# CHAPTER 13

# PRELIMINARY COST ESTIMATION

# CHAPTER 13

# PRELIMINARY COST ESTIMATION

## 13.1 METHODLOGY OF COST ESTIMATION

The construction cost was estimated using unit costs and exchange rate (1 EGP=20JPY) as of June 2008. The data on unit costs have been obtained from responses to the questionnaires sent out to local contractors and consultants through GARBLT and are considered the latest available information in Egypt as of yet. However, as a result of the recent remarkable price escalation observed in the country due to the increase in oil prices, further increment on the construction cost will have to be anticipated at the time of actual implementation of the project. during detailed design stage, all basic prices such as material price, labor rate and machine rental rate shall be investigated and detail unit cost analysis shall be carried out for cost estimation.

Any construction cost is comprised of two components, viz. direct and indirect costs. Total direct cost is a summation of the direct costs of all construction pay items, which are the product of estimated quantities and their determined unit rates. The quantities of each item are taken from the summary of quantities in the construction drawings, while the unit rates are taken from the unit price analysis of each item that are made up of three components; labor costs, material costs and the applicable equipment costs derived from the productivity requirement of the adopted construction methods and procedures.

Indirect Cost, on the other hand, consists of Overhead, Contingencies and Miscellaneous (OCM) cost. An OCM equivalent to 10%[1] of the total direct cost was adopted.

All costs are composed of foreign and local currency portions. The foreign currency portion is generally made up of cost, insurance and freight (CIF) for imported goods and materials. The local currency portion consists of, import tax; value added tax, domestic handling and transportation costs, local processing costs, overhead and local sales and market costs, profit of local firms, etc.

In the case of imported equipment and materials, all costs except domestic handling and transportation, local processing, overhead, etc. are deemed as foreign portion. The cost components of foreign and local currency portions were assumed to be based on prices of

[1] In this Study, 10% are adapted based on other similar projects in Philippines and Indonesia, due to such general information was not ready for use in Egypt, even after several investigations.

Egyptian products and materials of past projects. For Egyptian products and materials that will be produced using imported machines, the cost of machine was included in the foreign currency portion.

The procedure for cost estimation is summarized in Figure 13.1-1 while the composition of the basic costs (labor, materials and equipment) is shown in Figure 13.1-2.

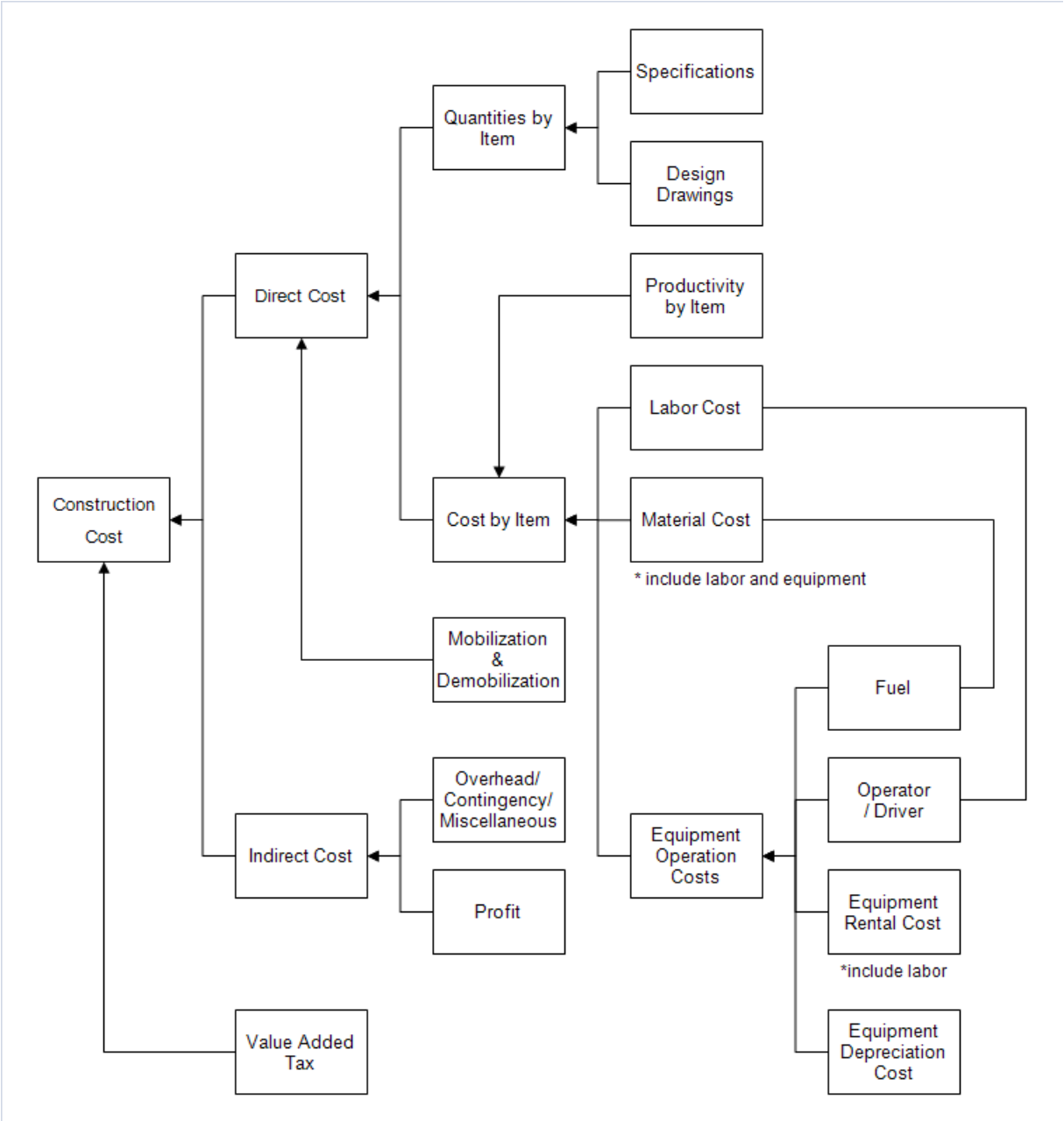


Figure 13.1-1 Procedure for Cost Estimation

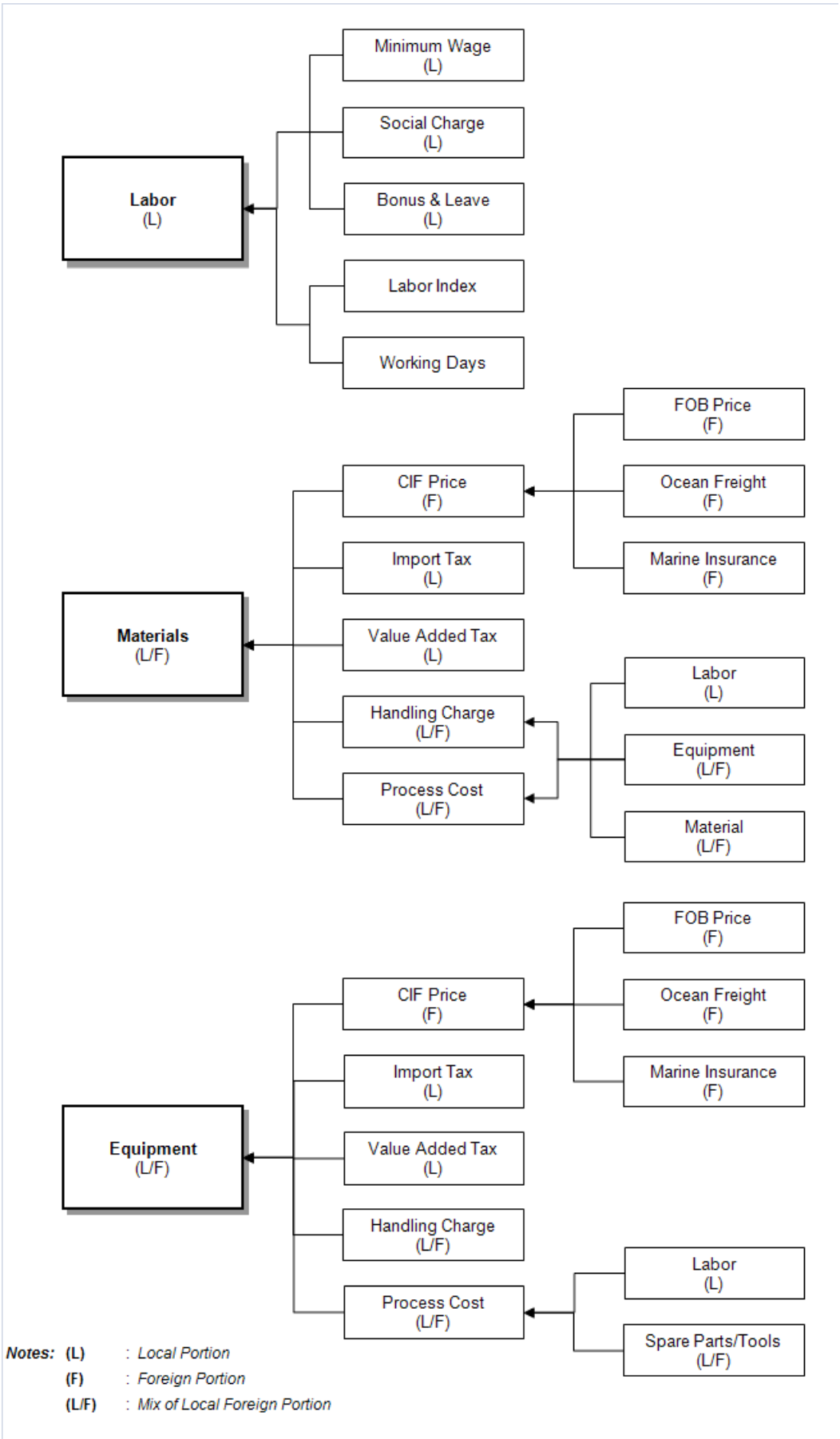


Figure 13.1-2 Composition of Basic Costs

## 13.2 CONSTRUCTION COST ESTIMATE

### 13.2.1 Basic Price

Dependable prices of basic commodities that can be used for materials, labor and equipment are not available in Egypt as prices increase by 2~10% every year because of inflation. Recently, a remarkable price escalation was also observed in Egypt due to the increase of oil prices in the world market. During the period from June 2006 to July 2007, the price of steel and cement has increased by 42% per annum. Then, during the period of this Study, i.e., from January to June 2008, the prices of basic construction materials such as steel plates, rebars, concrete and etc. have been rapidly increasing.

According to the Construction Materials Price Book (Construction Materials Price Investigation Society, Japan), the price escalation ratio of basic construction materials during the period of this Study, i.e., from January to June 2008 are as follows;

a) Steel Plate 26.6 %,
b) Rebar 43.7 %,
c) PC Strand 11.8 %,
d) Ready Mixed Concrete 5.0 %,
e) Diesel Oil 13.9 %,
f) Asphalt Emulsion 4.8 %,
g) Asphalt Concrete 3.7 %

Since the same upward tendency in the prices of materials is observed in Egypt, the People's Council has agreed to revise the Contractor's contract price every three (3) months rather than every year due to recent trend in price escalation (as published in the June 22, 2008 newspaper).

The data as of January 2008 have been gathered by sending out questionnaires to local contractors and consultants through GARBLT. These are shown in Table 13.2-1, Table 13.2-2, and Table 13.2-3. In consideration of the price escalation during the period of this Study, however, unit costs have been updated using prices as of June 2008.

