

TENDER STAGE VS CONSTRUCTION STAGE AWARENESS FOR QUANTITY SURVEYORS

Presented by Kyi Kyi Win

26th February, 2024

MY RESUME

- **Kyi Kyi Win**
- **A.G.T.I (Civil) (1982-1985)**
- **B.A (Myanmar) (1990-1993)**
- **RSE - 0076 (2015)**
- **1986 to 1989 – Irrigation Department**
- **1989 to 1996 - Meikhtila G.T.I**
- **1996 to Present – A1 Construction Company**

YANGON – MANDALAY RAILWAY IMPROVEMENT PROJECT

CONTENTS

- **Aims & Objectives**
- **Project**

- **Earth Work**
- **Culvert**
- **Track Work**
- **Station Structure**

Objective

- Awareness for Quantity Surveyors in Tender Stage vs Construction Stage for Construction Projects
- Importance of Technical and Contractual consideration in Bills of Quantities
- Importance of Quantity Surveyors' Knowledge and Competency in Costing for Tenders

About Project

Yangon-Mandalay Railway Line

- 620 km double track.
- the most important railway among the 5,876 km total track system of Myanmar.
- 96 stations.
- The current travel time is about 15-16 hours.
- To achieve the maximum train running speed of 100 km /hour and operation service of less than 8 hours.

Scope of Work – **Civil Work and Track Work**

- Signalling and Telecommunication

Track System - To install JIS 50N rail.(50 kg/m)

- To remove the BS 75R rail and Old sleeper.

Install new ballast, new concrete sleeper.

JIS 50N rail for Main Line.

BS 75R rail for Loop line.

Project - Phase I – Yangon to Taungoo

Phase II – Taungoo to Mandalay

Budget – JICA Loan Budget

Project Period – 2019 November to 2024 May

Train Operation – Single Line Track Operation

Window Time – Approxim: 6 hours of every night

Materials Supply –

1.50N rail by Main Contractor(Japan Company)

2. Main Ballast by Myanmar Railway

3. Concrete Sleeper by Myanmar Railway

4. The Other by Sub Contractor

eg – Approved soil , Subballast, Concrete,

Formwork, Rebar, Brick , Cement and Finishing work

Phase I - CP 101 –Yangon to Bago

CP 102 - Bago to Nyaunglebin

CP 103 - Nyaunglebin to Taungoo

Description	CP 101	CP 102	CP 103
Total Track Length (M)	162,702	173,878	240,349
Total P.C Girder Bridge (No)	9	17	8
Total Box Culvert (No)	37	57	105
Total Sub ballast Qty (M ³)	233,116	272,403	387,047
Total Platform Area (M ²)	22,498	24,744	28,246
Total Signal House (NO)	13	13	17

CP – 101 (70.78 Km)

- 1. Earth Works**
- 2. Track Works**
- 3. Bridge Works – Bridges and Culverts**
- 4. Station Structures**
- 5. Other Civil Works**
- 6. Signalling Works**
- 7. Telecommunication Works**

