

CHAPTER 18

COST ESTIMATES



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CHAPTER - 18

COST ESTIMATES

18.1 INTRODUCTION

Detailed cost estimates for Nagpur Metro Rail Project has been prepared corridor wise covering civil, electrical, signaling and telecommunications works, rolling stock, environmental protection, rehabilitation, etc. considering 25 kv ac Overhead Traction System at June 2012 price level.

While preparing the capital cost estimates, various items have generally been grouped under three major heads on the basis of (i) route km length of alignment, (ii) number of units of that item, and (iii) item being an independent entity. All items related with alignment, whether elevated or at-grade or underground construction, permanent way, traction, Signalling & telecommunication, whether in main lines or in maintenance depot, have been estimated at rate per route km basis. Cost of station structures, other electrical services at these stations including Lifts & Escalators and Automatic Fare Collection (AFC) installations at all stations have been assessed in terms of each station as a unit. Similarly Rolling stock costs have been estimated in terms of number of units required. In remaining items, viz. land, utility diversions, rehabilitation, etc. the costs have been assessed on the basis of each item, taken as an independent entity.

In order to arrive at realistic cost of various items, costs have been assessed on the basis of rates accepted for Delhi Metro. A suitable escalation factor has been applied to bring these costs to June 2012 price level. The details of taxes and duties are worked out separately.

The capital cost has been worked out for Corridor-1: NORTH-SOUTH CORRIDOR (AUTOMOTIVE SQUARE TO KHAPRI) and Corridor-2: EAST-WEST CORRIDOR (LOKMANYA NAGAR TO PRAJAPATI NAGAR). One depot cum maintenance workshop on each corridor has been planned..



18.2 CAPITAL COST ESTIMATE

CORRIDOR - 1: NORTH-SOUTH CORRIDOR (AUTOMOTIVE SQUARE TO KHAPRI)

The capital cost estimates is shown at Table 18.1

Table 18.1

NAGPUR METRO					
Capital Cost Estimate					
					June 2012 price level
CORRIDOR - I NORTH-SOUTH CORRIDOR (AUTOMOTIVE SQUARE TO KHAPRI)					
Total length = 19.658 Km, Elv = 15.058 Km At Grade :4.600 Km					
Total Station = 17 nos, Elv = 15, At Grade:2					

S. No.	Item	Unit	Rate	Qty.	Amount (Rs. in Cr.)
					Without taxes
1.0	Land				
1.1	Permanent				
a	Government	ha	5.00	50.220	251.10
b	Private	ha	35.52	3.800	134.98
1.2	Temporary				
a	Government	ha	1.20	20.000	24.00
	Private	ha			
	Subtotal (1)				410.08
2.0	Alignment and Formation				
2.1	Underground section by T.B.M excluding station length (260m each)	R. Km.	110.00	0.000	0.00
2.2	Underground section by Cut & Cover excluding Station length (260m each) RAMP PORTION	R. Km.	100.00	0.000	0.00
2.3	Elevated section including station length	R. Km.	29.00	15.058	436.68
2.4	At Grade section including station length	R. Km.	2.90	4.600	13.34
2.5	Entry to depot	R. Km.	2.90	1.000	2.90
	Subtotal (2)				452.92
3.0	Station Buildings				
3.1	Underground Station (260 m length) incl. EM works, lifts, escalators, VAC etc.	Each			
a	Underground Station- Civil works	Each	100.00	0	0.00
b	Underground Station- EM works etc.	Each	55.45	0	0.00