Table 13.2-1 Basic Materials Price

| No. | DESCRIPTION | UNIT | UNIT PRICE (LE) | REMARKS | |
|---|---|---|---|---|---|
| | | | | Local | Foreign |
| 1 | Common Embankment Material | m3 | 28 | ✓ | |
| 2 | Selected Embankment Material | m3 | 28 | ✓ | |
| 3 | Portland Cement | t | 560 | ✓ | |
| 4 | Fine Aggregate for Concrete | m3 | 56 | ✓ | |
| 5 | Coarse Aggregate for Concrete | m3 | 84 | ✓ | |
| 6 | Ready Mixed Concrete Fc=250 | m3 | 448 | ✓ | |
| 7 | Ready Mixed Concrete Fc=300 | m3 | 448 | ✓ | |
| 8 | Ready Mixed Concrete Fc=350 | m3 | 476 | ✓ | |
| 9 | Ready Mixed Concrete Fc=400 | m3 | 504 | ✓ | |
| 10 | Ready Mixed Concrete Fc=450 | m3 | 560 | ✓ | |
| 11 | Ready Mixed Concrete Fc=500 e | m3 | 616 | ✓ | |
| 12 | Aggregate for Subbase Course | m3 | 77 | ✓ | |
| 13 | Aggregate for Base Course | m3 | 77 | ✓ | |
| 14 | Stone for Masonry | m3 | 112 | ✓ | |
| 15 | Asphalt Concrete on Site | t | 182 | ✓ | |
| 16 | Tack Coat | liter | 1.89 | ✓ | |
| 17 | Prime Coat | liter | 1.89 | ✓ | |
| 18 | Mild Steel Bar | t | 5,740 | ✓ | |
| 19 | High Yield Steel Bar Dia 25 Under | t | 5,772 | ✓ | |
| 20 | High Yield Steel Bar Dia 29 Above | t | 5,751 | ✓ | |
| 21 | Structure Steel 37 | t | 8,400 | ✓ | |
| 22 | Structure Steel 44 | t | 8,540 | ✓ | |
| 23 | Structure Steel 52 | t | 8,750 | ✓ | |
| 24 | PC Strand 12 T 12.7 mm | t | not available | | ✓ |
| 25 | PC Strand 1 T 21.8 mm | t | not available | | ✓ |
| 26 | PC Bar Dia 32.0 mm | t | 16,800 | | ✓ |
| 30 | RC Pipe, Dia. 800 mm | m | 1,680 | ✓ | |
| 31 | PVC Dia. 6" | m | 92 | ✓ | |
| 32 | PVC Dia. 8" | m | 154 | ✓ | |
| 33 | PVC Dia. 10" | m | 231 | ✓ | |
| 34 | Guard Rail | m | 1,008 | ✓ | |
| 35 | Road Paint (Thermoplastic) | kg | 35 | ✓ | |
| 36 | Bridge Railing | m | 1,008 | ✓ | |
| 37 | Gasoline Fuel | liter | 1.4 | ✓ | |
| 38 | Diesel Fuel | liter | 0.75 | ✓ | |
| 39 | Lubricant Oil | Liter | 56 | ✓ | |
| 40 | Lumber | m3 | 3,780 | | ✓ |
| 41 | Ply Wood (t=12mm) | sheet | 100 | ✓ | |
| 42 | Water Proof Membrane | m2 | 25 | ✓ | |
| 43 | Masonry Brick | thousand | 420 | ✓ | |
| | | | | | |

Note: The prices are as of January 2008 in Cairo.

Table 13.2-2 Basic Labor Rate

| No. | Category | Basic Salary / Day (LE) | REMARKS |
|---|---|---|---|
| 1 | Supervisor | 130 | |
| 2 | Foremen | 100 | |
| 3 | Skilled Labor | 80 | |
| 4 | Common Labor | 40 | |
| 5 | Carpenter | 70 | |
| 6 | Steel Fixer | 80 | |
| 7 | Operator Heavy Equipment | 160 | |
| 8 | Operator Light Equipment | 100 | |
| 9 | Operator Assistant | 40 | |
| 10 | Mason | 70 | |
| 11 | Mechanic | 140 | |
| 12 | Mechanic Assistant | 100 | |
| 13 | Electrician | 75 | |
| 14 | Painter | 70 | |
| 15 | Driver | 90 | |
| | | | |
| No. | Category | Basic Salary/ Month (LE) | REMARKS |
| | | | |
| 1 | Experienced Site Engineer | 18,000 | |
| 2 | Site Engineer | 9,000 | |
| 3 | CAD Operator | 5,250 | |
| 4 | Secretary | 8,250 | |
| 5 | Encoder | 6,000 | |
| 6 | Office Boy | 2,250 | |
| | | | |
| | | | |

Note : Working hour ; 8 hours/ day
The Rate is as of January 2008 in Cairo

Table 13.2-3 Basic Machine Rental Rate

| No. | DESCRIPTION | UNIT PRICE / DAY (LE) | UNIT PRICE / MONTH (LE) | REMARKS |
|---|---|---|---|---|
| 1 | Truck Crane 15t | 1,330 | 34,580 | Used / Good Condition |
| 2 | Truck Crane 20t | 1,680 | 43,680 | Used / Good Condition |
| 3 | Truck Crane 30t | 1,820 | 47,320 | Used / Good Condition |
| 4 | Truck Crane 50t | 2,730 | 70,980 | Used / Good Condition |
| 5 | Truck Crane 80t | 3,850 | 100,100 | Used / Good Condition |
| 6 | Truck Crane 100t | 4,760 | 123,760 | Used / Good Condition |
| 7 | Truck Crane 200t | 7,700 | 200,200 | Used / Good Condition |
| 8 | Crawler Crane 100t | 7,000 | 182,000 | Used / Good Condition |
| 9 | Crawler Crane 150t | 8,400 | 218,400 | Used / Good Condition |
| 10 | Crawler Crane 300t | 11,200 | 291,200 | Used / Good Condition |
| 11 | Bulldozer 200 HP -1D6 | 1,680 | 43,680 | Used / Good Condition |
| 12 | Bulldozer 250 HP -1D8 | 3,010 | 78,260 | Used / Good Condition |
| 13 | Wheel Loader 1.5 cu.Yd. 80 HP | 1,190 | 30,940 | Used / Good Condition |
| 14 | Wheel Loader 2 cu.Yd. 105 HP | 1,820 | 47,320 | Used / Good Condition |
| 15 | Hydraulic Excavator 0.5 cu.Yd | 1,050 | 27,300 | Used / Good Condition |
| 16 | Hydraulic Excavator 3/4 cu.Yd | 1,750 | 45,500 | Used / Good Condition |
| 17 | Hydraulic Excavator 1.83 cu.Yd | 2,730 | 70,980 | Used / Good Condition |
| 18 | Motor Grader 145 HP | 1,610 | 41,860 | Used / Good Condition |
| 19 | Motor Grader 183 HP | 1,820 | 47,320 | Used / Good Condition |
| 20 | Tandem Roller 8-10t 60 HP | 770 | 20,020 | Used / Good Condition |
| 21 | Tire Roller 20t 100 HP | 980 | 25,480 | Used / Good Condition |
| 22 | Vibratory Roller | 630 | 16,380 | Used / Good Condition |
| 23 | Dump Truck 10t | 980 | 25,480 | Used / Good Condition |
| 24 | Dump Truck 12t | 1,050 | 27,300 | Used / Good Condition |
| 25 | Trailer Truck 20t | 1,120 | 29,120 | Used / Good Condition |
| 26 | Trailer Truck 40t | 1,680 | 43,680 | Used / Good Condition |
| 27 | Flat Bed Truck with Crane 5t (Unic Crane) | 1,400 | 36,400 | Used / Good Condition |
| 28 | Concrete Mixer Truck 6-7 Cu.m | 1,540 | 40,040 | Used / Good Condition |
| 29 | Concrete Mixer 7 Cu.Ft. 7.5 HP | 112 | 2,912 | New |
| 30 | Concrete Mixer 16 Cu.Ft. 18 HP | 140 | 3,640 | New |
| 31 | Hydraulic Giant Breaker | 3,010 | 78,260 | Used / Good Condition |
| 32 | Generator Set 125 KVA | 560 | 14,560 | Used / Good Condition |
| 33 | Generator Set 20 KVA | 140 | 3,640 | New |
| 34 | Compressor 4000-6500 rpm | 980 | 25,480 | Used / Good Condition |
| 35 | Concrete Vibrator 3.5 HP | 140 | 3,640 | New |
| 36 | Concrete Cutter | 140 | 3,640 | New |
| 37 | Asphalt Cutter | 70 | 1,820 | New |
| 38 | Steel Cutting Machine | 168 | 4,368 | New |
| 39 | Steel Bending Machine | 210 | 5,460 | New |
| 40 | Line Marker (Thermoplastic) | 2,170 | 56,420 | New |
| 41 | Water Pump 4" (30Cm3/ hour) | 98 | 2,548 | New |
| 42 | Water Pump 6" (60 m3/hour) | 140 | 3,640 | New |
| 43 | Jack Hammer | 140 | 3,640 | New |
| 44 | Welding Machine | 168 | 4,368 | New |
| 45 | Pickup | 420 | 10,920 | New |
| 46 | Car 1500cc | 350 | 9,100 | New |
| 47 | Asphalt Mixing Plant 50 t/h 150 HP | 3,500 | 91,000 | Used / Good Condition |
| 48 | Asphalt Finisher 100 t/h 130 HP | 1,400 | 36,400 | Used / Good Condition |
| 49 | Asphalt Distributor 600 liter 200 HP | 770 | 20,020 | Used / Good Condition |
| 50 | Concrete Batching Plant 80 cu.m/h 107HP | 2,800 | 72,800 | Used / Good Condition |
| 51 | Crushing Plant 100 t/h 200HP | 3,640 | 94,640 | New |
| | | | | |

Note ; Exclude mobilization and demobilization
Working hour ; 10 hours / day
The Rate is as of January 2008 in Cairo

### 13.2.2 Unit Cost

The data on unit costs has been gathered in the same manner (i.e. by sending out questionnaires to local contractors and consultants through GARBLT). Data on Previous projects have also been gathered and converted to the current unit costs considering the escalation rate of 5 % per annum. The data on similar projects in the other countries have likewise been gathered and converted to Egyptian Pound using appropriate exchange rate. The adequate unit costs for each pay item are adopted after comparison of gathered data.

Unit costs for pay items which are not available have been estimated based on the Construction Cost Estimation Standard Book (Ministry of Land and Transportation, Japan).

Unit costs as of January 2008 have been updated with costs as of June 2008 based on the price escalation ratio as mentioned under Section 13.2.1.

### 13.2.3 Construction Cost

The quantities for each pay item have been estimated based on the cross-section and profile.

The unit costs for each pay item mentioned in Section 13.2.2 have been used for Construction Cost Estimation. However, since no dependable datum for pay items which require special equipment or construction technique, such as Shield Tunnel (E1-2), Underground Road Crossing Tunnel (E1-2), Cable-stayed Bridge over the Nile (E3-3), Ventilation System for Tunnels (E1-2, E3-1 and E3-2) and etc. is available in Egypt. Prices have been estimated based on current prices in Japan and information from contractors. However further cost increment will be anticipated at the period of implementation of the project.

Construction cost for the Shield Tunnel Section (E1-2) was estimated based on the information from contractors in Japan and the cost of the Al-Azhar Tunnel Project in Egypt which was completed in October 2002.

Construction cost for the Underground Road Crossing Tunnel Section (E1-2 was estimated based on information from a contractor in Japan

For the Cable-stayed Bridge over the Nile (E3-3), construction cost was estimated based on present unit costs in Japan and information from a contractor in Japan.

While the current price of equipment in Japan was used to estimate the cost of Ventilation System for the Tunnel Section.

The costs for demolition of existing structures such as viaduct, pedestrian bridge, sewage box culvert and overpass were estimated from visual assessment. A more detailed survey will be required for cost estimation during the detailed design stage.

The building demolition and reconstruction costs were estimated based on current market prices as of June 2008 in Cairo, Egypt.

A study on the relocation of utilities along section E3-1 section has been done by Arab Consultant in 2003. This utilities relocation cost for E3-1 has been adopted from the estimates made under the said study and a price escalation rate of 5% per annum was applied. And since investigation of existing utilities for the other sections has not been done yet at this stage, unit costs were estimated using utilities relocation cost for section E3-1.

The summary of construction cost and the breakdown of cost of each section are shown in Table 13.2-6, Table 13.2-7, Table 13.2-8 and Table 13.2-9, respectively.

