

Summer Internship Report
On
Hyderabad Metro Rail Station
(Stage 4)



By

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Abstract

Larsen & Tourbo is a major technology, Engineering, construction, Manufacturing and Financial services conglomerate, with global operations. L&T addresses critical needs in key sector – Hydrocarbon, Infrastructure, Power, Process Industries and Defense- for customers in over 30 countries around the world.

L&T Construction, India's largest construction organization and ranked among the world's top 30 contractors, has been over the past seven decades transforming cityscapes and landscapes with structure of immense size and grandeur. The company's capabilities span the entire gamut of construction- civil, mechanical, electrical and instrumentation engineering-and its services extent to all core sector industries and infrastructures projects.

Certificate

This is to certify that the internship at L&T Hyderabad Metro Rail construction is completed by Miss. Komal Rajendra Soma from N. K. Orchid College of Engineering & Technology, Solapur (Civil Department T.E.) in a satisfactory manner under the guidance of

1. Mr.Dhiraj Kumar – HR
2. Mr. M. Jagadish – Project Manager
3. Mr. Suraj Murtya – Planning Engineer
4. Ms. Navyatha Reddy – Planning Engineer
5. Mr.Arogya Rao – Construction Manager (QPCY)

From 6th June,2018 to 20th June, 2018 successfully.

(Mr.M. Jagadish)

Project Manager-Stage 4
Stations

Hyderabad Metro Rail Project,
Hyderabad

Acknowledgement

I would like to express my gratitude to Mr. DHIRAJ KUMAR, Human Resources (HR) of L&T Ltd. for giving me this opportunity to attend 2 weeks internship training at Metro Rail Station Project at Stage 4, Hyderabad. I also extend my sincere thanks to Mr. M. JAGADISH, Project Manager, Metro Rail Station Construction ,Stage 4 for helping me to improve my skills in general and in Metro Rail project in particular.

I would like to give special thanks to Mr.K.S.SURAJ (Planning Engineer) , Ms.NAVYATHA R. (Planning Engineer), Mr.Lova Raju (Safety Engineer)and Mr.S.AROGYA RAO (Construction Manager, QPCY), who guided me throughout the span of the project with their valuable information that made my work experience better.

My gratitude extends to Administrative Department and Stores Department for facilities providing the required Personal Protective Equipment's (PPE)

I also thank the L&T staff working at this site for their support and guidance that made my work experience much better. Finally, I am grateful to the whole of L&T, for providing me with training in one of the highly reputed projects and safe environment for my first professional work experience.

Declaration

I, Komal Rajendra Soma, hereby declare that the presented report of internship titled "HYDERABAD METRO RAIL PROJECT" of LARSEN AND TOUBRO CONSTRUCTIONS Ltd. is uniquely prepared by me after the completion of 2 weeks internship at Stage 4 Metro Rail Station. And this project work is submitted in the partial fulfillment of the requirements for the internship session of 2018-2019 held for 3rd year student of N.K.Orchid College of Engineering and Technology, Solapur.

I also confirm that, the report is only prepared for my academic requirement not for any other purpose.

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1. Introduction

1.1. Introduction to L&T

Larsen & Toubro originated from a company founded in 1938 in Mumbai by two Danish engineers, Henning Holck-Larsen and Soren Kristian Toubro. The company began as a representative of Danish manufacturers of dairy equipment.

Larsen & Toubro Limited, commonly known as L&T, is the largest Indian multi-national firm headquartered in Mumbai, Maharashtra, India. It was founded by two Danish engineers taking refuge in India. The company has business interests in engineering, construction, manufacturing goods, information technology, and financial services, and has offices worldwide.

1.2. Introduction to Hyderabad Metro Rail

Larsen and Toubro Limited was awarded the Hyderabad Metro Rail Project by Government of Telangana. L&T incorporated a Special Purpose Vehicle - L&T Metro Rail (Hyderabad) Limited ("The Company") to implement the Project on Design, Built, Finance Operate and Transfer (DBFOT) basis.