EARTH WORKS

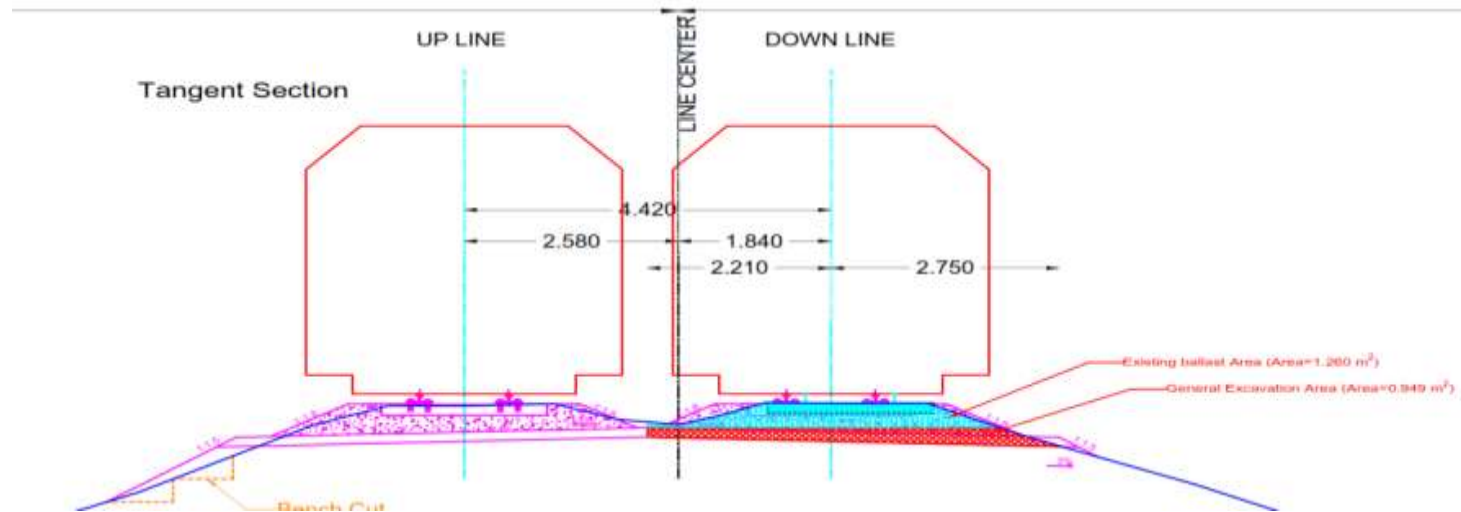
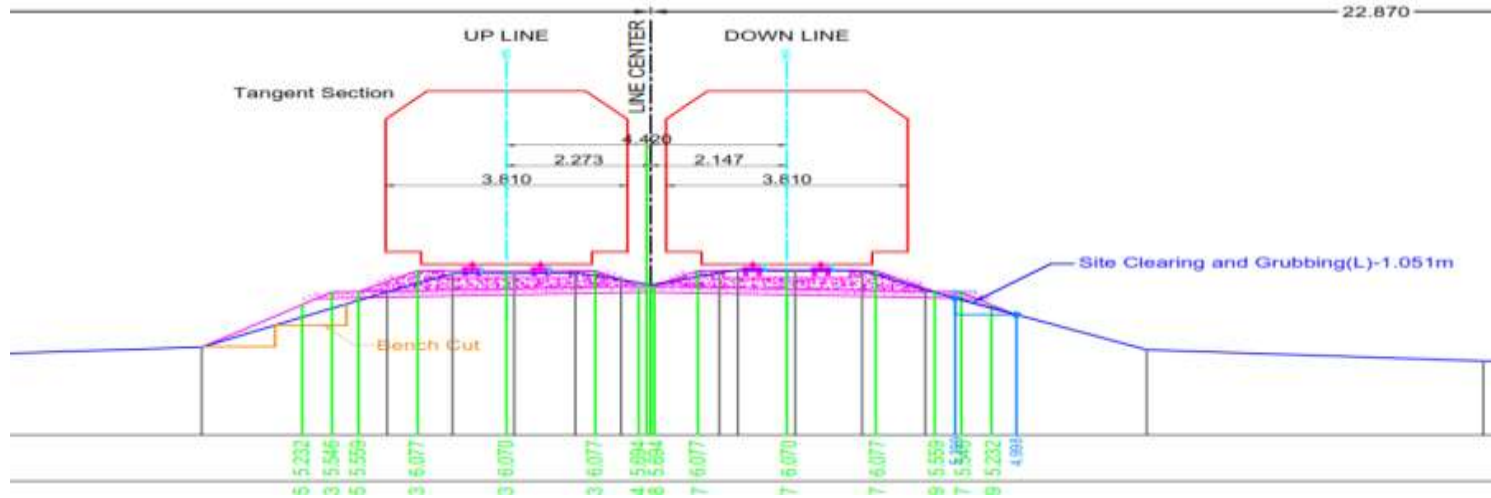
Item No.	Description	Unit
3.1.1	Site Clearing and Grubbing	sq.m.
3.2.1	General Excavation	cu.m.
3.2.2	Excavation and Temporary Stockpiling of the Existing Ballast	cu.m.
3.3.1	Roadbed (Sub-ballast) by new sub-ballast material	cu.m.
3.3.2	Roadbed (Sub-ballast) by existing ballast	cu.m.
3.3.3	Embankment Filling	cu.m.
3.3.4	Removal and Replace of Unsatisfied Existing Subgrade	cu.m.
3.4.1	Sodding	sq.m.
3.4.2	Stone Pitching	sq.m.
3.5.1	Reatning Wall (Gravity Type)	cu.m.
3.6.1	Surcharging	cu.m.
3.6.2	Install Old Rails	m
3.6.3	Continuous RC Capping Beam	cu.m.
3.6.4	Replace of Soft Soil by Suitable Material	cu.m.
TOTAL		