Table 13.2-4 Summary of Construction Cost

(Unit ; 1,000 LE)

| Section | | Length | Foreign Currency | Local Currency | Tax | Total | Remarks |
|---|---|---|---|---|---|---|---|
| **FS Section ( E1-2, E2-2, E3-1 )** | | | | | | | |
| A | E1-2 | 5,430 m | 915,903 | 1,334,526 | 397,489 | 2,647,918 | Shield Tunnel, Box Tunnel, Single Deck, Steel Girder and PC, Girder Viaduct |
| | E2-2 | 1,880 m | 92,505 | 178,659 | 46,047 | 317,211 | Double Deck, Steel Pier and Steel Girder Viaduct<br>Maspero Station |
| | E3-1 | 5,700 m | 711,939 | 1,259,620 | 334,364 | 2,305,923 | Cut & Cover Box Tunnel<br>Single Deck, PC Girder Viaduct |
| | **Sub Total** | **13,010 m** | **1,720,347** | **2,772,805** | **777,900** | **5,271,052** | |
| B | **Engineering Cost** ( A x 5 % ) | | **184,488** | **52,710** | **26,355** | **263,553** | |
| C | **Contingency** ( A + B ) x 5% | | **95,241** | **141,276** | **40,213** | **276,730** | |
| | **Total (F/S Section)** | | **2,000,076** | **2,966,791** | **844,468** | **5,811,335** | |
| **Pre-F/S Section ( E3-2, E3-3 )** | | | | | | | |
| D | E3-2 | 6,900 m | 469,551 | 833,941 | 225,368 | 1,528,860 | Cut & Cover Box Tunnel Single Deck, Steel Girder and PC Girder Viaduct |
| | E3-3 | 5,500 m | 715,605 | 848,236 | 289,299 | 1,853,140 | Double Deck, Steel Girder Viaduct, Cable Stayed Bridge over the Nile |
| | **Sub Total** | **12,400 m** | **1,185,156** | **1,682,177** | **514,667** | **3,382,000** | |
| E | **Engineering Cost** ( D x 5 % ) | | **118,370** | **33,820** | **16,910** | **169,100** | |
| F | **Contingency** ( D + E ) x 5% | | **65,176** | **85,800** | **26,579** | **177,555** | |
| | **Total (Pre-F/S Section)** | | **1,368,702** | **1,801,797** | **558,156** | **3,728,655** | |
| | **TOTAL (F/S & Pre-F/S Section)** | | **3,368,778** | **4,768,588** | **1,402,624** | **9,539,990** | |

As of June 2008

Table 13.2-5 Construction Cost of E1-2

(Unit : 1,000 LE)

| | Unit | Unit Rate (LE) | Component (%) | | | Quantity | Cost (1,000 LE) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Foreign | Local | Tax | | Foreign | Local | Tax | Total |
| **(Earth Work)** | | | | | | | | | | |
| Cleaning and Grubbing | m2 | 3 | 47 | 36 | 17 | 48,000 | 68 | 52 | 24 | 144 |
| Excavation of Existing Pavement | m2 | 5 | 47 | 36 | 17 | 31,600 | 74 | 57 | 27 | 158 |
| Demolition of Existing Side Walk | m2 | 121 | 47 | 36 | 17 | 4,240 | 241 | 185 | 87 | 513 |
| Structure Excavation | m3 | 12 | 47 | 36 | 17 | 130,331 | 735 | 563 | 266 | 1,564 |
| Rock Excavation | m3 | 50 | 47 | 36 | 17 | 5,463 | 128 | 98 | 46 | 273 |
| Special Excavation | m3 | 227 | 37 | 45 | 18 | 25,624 | 2,152 | 2,617 | 1,047 | 5,817 |
| Mechanical Stabilized Earthwall | m2 | 935 | 25 | 58 | 17 | 2,426 | 567 | 1,316 | 386 | 2,268 |
| Selected Backfill for MSE Wall | m3 | 16 | 33 | 52 | 15 | 10,702 | 57 | 89 | 26 | 171 |
| Back Fill | m3 | 16 | 33 | 52 | 15 | 35,350 | 187 | 294 | 85 | 566 |
| **Sub Total** | | | | | | | **4,209** | **5,271** | **1,994** | **11,474** |
| **(Pavement Works)** | | | | | | | | | | |
| Base Course | m3 | 90 | 28 | 59 | 13 | 13,381 | 337 | 711 | 157 | 1,204 |
| Prime Coat | m2 | 2 | 28 | 59 | 13 | 33,450 | 19 | 39 | 9 | 67 |
| Tuck Coat | m2 | 1.5 | 28 | 59 | 13 | 101,824 | 43 | 90 | 20 | 153 |
| Asphalt Concrete | m3 | 427 | 28 | 59 | 13 | 12,236 | 1,463 | 3,083 | 679 | 5,225 |
| Road Marking | km | 10,210 | 42 | 42 | 16 | 13.79 | 59 | 59 | 23 | 141 |
| Sidewalk Concrete | m3 | 459 | 28 | 59 | 13 | 3,349 | 430 | 907 | 200 | 1,537 |
| Road Curb | m | 51 | 28 | 59 | 13 | 4,878 | 70 | 147 | 32 | 249 |
| PCCP Pavement (t=250mm) | m2 | 306 | 28 | 59 | 13 | 1,997 | 171 | 361 | 79 | 611 |
| **Sub Total** | | | | | | | **2,592** | **5,396** | **1,198** | **9,186** |
| **(Structure Works)** | | | | | | | | | | |
| Cast in place Bored Pile Dia 800mm | m | 1,368 | 28 | 59 | 13 | 13,160 | 5,041 | 10,622 | 2,340 | 18,003 |
| Cast in place Bored Pile Dia 1,000mm | m | 1,917 | 28 | 59 | 13 | 1,440 | 773 | 1,629 | 359 | 2,760 |
| Cast in place Bored Pile Dia 1,200mm | m | 2,400 | 28 | 59 | 13 | 3,940 | 2,648 | 5,579 | 1,229 | 9,456 |
| Cast in place Bored Pile Dia 1,500mm | m | 4,941 | 28 | 59 | 13 | 3,040 | 4,206 | 8,862 | 1,953 | 15,021 |
| Cast in place Bored Pile Dia 2,500mm | m | 15,782 | 28 | 59 | 13 | 1,380 | 6,098 | 12,850 | 2,831 | 21,779 |
| Pile Integrity Sonic Test | no | 803 | 35 | 52 | 13 | 713 | 200 | 298 | 74 | 573 |
| Pile Load Test (500t) | no | 75,261 | 28 | 59 | 13 | 10 | 211 | 444 | 98 | 753 |
| Pile Load Test(1000t) | | 150,521 | 28 | 59 | 13 | 10 | 421 | 888 | 196 | 1,505 |
| Granular Bedding | m3 | 92 | 28 | 59 | 13 | 4,117 | 106 | 223 | 49 | 379 |
| Diaphragm Wall | m3 | 3,638 | 28 | 59 | 13 | 15,428 | 15,716 | 33,115 | 7,297 | 56,127 |
| GRP Panel | m2 | 743 | 38 | 45 | 17 | 5,523 | 1,559 | 1,847 | 698 | 4,104 |
| PSC-PLANK (H=550mm) | m2 | 2,196 | 38 | 45 | 17 | 3,054 | 2,549 | 3,018 | 1,140 | 6,707 |
| PSC-PLANK (H=1,1000mm) | m2 | 2,761 | 38 | 45 | 17 | 0 | 0 | 0 | 0 | 0 |
| RC Topping | m3 | 459 | 28 | 59 | 13 | 494 | 63 | 134 | 29 | 227 |
| Joint Filler (45 x 100) | m | 143 | 28 | 59 | 13 | 153 | 6 | 13 | 3 | 22 |
| Leveling Concrete | m3 | 439 | 28 | 59 | 13 | 2,156 | 265 | 558 | 123 | 946 |
| Structure Concrete Fc300(RC Slab, Sub Structure) | m3 | 817 | 29 | 56 | 15 | 86,734 | 20,555 | 39,692 | 10,632 | 70,878 |
| Structure Concrete Fc450 (Super Structure) | m3 | 1,174 | 29 | 56 | 15 | 25,960 | 8,838 | 17,067 | 4,572 | 30,477 |
| Reinforcing Bar | t | 8,532 | 27 | 58 | 15 | 29,513 | 67,987 | 146,047 | 37,771 | 251,805 |
| PC Strand | t | 25,786 | 53 | 30 | 17 | 441 | 6,023 | 3,409 | 1,932 | 11,364 |
| Structure Steel | t | 15,369 | 27 | 58 | 15 | 4,167 | 17,292 | 37,145 | 9,606 | 64,043 |
| Expansion Joint | m | 6,139 | 53 | 30 | 17 | 523 | 1,702 | 963 | 346 | 3,211 |
| Bridge Bearing | no | 8,185 | 53 | 30 | 17 | 466 | 2,022 | 1,144 | 648 | 3,814 |
| Bridge Railing | m | 706 | 25 | 62 | 13 | 11,091 | 1,958 | 4,855 | 1,018 | 7,830 |
| Waterproofing | m2 | 271 | 52 | 31 | 17 | 17,496 | 2,466 | 1,470 | 806 | 4,741 |
| Composite Steel | t | 15,369 | 27 | 58 | 15 | 2,902 | 12,042 | 25,868 | 6,690 | 44,601 |
| **Sub Total** | | | | | | | **180,745** | **357,739** | **92,640** | **631,124** |
| **(Shield Tunnel Works)** | | | | | | | | | | |
| Manufacture of Shield Machine | ls | 142,107,480 | 80 | 7 | 13 | 1 | 113,686 | 9,948 | 18,474 | 142,107 |
| RC Segment | m | 106,018 | 31 | 54 | 15 | 4,700 | 154,468 | 269,074 | 74,743 | 498,285 |
| First lining | m | 91,852 | 29 | 56 | 15 | 4,700 | 125,194 | 241,754 | 64,756 | 431,704 |
| Excavation & Disposal | m3 | 402 | 47 | 36 | 17 | 479,487 | 90,594 | 69,391 | 32,768 | 192,754 |
| Soil Improvement | ls | 16,207,978 | 29 | 56 | 15 | 1 | 4,700 | 9,076 | 2,431 | 16,208 |
| Vertical Shaft | no | 66,035,132 | 29 | 56 | 15 | 3 | 57,451 | 110,939 | 29,716 | 198,105 |
| **Sub Total** | | | | | | | **546,094** | **710,183** | **222,887** | **1,479,164** |
| **(Road Crossing Tunnel Works)** | | | | | | | | | | |
| RC Segment | m3 | 4,181 | 31 | 54 | 15 | 3,396 | 4,402 | 7,667 | 2,130 | 14,199 |
| Pipe Roof Works | m | 12,582 | 27 | 58 | 15 | 3,600 | 12,230 | 26,271 | 6,794 | 45,295 |
| Excavation and Installation | m3 | 5,070 | 47 | 36 | 17 | 9,720 | 23,162 | 17,741 | 8,378 | 49,280 |
| Waterproof Expansion Joint | no | 386,742 | 53 | 30 | 17 | 8 | 1,640 | 928 | 526 | 3,094 |
| Disposal of Soil | m3 | 15 | 47 | 36 | 17 | 9,720 | 69 | 52 | 25 | 146 |
| Departure Shaft | no | 12,864,285 | 29 | 56 | 15 | 2 | 7,461 | 14,408 | 3,859 | 25,729 |
| Arrival Shaft | no | 6,432,143 | 29 | 56 | 15 | 2 | 3,731 | 7,204 | 1,930 | 12,864 |
| Anchor Facilities | no | 1,286,429 | 29 | 56 | 15 | 2 | 746 | 1,441 | 386 | 2,573 |
| Soil Improvement | m3 | 1,286 | 29 | 56 | 15 | 8,000 | 2,984 | 5,761 | 1,543 | 10,288 |
| **Sub Total** | | | | | | | **56,423** | **81,474** | **25,571** | **163,468** |
| **Drainage System** | km | 102,098 | 28 | 59 | 13 | 10.3 | 294 | 620 | 137 | 1,052 |
| **Lighting System** | km | 832,146 | 29 | 56 | 15 | 10.3 | 2,486 | 4,800 | 1,286 | 8,571 |
| **Traffic Sign** | km | 55,476 | 27 | 58 | 15 | 10.3 | 154 | 331 | 86 | 571 |
| **Ventilation System** | ls | 20,952,000 | 59 | 24 | 17 | 1 | 12,362 | 5,028 | 3,562 | 20,952 |
| **Emergency Parking Bay** | no | 765,000 | 29 | 56 | 15 | 7 | 1,553 | 2,999 | 803 | 5,355 |
| **Connecting Tunnel** | no | 66,000 | 29 | 56 | 15 | 4 | 77 | 148 | 40 | 264 |
| **Other Tunnel Facilities (Fire Fighting, Telcom System etc)** | ls | 5,000,000 | 59 | 24 | 17 | 1 | 2,950 | 1,200 | 850 | 5,000 |
| **Underpinning for Viaduct** | no | 387,000 | 29 | 56 | 15 | 15 | 1,683 | 3,251 | 871 | 5,805 |
| **Demolition of Existing Pier** | no | 95,000 | 47 | 36 | 17 | 15 | 670 | 513 | 242 | 1,425 |
| **Demolition of Existing Ramp-1** | ls | 1,620,000 | 47 | 36 | 17 | 1 | 761 | 583 | 275 | 1,620 |
| **Demolition of Existing Ramp-2** | ls | 1,320,000 | 47 | 36 | 17 | 1 | 620 | 475 | 224 | 1,320 |
| **Demolition of 6th of Oct. Bridge** | ls | 5,075,000 | 47 | 36 | 17 | 1 | 2,383 | 1,827 | 863 | 5,075 |
| **Demolition of Existing RCBC** | m | 5,200 | 47 | 36 | 17 | 550 | 1,344 | 1,030 | 486 | 2,860 |
| **Reconstruction of RCBC** | m | 30,000 | 29 | 56 | 15 | 550 | 4,785 | 9,240 | 2,475 | 16,500 |
| **Demolition of Existing Pedestrian Bridge(A)** | ls | 224,000 | 47 | 36 | 17 | 1 | 105 | 81 | 38 | 224 |
| **Demolition of Existing Pedestrian Bridge(B)** | ls | 430,000 | 47 | 36 | 17 | 1 | 202 | 155 | 73 | 430 |
| **Reconstruction of Pedestrian Bridge (A)** | ls | 390,000 | 29 | 56 | 15 | 1 | 113 | 218 | 59 | 390 |
| **Reconstruction of Pedestrian Bridge (B)** | ls | 780,000 | 29 | 56 | 15 | 1 | 226 | 437 | 117 | 780 |
| **Demolition of Existing Building** | ls | 468,000 | 47 | 36 | 17 | 1 | 220 | 168 | 80 | 468 |
| **Reconstruction of New Building** | ls | 3,120,000 | 29 | 56 | 15 | 1 | 905 | 1,747 | 468 | 3,120 |
| **Utilities Relocation** | km | 10,000,000 | 28 | 59 | 13 | 3.1 | 8,680 | 18,290 | 4,030 | 31,000 |
| **Sub Total** | | | | | | | **42,576** | **53,142** | **17,064** | **112,782** |
| **Mobilization & Demobilization, Overhead & Profit(10%)** | | | | | | | **83,264** | **121,321** | **36,135** | **240,720** |
| **TOTAL** | | | | | | | **915,903** | **1,334,526** | **397,490** | **2,647,918** |