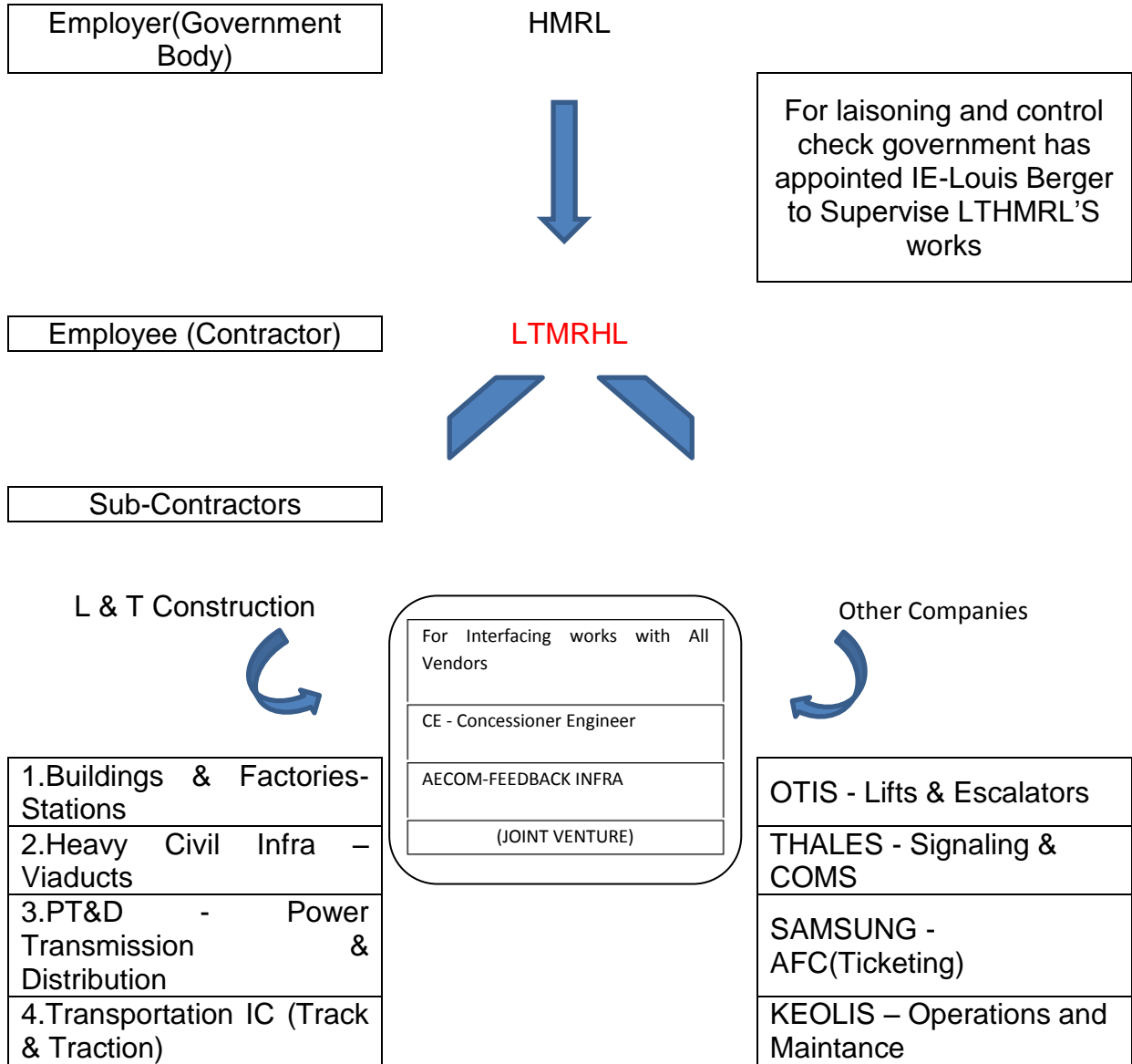
The Company has signed the Concession Agreement with Government of Andhra Pradesh on 4th September, 2010 and completed the financial closure for the Project on 1st March, 2011 in record six months. A consortium of 10 banks led by the State Bank of India has sanctioned the entire debt requirement of the project. This is the largest fund tie-up in India for a non-power infrastructure Public Private Partnership (PPP) project.

