

## **Practical Training Report**

at

# Ayman Ahmad & Partner Co. Construction Contracting

Practical Training Report Submitted to the Faculty of Civil Engineering Department The Hashemite University

> in partial fulfillment of the requirements for the degree of

> > Bachelor's in civil engineering

By

Abdullah Khaled Qadoumi (1737532)

Supervised by

Dr. Hazim Dwairi & Eng. Ayman Shorbaji

**Training Institution:** 

**Training Duration: From 3/7/2021 to 29/8/2021** 

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### **EXECUTIVE SUMMARY**

During my practical training at Ayman Ahmed & partner Co. in Bus Rapid Transit (BRT) between Amman and Zarqa package 4 project, which lasted for 8 continuous weeks, started from 3/7 to 29/8 was useful and full of practical experience.

During the training period, there are three main training sites that have Concrete Structure works (Zarqa Tunnel, Al-Zaytouna Tunnel & Al-Hashimiah Station) and have a lot of activity that showed in weekly reports, that will be discussed in this report.

The most important skills and knowledge that has been developed construction works sequence, waterproofing materials, plastering materials, soil nail shoring system, segregation repair sequence, types of structural joints & formwork.

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# **Chapter 1 Introduction**

Bus Rapid Transit (BRT) is the first rapid transit system in Jordan and will be the centerpiece of a fully integrated and hierarchical public transport network. That will provide rapid, safe, and highly reliable service.

The concept revolves around large-capacity buses that operate on dedicated tracks to provide a high level of serviceability. The buses shall travel at intervals of no longer than 5 minutes to and from modern fully integrated terminals.

#### **Project Information:**

Project: Bus Rapid Transit (BRT) Between Amman and Zarqa Package (4)
Tender no.: 23/2018
Employer: Ministry of Public Works and Housing
Designer: Dar Al Omran / AEC / SYSTRA
Consultant: Arabtech Jardaneh Water & Environment
Main Contractor: Haymoor Cousins & Partner Co.
Sub-Contractor: Ayman Ahmad & Partner Co.
Commencement Order: 2/3/2019
Tender period: 730 days
Tender value: 32,451,740 JOD



Figure 1: Sign Board Tender

# **Chapter 2 Company Profile**

Ayman Ahmad & Partner for Construction Contracting Was Established in Amman in 2008 A.D. It was classified and registered for practicing works under the supervision of the Ministry of Public Works & Housing and of the Jordanian Contractors Association. The classification was upraised within the subsequent years and according to the completed projects to the second class in Concrete works, bridges, intersections, and tunnels.

The company was implemented and delivered many governmental and private projects such as Sport City Intersection (BRT), Gardens Hospital, Jordan power station, The Hashemite University Entrance Intersection, Royal Jordanian Head office, Al Istiklal Street Tunnel, and others.

In this project, the company's role as a sub-contractor and responsible for the construction and implementation of construction works such as Tunnels, Bridges, Retaining Walls, Slabs, Columns, and Foundation.



Figure 2: Company logo

## **Chapter 3 Practical Training Description**

The Project aims at constructing a track of Rapid Transit Buses connecting Amman and Zarqa cities. The fourth package of the project includes Construction the longest tunnel in Zarqa (800 m) and implementation of the 4.5 km bus route, as a middle 2-way lane, starting from Al-Hashimiah Station to Zarqa Station, and Widening the Autostrad road on both sides to accommodates BRT lanes in addition to 3 Autostrad lanes on each side for each direction, and including all stations civil works, pavement, surface road maintenance, box culverts, storm water drainage, detours, construct tunnels, bridge and retaining walls.



Figure 3: Track of BRT Package 4

The Main Roles of Contractors in the Project:

- ⇒ Haymoor Cousins & Partner Co.: Road Construction, Pavement, and infrastructure Contractor
- ⇒ Ayman Ahmad & Partner Co.: Concrete Structure Contractor "Tunnels, Retaining walls, Foundation, Wing walls, and Slabs"
- $\Rightarrow$  Issa haddadin & Partners Co.: Soil Nail Shoring System Contractor
- $\Rightarrow$  Yousef AL-Najjar: Excavation Contractor
- ⇒ Al Zuhairi Brothers for Ready Mix Concrete LLC: Ready Mix Concrete Supplier
- $\Rightarrow$  Al Qanadeel Steel Structure Co.: Steel Structure Contractor

### ✤ Formwork

Due to its high load capacity, <u>Shore-brace Table Form System</u> is one of the most economical table systems used for heavy civil engineering projects.