* Figures were rounded-off to 1,000LE; it must therefore be noted that the fractions have difference.

Table 13.2-6 Construction Cost of E2-2

(Unit ; 1,000 LE)

| | Unit | Unit Rate | Component (%) | | | Quantity | Cost (1,000 LE) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | (LE) | Foreign | Local | Tax | | Foreign | Local | Tax | Total |
| **(Earth Work)** | | | | | | | | | | |
| Clearing and Grubbing | m2 | 3 | 47 | 36 | 17 | 0 | 0 | 0 | 0 | 0 |
| Excavation of Existing Pavement | m2 | 5 | 47 | 36 | 17 | 19,000 | 45 | 34 | 16 | 95 |
| Demolition of Existing Side Walk | m2 | 121 | 47 | 36 | 17 | 3,800 | 216 | 166 | 78 | 460 |
| Structure Excavation | m3 | 12 | 47 | 36 | 17 | 19,215 | 108 | 83 | 39 | 231 |
| Rock Excavation | m3 | 50 | 47 | 36 | 17 | 0 | 0 | 0 | 0 | 0 |
| Special Excavation | m3 | 227 | 37 | 45 | 18 | 12,990 | 1,091 | 1,327 | 531 | 2,949 |
| Mechanical Stabilized Earthwall | m2 | 935 | 25 | 58 | 17 | 0 | 0 | 0 | 0 | 0 |
| Selected Backfill for MSE Wall | m3 | 16 | 33 | 52 | 15 | 0 | 0 | 0 | 0 | 0 |
| Back Fill | m3 | 16 | 33 | 52 | 15 | 20,817 | 110 | 173 | 50 | 333 |
| **Sub Total** | | | | | | | **1,570** | **1,783** | **714** | **4,067** |
| **(Pavement Works)** | | | | | | | | | | |
| Base Course | m3 | 90 | 28 | 59 | 13 | 5,700 | 144 | 303 | 67 | 513 |
| Prime Coat | m2 | 2.04 | 28 | 59 | 13 | 19,000 | 11 | 23 | 5 | 39 |
| Tuck Coat | m2 | 1.53 | 28 | 59 | 13 | 16,520 | 7 | 15 | 3 | 25 |
| Asphalt Concrete | t | 427 | 28 | 59 | 13 | 3,100 | 371 | 781 | 172 | 1,324 |
| Road Marking | km | 10,210 | 42 | 42 | 16 | 3.90 | 17 | 17 | 6 | 40 |
| Sidewalk Concrete | m3 | 459 | 28 | 59 | 13 | 760 | 98 | 206 | 45 | 349 |
| Road Curb | m | 51 | 28 | 59 | 13 | 1,900 | 27 | 57 | 13 | 97 |
| PCCP Pavement (t=250mm) | m2 | 306 | 28 | 59 | 13 | 0 | 0 | 0 | 0 | 0 |
| **Sub Total** | | | | | | | **674** | **1,401** | **311** | **2,386** |
| **(Structure Works)** | | | | | | | | | | |
| Cast in place Bored Pile Dia 800mm | m | 1,368 | 28 | 59 | 13 | 6,140 | 2,352 | 4,956 | 1,092 | 8,400 |
| Cast in place Bored Pile Dia 1,500mm | m | 4,941 | 28 | 59 | 13 | 480 | 664 | 1,399 | 308 | 2,372 |
| Cast in place Bored Pile Dia 2,500mm | m | 15,782 | 28 | 59 | 13 | 640 | 2,828 | 5,959 | 1,313 | 10,100 |
| Pile Integrity Sonic Test | no | 803 | 35 | 52 | 13 | 363 | 102 | 152 | 38 | 291 |
| Pile Load Test (500t) | no | 75,261 | 28 | 59 | 13 | 6 | 126 | 266 | 59 | 452 |
| Pile Load Test(1000t) | | 150,521 | 28 | 59 | 13 | 3 | 126 | 266 | 59 | 452 |
| Granular Bedding | m3 | 92 | 28 | 59 | 13 | 320 | 8 | 17 | 4 | 29 |
| Diaphragm Wall | m3 | 3,686 | 28 | 59 | 13 | 12,600 | 13,004 | 27,402 | 6,038 | 46,444 |
| GRP Panel | m2 | 743 | 38 | 45 | 17 | 0 | 0 | 0 | 0 | 0 |
| PSC-PLANK (H=550mm) | m2 | 2,196 | 38 | 45 | 17 | 0 | 0 | 0 | 0 | 0 |
| PSC-PLANK (H=1,1000mm) | m2 | 2,761 | 38 | 45 | 17 | 0 | 0 | 0 | 0 | 0 |
| RC Topping | m3 | 459 | 28 | 59 | 13 | 0 | 0 | 0 | 0 | 0 |
| Joint Filler (45 x 100) | m | 143 | 28 | 59 | 13 | 0 | 0 | 0 | 0 | 0 |
| Leveling Concrete | m3 | 439 | 28 | 59 | 13 | 523 | 64 | 135 | 30 | 229 |
| Structure Concrete Fc300(RC Slab, Sub Structure) | m3 | 817 | 29 | 56 | 15 | 13,258 | 3,141 | 6,066 | 1,625 | 10,832 |
| Structure Concrete Fc450 (Super Structure) | m3 | 1,174 | 29 | 56 | 15 | 6,895 | 2,347 | 4,533 | 1,214 | 8,095 |
| Reinforcing Bar | t | 8,532 | 27 | 58 | 15 | 4,815 | 11,092 | 23,827 | 6,162 | 41,082 |
| PC Strand | t | 25,786 | 53 | 30 | 17 | 306 | 4,182 | 2,367 | 1,341 | 7,891 |
| Structure Steel | t | 15,369 | 27 | 58 | 15 | 6,960 | 28,881 | 62,042 | 16,045 | 106,968 |
| Expansion Joint | m | 6,139 | 53 | 30 | 17 | 330 | 1,074 | 608 | 344 | 2,026 |
| Bridge Bearing | no | 8,185 | 53 | 30 | 17 | 90 | 390 | 221 | 125 | 737 |
| Bridge Railing | m | 706 | 25 | 62 | 13 | 3,928 | 693 | 1,719 | 361 | 2,773 |
| Waterproofing | m2 | 271 | 52 | 31 | 17 | 16,520 | 2,328 | 1,388 | 761 | 4,477 |
| Composite Steel | t | 15,369 | 27 | 58 | 15 | 289 | 1,199 | 2,576 | 666 | 4,442 |
| **Sub Total** | | | | | | | **74,604** | **145,900** | **37,585** | **258,090** |
| **Drainage System** | km | 102,098 | 28 | 59 | 13 | 1.9 | 54 | 114 | 25 | 194 |
| **Lighting System** | km | 832,146 | 29 | 56 | 15 | 1.9 | 459 | 885 | 237 | 1,581 |
| **Traffic Sign** | km | 55,476 | 27 | 58 | 15 | 1.9 | 28 | 61 | 16 | 105 |
| **Demolition of Existing Viaduct** | ls | 2,950,000 | 47 | 36 | 17 | 1 | 1,387 | 1,062 | 502 | 2,950 |
| **Utilities Relocation** | km | 10,000,000 | 28 | 59 | 13 | 1.9 | 5,320 | 11,210 | 2,470 | 19,000 |
| **Sub Total** | | | | | | | **7,248** | **13,333** | **3,250** | **23,830** |
| **Mobilization & Demobilization, Overhead & Profit(10%)** | | | | | | | **8,410** | **16,242** | **4,186** | **28,837** |
| **TOTAL** | | | | | | | **92,506** | **178,659** | **46,047** | **317,211** |

* Figures were rounded-off to 1,000LE; it must therefore be noted that the fractions have difference.

Table 13.2-7 Construction Cost of E3-1

(Unit ; 1,000LE)