The Company is a subsidiary of L&T Infrastructure Development Projects Ltd., an infrastructure development arm of Larsen of Toubro Ltd.

The company will develop 18.5 million sq.ft. of Transit-Oriented Development (TOD) and is expected to trigger robust economic activity in and around the city of Hyderabad and will generate substantial employment.

2. Project Planning

Hyderabad Metro Rail Project –HMRP



3. Project Overview



3.1. Construction Phases

The construction work will be undertaken in two phases.

There are six stages of completion in Phase I.

3.1.1. Phase I-

The Phase I of the project includes 3 lines covering a distance of around 71.2 km.

- Line 1 - Red Line - Miyapur – L B Nagar - 29.2 km (18.1 mi)
- Line 2 - Green Line - Parade Grounds - Falaknuma 15 km (9.3 mi)
- Line 3 - Blue Line - Nagole – Raidurg - 27 km (17 mi)

Six Stages construction schedule

Stage 1	Nagole to Mettuguda
Stage 2	Miyapur to SR Nagar
Stage 3	Parade grounds to Begum pet
Stage 4	Madhuranagar to Raidurg
Stage 5	Punjagutta to LB Nagar
Stage 6	JBS to Falaknuma

4. Safety Induction

Safety is an integral part of any construction and it's un-interrupted continuation of the process. It is for the safety of workers, health and working conditions of the site and its workers. For prevention of accidents and loss of human life safety measures are must. The site is divided in to PPE and NON-PPE zone which says whether you are supposed to have your personal protective equipment or whether it is an official area. These are the various PPE's and safety devices which are used for various type of protection at site:

4.1. **HEAD PROTECTION:** All personals engaged for this job has to wear safety helmet along with chin strap.



Fig.4.1.Head Protection Helmet

4.2. **HAND PROTECTION:** Appropriated hand gloves will be used for materials handling, concreting.



Fig.4.2.Hand Protection Gloves

4.3. **LEGS PROTECTION:** Everyone engaged in site activities has to wear shoes with extra grip sole and glued seams.



Fig.4.5.Legs Protection Shoes

4.4 **EYE PROTECTION:** Suitable goggles must be used for the personnel developed for welding (Face Shield),Grinding, Gas Cutting,Concreting,Chipping etc. work a site.



Fig.4.4.Eye Protection Google's

5. Pre-Cast Yard Quthbullapur

5.1. Introduction

Precast concrete is a construction product produced by casting concrete in a reusable mold or "form" which is then cured in a controlled environment, transported to the construction site and lifted into place ("tilt up"). In contrast, standard concrete is poured into site-specific forms and cured on site.

5.2. Elements Casted at Precast Yard (PC Yard)

1. Street Level
 - Staircase Flight (Entry and Exit)
2. Concourse Level
 - Spines
 - Wings
 - Lift pits
3. Platform Level
 - Beams
 - Planks

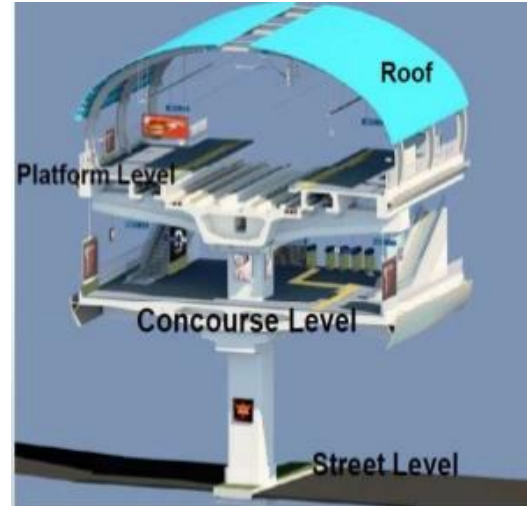


Fig.5.2. Levels of a Station

5.3. General Arrangements of Casting Yard

Station consist of four bays for casting of precast segments

- First Bay- Spine, Staircase and Lift pits
- Second Bay- Platform Level Beams
- Third Bay- Wings
- Fourth Bay- Planks (Slab)

All these four bays are built-up for casting, curing and staking the precast elements with proper ground control.