Site Clearing and Grubbing

3.3.1 Method of Measurement

- (1) “Site Clearing and Grubbing” shall be measured in square meter (m²).
- (2) “Site Clearing and Grubbing” shall be measured in following items:
 - a) Payment for Site Clearing and Grubbing shall be made only for the locations under new permanent or temporary embankment of the track as shown on the drawings.
 - b) The area of “Site Clearing and Grubbing” shall be measured as the existing ground area underneath the permanent and temporary embankment in square meter (m²).
 - c) Temporary embankment means embankment, which is necessary for temporary track operation, but not includes embankment for temporary access road.

Site Clearing and Grubbing



Roadbed (Sub-ballast) by new sub-ballast material

Table 5.1 Percent passing for testing of Roadbed (Sub-ballast) material

Sieve <u>Designatio</u>	Percentage passing
50 mm (2")	100 %
25 mm (1")	90% to 100%
9,5 mm (2/8")	50 % to 84 %
2 mm (No.10)	26 % to 50 %
0,425 mm (No.40)	12 % to 30 %
0,075 mm (No.200)	0 % to 10 %

The material shall conform to the following standards and requirement:

- Liquid Limit (AASHTO T 89) 25 % max.
- Plasticity Index (AASHTO T 90) 6 % max.
- Sand Equivalent(AASHTO T 176) 25 % min.
- Loss by Abrasion (AASHTO T 96) 50% max.
- Minimum Dry Density (AASHTO T 180) 2.0gr/cm²

Sub-Ballast Materials Mixing Works



Subgrade Compaction Works



Sub-ballast Filling Works



Sub ballast mixing Ratio

3/4" – 10%

1/2" - 15%

3/8" – 15%

Fine – 60%

1. Mixing & Transportation Allowance – 40%
2. Side Shape Allowance – 7%
3. Compaction Allowance – 35%

Total Allowance – 82%

In Breakdown-35%

Claimed Qty: 0.762 m³/m

Supplied Qty: 1.386 m³/m

Sub-ballast Laying work by Paver



Embankment Filling

- To know requirement total volumn.
- To know location of borrow quarries.
- To know condition of Route.

At least 1 boring or 1 test pit every 10,000 M³

(2) Laboratory Tests of Quarry Material

The following laboratory tests will be carried out to ascertain the characteristics and suitability of the materials:

- c) granulometry (at least one every 5,000 cu.m. of material);
- d) natural water content (at least one every 5,000 cu.m of material)
- e) liquid limit and the plastic limit on the portion of the material which passes through a 0.4 UNI 2332 sieve (at least one every 5,000 cu.m of material);
- f) granulometric analysis of the materials used in the compaction test which are suspected of containing unsuitable materials, both before and after the test;

Embankment Filling (compaction & Shape allow: 80%)



TRACK WORKS

Train Operating Speed

Main Line - 100 km/h

Others: 70km/h

Table 1.1 Speed Restriction at Curves

Radius (m)	Speed Restriction
>500	100 km/h
450-500	95 km/h
400-450	90 km/h
350-400	85 km/h
300-350	75 km/h
250-300	70 km/h
200-250	60 km/h
150-200	50 km/h
100-150	40 km/h

Table 1.2 Speed Restrictions on Turnouts

Turnout No.	Speed Restriction
8	25 Km/h
10	35 Km/h
12	40 Km/h

Speed Restriction at Loops and Sidings

The Speed Restriction at Sidings is as follows:

- a) Sub main lines: 25 km/h~40 km
- b) Sidings: 25 km/h

Note

- JIS 50 rail – 50kg/m , 50m/ 1no
- BS 75 rail - 75lb/yard , 12m/ 1no
- CWR - Continuous welded rail (200m , 600m)
- Compromise Rail: To connect two different rails (JIS 50N to BS 75R)
- Flash butt welding -. end to end are electronically charged
- Thermit Welding -used by iron oxide and aluminum powder

Breakdown Comparison

TRACK LAYING WORK BREAKDOWN (BY TENDER STAGE)	
Item No	Description
	Track Laying Work for One meter
1	Transporting of Fastenings
2	Transporting of Rails
3	Transporting of P.C Sleepers
4	Track Linking
5	Ballasting, Compacting & Levelling
6	1st Tamping by Hand Tie Tamper
7	2nd Tamping by Hydraulic Tamping Machine
8	3rd Tamping by M.T.T & Dressing
9	Flash - butt Welding
	Track Laying Work for One meter

TRACK LAYING WORK BREAKDOWN (BY CONSTRUCTION STAGE)	
Item No	Description
	Track Laying Work for One meter
1	Transporting of Fastenings
2	Transporting of Rails
3	Transporting of P.C Sleepers
4	Track Linking
5	Ballasting, Compacting & Levelling
6	1st Tamping by Hand Tie Tamper
7	2nd Tamping by Hydraulic Tamping Machine
8	3rd Tamping by M.T.T & Dressing
9	Flash - butt Welding
10	Destressing
11	Thermit Welding
12	Profiling & Site Cleanning
	Track Laying Work for One meter