S. No.	Item	Unit	Rate	Qty.	Amount (Rs. in Cr.)
3.2	Elevated stations (including finishes)	Each			
a	Type (A) way side- civil works	Each	17.00	10	170.00
b	Type (A) way side- EM works etc	Each	7.02	10	70.20
c	Type (B) Way side with signalling-civil works	Each	18.70	4	74.80
d	Type (B) Way side with signalling-EM works etc	Each	7.02	4	28.08
e	Type (C), Terminal station -civil works	Each	20.00	1	20.00
f	Type (c), Terminal station -EM works	Each	7.02	1	7.02
3.3	At grade Stations (including finishes)				
a	Type (A) way side- civil works	LS	13.600	2.000	27.20
b	Type (A) way side- EM works etc	LS	5.616	2.000	11.23
3.3	Metro Bhawan & OCC bldg.	LS			
a	Metro Bhawan & OCC bldg.-civil works	LS			41.33
b	Metro Bhawan & OCC bldg.-EM works etc	LS			7.29
	Subtotal (3)				457.15
4.0	Depot	LS			
a	Civil works	LS			58.40
b	EM works etc	LS			87.60
	Subtotal (4)				146.00
5.0	P-Way				
5.1	Ballastless track for elevated & underground Section	R. Km.	6.48	15.058	97.58
5.2	Ballasted track for (a) at grade alignment and (b) in depot	R. Km.	2.31	10.600	24.48
	Subtotal (5)				122.06
6.0	Traction & power supply incl. OHE, ASS etc. Excl. lifts & Escalators				
6.1	UG Section	R.Km.	16.88	0.000	0.00
6.1	Elevated & at grade section	R.Km.	16.88	20.658	348.71
	Subtotal (6)				348.71
7.0	Signalling and Telecom.				
7.1	Sig. & Telecom.	R. Km.	14.09	20.658	291.07
7.2	Automatic fare collection	Stn.			
	At Grade Station	Each	5.00	2	10.00
	Elevated stations	Each	5.00	15	75.00
	Subtotal (7)				376.07
8.0	R & R incl. Hutments etc.	LS			60.00
	Subtotal (8)				60.00
9.0	Misc. Utilities, roadworks, other civil works such as median stn. signages Environmental protection	R. Km.			



S. No.	Item	Unit	Rate	Qty.	Amount (Rs. in Cr.)
a	Civil works+EM works	R. Km.	4.69	20.658	96.92
	Subtotal (9)				96.92
10.0	Rolling Stock	Each	8.50	33.000	280.50
	Subtotal (10)				280.50
11.0	Capital expenditure on security	LS			
a	Civil works	LS			6.00
b	EM works etc	LS			4.00
	Sub Total (11)				10.00
12.0	Capital expenditure on Feeder buses				
	Feeder Buses @ 2% of Total Cost of all items except Land	LS			47.01
13.0	Total of all items except Land				2350.33
	Total of all items except Land but including Feeder Buses				2397.34
14.0	General Charges incl. Design charges @ 5 % on all items except land				119.87
15.0	Total of all items including G. Charges except land				2517.21
16.0	Contingencies @ 3 %				75.52
17.0	Gross Total				2592.72
	Cost without land			=	2593
	Cost with land			=	3015



CORRIDOR - II: EAST-WEST CORRIDOR (LOKMANYA NAGAR TO PRAJAPATI NAGAR)

The capital cost estimates is shown at Table 18.2

Table 18.2

NAGPUR METRO					
Capital Cost Estimate					
				June 2012 price level	
CORRIDOR - II EAST-WEST CORRIDOR (LOKMANYA NAGAR TO PRAJAPATI NAGAR)					
Total length = 18.557 Km, Elv = 18.557 Km					
Total Station = 19 nos, Elv = 19					

S. No.	Item	Unit	Rate	Qty.	Amount (Rs. in Cr.)
					Without taxes
1.0	Land				
1.1	Permanent				
a	Government	ha	5.00	27.460	137.30
b	Private	ha	35.52	1.490	52.92
1.2	Temporary				
a	Government	ha	1.20	20.000	24.00
	Private	ha			
	Subtotal (1)				214.22
2.0	Alignment and Formation				
2.1	Underground section by T.B.M excluding station length (260m each)	R. Km.	110.00	0.000	0.00
2.2	Underground section by Cut & Cover excluding Station length (260m each) RAMP PORTION	R. Km.	100.00	0.000	0.00
2.3	Elevated section including station length	R. Km.	29.00	18.557	538.15
2.4	At Grade section including station length	R. Km.	2.90	0.000	0.00
2.5	Entry to depot	R. Km.	2.90	1.000	2.90
	Subtotal (2)				541.05
3.0	Station Buildings				
3.1	Underground Station (260 m length) incl. EM works, lifts, escalators, VAC etc.	Each			
a	Underground Station- Civil works	Each	100.00	0	0.00
b	Underground Station- EM works etc.	Each	55.45	0	0.00