5.4. Casting of Station elements

- 1) Spines
- 2) Wings
- 3) Beams
- 4) Planks
- 5) Staircase flight
- 6) Lift pits

5.4.1. Spines

- Spine segments are pre tensioning members. All together a typical station has 62 spines.

Each Station consist of 6 no's of spine segments of 13.4m span and 8 no's of spine segments of 17m span

*For 6 no's of span segments of 13.4m span

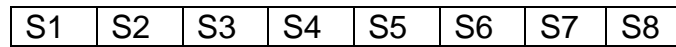
S1 and S6 are pier end segments

S2 and S5 are varying segments

S3 and S4 are running segments

S1	S2	S3	S4	S5	S6
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*For 8 no's of span segments of 17m span
 S1 and S8 are pier end segments
 S2 and S7 are varying segments
 S3 to S6 are running segments



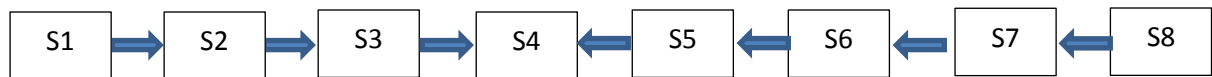
5.4.1.1. Methods of spine segments

- i) Long line method
- ii) Short line method

i) Long line method

In this method, segment casing is set out on whole span as per geometric requirements i.e. both pier end segment are aligned parallelly and the soffit beds are aligned and leveled as per geometric requirement of the particular span in all the three directions X, Y, and Z respectively.

This segment casing will follow the sequence:



*For 8 no's of span segments of 17m span
 S1 and S8 are pier end segments
 S2 and S7 are varying segments
 S3 to S6 are running segments

ii) Short line method

In this method, each segment casing is casted by placing in the mould match casing with another adjacent segment which is already casted.



Fig.5.4.1.Spines

5.4.2. Wings

Wings are the structural members that are tensioned by using post tensioning method. All together a typical station has 112 wings.

5.4.2.1. Casting methodology of wings

- Prepare the mould by applying the shuttering oil and cleaning with the wire brush or electrical buffing machine.
- Prepare the reinforcement cage i.e. by cutting, bending and tying.
- Place the reinforcement cage into the mould and closing the shutters with the clear cover of 35mm.
- Transverse profiling is done as per profile drawings.
- Placing the upper reinforcement through transverse pipe, closing the moulds, locking the shutters. Hence, mould ready for concreting.
- Concreting is done with M50 grade with the help of boomer placer, needle vibrator of 60/40 mm electrical, electrical mould vibrator of 3HP (Horse Power).
- After achieving 20MPa strength de-shuttering is done and after 30MPa strength de-moulding is done.
- Curing is done for 14 days and wing is lifted and placed in a wing stacking yard.
- Finally wings are ready for post concrete checks by the clients.

5.4.3. Beams

5.4.3.1. Beams casting methodology

All together a typical station has 54 beams. There are 2 types of beam based on their shape:

- a) Rectangular beam
- b) L-Shaped beam

And they are broadly divided into two type:

1. Pre-Tensioned Beams
2. Reinforced Concrete Beams



Fig. 5.4.3. L-Shaped Beam

5.4.4. Planks

Planks are elements that are placed over the beams as the base of platform level. These are precast members.



Fig.5.4.4.Planks

5.4.5. Staircase flights

Staircase is a element which connect from street level to concourse and then to platform level in the metro station. Opening provided to access.



Fig.5.4.5. Staircase Flight



Fig.5.4.5.Staircase Mould

5.4.6. Lift Pits

Lift pits are placed below the lift area.

