluar / Export	
Membawa / Removal	

3. yang termasuk di bawah ini /  
are included in this licence for  
explosives.

Jenis Letupan / Name of Explosive	Banyaknya / Amount	Daripada / From	Kepada / To
1) Bahan Explosive	70 kg	Pengusaha / Sdn Bhd	Pemilikan / Bilik / Kedua
2) Detonator	70 butir	Perusahaan / Kedua	Pemilikan / Bilik / Kedua
3) Detonating Cord	40 meter	Pengusaha / Sdn Bhd	Pemilikan / Bilik / Kedua

4. ini sah /  
is valid for 1 hari /  
days after the date hereof.  
(3/5/20)

5. ditandatangani /  
is signed by Sukuningsih Binti Jusuf pada /  
on this 2 day of Mei 20 20

**JAC PHENARD LAM**  
KETUA PERIKLUBAN  
PERANGKAPUTERANGAN

6. Satu Ringgit Malaysia  
One Ringgit Malaysia

7. This licence is valid only if the holder complies with the provisions of the Explosives Act (Cap 200) and the Explosives Regulations (Cap 200) and the holder is given to the Licensing Officer before issuing or renewed when valid.



CHINA INTERNATIONAL WATER & ELECTRIC CORP. (M) SDN. BHD.  
Mengkluang Dam Expansion Project, Pulau Pinang  
- Construction of Dam and Associated Works

JOINT MESUREMENT FOR BOULDERS

RFI No.:

DATE: 30/7/2012  
STRUCTURE: BOULDERS  
LOCATION: DRAW OF TOWER NO. 2

NO.	SIZE			VOLUME (m <sup>3</sup> )	REMARKS
	LENGTH (m)	WIDTH (m)	HEIGHT (m)		
925	2.8	2.8	1.2	6.91	
926	1.8	1.8	1.3	2.55	
927	2.4	1.6	1.8	6.91	
928	2.3	2.4	2.2	14.78	
929	1.8	2.6	2.7	12.64	
930	2.8	2.2	2.6	16.02	
931	4.2	3.0	2.5	31.50	
932	2.2	1.5	1.2	4.62	
933	2.0	1.5	1.9	5.40	
934	2.0	1.5	2.5	7.50	
935	3.0	3.5	4.0	112.00	
936	5.0	3.5	3.5	61.25	
937	4.0	5.0	2.5	50.00	
938	1.8	1.5	1.8	4.86	
939	1.2	1.0	1.3	1.56	
940	2.0	3.5	2.0	14.00	

941	4.0	5.0	3.0	14.40	
942	3.6	2.0	2.0	10.80	
943	2.0	1.8	2.0	4.11	
944	1.7	2.2	1.1	5.40	
945	2.0	1.8	1.5	6.48	
946	2.0	1.8	1.8	1.30	
947	2.0	0.9	1.8	24.00	
948	4.0	3.0	2.0	13.11	
949	3.0	2.3	1.9	2.18	
950	1.1	1.8	1.1	29.84	
951	3.5	2.7	1.3	2.54	
952	1.5	1.5	1.3	7.28	
953	2.6	2.1	1.7	3.32	
954	1.2	1.2	1.5	59.36	
955	4.0	3.3	2.8	11.00	
956	2.0	2.2	2.5	3.98	
957	2.0	1.3	1.3	4.95	
958	2.2	1.5	1.5	3.46	
959	1.8	1.6	1.2		

Submitted by: (I.O.W/A.R.E.)  
(ACS Sdn Bhd)

Checked by: (I.O.W/A.R.E.)  
(ACS Sdn Bhd)

Approved by: (A.R.E./R.E.)  
(ACS Sdn Bhd)

Name: 30/7/2012  
Date:

Name:  
Date:

Name:  
Date:

Tel

THOMAS INSTRUMENTS INC.