S. No.	Item	Unit	Rate	Qty.	Amount (Rs. in Cr.)
3.2	Elevated stations (including finishes)	Each			
a	Type (A) way side- civil works	Each	17.00	13	221.00
b	Type (A) way side- EM works etc	Each	7.02	13	91.26
c	Type (B) Way side with signalling-civil works	Each	18.70	4	74.80
d	Type (B) Way side with signalling-EM works etc	Each	7.02	4	28.08
e	Type (C), Terminal station -civil works	Each	20.00	2	40.00
f	Type (c), Terminal station -EM works	Each	7.02	2	14.04
3.3	At grade Stations (including finishes)				
a	Type (A) way side- civil works	LS	13.600	0.000	0.00
b	Type (A) way side- EM works etc	LS	5.616	0.000	0.00
3.3	Metro Bhawan & OCC bldg.	LS			
a	Metro Bhawan & OCC bldg.-civil works	LS			41.33
b	Metro Bhawan & OCC bldg.-EM works etc	LS			7.29
	Subtotal (3)				517.80
4.0	Depot	LS			
a	Civil works	LS			58.40
b	EM works etc	LS			87.60
	Subtotal (4)				146.00
5.0	P-Way				
5.1	Ballastless track for elevated & underground Section	R. Km.	6.48	18.557	120.25
5.2	Ballasted track in depot	R. Km.	2.31	5.000	11.55
	Subtotal (5)				131.80
6.0	Traction & power supply incl. OHE, ASS etc. Excl. lifts & Escalators				
6.1	UG Section	R.Km.	16.88	0.000	0.00
6.1	Elevated & at grade section	R.Km.	16.88	19.557	330.12
	Subtotal (6)				330.12
7.0	Signalling and Telecom.				
7.1	Sig. & Telecom.	R. Km.	14.09	19.557	275.56
7.2	Automatic fare collection	Stn.			
	At Grade Station	Each	5.00	0	0.00
	Elevated stations	Each	5.00	19	95.00
	Subtotal (7)				370.56
8.0	R & R incl. Hutments etc.	LS			60.00
	Subtotal (8)				60.00
9.0	Misc. Utilities, roadworks, other civil works such as median stn. signages Environmental protection	R. Km.			



S. No.	Item	Unit	Rate	Qty.	Amount (Rs. in Cr.)
a	Civil works+EM works	R. Km.	4.69	19.557	91.76
	Subtotal (9)				91.76
10.0	Rolling Stock	Each	8.50	36.000	306.00
	Subtotal (10)				306.00
11.0	Capital expenditure on security	LS			
a	Civil works	LS			6.00
b	EM works etc	LS			4.00
	Sub Total (11)				10.00
12.0	Capital expenditure on Feeder buses				
	Feeder Buses @ 2% of Total Cost of all items except Land	LS			50.10
13.0	Total of all items except Land				2505.09
	Total of all items except Land but including Feeder Buses				2555.19
14.0	General Charges incl. Design charges @ 5 % on all items except land				127.76
15.0	Total of all items including G. Charges except land				2682.95
16.0	Contingencies @ 3 %				80.49
17.0	Gross Total				2763.44
	Cost without land			=	2763
	Cost with land			=	2984



18.3 LAND

- i) Land requirements have been kept to the barest minimum & worked out on area basis. For underground and elevated alignment, no land is proposed to be acquired permanently, except small areas for locating entry/exit structures, traffic integration, etc. at stations, and wherever the alignment is off the road.
- ii) To workout cost of land its rates have been assumed as Rs. 5.00 Crore per hectare for government land and rates for private land have been taken as Rs. 35.52 Crore per hectare.
- iii) Land required for Property Development for funding the project after its commercial exploitation has not been taken in to account while working out project cost.

18.4 FORMATION, ALIGNMENT

- i) **Elevated Section:** The basis of rate is as accepted for Delhi Metro duly escalated to June 2012 price level.