| | Unit | Unit Rate | Component (%) | | | Quantity | Cost | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Foreign | Local | Tax | | Foreign | Local | Tax | Total |
| **(Earth Work)** | | | | | | | | | | |
| Clearing and Grubbing | m2 | 3 | 47 | 36 | 17 | 0 | 0 | 0 | 0 | 0 |
| Excavation of Existing Pavement | m2 | 5 | 47 | 36 | 17 | 132,000 | 310 | 238 | 112 | 660 |
| Demolition of Existing Side Walk | m2 | 121 | 47 | 36 | 17 | 23,000 | 1,308 | 1,002 | 473 | 2,783 |
| Structure Excavation | m3 | 12 | 47 | 36 | 17 | 1,300,000 | 7,332 | 5,616 | 2,652 | 15,600 |
| Rock Excavation | m3 | 50 | 47 | 36 | 17 | 144,000 | 3,384 | 2,592 | 1,224 | 7,200 |
| Special Excavation | m3 | 227 | 37 | 45 | 18 | 7,830 | 658 | 800 | 320 | 1,777 |
| Mechanical Stabilized Earthwall | m2 | 935 | 25 | 58 | 17 | 1,035 | 242 | 561 | 165 | 968 |
| Selected Backfill for MSE Wall | m3 | 16 | 33 | 52 | 15 | 5,900 | 31 | 49 | 14 | 94 |
| Back Fill | m3 | 16 | 33 | 52 | 15 | 4,185 | 22 | 35 | 10 | 67 |
| **Sub Total** | | | | | | | **13,287** | **10,893** | **4,970** | **29,149** |
| **(Pavement Works)** | | | | | | | | | | |
| Base Course | m3 | 90 | 28 | 59 | 13 | 39,600 | 998 | 2,103 | 463 | 3,564 |
| Prime Coat | m2 | 2.04 | 28 | 59 | 13 | 132,000 | 75 | 159 | 35 | 269 |
| Tuck Coat | m2 | 1.53 | 28 | 59 | 13 | 176,442 | 76 | 159 | 35 | 270 |
| Asphalt Concrete | m3 | 427 | 28 | 59 | 13 | 30,534 | 3,651 | 7,692 | 1,695 | 13,038 |
| Road Marking | km | 10,210 | 42 | 42 | 16 | 22.9 | 98 | 98 | 37 | 233 |
| Sidewalk Concrete | m3 | 459 | 28 | 59 | 13 | 5,500 | 707 | 1,489 | 328 | 2,525 |
| Road Curb | m | 51 | 28 | 59 | 13 | 0 | 0 | 0 | 0 | 0 |
| PCC Pavement (t=250mm) | m2 | 306 | 28 | 59 | 13 | 1,547 | 133 | 279 | 62 | 473 |
| **Sub Total** | | | | | | | **5,737** | **11,980** | **2,655** | **20,373** |
| **(Structure Works)** | | | | | | | | | | |
| Cast in place Bored Pile Dia 800mm | m | 1,368 | 28 | 59 | 13 | 5,050 | 1,934 | 4,076 | 898 | 6,908 |
| Pile Integrity Sonic Test | no | 803 | 35 | 52 | 13 | 202 | 57 | 84 | 21 | 162 |
| Pile Load Test | no | 75,261 | 28 | 59 | 13 | 4 | 84 | 178 | 39 | 301 |
| Granular Bedding | m3 | 92 | 28 | 59 | 13 | 50,000 | 1,288 | 2,714 | 598 | 4,600 |
| Diaphragm Wall | m3 | 3,686 | 28 | 59 | 13 | 230,000 | 237,378 | 500,190 | 110,211 | 847,780 |
| GRP Panel | m2 | 743 | 38 | 45 | 17 | 124,000 | 35,010 | 41,459 | 15,662 | 92,132 |
| PSC-PLANK (H=550mm) | m2 | 2,196 | 38 | 45 | 17 | 100,000 | 83,448 | 98,820 | 37,332 | 219,600 |
| PSC-PLANK (H=1,100mm) | m2 | 2,761 | 38 | 45 | 17 | 48,000 | 50,361 | 59,638 | 22,530 | 132,528 |
| RC Topping | m3 | 459 | 28 | 59 | 13 | 27,000 | 3,470 | 7,312 | 1,611 | 12,393 |
| Joint Filler (45 x 100) | m | 143 | 28 | 59 | 13 | 148,000 | 5,926 | 12,487 | 2,751 | 21,164 |
| Leveling Concrete | m3 | 439 | 28 | 59 | 13 | 16,754 | 2,059 | 4,339 | 956 | 7,353 |
| Structure Concrete Fc300(RC Slab, Sub Structure) | m3 | 817 | 29 | 56 | 15 | 168,690 | 39,968 | 77,179 | 20,673 | 137,820 |
| Structure Concrete Fc450 (Super Structure) | m3 | 1,174 | 29 | 56 | 15 | 7,030 | 2,393 | 4,622 | 1,238 | 8,253 |
| Reinforcing Bar | t | 8,532 | 27 | 58 | 15 | 43,485 | 100,174 | 215,188 | 55,652 | 371,014 |
| PC Strand | t | 25,786 | 53 | 30 | 17 | 260 | 3,553 | 2,011 | 1,140 | 6,704 |
| Structure Steel | t | 15,369 | 27 | 58 | 15 | 0 | 0 | 0 | 0 | 0 |
| Expansion Joint | m | 6,139 | 53 | 30 | 17 | 152 | 495 | 280 | 159 | 933 |
| Bridge Bearing | no | 8,185 | 53 | 30 | 17 | 35 | 152 | 86 | 49 | 286 |
| Bridge Railing | m | 706 | 25 | 62 | 13 | 6,400 | 1,130 | 2,801 | 587 | 4,518 |
| Waterproofing | m2 | 271 | 52 | 31 | 17 | 8,780 | 1,237 | 738 | 404 | 2,379 |
| **Sub Total** | | | | | | | **570,117** | **1,034,202** | **272,512** | **1,876,832** |
| **Drainage System** | km | 102,098 | 28 | 59 | 13 | 22.9 | 655 | 1,379 | 304 | 2,338 |
| **Lighting System** | km | 832,146 | 29 | 56 | 15 | 22.9 | 5,526 | 10,671 | 2,858 | 19,056 |
| **Traffic Signs** | km | 55,476 | 27 | 58 | 15 | 22.9 | 343 | 737 | 191 | 1,270 |
| **Ventilation System** | ls | 28,275,000 | 59 | 24 | 17 | 1 | 16,682 | 6,786 | 4,807 | 28,275 |
| **Other Tunnel Facilities (Fire Fighting, Telecom System etc)** | ls | 5,000,000 | 59 | 24 | 17 | 1 | 2,950 | 1,200 | 850 | 5,000 |
| **Utilities Relocation** | km | 20,000,000 | 28 | 59 | 13 | 5.7 | 31,920 | 67,260 | 14,820 | 114,000 |
| **Sub Total** | | | | | | | **58,076** | **88,034** | **23,830** | **169,940** |
| **Mobilization & Demobilization, Overhead & Profit (10%)** | ls | | | | | 1 | **64,722** | **114,511** | **30,397** | **209,629** |
| **TOTAL** | | | | | | | **711,940** | **1,259,620** | **334,364** | **2,305,923** |

* Figures were rounded-off to 1,000LE; it must therefore be noted that the fractions have difference.

Table 13.2-8 Construction Cost of E3-2

(Unit ; 1,000LE)

| | Unit | Unit Rate | Component (%) | | | Quantity | Cost | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Foreign | Local | Tax | | Foreign | Local | Tax | Total |
| **(Earth Work)** | | | | | | | | | | |
| Clearing and Grubbing | m2 | 3 | 47 | 36 | 17 | 36,000 | 51 | 39 | 18 | 108 |
| Excavation of Existing Pavement | m2 | 5 | 47 | 36 | 17 | 41,766 | 98 | 75 | 36 | 209 |
| Demolition of Existing Side Walk | m2 | 121 | 47 | 36 | 17 | 12,010 | 683 | 523 | 247 | 1,453 |
| Structure Excavation | m3 | 12 | 47 | 36 | 17 | 283,812 | 1,601 | 1,226 | 579 | 3,406 |
| Rock Excavation | m3 | 50 | 47 | 36 | 17 | 31,157 | 732 | 561 | 265 | 1,558 |
| Special Excavation | m3 | 227 | 37 | 45 | 18 | 69,136 | 5,807 | 7,062 | 2,825 | 15,694 |
| Mechanical Stabilized Earthwall | m2 | 935 | 25 | 58 | 17 | 5,393 | 1,261 | 2,925 | 857 | 5,042 |
| Selected Backfill for MSE Wall | m3 | 16 | 33 | 52 | 15 | 27,634 | 146 | 230 | 66 | 442 |
| Back Fill | m3 | 16 | 33 | 52 | 15 | 62,354 | 329 | 519 | 150 | 998 |
| **Sub Total** | | | | | | | **10,707** | **13,160** | **5,043** | **28,910** |
| **(Pavement Works)** | | | | | | | | | | |
| Base Course | m3 | 90 | 28 | 59 | 13 | 14,280 | 360 | 758 | 167 | 1,285 |
| Prime Coat | m2 | 2.04 | 28 | 59 | 13 | 46,800 | 27 | 56 | 12 | 95 |
| Tuck Coat | m2 | 1.53 | 28 | 59 | 13 | 169,230 | 72 | 153 | 34 | 259 |
| Asphalt Concrete | m3 | 427 | 28 | 59 | 13 | 16,620 | 1,987 | 4,187 | 923 | 7,097 |
| Road Marking | km | 10,210 | 42 | 42 | 16 | 32.2 | 138 | 138 | 53 | 329 |
| Sidewalk Concrete | m3 | 459 | 28 | 59 | 13 | 836 | 107 | 226 | 50 | 384 |
| Road Curb | m | 51 | 28 | 59 | 13 | 5,574 | 80 | 168 | 37 | 284 |
| PCC Pavement (t=250mm) | m2 | 306 | 28 | 59 | 13 | 3,266 | 280 | 590 | 130 | 999 |
| **Sub Total** | | | | | | | **3,051** | **6,276** | **1,405** | **10,732** |
| **(Structure Works)** | | | | | | | | | | |
| Cast in place Bored Pile Dia 800mm | m | 1,368 | 28 | 59 | 13 | 640 | 245 | 517 | 114 | 876 |
| Cast in place Bored Pile Dia 1,000mm | m | 1,917 | 28 | 59 | 13 | 6,080 | 3,264 | 6,877 | 1,515 | 11,655 |
| Cast in place Bored Pile Dia 1,500mm | m | 4,941 | 28 | 59 | 13 | 800 | 1,107 | 2,332 | 514 | 3,953 |
| Cast in place Bored Pile Dia 1,800mm | m | 6,353 | 28 | 59 | 13 | 8,160 | 14,515 | 30,586 | 6,739 | 51,840 |
| Pile Integrity Sonic Test | no | 803 | 35 | 52 | 13 | 784 | 220 | 327 | 82 | 630 |
| Pile Load Test(500t) | no | 75,261 | 28 | 59 | 13 | 2 | 42 | 89 | 20 | 151 |
| Pile Load Test(1,000t) | no | 150,521 | 28 | 59 | 13 | 16 | 674 | 1,421 | 313 | 2,408 |
| Barretes (800mm x 2,200mm) | m3 | 3,686 | 28 | 59 | 13 | 7,040 | 7,266 | 15,310 | 3,373 | 25,949 |
| Granular Bedding | m3 | 92 | 28 | 59 | 13 | 11,125 | 287 | 604 | 133 | 1,024 |
| Diaphragm Wall | m3 | 3,686 | 28 | 59 | 13 | 52,578 | 54,265 | 114,343 | 25,194 | 193,803 |
| GRP Panel | m2 | 743 | 38 | 45 | 17 | 28,918 | 8,165 | 9,669 | 3,653 | 21,486 |
| PSC-PLANK (H=550mm) | m2 | 2,196 | 38 | 45 | 17 | 23,660 | 19,744 | 23,381 | 8,833 | 51,958 |
| PSC-PLANK (H=1,100mm) | m2 | 2,761 | 38 | 45 | 17 | 10,516 | 11,033 | 13,065 | 4,936 | 29,034 |
| RC Topping | m3 | 459 | 28 | 59 | 13 | 6,309 | 811 | 1,709 | 376 | 2,896 |
| Joint Filler (45 x 100) | m | 143 | 28 | 59 | 13 | 34,176 | 1,368 | 2,883 | 635 | 4,887 |
| Leveling Concrete | m3 | 439 | 28 | 59 | 13 | 4,288 | 527 | 1,111 | 245 | 1,882 |
| Structure Concrete Fc300(RC Slab, Sub Structure) | m3 | 817 | 29 | 56 | 15 | 134,497 | 31,866 | 61,535 | 16,483 | 109,884 |
| Structure Concrete Fc450 (Super Structure) | m3 | 1,174 | 29 | 56 | 15 | 86,171 | 29,338 | 56,652 | 15,175 | 101,165 |
| Reinforcing Bar | t | 8,532 | 27 | 58 | 15 | 43,650 | 100,554 | 216,005 | 55,863 | 372,422 |
| PC Strand | t | 25,786 | 53 | 30 | 17 | 2,352 | 32,144 | 18,195 | 10,310 | 60,649 |
| Structure Steel | t | 15,369 | 27 | 58 | 15 | 8,060 | 33,446 | 71,847 | 18,581 | 123,874 |
| Expansion Joint | m | 6,139 | 53 | 30 | 17 | 1,259 | 4,096 | 2,319 | 1,314 | 7,729 |
| Bridge Bearing | no | 8,185 | 53 | 30 | 17 | 2,310 | 10,021 | 5,672 | 3,214 | 18,907 |
| Bridge Railing | m | 706 | 25 | 62 | 13 | 14,887 | 2,628 | 6,516 | 1,366 | 10,510 |
| Waterproofing | m2 | 271 | 52 | 31 | 17 | 47,201 | 6,632 | 3,965 | 2,175 | 12,791 |
| **Sub Total** | | | | | | | **374,277** | **666,929** | **181,156** | **1,222,362** |
| **Drainage System** | km | 102,098 | 28 | 59 | 13 | 13.8 | 395 | 831 | 183 | 1,409 |
| **Lighting System** | km | 832,146 | 29 | 56 | 15 | 13.8 | 3,330 | 6,431 | 1,723 | 11,484 |
| **Traffic Signs** | km | 55,476 | 27 | 58 | 15 | 13.8 | 207 | 444 | 115 | 766 |
| **Ventilation System** | ls | 8,700,000 | 59 | 24 | 17 | 1 | 5,133 | 2,088 | 1,479 | 8,700 |
| **Other Tunnel Facilities (Fire Fighing, Telecom System, etc)** | ls | 1,000,000 | 31 | 54 | 15 | 1 | 310 | 540 | 150 | 1,000 |
| **Demolition of Existing Bridge** | ls | 610,000 | 47 | 36 | 17 | 1 | 287 | 220 | 104 | 610 |
| **Demolition of Small Bridge** | no | 200,000 | 47 | 36 | 17 | 2 | 188 | 144 | 68 | 400 |
| **Utilities Relocation** | km | 15,000,000 | 28 | 59 | 13 | 6.9 | 28,980 | 61,065 | 13,455 | 103,500 |
| **Sub Total** | | | | | | | **38,829** | **71,763** | **17,276** | **127,868** |
| **Mobilization & Demobilization, Overhead & Profit (10%)** | ls | | | | | | **42,686** | **75,813** | **20,488** | **138,987** |
| **TOTAL** | | | | | | | **469,551** | **833,941** | **225,368** | **1,528,860** |

