

# Chapter - 12

## Estimates

### 12.1 General

The chapter pertaining to estimates is prepared as per the Working Group Report on "Guidelines for preparation of detailed project reports of irrigation and multipurpose projects", Govt. of India, Ministry of Irrigation 1980. The cost of project has been estimated under the following units.

### 12.2 Classification of units

The project works will be grouped into the following units :

#### 12.2.1 Unit –I : Head works and their appurtenant works

The provisions are made under various sub-heads as enunciated in the paras 12.3 and 12.4.

#### 12.2.2 Unit –II: Main canal, feeder canals, branch canals etc. and canal structures.

#### 12.2.3 Unit-III: Hydro power installation

The cost under this head has been worked out on the lines of Surya Hydroelectric project across Surya river, a tributary of Vaitarna river. The project is located in Maharashtra state.

#### 12.2.4 Unit-IV : Navigation works

Navigation is not proposed in the canals under Par-Tapi-Narmada link project. Hence no provision is made.

#### 12.2.5 Unit-V: Water supply works

Water supply works are not proposed at present under this link project. Hence no provisions is made under this head.

## 12.2.6 Unit-VI: Command area development works

A rate of Rs.35,600 per ha of CCA in Par-Tapi-Narmada link project has been adopted for command area development.

## 12.3 Classification of minor heads / sub-heads

Each unit has been divided into the following minor heads classified as direct and indirect charges.

### 12.3.1 Direct charges

The direct charges include following items in each unit. The total cost of all units under following items is also summarized below:

Items	Cost Rs. Lakh
I - Works	5,44,500
II - Establishment	52,430
III - Tools & plants (ordinary)	5,243
IV - Suspense	-
V - Receipts and recoveries on capital account	(-) 6,990

### 12.3.2 Indirect charges

The indirect charges include the following items. The abstract of cost of these items of all units is also given below:

a) Capitalized value of abatement of land revenue	1,015
b) Audit and accounts charges.	<u>5,446</u>
Total cost of the project	6,01,644

### 12.3.3 The provisions under the minor head have been further subdivided into the following sub-heads

- A) Preliminary
- B) Land
- C) Works
- D) Regulators
- E) Falls (for canals only)
- F) Cross drainage works (for canals only)
- G) Bridges (for canals only)
- H) Escapes (for canals only)

- I) Navigation works
- J) Power plant appurtenance (civil works)
- K) Buildings
- L) i. Earth work (for canals only)  
ii. Lining (for canals only)
- M) Plantation
- N) Tanks and reservoirs
- O) Miscellaneous
- P) Maintenance
- Q) Special tools and plants
- R) Communications
- S) Power plant and electrical systems
- T) Water supply works
- U) Distributaries, minors and sub-minors
- V) Water course
- W) Drainage
- X) Environment and ecology
- Y) Losses on stock and unforeseen

While preparing estimates for Par-Tapi portion of Par-Tapi-Narmada link the schedule of rates of 1992-93 of Damanganga project with 10% escalation factor have been adopted in order to arrive at the rates for the year 1993-94. However, for Tapi-Narmada portion of Par-Tapi-Narmada link, the Schedule Of Rates (SOR) of 2004-05 for south Gujarat region, Damanganga Project Circle, Valsad has been adopted for estimate purpose. The estimates of the project under various units are given in Table - 12.1.

**Table – 12.1  
Unit wise cost of project**

<b>Sl. No.</b>	<b>Classification of head</b>	<b>Esitmated cost (Rs. in lakhs)</b>
<b>1</b>	<b>Unit –I Head works and their appurtenant works</b>	<b>2,61,220</b>
a)	Direct charges	
	I – Works	2,36,591
	II- Establishment	22,157
	III-Tools and plants	2,215
	IV-Suspence	-
	V- Receipts & recoveries	(-)2,866
b)	Indirect charges	
	i) Capital value of abatement of land revenue	757
	ii) Audit & account charges	2,366
<b>2</b>	<b>Unit-II Canals and their structures</b>	<b>3,15,389</b>
a)	Direct charges	
	I- Works	2,85,557
	II- Establishment	28,038
	III-Tools and plants	2,804
	IV- Suspence	-
	V- Receipts & recoveries	(-) 4,124
b)	Indirect charges	
	i) Capitalized value of abatement of land revenue	258
	ii) Audit & account charges	2,856
<b>3</b>	<b>Unit-III Hydropower installation</b>	<b>25,035</b>
a)	Direct charges	
	I – Works	22,352
	II- Establishment	2,235
	III-Tools and plants	224
	IV-Suspence	-
	V- Receipts & recoveries	-
	b) Indirect charges	
	i) Capital value of abatement of land revenue	-
	ii) Audit & account charges	224
4.	Unit-IV Navigation works	-
5.	Unit-V Water supply works	-
6.	Unit-VI Command area development works (CAD)	67,075*
	<b>Total</b>	<b>6,01,644</b>