Track Yellow Book



Track Yellow Book.pdf

Ballast Unloading on Site



Bottom Ballast Compaction Work



P.C Sleeper Loading at Stock Yard



Sleeper unloading Works



PC Sleeper Sprading Work



Rail Transportation for Short Rail



Rail Transportation for Long Rail



Rail Shifting and Laying on P.C Sleeper



Rail Shifting and Laying on P.C Sleeper



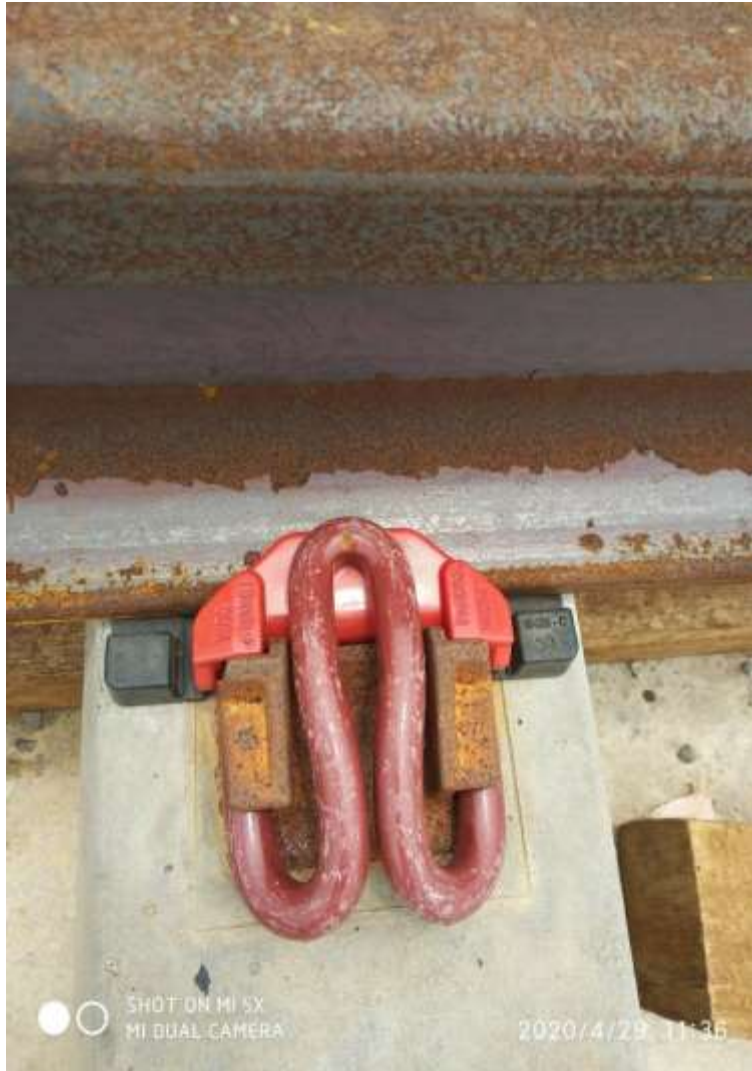
Rail Shifting and Laying on P.C Sleeper



Rail Installation



Rail Clip and Rubber Pad



Sleeper Spacing Square and Clipping



Top Ballast Filling



1st Tamping by Hand Tie Tamper



Ballast Filling after Tamping



2nd Tamping by Hydraulic Tamping Machine



2nd Tamping by Hydraulic Tamping Machine



Multi Tie Tamping Machine



Final Tamping by Multi Tie Tamping Machine



Ballast Profile Regulator



Rail Destressing before Welding Work



Rail Destressing before Welding Work



Track laying and IRJ joint spacing squareness inspection



Rectification Work



Ballast shoulder profiling work



Final Handover



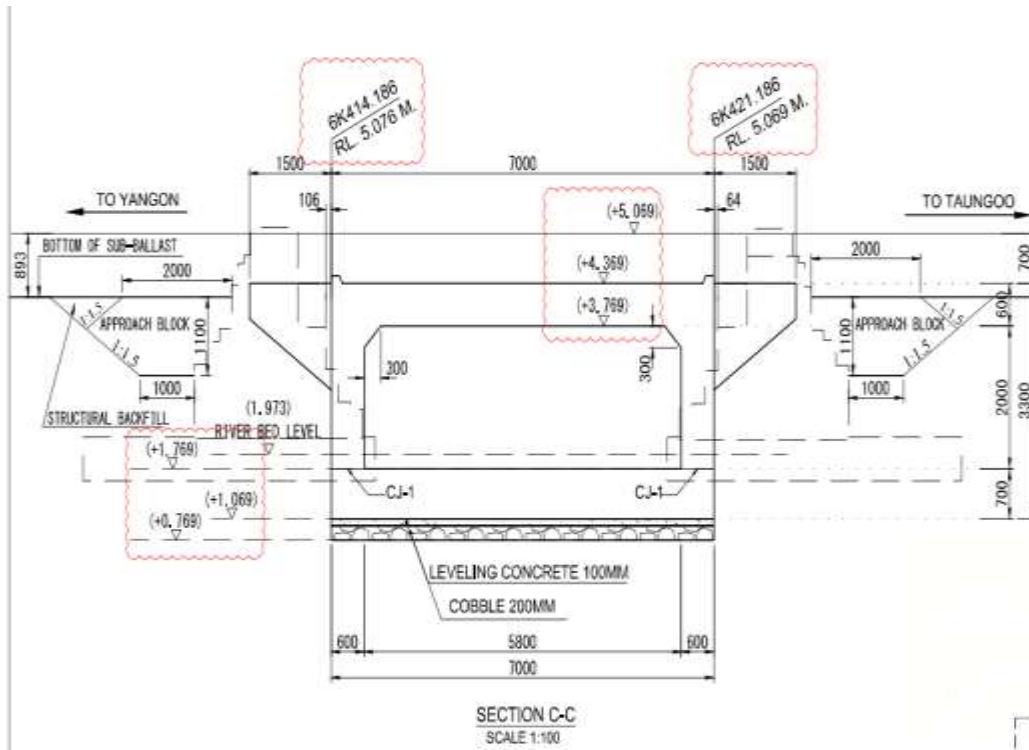
Breakdown by Track Laying Work

No	Work Item		Resource	Productivity	Remark	
		Manpower				
			Machinery			
1	Track Work	Project Engineers	Skilled Labours			
1	Bottom Ballast Laying Work	4 Nos for Each Season (1,2 &3)	Labour-15 Nos	20T, 8T Excavator/ 10 T Compactor	150 m/day	Required Hand Tools are already prepared and maintained.
2	Sleeper Laying & Adjustment Work		Labour-12 Nos	20 T Excavator	150 m/day	
3	Rail Installation Work		Labour-45 Nos	Rail Changers-23 Nos	200 m/day	
	Top Ballasting Work		Labour-24 Nos		250 m/day	
5	1st & 2nd Tamping Work			Hand Tie Tamper(1 No), Hydraulic Tamping Machine (1 Nos)	150 m/day	Assisted by Operators and Mechanics
6	Destressing Work			Bottom Rollers, Side Rollers	600 m/day	Procurement already completed.
7	Final Tamping Work with MTT			Labour-15 Nos		1km/day