18.5 STATION BUILDINGS

- i) **Underground Stations:** The basis of rate is as accepted for Delhi Metro duly escalated to June 2012 price level. The work cover U.G. alignment, as well as, other civil electrical works like ventilation, air-conditioning, lifts & escalators, but does not cover P-way, O.H.E, signaling and interlocking works, AFC installations.
- ii) **Elevated Stations:** Rates are based on accepted rates of Delhi metro, duly updated to June 2012 price level. The cost includes the general services at the stations but excludes the cost of viaduct, lifts & escalators, which have been considered separately under, respective items. One station is planned at double height. The extra cost on double height account to be charged to contingency.

18.6 PERMANENT WAY

For elevated and underground sections, ballast-less track and for at-grade section and Depot ballasted track has been planned. Rates are based on accepted rates of Delhi Metro, duly updated to June 2012 price level.

18.7 DEPOT

One Car Maintenance Depot-cum-Workshop serving both the corridors have been proposed at KHAPRI (for NS Corridor) and at Subhash Nagar (for EW Corridor). The depot is planned at ground level. Costs have been worked out for various items of building, elevated structures, tracks, boundary wall & plants machinery etc.



18.8 UTILITY DIVERSIONS

The costs of utility diversions involved in the stretch have been considered separately and provided for in the estimate. In addition to sewer/drainage/water pipelines other important utilities works considered are road diversions, road restoration etc. Cost provision has been made on route km basis based on experience of Delhi Metro.

18.9 ENVIRONMENTAL IMPACT ASSESSMENT

Provision for environmental impacts of the proposed two Corridors has been made to cover various protection works, additional compensatory measures, and compensation for loss of trees, compensatory afforestation and fencing, monitoring of water quality, air/noise pollution during construction, establishment of Environmental Division.

18.10 REHABILITATION & RESETTLEMENT

Provision towards compensation/rehabilitation of structure likely to be affected has been assessed. Sufficient provision is kept in the estimate to cover the cost of shifting of structures.

18.11 TRACTION & POWER SUPPLY

Provisions have been made to cover following subheads:

- OHE
- Receiving-cum-Traction Sub-stations including cables.
- ASS for elevated and at-grade stations.
- Service connection charges for Receiving Sub-stations.
- SCADA augmentation.
- Miscellaneous items e.g. illumination, lifting T&P, etc.

The rates adopted for various items are based on costs of works being done for Delhi Metro, duly updated to June 2012 level.

18.12 ELECTRICAL SERVICES AT STATIONS

These are included in estimated costs of stations. Cost of escalators for elevated stations have not been included in station costs, and therefore, are provided under electrical estimates & shown separately.

18.13 SIGNALLING & TELECOMMUNICATION WORKS

The rates adopted are based on assessment done considering rates of similar sub-system as accepted for Delhi Metro, duly updated to June 2012 price level and TPWS works. These rates include escalation during manufacture & supply of equipment and their installation at site, but exclude CD and WT.

18.14 AUTOMATIC FARE COLLECTION

Adopted rates are based on assessment done considering rates of similar works in Delhi Metro /other metro projects, duly updated to June 2012 price level. These rates exclude



CD & WT, but include escalation during the period of equipment manufacture and their supply, including installation.

18.15 ROLLING STOCK

The estimated cost per coach at June 2012 price level exclusive of taxes and duties has been taken as Rs. 8.5 Crores per coach.

18.16 CAPITAL EXPENDITURE ON SECURITY

A lump-sum cost of 10 crore has been considered for this purpose.

18.17 CAPITAL EXPENDITURE ON FEEDER BUSES

A lump-sum cost of Feeder Buses @ 2% of Total Cost of all items except Land has been considered.

18.18 TAXES AND DUTIES

The component of Import Duty, Excise Duty and VAT is not included in the Capital cost estimated. The estimated taxes and duties for various corridors are given in the following tables.

Details of Taxes and duties for Corridor-I and Corridor-II are provided in table 18.3 and 18.4 respectively.