*Note : \* The cost of CAD works included in unit-II-canals & its structures*

The details of estimates of each components of the project under different sub-heads are described below.

## **12.4 Requirements under different sub-heads of units-I Head works and their appurtenant works**

The estimate under head works includes the cost of seven dams, 3 weirs, main canal head regulators including intake and outlet structures of the tunnel etc. The total cost of Unit-I – Headworks works out to be Rs.2,61,220 lakhs which includes direct and indirect charges. Details of estimates under different sub-heads are furnished below.

### **12.4.1 Direct charges**

I – Works

A- Preliminary

This sub-head covers the expenditure on investigations so far incurred and likely to be incurred further, just before and during the period of execution such as general and annual surveys, design studies including laboratory tests, Publication of reports, fee of consultants. Camp equipment required for investigation staff, construction of access roads to facilitate investigation and also further investigation of foundations of spillways, earth dams etc. The expenditure so far incurred for geophysical and geotechnical investigations, foundation exploration, construction materials surveys, soil testing and environmental and ecological studies of the project is about 40 lakhs. However a provision of Rs. 4,706 lakhs has been made for the preliminary sub-head at 2% of the cost of I-works. i.e Rs.2,36,591.

B- Land

The estimate provided is for acquisition of land upto FRL condition and transfer of the properties is upto FRL + 5m. The total area coming under the submergence of all the seven reservoirs and three weirs is about 7739 ha. including river portion at FRL condition. The particulars of lands likely to be submerged are given below:

Sr. No.	Reservoir/weir	Forest land (ha)	Cultivable land (ha)	River portion (ha)	Total (ha)
<b>I</b>	<b>Reservoirs</b>				
1.	Jheri	408	256	172	836
2.	Mohankavchali	743	486	265	1494
3.	Paikhed	317	589	88	994
4.	Chasmandva	300	255	60	615
5.	Chikkar	300	332	110	742
6.	Dabdar	614	482	153	1249
7.	Kelwan	890	450	289	1629
<b>II</b>	<b>Weirs *</b>				
1.	Chasmandva	30	25	5	60
2.	Chikkar	30	25	5	60
3.	Kelwan	30	25	5	60
	*Assumed figures				
	<b>Total</b>	<b>3662</b>	<b>2925</b>	<b>1152</b>	<b>7739</b>

The cost of cultivable lands has been worked out based on the local prevailing rates i.e. at the rate of Rs.19819 per ha, for Valsad district and Rs.44301 per ha for Dang district. Provision for afforestation of 3662 ha of degraded forest area at the rate of Rs.100937 per ha as prevailing in the project area is adopted. In addition, provision for making alternative arrangement of communication disrupted by submergence has also been made in the estimate. 75 villages are affected due to submergence of all the seven reservoirs. The total population affected as per 1991 census is about 14832. All the affected properties have been proposed to be acquired and provision is also made in the estimate. Provision for compensation for standing crops has also been made. The estimated cost of rehabilitation, resettlement including cost of lands under head B-Land of I-Works out to Rs.15143 lakhs.

### C – Works

The cost of Jheri, Mohankavchali, Paikhed, Chasmandva, Chikkar, Dabdar, Kelwan dams and the three weirs has been estimated separately. This includes preparation of foundation and excavation, bank protection works and core filling, grouting, drilling, drainage and ventilation, masonry dams and appurtenant works, reinforcement and steel gates and other miscellaneous works. The cost of the interlinking tunnel is also estimated. The overall provision under this sub-head works out to Rs. 1,89,539 lakhs.