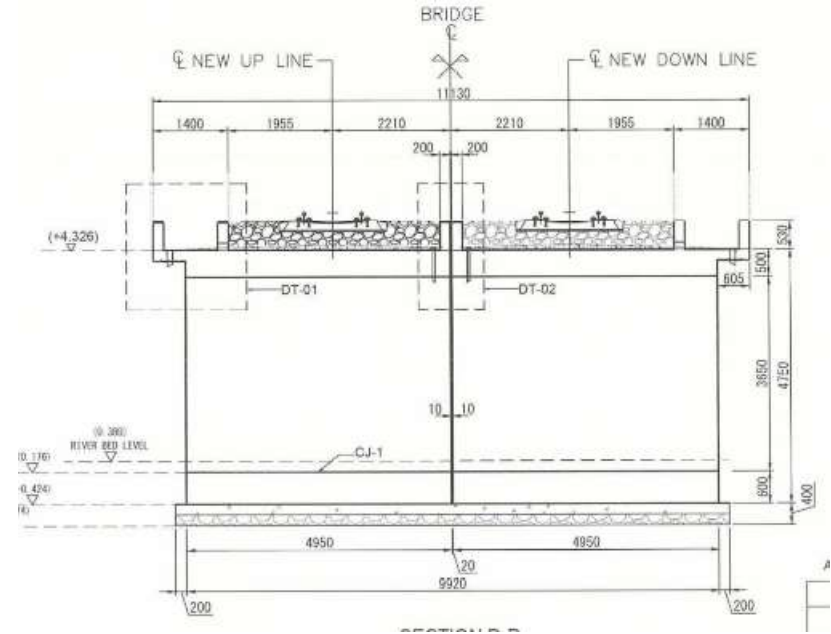
CULVERT WORKS

4.2	Culvert Works	
4.2.1.(a)	Dismantle and Demolition (Existing Superstructure)	span
4.2.1.(b)	Dismantle and Demolition (Existing Substructure)	nr
4.2.1.(c)	Foundation (Rail Piles with Vibratory Method)	m
4.2.1.(d)	Foundation (Rail Piles with Press-In Method)	m
4.2.1.(e)	Culvert	m
4.2.1.(f)	Wing Wall	LS
4.2.1.(g)	Revetment	m
4.2.1.(h)	Drop Structure	LS
4.2.1.(i)	Gabion	cu.m
4.2.1.(j)	Temporary Works (Temporary Access Road)	LS
4.2.1.(k)	Temporary Works (Watercourse Management)	LS
4.2.1.(l)	Temporary Works (Temporary Retaining Wall)	nr
4.2.1.(m)	Temporary Works (Load Supprt Frame)	LS

Types of Culvert (One Cell Culvert)