The Shore-brace Table Form System is composed of standard components that can be used in different projects and different systems. The Shore-brace is characterized using one basic size of Shore-brace frame (180 cm high and 120 cm wide) combined with one size of cross braces to obtain economic spacing of frames.

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Figure 4: Design of Shore-Brace Table for BRT Package 4 project

There are some Figures that show Placing Formwork in the Project:



Figure 5: Shore-Brace Table (1) - 9 -



Figure 6: Shore-Brace Table (2)



Figure 7: Shore-Brace Table (3)



### \* Main Training Construction Work

During the training period, there are three main training sites that have Concrete Structure works:



**Figure 9: BRT station details** 1) Zarqa Tunnel, Station (18+420 - 19+220)



Figure 10: Detailed Section of BRT lane in the Zarqa tunnel







The construction sequence in this station:

• Excavation Work (110m length, 8m depth) in each section



Figure 13: Excavation work



Figure 14: Finish Excavation work in Station (18+892 - 19+020)



Figure 15: Preparing blinding concrete formwork



Figure 16: Casting blinding concrete under raft foundation

• Placing Formwork, Reinforcement & Casting Concrete for Raft Foundation



Figure 17: Placing Formwork & Reinforcement for Raft Foundation (1)



Figure 18: Placing Formwork & Reinforcement for Raft Foundation (2)



Figure 19: Placing Formwork & Reinforcement for raft Foundation (3)



Figure 20: After Casting Concrete for Raft Foundation

• Placing Formwork, Reinforcement & Casting Concrete for Retaining walls and Wing walls.



Figure 21: Placing Formwork, Reinforcement for Wing Wall (1)



Figure 22: Placing Formwork, Reinforcement for Wing wall (2)



Figure 23: Placing Formwork, Reinforcement for Retaining Wall (1)



Figure 24: Placing Formwork, Reinforcement for Retaining Wall (2)



Figure 25: Placing Formwork, Reinforcement for Retaining Wall (3)



Figure 26: Placing Formwork, Reinforcement for Retaining Wall (4)



Figure 27: Casting Concrete for Wing wall (1)



Figure 28: Casting Concrete for Wing wall (2)



Figure 29: Casting Concrete for Retaining wall (1)



Figure 30: Casting Concrete for Retaining wall (2)



Figure 31: Concrete test & details



Figure 32: Wing Wall



Figure 33: Retaining Wall

• Placing Formwork, Reinforcement & Casting Concrete for Slabs



Figure 34: reinforcement for left hand slab section (1)



Figure 35: reinforcement for left hand slab section (2)

Note: the right-hand section of retaining walls didn't place formwork and reinforcement yet because Issuance variation orders related to the emergency exit.



Figure 36: The tunnel will be after casting slabs

• Using three layers of bituminous materials for Waterproofing retaining walls & wing walls



Figure 37: 200 liters of Bituminous Waterproofing product



Figure 38: Retaining Wall Waterproofing (1)



Figure 39: Retaining Wall Waterproofing (2)



Figure 40: Wing Wall Waterproofing

Backfilling single size aggregate installed directly behind retaining ٠ walls & wing walls



Figure 41: Backfilling Single Size behind Retaining Wall



Figure 42: Backfilling Single Size behind Wing Wall

### 2) Al-Zaytouna Tunnel, Station (16+880 - 17+108.53)



Figure 43: Detailed Section of BRT lane in al-zaytouna tunnel

Plastering •



**Figure 44: Plastering Construction Chemicals** 





Figure 46: Applying Plastering (2)



Figure 47: Applying Plastering (3)

### • Soil Nail Shoring System

This system was used before the beginning of practical training, the importance of this system brings soil stability in areas where landslides might be a problem, and the engineers provided us Structure plans and explained all practical details.



Figure 48: Section Plan of Soil Nail Shoring System





Figure 51: Top Architect Detailed plan for al-Hashimiah station



The construction sequence in Right hand station (R.H.S):

• Placing Formwork and Reinforcement for Columns, Lift Wall & Retaining Walls.



Figure 53: Placing Reinforcement retaining wall at R.H.S





Figure 55: Placing Formwork & Reinforcement columns at R.H.S (1)



Figure 56: Placing Formwork & Reinforcement columns at R.H.S (2)



Figure 57: Retaining wall & Columns after casting at R.H.S (1)



Figure 58: Retaining wall & Columns after casting at R.H.S (2) - 35 -

The construction sequence in left hand station (L.H.S):

• Placing Formwork and Reinforcement for Raft Foundation, Lift Wall & Retaining Walls.