* Figures were rounded-off to 1,000LE; it must therefore be noted that the fractions have difference

Table 13.2-9 Construction Cost of E3-3

(Unit ; 1,000 LE)

| | Unit | Unit Rate | Component (%) | | | Quantity | Cost | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Foreign | Local | Tax | | Foreign | Local | Tax | Total |
| **(Earth Work)** | | | | | | | | | | |
| Clearing and Grubbing | m2 | 3 | 47 | 36 | 17 | 9,000 | 13 | 10 | 5 | 27 |
| Excavation of Existing Pavement | m2 | 5 | 47 | 36 | 17 | 39,000 | 92 | 70 | 33 | 195 |
| Demolition of Existing Side Walk | m2 | 121 | 47 | 36 | 17 | 5,200 | 296 | 227 | 107 | 629 |
| Structure Excavation | m3 | 12 | 47 | 36 | 17 | 3,400 | 19 | 15 | 7 | 41 |
| Rock Excavation | m3 | 50 | 47 | 36 | 17 | 0 | 0 | 0 | 0 | 0 |
| Special Excavation | m3 | 227 | 37 | 45 | 18 | 131,134 | 11,014 | 13,395 | 5,358 | 29,767 |
| Mechanical Stabilized Earthwall | m2 | 935 | 25 | 58 | 17 | 2,400 | 561 | 1,302 | 381 | 2,244 |
| Selected Backfill for MSE Wall | m3 | 16 | 33 | 52 | 15 | 9,000 | 48 | 75 | 22 | 144 |
| Back Fill | m3 | 16 | 33 | 52 | 15 | 59,679 | 315 | 497 | 143 | 955 |
| **Sub Total** | | | | | | | **12,357** | **15,589** | **6,056** | **34,002** |
| **(Pavement Works)** | | | | | | | | | | |
| Base Course | m3 | 90 | 28 | 59 | 13 | 11,700 | 295 | 621 | 137 | 1,053 |
| Prime Coat | m2 | 2.04 | 28 | 59 | 13 | 41,800 | 24 | 50 | 11 | 85 |
| Tuck Coat | m2 | 1.53 | 28 | 59 | 13 | 142,262 | 61 | 128 | 28 | 218 |
| Asphalt Concrete | m3 | 427 | 28 | 59 | 13 | 14,139 | 1,690 | 3,562 | 785 | 6,037 |
| Road Marking | km | 10,210 | 42 | 42 | 16 | 18.93 | 81 | 81 | 31 | 193 |
| Sidewalk Concrete | m3 | 459 | 28 | 59 | 13 | 1,300 | 167 | 352 | 78 | 597 |
| Road Curb | m | 51 | 28 | 59 | 13 | 10,400 | 149 | 313 | 69 | 530 |
| PCC Pavement (t=250mm) | m2 | 306 | 28 | 59 | 13 | 2,800 | 240 | 506 | 111 | 857 |
| **Sub Total** | | | | | | | **2,707** | **5,614** | **1,250** | **9,570** |
| **(Structure Works)** | | | | | | | | | | |
| Cast in place Bored Pile Dia 1000mm | m | 1,917 | 28 | 59 | 13 | 5,760 | 3,092 | 6,515 | 1,435 | 11,042 |
| Cast in place Bored Pile Dia 1,500mm | m | 4,941 | 28 | 59 | 13 | 9,400 | 13,005 | 27,403 | 6,038 | 46,445 |
| Cast in place Bored Pile Dia 1,800mm | m | 6,353 | 28 | 59 | 13 | 9,660 | 17,184 | 36,208 | 7,978 | 61,370 |
| Pile Integrity Sonic Test | no | 803 | 35 | 52 | 13 | 1,241 | 349 | 518 | 130 | 997 |
| Pile Load Test (550t) | no | 75,261 | 28 | 59 | 13 | 6 | 126 | 266 | 59 | 452 |
| Pile Load Test (1,000t) | no | 150,521 | 28 | 59 | 13 | 20 | 843 | 1,776 | 391 | 3,010 |
| Granular Bedding | m3 | 92 | 28 | 59 | 13 | 0 | 0 | 0 | 0 | 0 |
| Diaphragm Wall | m3 | 3,686 | 28 | 59 | 13 | 0 | 0 | 0 | 0 | 0 |
| GRP Panel | m2 | 743 | 38 | 45 | 17 | 0 | 0 | 0 | 0 | 0 |
| PSC-PLANK (H=550mm) | m2 | 2,196 | 38 | 45 | 17 | 0 | 0 | 0 | 0 | 0 |
| PSC-PLANK (H=1,100mm) | m2 | 2,761 | 38 | 45 | 17 | 0 | 0 | 0 | 0 | 0 |
| RC Topping | m3 | 459 | 28 | 59 | 13 | 0 | 0 | 0 | 0 | 0 |
| Joint Filler (45 x 100) | m | 143 | 28 | 59 | 13 | 0 | 0 | 0 | 0 | 0 |
| Leveling Concrete | m3 | 439 | 28 | 59 | 13 | 3,439 | 423 | 891 | 196 | 1,510 |
| Structure Concrete Fc300(RC Slab, Sub Structure) | m3 | 817 | 29 | 56 | 15 | 97,505 | 23,102 | 44,610 | 11,949 | 79,662 |
| Structure Concrete Fc450 (Super Structure) | m3 | 1,174 | 29 | 56 | 15 | 84,561 | 28,790 | 55,594 | 14,891 | 99,275 |
| Reinforcing Bar | t | 8,532 | 27 | 58 | 15 | 45,042 | 103,761 | 222,893 | 57,645 | 384,298 |
| PC Strand | t | 25,786 | 53 | 30 | 17 | 2,644 | 36,134 | 20,453 | 11,590 | 68,178 |
| Structure Steel | t | 15,369 | 27 | 58 | 15 | 12,440 | 51,621 | 110,890 | 28,679 | 191,190 |
| Expansion Joint | m | 6,139 | 53 | 30 | 17 | 1,233 | 4,012 | 2,271 | 1,287 | 7,569 |
| Bridge Bearing | no | 8,185 | 53 | 30 | 17 | 962 | 4,173 | 2,362 | 1,339 | 7,874 |
| Bridge Railing | m | 706 | 25 | 62 | 13 | 27,354 | 4,828 | 11,973 | 2,511 | 19,312 |
| Waterproofing | m2 | 271 | 52 | 31 | 17 | 61,054 | 8,604 | 5,129 | 2,813 | 16,546 |
| **Sub Total** | | | | | | | **300,045** | **549,754** | **148,930** | **998,730** |
| **Cable Stayed Bridge over the Nile** | LS | 383,000,000 | 59 | 24 | 17 | 1 | 225,970 | 91,920 | 65,110 | 383,000 |
| **Construction of Underpass** | ls | 190,000,000 | 47 | 36 | 17 | 1 | 89,300 | 68,400 | 32,300 | 190,000 |
| **Drainage System** | km | 102,098 | 28 | 59 | 13 | 11.0 | 314 | 663 | 146 | 1,123 |
| **Lighting System** | km | 832,146 | 29 | 56 | 15 | 11.0 | 2,655 | 5,126 | 1,373 | 9,154 |
| **Traffic Signs** | km | 55,476 | 27 | 58 | 15 | 11.0 | 165 | 354 | 92 | 610 |
| **Demolition of Existing Flyover** | ls | 2,670,000 | 47 | 36 | 17 | 1 | 1,255 | 961 | 454 | 2,670 |
| **Demolition of Existing Viaduct at Giza Sq.** | ls | 814,000 | 47 | 36 | 17 | 1 | 383 | 293 | 138 | 814 |
| **Utilities Relocation** | km | 10,000,000 | 28 | 59 | 13 | 5.5 | 15,400 | 32,450 | 7,150 | 55,000 |
| **Sub Total** | | | | | | | **335,441** | **200,167** | **106,763** | **642,371** |
| **Mobilization & Demobilization, Overhead & Profit (10%)** | | | | | | | **65,055** | **77,112** | **26,300** | **168,467** |
| **TOTAL** | | | | | | | **715,605** | **848,236** | **289,299** | **1,853,141** |

* Figures were rounded-off to 1,000LE; it must therefore be noted that the fractions have difference.

## 13.3 TRAFFIC INFORMATION AND TOLL COLLECTION SYSTEM COST

The Traffic Information and Toll Collection Systems shall cover the entire expressway network in Cairo. These are an integrated system consisting of several subsystems with different functions which vary from basic and simple to the most advanced and sophisticated ones. In this Study, the present system prices in Japan were adopted for rough cost estimation. Table 13.3-1 presents the cost of traffic information and toll collection systems.

Table 13.3-1 Cost of Traffic Information and Toll Collection Systems

(Unit : 1,000 LE)