6. Ready Made Steel Plant (RMS)

6.1. Steel Service Centre (SSC)

- RMS will reduce the time with huge productivity, it gives 50MT/day.
- Production is done with good quality and avoids human errors.
-

6.2. Reinforcement cutting, tying, bending and fixing the cage

Reinforcement bar bending has particular process with schedules of “BBS- Bar Bending Schedule”.

For example, the bar bending schedule of reinforcement table consists of following data-

Given in drawing- Spacing and Diameter of bar

*Length= (Length-cover both sides)+(Depth –covers both sides)+Extra length or any L- shape or any extra bar

*Cut Length=Length-No. of bends X 2 X Diameter of bar -(for below 16mm diameter bar)

Or

*Cut Length= Length-No. of bends X 1 X Diameter of bar -(for above 16mm diameter bar)

Sr. No.	Bar Mark No.	Structure identification	Shape of bar	Bar Diameter in mm	Spacing in mm	Length in m	Bend Deduction	Cut Length	No. of sets	Total No. of bars	Total length of bar in m	Unit weight of bar in Kg/m	Total weight in kg	Remark
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Unit weight= $d^2/162$ = /per meter X Length of bars= kgs

No. of bars= Outer to outer length/Spacing's =

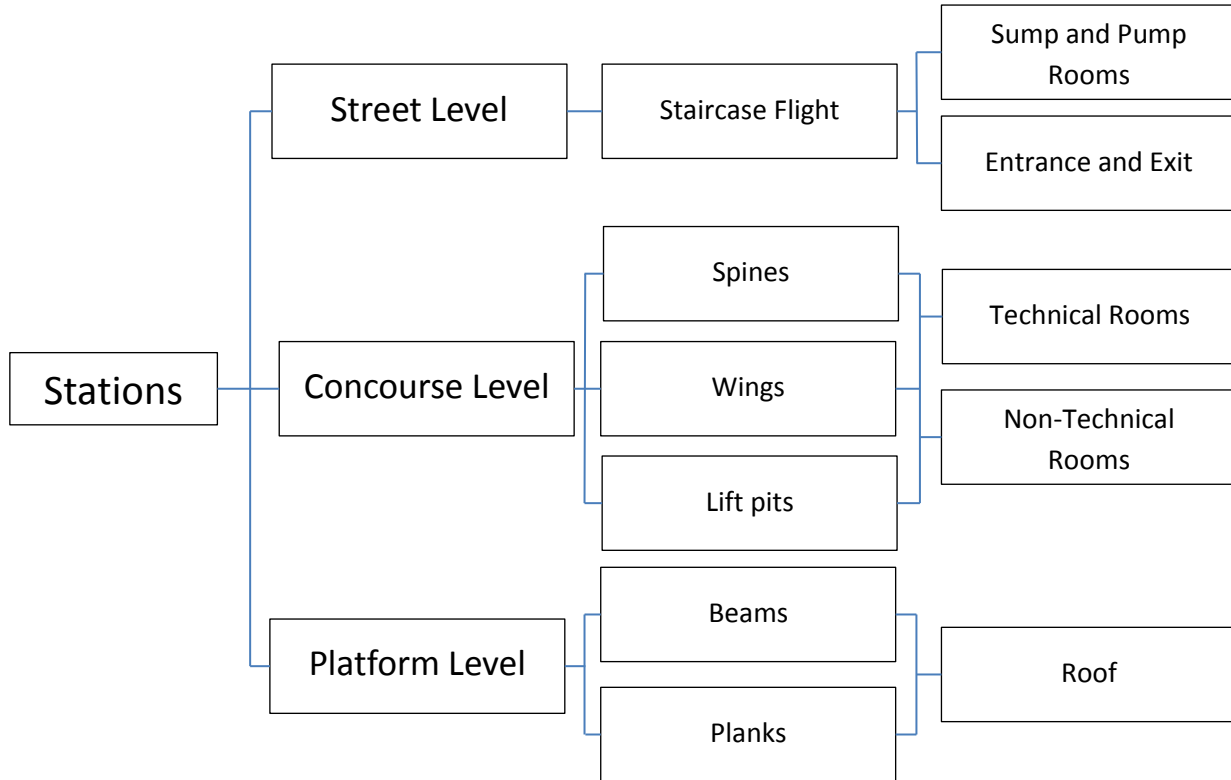
Reinforcement shall be of Fe-500 grade; cutting and bending shall be done as per the requirements with either the manpower or automatic bar bending machine.