Figure 59: Placing first layer of rebar at L.H.S



Figure 60: Placing second layer of rebar at L.H.S



Figure 61: Placing Retaining wall rebar at L.H.S (1)



Figure 62: Placing Retaining wall rebar at L.H.S (2)

• Casting Columns, Lift Wall & Retaining Walls.



Figure 63: Casting concrete for Raft foundation at L.H.S (1)



Figure 64: Casting concrete for Raft foundation at L.H.S (2)



Figure 65: placing formwork & rebar for Retaining wall at L.H.S (1)



Figure 66: placing formwork & rebar for Retaining wall at L.H.S (2)



Figure 67: during casting concrete



Figure 68: after casting concrete (1)



Figure 69: after casting concrete (2)



Figure 70: Retaining Wall next to the park retaining wall



Figure 71: after casting concrete (3)

• Repair

At Al-Hashimiah station, segregation was appeared in the Lift Shear wall, the sequence of repair it:

- 1) Breaking segregation concrete until reach the rebar
- 2) using zinc crush to coat the rebar



Figure 72: after broken segregation & used zinc crush

3) Pouring the old concrete with white Liquid polymer bonding agent (DCP cempatch SBR 400)



Figure 73: DCP cempatch SBR 400



Figure 74: Pouring the old concrete with Liquid polymer bonding agent

4) Placing formwork in segregation area and put foam on the outside of formwork (akfix 805)



Figure 75: akfix 805 foam



Figure 76: segregation area formwork & foam

5) Casting Shrinkage polymer modified component repair (DCP cempatch FL)



Figure 77: DCP cempatch FL



Figure 78: result of repair work

### 

Structure joints are used to compensate when the concrete expands and contracts because of the weather conditions, its surface inevitably cracks under the pressure and can become weak. the only way to avoid this is to add joints to the concrete. In general, there will Structure joints in most of the structures constructed as we cannot construct a structure by one pour. These following types of Structure joints are used in BRT package 4 project:

1) <u>Construction joint</u>: for large structures is challenging to place concrete at one time. Therefore, the concrete casting is divided into stages. The boundary between foundation & retaining walls is known as construction joints. Shear keys (kicker) should also be added to improve shear resistance.



Figure 79: Shear keys formwork



Figure 80: Shear keys after casting



Figure 81: construction joint between foundation & wing wall

2) <u>Contraction joint:</u> is a vertical joint place in a structure in such a manner that it does not affect the structural performance. it's sawed or formed in concrete to regulate the location of cracks.



Figure 82: contraction joint in retaining walls

3) <u>Expansion Joints</u>: the purpose of it to accommodate the volume change of concrete structures. the joints are formed by providing a Dowel bar (length 60 cm) and gap (filler with a compressible fiber board material "blue foam") between the building parts.





Figure 84: Expansion joint between foundations



Figure 85: Expansion joint between retaining walls

# **Chapter 4 Discussion and Conclusions**

As an undergraduate of Civil Engineering College, I would like to say this training program is an Excellent opportunity to get experience that I would have never gained through going straight into a job, I'm grateful to Eng. Ayman Shorbaji for giving this wonderful opportunity.

The main objective of the internship is to provide an opportunity to undergraduate to identify, observe and practice how civil engineering is applicable and the real site it is not only to get experience on technical practices but also to observe management practices and to interact with the field workers.

The responsibility of the internship supervises and inspects construction and maintenance work on structural elements, Assist Senior Engineer in maintaining the quality of all civil work, check the quality of all materials received on site and Study Project Workflow.

The most important skills that have been developed during internship Report writing skills, understand how the construction site is managed and the tasks of the Contractor's Engineers, Consultant Engineers and Labours, linked between what has been learned at the university, and what really happen in the site and Learn more about soil nails shoring system and waterproofing structure elements.

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[3] Eng. Abdurhman Obaid, "Site Engineer", Ayman Ahmad & Partner Co.

[4] Eng. Abdullah Salameh, "Project Manager", Haymoor Cousins & Partner Co.

[5] Eng. Mohammed Ayad "Surveyor", Ayman Ahmad & Partner Co.

[6] Khaled Obeidah "Surveyor Assistant", Ayman Ahmad & Partner Co.

[7] Eng. Ahmad Muslam "Site Engineer", Arabtech Jardaneh Water & Environment

[8] Eng. Mohammed Mohsen "Site Engineer", Ministry of Public Works and Housing

[9] Web sites:

a) http://www.aymanahmad.com

b) http://www.ammanbrt.jo

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