| | Item | Unit | Unit Rate | Component | | | Quantity | Cost | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Foreign | Local | Tax | | Foreign | Local | Tax | Total |
| **1. Cost of Traffic Information System** | | | | | | | | | | | |
| 1-1 | Vehicle Detector Sensing Head | no | 5 | 90 | 0 | 10 | 838 | 3,771 | 0 | 419 | 4,190 |
| | Vehicle Detector Computing Unit | no | 400 | 90 | 0 | 10 | 112 | 40,320 | 0 | 4,480 | 44,800 |
| | Vehicle Detector data concentrator (Center) | no | 2,050 | 90 | 0 | 10 | 1 | 1,845 | 0 | 205 | 2,050 |
| | Installation Cost (Gantry) | no | 125 | 47 | 36 | 17 | 112 | 6,380 | 5,040 | 2,380 | 14,000 |
| | **Sub Total** | | | | | | | **52,516** | **5,040** | **7,484** | **65040** |
| 1-2 | CCTV Camera,Road side Equipment | no | 220 | 90 | 0 | 10 | 44 | 8,712 | 0 | 968 | 9,680 |
| | Camera Control(Center) | no | 4,750 | 90 | 0 | 10 | 1 | 4,275 | 0 | 475 | 4,750 |
| | Monitor | no | 150 | 90 | 0 | 10 | 1 | 135 | 0 | 15 | 150 |
| | Installation Cost (Pole) | no | 50 | 47 | 36 | 17 | 44 | 1,034 | 792 | 374 | 2,200 |
| | **Sub Total** | | | | | | | **14,156** | **792** | **1,832** | **16780** |
| 1-3 | Variable Message Sign(VMS) | no | 2,000 | 90 | 0 | 10 | 10 | 18,000 | 0 | 2,000 | 20,000 |
| | VMS Control(Center) | no | 1,750 | 90 | 0 | 10 | 1 | 1,575 | 0 | 175 | 1,750 |
| | Installation VMS (Gantry) | no | 150 | 47 | 36 | 17 | 10 | 705 | 540 | 255 | 1,500 |
| | **Sub Total** | | | | | | | **20,280** | **540** | **2,430** | **23,250** |
| 1-4 | Fiber Optic Cable Network | km | 500 | 90 | 0 | 10 | 84 | 37,800 | 0 | 4,200 | 42,000 |
| | Key Station(Center) | no | 1,750 | 90 | 0 | 10 | 1 | 1,575 | 0 | 175 | 1,750 |
| | Fiber Optic Cable (42km*2) | km | 100 | 90 | 0 | 10 | 84 | 7,560 | 0 | 840 | 8,400 |
| | **Sub Total** | | | | | | | **46,935** | **0** | **5,215** | **52,150** |
| 1-5 | Emergency Telephone | no | 50 | 90 | 0 | 10 | 84 | 3,780 | 0 | 420 | 4,200 |
| | Automatic Changer(Center) | no | 1,500 | 90 | 0 | 10 | 1 | 1,350 | 0 | 150 | 1,500 |
| | Console(Center) | no | 750 | 90 | 0 | 10 | 1 | 675 | 0 | 75 | 750 |
| | **Sub Total** | | | | | | | **5,805** | **0** | **645** | **6,450** |
| | | | | 90 | 0 | 10 | | | | | |
| 1-6 | TIS Center System | no | 36,500 | 90 | 0 | 10 | 1 | 32,850 | 0 | 3,650 | 36,500 |
| | Installation | no | 1,000 | 47 | 36 | 17 | 1 | 470 | 360 | 170 | 1,000 |
| | **Sub Total** | | | | | | | **33,320** | **360** | **3,820** | **37,500** |
| **2. Cost of Electronic Toll Collection** | | | | | | | | | | | |
| | Roadside Equipment | no | 1,000 | 90 | 0 | 10 | 16 | 14,400 | 0 | 1,600 | 16,000 |
| | Operation Center | no | 15,000 | 90 | 0 | 10 | 1 | 13,500 | 0 | 1,500 | 15,000 |
| | Installation | no | 500 | 47 | 36 | 17 | 16 | 3,760 | 2,880 | 1,360 | 8,000 |
| | **Sub Total** | | | | | | | **31,660** | **2,880** | **4,460** | **39,000** |
| **3. Cost of Installation of Fiber Optic Cable** | | | | | | | | | | | |
| | Installaion of Fiber Optic Cable | km | 130 | 47 | 36 | 17 | 84 | 5,132 | 3,931 | 1,856 | 10,920 |
| | **Sub Total** | | | | | | | **5,132** | **3,931** | **1,856** | **10,920** |
| **4. Freight & Inland Transportation** | | | 1,500 | 70 | 20 | 10 | 1 | 1,050 | 300 | 150 | 1,500 |
| | **Sub Total** | | | | | | | **1,050** | **300** | **150** | **1,500** |
| **5. Control Center Building** | | m2 | 1 | 29 | 56 | 15 | 1,000 | 232 | 448 | 120 | 800 |
| | Building Facilities | ls | 240 | 29 | 56 | 15 | 1 | 70 | 134 | 36 | 240 |
| | **Sub Total** | | | | | | | **302** | **582** | **156** | **1,040** |
| **6. Toll Booth** | | | | | | | | | | | |
| | | no | 2,500 | 60 | 30 | 10 | 58 | 87,000 | 43,500 | 14,500 | 145,000 |
| | **Sub Total** | | | | | | | **87,000** | **43,500** | **14,500** | **145,000** |
| | **TOTAL** | | | | | | | **298,156** | **57,926** | **42,548** | **398,630** |

(Note) Price of Electronic Toll Collection System is based on Japanese Specification. Price of Equipment for Car is not included.
Price of Detector is based on 372 lanes Highway and Supersonic wave system.

* Figures were rounded-off to 1,000LE; it must therefore be noted that the fractions have difference.

## 13.4 LAND ACQUISITION COST

As a result of the field study, it is anticipated that portion of land area will be required for the right-of-way. The estimated acquisition cost is shown in Table 13.4-1. The information of unit prices for land and compensation has been given by Cairo Governor office.

Table 13.4-1 Land Acquisition Cost

(Unit: '000 LE)

| | | Land | | | | | | | | Building | | | Household | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Government Land | | | Private Land | | | Sub Total | | Area | Unit Price | Amount | House | Unit Price | Amount | |
| | | Area '000 sq.m | Unit Price per sq.m | Amount | Area '000 sq.m | Unit Price per sq.m | Amount | Area '000 sq.m | Amount | sq.m | per sq.m | | number | per number | | |
| E1-2 | Near Pedestrian Bridge | 0.40 | | 0 | | | 0 | 0.40 | 0 | 0.40 | 0.30 | 120 | 50 | 60.0 | 3,000 | 3,120 |
| | NAT Dormitory | 1.50 | | 0 | | | 0 | 1.50 | 0 | | | 0 | 50 | 60.0 | 3,000 | 3,000 |
| E2-2 | Ramses | | | 0 | 0.80 | 4.00 | 3,200 | 0.80 | 3,200 | | | 0 | | | 0 | 3,200 |
| E3-1 | Interchange | 220.00 | | 0 | | | 0 | 220.00 | 0 | | | 0 | | | 0 | 0 |
| E3-2 | Arab Contractor | | | 0 | 9.00 | 1.00 | 9,000 | 9.00 | 9,000 | | | 0 | | | 0 | 9,000 |
| E3-3 | Southern Cemetery | | | 0 | 19.00 | 1.00 | 19,000 | 19.00 | 19,000 | 19.00 | 0.30 | 5,700 | 50 | 60.0 | 3,000 | 27,700 |
| | Giza | | | 0 | 2.00 | 4.00 | 8,000 | 2.00 | 8,000 | 2.72 | 0.30 | 816 | | | 0 | 8,816 |
| **Total** | | **221.90** | | **0** | **30.80** | | **39,200** | **252.70** | **39,200** | **22.12** | | **6,636** | **150** | | **9,000** | **54,836** |

## 13.5 OPERATION AND MAINTENANCE COST

The operation of an expressway and the corresponding maintenance works are divided into three items; (1) Expressway Maintenance, (2) Traffic Management and (3)Toll Collection Management.

The summary of annual cost for maintenance and operation is shown in Table 13.5-1.

(1) Expressway Maintenance

New urban expressways are expected to provide technologically advanced facilities and high quality services to road users. The actual unit cost for maintenance of the existing E1 and E2 used by Cairo Governorate in 2005 is LE 0.05 mil./km/annum. But since the recent price escalation has impacted on the prices of these items, a unit cost of 0.08 mil LE/km/annum was adopted for estimation purposes. The unit cost has been estimated based on the previous PPP Study report considering the escalation rate of 5% per annum.

The annual maintenance cost is shown in Table 13.5-2 covers cost for the following.

a) Cleaning of pavement
b) Cleaning of ditches and culverts
c) Repairs of pavement, such as patching and resurfacing

d) Repairs of expansion joints of bridges and viaduct

e) Repairs of road facilities damaged by traffic accidents

f) Pavement overlay and repairs of road thermoplastic markings and curb stones

g) Handling of accidents

Table 13.5-1 Annual Cost of Operation and Maintenance

(Unit ; '000LE/Year)

| Item | | Foreign | Local | Tax | Total |
|---|---|---|---|---|---|
| 1 | Maintenance Cost | 2,400 | 12,000 | 1,600 | 16,000 |
| | Sub Total | 2,400 | 12,000 | 1,600 | 16,000 |
| 2 | Operation Cost | | | | |
| | Traffic Management | 19,019 | 5,743 | 2,572 | 27,334 |
| | Toll Collection Management Office | 540 | 950 | 90 | 1,580 |
| | Toll Collector | 0 | 17,971 | 0 | 17,971 |
| | Sub Total | 19,559 | 24,664 | 2,662 | 46,885 |
| **TOTAL** | | **21,959** | **36,664** | **4,262** | **62,885** |

*Foreign portion of the above cost are mainly for imported equipment and spare parts.

Table 13.5-2 Annual Cost of Maintenance

(Unit ; '000 LE / Year )

| Section | | Length (km) | Unit Cost | Component (%) | | | Cost | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Foreign | Local | Tax | Foreign | Local | Tax | Total |
| Existing | E1-1 | 11 | 80 | 15 | 75 | 10 | 136 | 678 | 90 | 904 |
| | E2-1 | 3 | 80 | 15 | 75 | 10 | 34 | 168 | 22 | 224 |
| | R.R | 95 | 80 | 15 | 75 | 10 | 1,140 | 5,700 | 760 | 7,600 |
| | S. Total | 109 | | | | | 1,309 | 6,546 | 873 | 8,728 |
| Expressway Plan | E3-1,2,3 | 20 | 80 | 15 | 75 | 10 | 234 | 1,170 | 156 | 1,560 |
| | E4-1,2,3 | 18 | 80 | 15 | 75 | 10 | 210 | 1,050 | 140 | 1,400 |
| | E5-1,2 | 11 | 80 | 15 | 75 | 10 | 132 | 660 | 88 | 880 |
| | E6 | 8 | 80 | 15 | 75 | 10 | 90 | 450 | 60 | 600 |
| | E7-1 | 11 | 80 | 15 | 75 | 10 | 132 | 660 | 88 | 880 |
| | E8-1,2 | 5 | 80 | 15 | 75 | 10 | 56 | 282 | 38 | 376 |
| | E9 | 4 | 80 | 15 | 75 | 10 | 48 | 240 | 32 | 320 |
| | E11 | 3 | 80 | 15 | 75 | 10 | 37 | 186 | 25 | 248 |
| | S. Total | 78 | | | | | 940 | 4,698 | 626 | 6,264 |
| Maximum Plan | E1-2 | 2 | 80 | 15 | 75 | 10 | 25 | 126 | 17 | 168 |
| | E2-2 | 1 | 80 | 15 | 75 | 10 | 14 | 72 | 10 | 96 |
| | E7-2 | 5 | 80 | 15 | 75 | 10 | 64 | 318 | 42 | 424 |
| | E10 | 4 | 80 | 15 | 75 | 10 | 48 | 240 | 32 | 320 |
| | S. Total | 13 | | | | | 151 | 756 | 101 | 1,008 |
| **Total** | | **200** | | | | | **2,400** | **12,000** | **1,600** | **16,000** |

(2) Traffic Management

The objective of traffic management is to improve (1) movement of people and goods primarily, (2) the quality and safety of traffic and transport system, and (3) the traffic related environment. This will be achieved by providing timely traffic information to road users and by carrying out a regular patrol of the highway for early detection of damage to road facilities and abnormal conditions, prevention of traffic accidents, provision of assistance to stalled vehicles, and to crackdown illegal parking.

The annual cost of traffic management in Table 13.5-3 includes cost for the following:

a) Personnel cost for traffic control office
b) Purchase and maintenance cost for office building equipments, vehicle, supplies, utilities, etc.
c) Maintenance cost of traffic information system
d) Overhead (20%)

(3) Toll Collection Management

Toll collection should be operated by a toll collection administration office. It will manage each tollgate on approach ramps. Table 13.5-4 presents the annual cost of keeping the said office while

Table 13.5-5 shows the annual cost of toll collector. The necessary number of tollgates will generally depend on traffic volume, but the number of tollgates had to be assumed for cost estimation.