Minimum cover provided in spines and wings as per drawing is 35mm.

General standard lap length =48d or 50d, but for segments in PC yard lap length =63d.

7. Stations

A station is constructed on a single pier. It is constructed in 3 levels. Entire station is rested at median of the road alignment.



7.1. Street Level- It provides entrance and exit to the concourse level. The height is 5.5m from the road surface.

- Pump and Sump Room
- Staircase flight
- Entrance and Exit (Arm1-Lift , Arm2-Escalator, Arm3-Lift , Arm4-Escalator)



Fig.7.1.Street Level

7.2. Concourse Level-It consist of various technical and non-technical rooms for various utility. The height is normally 6m.

- Lift pits
- Spines
- Wings
- Technical and Non-Technical Rooms
 - Technical Room
 - 1) UPS and Battery Room
 - 2) EPS(Emergency Power Supply) and Battery Room
 - 3) ASS (Axillary Sub-Station)
 - 4) SER (Signaling Equipment Room)
 - 5) TER (Telecommunication Equipment Room)
 - 6) SCR (Station Control Room)
 - 7) Ante Room
 - 8) Excess Fare Office Room
 - 9) Ticket Vending Room
 - Non-Technical Room
 - 1) SMR (Station Manager Room)
 - 2) Staff Room
 - 3) Wash Rooms
 - 4) First Aid Room
 - 5) Cleaners Room
 - 6) Refuse Room
 - 7) Cash Room
 - 8) Fire Equipment Area Shafts
 - 9) Security Room

7.3. Platform Level- It is the upper most part of the station where the metro runs.the height is 7m from platform to roof.

- Beams
- Planks
- Roof



Fig.7.3. Platform Level

8. Openings

A typical station consists of 4 openings. A staircase is also a opening along with lift and escalators. These 4 openings divided into 2 of each:

8.1. Lifts

8.2. Escalators

8.1. Lifts

It is the device used for raising people or from lower level to higher level or vice-versa.

It is a mechanical device helps to get up stairs easily.

8.2. Escalators

It is the type of vertical transport in a moving staircase. It consists of a motor-driven chain of individually linked steps on a track which cycle on a pair of tracks which keep them horizontal.

9. Finishing Works

Finishing is the last step of construction.

9.1. Block work

9.2. Plastering and Flooring

Plastering and flooring is also called as interfacing. Flooring is based upon the usage.

Mostly granite is used for flooring in all the stations. Flooring is done in public areas. As other rooms does not require such finishing floor.

9.3. Ceiling

The type of ceiling used in technical n non-technical rooms is False ceiling. Ceiling is covered with tiles rest on steel angles.

9.4. Expansion Joint

8. Visit to a Metro Station

10.1. Jubilee Check post

10.2. Cyber Tower Hi-tech City Check post

10.1. Jubilee Check post

- This station is considered as special station.
- Station has two rail track on a single station erected on single pillar.
- Safety against Signaling system and communication.
- It is divided into two parts public and non-public areas.
- It is fully constructed in situ.
- The length of this station is longest among all other metro station.



Fig.10.1.Jubilee Check post



Fig.10.1.2.Jubilee Check post

10.2. Cyber Tower Hi-tech City Check post

- Cyber tower hi-tech city check post consists of concourse and sub-concourse level in which sub concourse level consist of retail shops as well.
- Where other stations does not have sub- concourse level.

11. Conclusion

The Summer Internship training programme which I have undergone for 2 weeks helped me in gaining information that is useful for actual practice. I have learned about various activities.

This training has given me enough experience about the execution work.

The execution of stations work is undertaken by L&T Construction Company. The execution of work is done in coordination with other departments like civil, mechanical, electrical, Safety, Planning, etc. So that there will be no restrictions for working and safe execution.