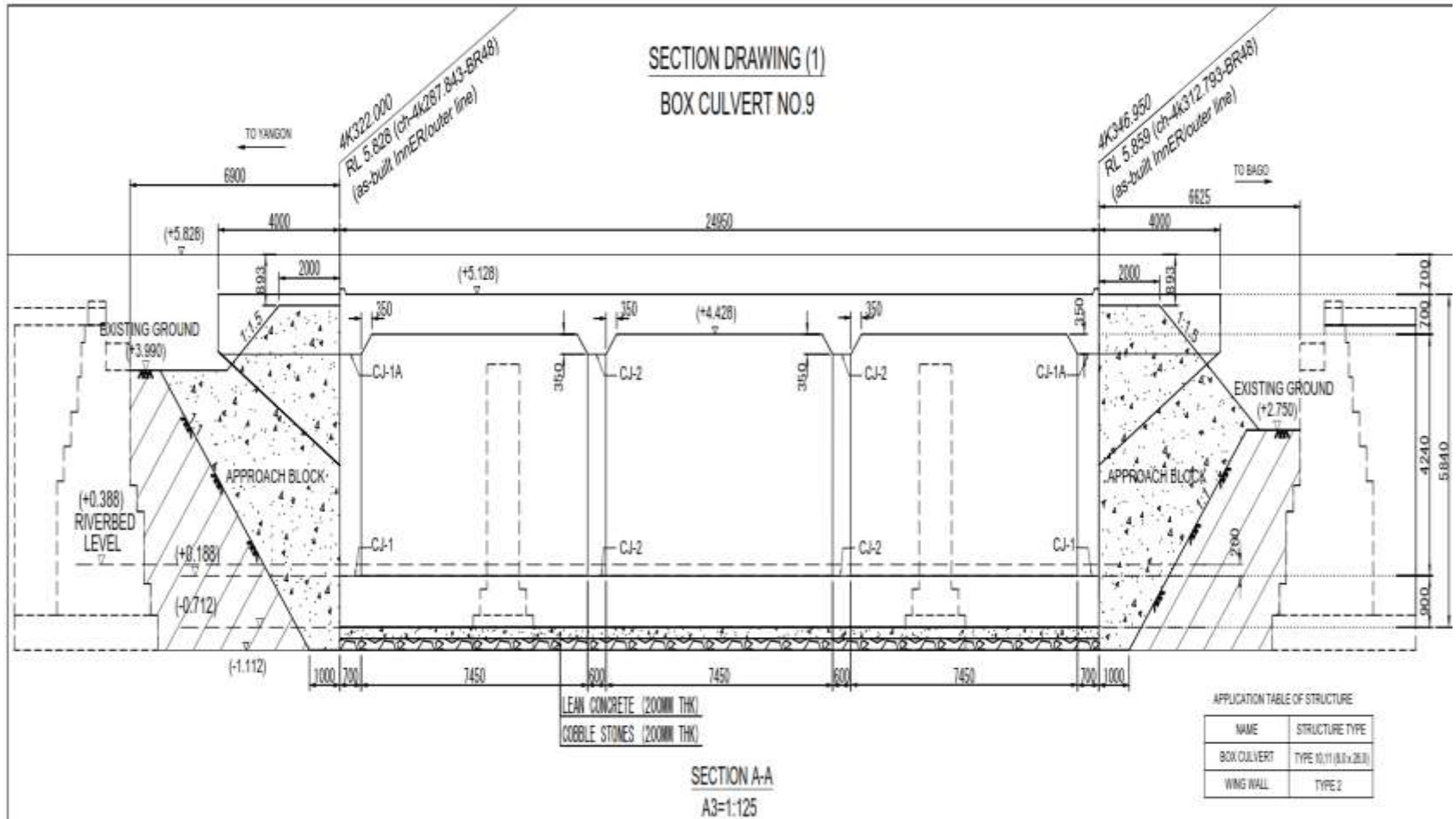


SECTION C-C
SCALE 1:100



SECTION D-D

Types of Culvert (Two Cell Culvert)



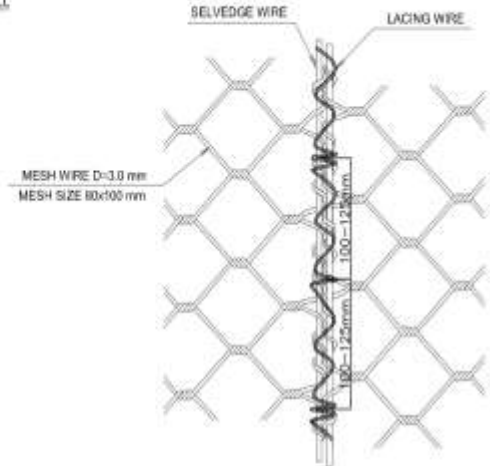
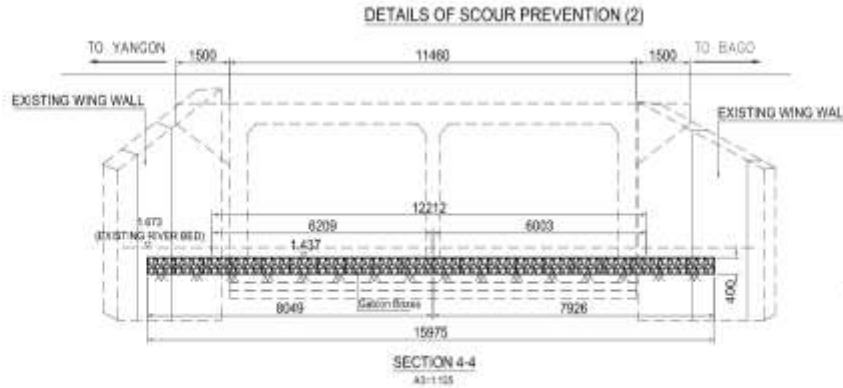
Wall & Slab Formwork (One time use)