**TABLE 18.3
Details of Taxes and Duties (NS CORRIDOR)**

Details of Taxes and Duties (NS CORRIDOR)						
S. No.	Description	Total cost without Taxes & duties (Cr.)	Taxes and duties			Total taxes & duties (Cr.)
			custom duty (Cr.)	excise duty (Cr.)	VAT(Cr.)	
	Customs duty =	22.8531	%			
	Excise duty =	12.36	%			
	Sale tax =	6.25	%			
	Works tax =	6.25	%			
	VAT =	12.5	%			
1	Alignment & Formation					
	Underground	0.00	0.00	0.00	0.00	0.00
	Elevated, at grade & entry to Depot	452.92		39.19	22.26	61.45
2	Station Buildings					
	a) Underground station-civil works	0.00	0.00	0.00	0.00	0.00
	b) Underground station-EM works	0.00	0.00	0.00	0.00	0.00
	Elevated station - civil works	292.00		25.26	14.35	39.62
	Elevated station-EM works	116.53	5.33	9.79	5.56	20.69
	e) Metro bhawan & OCC bldg-civil works	41.33		3.58	2.03	5.61
	f) Metro bhawan & OCC bldg-EM works	7.29	0.33	0.61	0.35	1.29
3	Depot					
	Civil works	58.40	4.00	3.54	2.01	9.55
	EM works	87.60	4.00	7.36	4.18	15.55
4	P-Way	122.06	22.31	2.56	1.46	26.34
5	Traction & power supply					
	Traction and power supply	348.71	31.88	21.98	12.49	66.35
6	S & T Works					
	S & T	291.07	53.22	7.20	4.09	64.50
	AFC	85.00	14.57	2.63	1.49	18.69
7	R & R hutments	60.00			3.75	3.75
8	Misc.					
	Civil works	72.69		6.29	3.57	9.86
	EM works	24.23		2.55	1.45	3.99
9	Rolling stock	280.50	56.41	2.70	1.54	60.65
10	Security					
	Civil works	6.00		0.52	0.38	0.90
	EM works	4.00		0.49	0.36	0.85
11	Feeder Buses	47.01		5.81	4.23	10.04
	Total	2397.34	192.05	142.06		419.67
	Total taxes & Duties					420



TABLE 18.4
Details of Taxes and Duties (EW CORRIDOR)

Details of Taxes and Duties (NS CORRIDOR)						
S. No.	Description	Total cost without Taxes & duties (Cr.)	Taxes and duties			Total taxes & duties (Cr.)
			custom duty (Cr.)	excise duty (Cr.)	VAT(Cr.)	
	Customs duty =	22.8531	%			
	Excise duty =	12.36	%			
	Sale tax =	6.25	%			
	Works tax =	6.25	%			
	VAT =	12.5	%			
1	Alignment & Formation					
	Underground	0.00	0.00	0.00	0.00	0.00
	Elevated, at grade & entry to Depot	541.05		46.81	26.60	73.41
2	Station Buildings					
	a) Underground station-civil works	0.00	0.00	0.00	0.00	0.00
	b) Underground station-EM works	0.00	0.00	0.00	0.00	0.00
	Elevated station - civil works	335.80		29.05	16.51	45.56
	Elevated station-EM works	133.38	6.10	11.21	6.37	23.68
	e) Metro bhawan & OCC bldg-civil works	41.33		3.58	2.03	5.61
	f) Metro bhawan & OCC bldg-EM works	7.29	0.33	0.61	0.35	1.29
3	Depot					
	Civil works	58.40	4.00	3.54	2.01	9.55
	EM works	87.60	4.00	7.36	4.18	15.55
4	P-Way	131.80	24.10	2.77	1.57	28.44
5	Traction & power supply					
	Traction and power supply	330.12	30.18	20.81	11.82	62.81
6	S & T Works					
	S & T	275.56	50.38	6.81	3.87	61.06
	AFC	95.00	16.28	2.94	1.67	20.89
7	R & R hutments	60.00			3.75	3.75
8	Misc.					
	Civil works	68.82		5.95	3.38	9.34
	EM works	22.94		2.41	1.37	3.78
9	Rolling stock	306.00	61.54	2.95	1.68	66.17
10	Security					
	Civil works	6.00		0.52	0.38	0.90
	EM works	4.00		0.49	0.36	0.85
11	Feeder Buses	50.10		6.19	4.50	10.70
	Total	2555.19	196.91	154.01		443.32
	Total taxes & Duties					443