Table 13.5-3 Annual Cost of Traffic Management

(Unit ; '000 LE / Year)

| | Item | Q'ty | Unit Cost | Compornent (%) | | | Cost | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Foreign | Local | Tax | Foreign | Local | Tax | Total |
| Personnel | General Manager | 1 | 90 | 0 | 100 | 0 | 0 | 90 | 0 | 90 |
| | Deputy General Manager | 1 | 63 | 0 | 100 | 0 | 0 | 126 | 0 | 126 |
| | Supervisor | 3 | 45 | 0 | 100 | 0 | 0 | 270 | 0 | 270 |
| | Accountant | 2 | 32.4 | 0 | 100 | 0 | 0 | 486 | 0 | 486 |
| | Clerk | 3 | 27 | 0 | 100 | 0 | 0 | 81 | 0 | 81 |
| | Secretary | 2 | 27 | 0 | 100 | 0 | 0 | 81 | 0 | 81 |
| | Driver | 3 | 18 | 0 | 100 | 0 | 0 | 162 | 0 | 162 |
| | Janitor | 2 | 13 | 0 | 100 | 0 | 0 | 50 | 0 | 50 |
| | Sub Total | | | | | | 0 | 1,346 | 0 | 1,346 |
| Purchase & Maintenance for Supply, Utility, Housing, Machinery, Car, etc | | 1 | 1,500 | 60 | 30 | 10 | 900 | 450 | 150 | 1,500 |
| Traffic Information System 5% of Maximum System Cost | | | 19,932 | 75 | 15 | 10 | 14,949 | 2,990 | 1,993 | 19,932 |
| Sub Total | | | | | | | 15,849 | 3,440 | 2,143 | 21,432 |
| Overhead 20 % | | | | | | | 3,170 | 957 | 429 | 4,556 |
| **Total** | | | | | | | **19,019** | **5,743** | **2,572** | **27,334** |

Table 13.5-4 Annual Cost of Operation of Toll Collection Management Office

(Unit ; '000 LE / Year)

| | Item | Q'ty | Unit Cost | Compornent (%) | | | Cost | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Foreign | Local | Tax | Foreign | Local | Tax | Total |
| Personnel | General Manager | 1 | 90 | 0 | 100 | 0 | 0 | 90 | 0 | 90 |
| | Deputy General Manager | 1 | 63 | 0 | 100 | 0 | 0 | 63 | 0 | 63 |
| | Supervisor | 3 | 45 | 0 | 100 | 0 | 0 | 135 | 0 | 135 |
| | Accountant | 2 | 32.4 | 0 | 100 | 0 | 0 | 65 | 0 | 65 |
| | Clerk | 3 | 27 | 0 | 100 | 0 | 0 | 81 | 0 | 81 |
| | Secretary | 2 | 27 | 0 | 100 | 0 | 0 | 54 | 0 | 54 |
| | Driver | 3 | 18 | 0 | 100 | 0 | 0 | 54 | 0 | 54 |
| | Janitor | 2 | 13 | 0 | 100 | 0 | 0 | 25 | 0 | 25 |
| | Sub Total | | | | | | 0 | 567 | 0 | 567 |
| Purchase & Maintenance for Supply, Utility, Housing, Machinery, Car, etc | | 1 | 750 | 60 | 30 | 10 | 450 | 225 | 75 | 750 |
| Sub Total | | | | | | | 450 | 225 | 75 | 750 |
| Overhead 20 % | | | | | | | 90 | 158 | 15 | 263 |
| **Total** | | | | | | | **540** | **950** | **90** | **1,580** |

Table 13.5-5 Annual Cost of Toll Collector

(Unit ; '000 LE / Year)

| Section | | Ramp | Qty. | Unit Cost | Direct Cost | Over-head | Cost | Compornent (%) | | | Cost | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 20% | | Foreign | Local | Tax | Foreign | Local | Tax | Total |
| Existing | E1-1 | 15 | 120 | 18 | 2,160 | 432 | 2,592 | 0 | 100 | 0 | 0 | 2,592 | 0 | 2,592 |
| | E2-1 | 9 | 72 | 18 | 1,296 | 259 | 1,555 | 0 | 100 | 0 | 0 | 1,555 | 0 | 1,555 |
| | Ring Road | 42 | 336 | 18 | 6,048 | 1,210 | 7,258 | 0 | 100 | 0 | 0 | 7,258 | 0 | 7,258 |
| | Sub Total | | 528 | | 9,504 | 1,901 | 11,405 | | | | 0 | 11,405 | 0 | 11,405 |
| Expressway Plan | E3-1,2,3 | 7 | 56 | 18 | 1,008 | 202 | 1,210 | 0 | 100 | 0 | 0 | 1,210 | 0 | 1,210 |
| | E4-1,2,3 | 9 | 72 | 18 | 1,296 | 259 | 1,555 | 0 | 100 | 0 | 0 | 1,555 | 0 | 1,555 |
| | E5-1,2 | 5 | 40 | 18 | 720 | 144 | 864 | 0 | 100 | 0 | 0 | 864 | 0 | 864 |
| | E6 | 3 | 24 | 18 | 432 | 86 | 518 | 0 | 100 | 0 | 0 | 518 | 0 | 518 |
| | E7-1 | 6 | 48 | 18 | 864 | 173 | 1,037 | 0 | 100 | 0 | 0 | 1,037 | 0 | 1,037 |
| | E8-1,2 | 1 | 8 | 18 | 144 | 29 | 173 | 0 | 100 | 0 | 0 | 173 | 0 | 173 |
| | E9 | 1 | 8 | 18 | 144 | 29 | 173 | 0 | 100 | 0 | 0 | 173 | 0 | 173 |
| | E11 | 1 | 8 | 18 | 144 | 29 | 173 | 0 | 100 | 0 | 0 | 173 | 0 | 173 |
| | Sub Total | | 264 | | 4,752 | 950 | 5,702 | | | | 0 | 5,702 | 0 | 5,702 |
| Maximum Plan | E1-2 | 2 | 16 | 18 | 288 | 58 | 346 | 0 | 100 | 0 | 0 | 346 | 0 | 346 |
| | E2-2 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0 |
| | E7-2 | 2 | 16 | 18 | 288 | 58 | 346 | 0 | 100 | 0 | 0 | 346 | 0 | 346 |
| | E10 | 1 | 8 | 18 | 144 | 29 | 173 | 0 | 100 | 0 | 0 | 173 | 0 | 173 |
| | Sub Total | | 40 | | 720 | 144 | 864 | | | | 0 | 864 | 0 | 864 |
| **Total** | | | **832** | | | | **17,971** | | | | **0** | **17,971** | **0** | **17,971** |

## 13.6 CONSTRUCTION COST OF THE REST OF EXPRESSWAY NETWORK

In order to carry out the economic and financial analysis of the overall expressway network, the construction cost of the rest of expressways and interchanges excluding F/S and Pre-F/S expressways is roughly estimated as presented in Table 13.6-1.

In the estimation the average unit costs, expressway lengths, number of traffic lanes, half interchange alignment and full interchange alignment are considered.

As can be recognized the total construction cost is about 20.5 Billion LE. The actual construction cost is about 17.6 Billion LE and the rest, about 2.9 Billion LE, is the estimated Tax.

Table 13.6-1 Estimated Construction Cost of the Rest of Expressways (LE Million)

| Section | Lane | Unit | Length | Total Length | Unit Cost | | Cost | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Foreign & Local | Tax | Foreign & Local | Tax | Total | |
| E1-1 | 4 | km | 11.0 | | | | | | | |
| E1-2 | 4 | km | - | | | | | | | F/S |
| E2-1 | 4 | km | 6.4 | | | | | | | |
| E2-2 | 2 | km | - | | | | | | | F/S |
| E3-1 | 4/6 | km | - | | | | | | | F/S |
| E3-2 | 6 | km | - | | | | | | | Pre-F/S |
| E3-3 | 6 | km | - | | | | | | | Pre-F/S |
| E4-1 | 4 | km | 4.7 | 9.4 | 80.8 | 13.5 | 759 | 127 | 886 | |
| E4-2 | 6 | km | 7.1 | 14.2 | 107.3 | 17.9 | 1,524 | 254 | 1,778 | |
| E4-3 | 4 | km | 5.2 | 10.4 | 80.8 | 13.5 | 840 | 140 | 980 | |
| E5-1 | 4 | km | 5.3 | 10.6 | 80.8 | 13.5 | 856 | 143 | 999 | |
| E5-2 | 6 | km | 4.7 | 9.4 | 107.3 | 17.9 | 1,009 | 168 | 1,177 | |
| E6 | 4 | km | 7.5 | 15.0 | 80.8 | 13.5 | 1,212 | 202 | 1,414 | |
| E7-1 | 4 | km | 10.5 | 21.0 | 80.8 | 13.5 | 1,697 | 283 | 1,979 | |
| E7-2 | 4 | km | 5.4 | 10.8 | 80.8 | 13.5 | 873 | 145 | 1,018 | |
| E8-1 | 6 | km | 2.9 | 5.8 | 107.3 | 17.9 | 622 | 104 | 726 | |
| E8-2 | 6 | km | 1.9 | 3.8 | 107.3 | 17.9 | 408 | 68 | 476 | |
| E9 | 4 | km | 4.0 | 8.0 | 80.8 | 13.5 | 646 | 108 | 754 | |
| E10 | 6 | km | 4.0 | 8.0 | 107.3 | 17.9 | 858 | 143 | 1,001 | |
| E11 | 6 | km | 4.0 | 8.0 | 107.3 | 17.9 | 858 | 143 | 1,001 | |
| E12 | 4 | km | 10.8 | 21.6 | 80.8 | 13.5 | 1,745 | 291 | 2,036 | |
| E13 | 4 | km | 1.6 | 3.2 | 80.8 | 13.5 | 259 | 43 | 302 | |
| I.C. (Full) | 2 | no | | 8.0 | 274.7 | 45.8 | 2,197 | 366 | 2,564 | |
| I.C. (Half) | 2 | no | | 9.0 | 137.3 | 22.9 | 1,236 | 206 | 1,442 | |
| **Total** | | | | | | | **17,599** | **2,933** | **20,533** | |

## 13.7 DISBURSEMENT SCHEDULE

As a result of the Cost Estimation Study, a disbursement schedule was prepared. This is shown in Table 13.7-1. The construction costs as of June 2008 were used in this table. At the implementation of the projects, this disbursement schedule shall be updated using updated construction costs. This disbursement schedule was prepared on the following assumptions.

1) The construction of Feasibility Study Sections (E1-2, E2-2 and E3-1) starts in 2010.
2) The construction of Pre-Feasibility Study Sections (E3-2 and E3-3) starts in 2011.
3) Advance payment will be disbursed in the first year of the construction period.
4) Amount of advance payment is 25% of the construction cost
5) Land acquisition and resettlement for all sections are completed in 2010 and 2011, beginning of the construction period.
6) Traffic Information and Toll Collection System are installed in the latter part of the construction period.

Table 13.7-1 Disbursement Schedule for High Priority Urban Toll Expressway

(Unit : 000 LE)

| Item | 2010 | 2011 | 2012 | 2013 | 2014 | Total | Remarks |
|---|---|---|---|---|---|---|---|
| (Construction Cost) | | | | | | | |
| A. Feasibility Study Section | | | | | | | |
| 1 E1-2 Section | | | | | | | |
| 2 E2-2 Section | | | | | | | |
| 3 E3-1 Section | | | | | | | |
| Engineering Service (Construction Supervision) | | | | | | | |
| | (Advance Payment) | | | | | | |
| 1 E1-2 Section | 661,980 441,320 | 441,320 | 441,320 | 441,320 | 220,659 | 2,647,918 | Advance Payment (25 % of Const. Cost) |
| 2 E2-2 Section | 79,303 79,303 | 79,303 | 79,303 | | | 317,211 | |
| 3 E3-1 Section | 576,481 432,361 | 432,361 | 432,361 | 432,360 | | 2,305,923 | |
| Sub Total | 1,317,763 952,983 | 952,984 | 952,984 | 873,680 | 220,659 | 5,271,052 | |
| Engineering Service (Construction Supervision) | 65,888 47,649 | 47,649 | 47,649 | 43,684 | 11,033 | 263,553 | |
| Contingency | 61,496 | 61,496 | 61,496 | 61,496 | 30,746 | 276,730 | |
| Sub Total (F/S Section) | 2,445,779 | 1,062,129 | 1,062,129 | 978,860 | 262,438 | 5,811,335 | |
| B. Pre-Feasibility Study Section | | | | | | | |
| 1 E3-2 Section | | | | | | | |
| 2 E3-3 Section | | | | | | | |
| Engineering Service (Construction Supervision) | | | | | | | |
| | | (Advance Payment) | | | | | |
| 1 E3-2 Section | 0 | 382,215 327,613 | 327,613 | 327,613 | 163,806 | 1,528,860 | Advance Payment (25 % of Contract Amount) |
| 2 E3-2 Section | 0 | 463,285 347,464 | 347,464 | 347,464 | 347,463 | 1,853,140 | |
| Sub Total | 0 | 845,500 675,077 | 675,077 | 675,077 | 511,269 | 3,382,000 | |
| Engineering Service (Construction Supervision) | 0 | 42,275 33,754 | 33,754 | 33,754 | 25,563 | 169,100 | |
| Contingency | 0 | 44,389 | 44,389 | 44,389 | 44,388 | 177,555 | |
| Sub Total (Pre-F/S Section) | 0 | 1,640,994 | 753,220 | 753,220 | 581,221 | 3,728,655 | |
| Total | 2,445,779 | 2,703,123 | 1,815,349 | 1,732,080 | 843,659 | 9,539,990 | |
| (Traffic Information & Toll Collection System) | | | 79,726 | 159,452 | 159,452 | 398,630 | |
| (Land Acquisition & Resettlement Cost) | 27,418 | 27,418 | | | | 54,836 | |
| Grand Total | 2,473,197 | 2,730,541 | 1,895,075 | 1,891,532 | 1,003,111 | 9,993,456 | |