Fax: (603)-383-4246

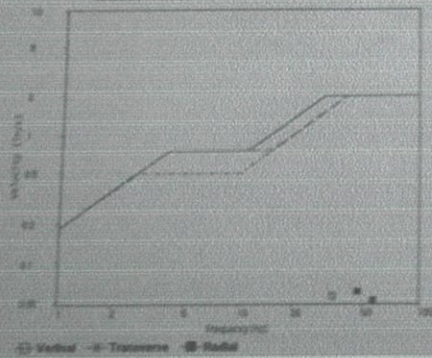
### VIBRATION REPORT

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 Recording Time: 16:55:57  
 Recording Date: 05-17-12  
 Project: Proyek Pembesaran Empangan Mengkuang  
 Client: Kementerian Tenaga, Teknologi Hijau Dan Air  
 JBA  
 Location: Valve House (N -595229 , E 278336 )  
 Operator:  
 Notes: OTA Blasting  
 Blast to Sensor Distance (ft.): 150m  
 Maximum Weight per Delay (lb.):

#### Peak Measurements

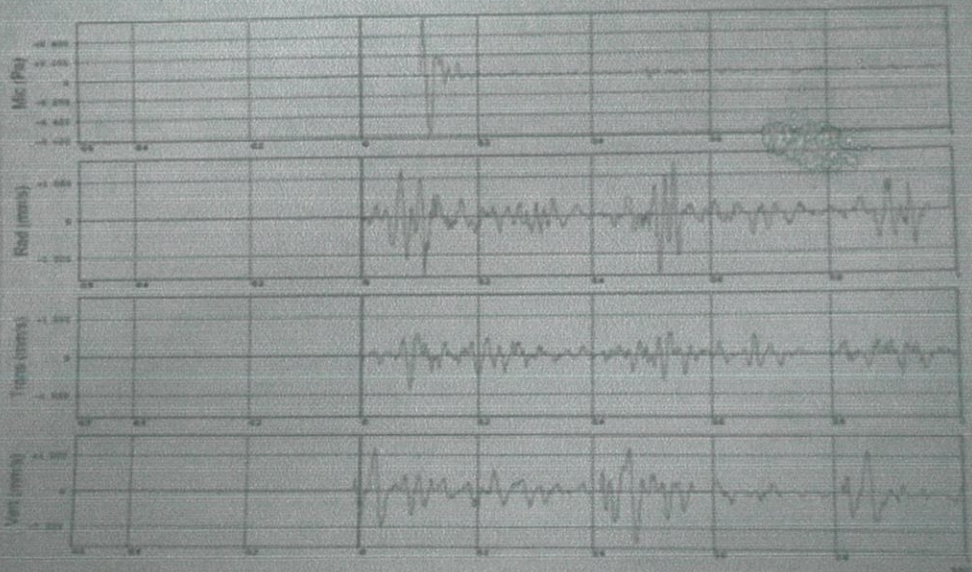
	Vertical	Transverse	Radial
PPV (mm/s)	1.44	0.88	1.55
Freq (Hz)	36.6	42.7	46.5
Time (ms)	472	84	108
PPA (g)	0.03	0.02	0.05
PPD (mm)	0.00626	0.00328	0.00531
PVS (mm/s)	1.608 @ 108.4ms		
PSPL (PA)	166.82 (138.427 dB) @ 118.2ms		
PSPL Freq	39.4Hz		
Sensor Test	Passed	Passed	Passed

#### OSM and USBM R18507 Analysis



#### System Configuration

Serial Number: V22A062453  
 Calibration Date: January 06, 2012  
 Model: VMS2000MP  
 Geo Trigger: 0.51(mm/s)  
 Mic Trigger: Disabled  
 Manual Trigger: Disabled  
 Record Time: 1 second(s)  
 SeisWare ver. used for download: 01.00.0029  
 Current SeisWare version: 01.00.0029



P.O. BOX 50 ROUTE 9

SPOFFORD, NH 03482