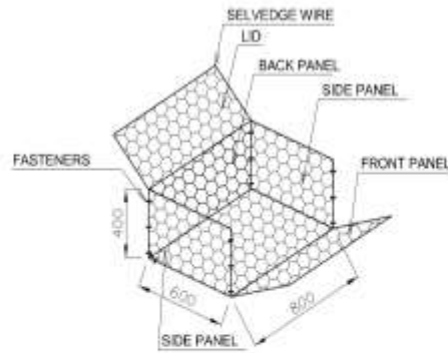
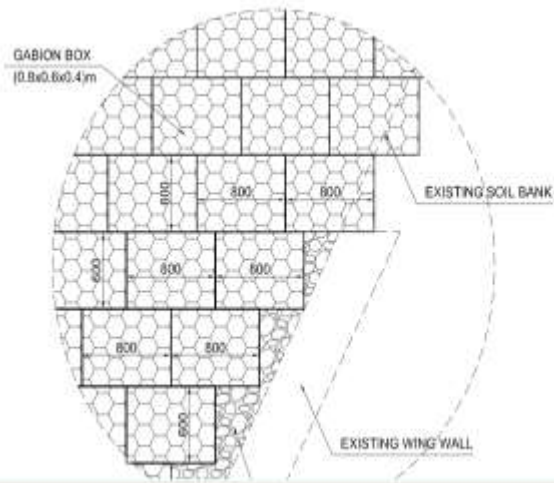
Wall & Slab Formwork (One time use)



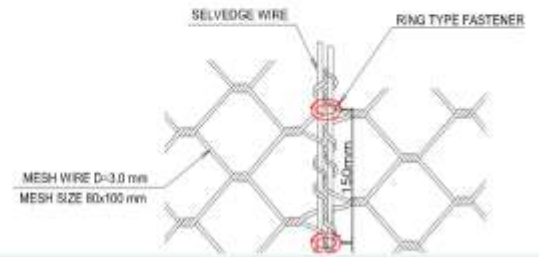
Gabion (800 x 600 x 400)



CONNECTING GABIONS BY BINDING WIRE



DETAIL OF GABION
A3 130



Gabion (800 x 600 x 400)



STATION STRUCTURE

STATION STRUCTURES		
Item No.	Description	Unit
5.1.1 (b)	Platform	sq.m.
5.1.2	Station Level Crossing and Stair (w=1.5m)	m
5.1.3 (b)	FOB	nos
5.1.4 (d)	U Ditch (B400mm×H600mm)	m
5.1.4 (e)	Catch Basin	nos
5.2.1.(h)	Embankment Widening for Signalling System Foundation	cu.m.
5.2.2.(a)	Transformer Foundation Type-A(incl. Fence)	nos
5.3.1	Signal Cabin Type-3 (MSH)	nr
5.3.2	Signal Cabin Type-2A (SH)	nr
5.3.3	Signal House Type-2B (MSH)	nr
5.3.4	Signal House Type-1A Ver.1 (SSH)	nr
5.3.5	Relay House Type-1B Ver.1	nr
5.3.6	Precast Concrete Pile	m
5.5	Removal and Repairing of Platform Shed	m
TOTAL		

Platform Backfilling Work



Temporary Roofing Work



Formwork for Signal House



Brick Work for Signal House



Conclusion

- Lesson learnt for future tenders
- Competence of Quantity Surveyors
- Pitfalls in Tender Stage
- Technical and Contractual reflection for tender costing

SO MANY THANKS FOR YOUR ATTENTIONS

Kyi Kyi Win (R.S.E – 0076)