## D - Regulators

The estimate under this sub-head covers the cost of those head regulators which are provided at the dams for canals to offtake directly from the reservoir. The cost of head regulators at Dabdar, Kelwan and Ukai dams is estimated to Rs.1938 lakhs.

## E - Falls (for canals only)

Does not apply to unit-I head works.

## F - Cross drainage works (for canals only)

Does not apply to unit-I head works

## G - Bridges (for canals only)

Does not apply to unit-I head works

## H - Escapes (for canals only)

Does not apply to unit-I head works

## I - Navigation works

Navigation is not provided in canal system and hence no provision is made in the estimate.

## J - Power plant appurtenances (civil works)

The particulars of power plant appurtenances are furnished in unit-III.

## K - Buildings

A lumpsum provision of Rs.7150 lakhs (i.e. 3.1% of cost of I-works) has been made under this sub-head. The amount provided under this sub head is for all the permanent and temporary categories of buildings (for residential and Non-residential buildings).

## L - Earthwork, lining (for canals only)

Does not apply to unit-I head works.

## M - Plantation

A lumpsum provision of Rs.235 lakhs (i.e. 0.1% of cost of I-Works) has been made towards plantation of avenue trees, horticulture etc. required for beautification at the dams around power houses and at other important

structures. The provision includes maintenance and protection for 2-3 years.

N - Tanks and reservoirs  
Does not apply to this project

O - Miscellaneous

A provision of Rs.4706 lakhs has been made to cover the capital cost of electrification, water supply, sewage disposal, telephone, medical equipments, recreation facilities etc. and their maintenance including running and maintenance of inspection vehicles. The provisions made is 2% of the cost of unit I – Works.

P - Maintenance

A provision of Rs. 2113 lakhs has been made to cover the cost of maintenance of buildings, roads and other structures during the period of construction. The provision made is 1% of the cost of I-Works excluding A- preliminary, B-Land and Q-Special T & P and covers maintenance of all works during the construction period.

Q - Special T & P

A provision of Rs. 13198 lakhs has been provided for purchasing earth moving machinery and other ancillary machinery and equipment as per Table - 10.1, 10.2 and 10.3 given in Chapter-10. 75% of the cost is recovered from works as hourly use rates. The net amount charged to 'Q' Special T & P is 25% of the capital cost of machinery and the entire capital cost of inspection and transport vehicles. The provision made for purchase of inspection and transport vehicles is Rs.881 lakhs. Thus a provision of Rs.4181 lakhs is made under this head. 20% of the capital cost of inspection and transport vehicles has also been considered as resale value which works out to Rs.176 lakhs.

R - Communication

A provision of Rs. 6353 lakhs is made under this sub-head towards formation of new roads, improving existing approach roads to dam sites & weir sites, construction of quarry roads and temporary roads in the work area. The provision made is 2.7% of cost of I-Works.



S - Power plant  
Does not apply to unit- I head works.

T to X  
Does not apply to unit –I head works.

Y - Losses on stock and unforeseen  
A provision of Rs.527 lakhs is made at 0.25% of cost of I- Works less cost of A- preliminary, B- Land and Q – Special T & P towards losses on stock of material due to natural causes.

Thus the total cost of I-Works after considering all the above items works out to Rs.236591 lakhs.

II Establishment

An amount of Rs.22157 lakhs at 10% of the cost of I-Work less B-Land is provided under this sub head for establishment including leave and pensioner charges.

III Tools & plants (Ordinary)

A provision of Rs.2215 lakhs has been made under this sub head to cover survey instruments, camp equipment, office equipment and other small tools. The provision made is 1% of I – Works less B land.

IV Suspenses

The provision made under this head is taken as Nil.

V Receipts and recoveries

75% of 25% cost of special T&P is taken as receipts and recoveries. For inspection vehicles 100% of capital cost provided under the special T&P and 20% of this provision shown under V-receipts and recoveries. The estimated recoveries by way of resale or renting of temporary buildings, resale of special tools and plants and miscellaneous receipts would be of the order of Rs.2866 lakhs.

## **12.4.2 Indirect charges**

### (i) Audit and account charges

A provision of Rs.2366 lakhs at 1% of cost of I-Works is made towards audit and accounts charges.

### (ii) Abatement and land revenue

A provision of Rs.757 lakhs at 5% of the cost of B-Land has been made towards abatement and land revenue acquired for camp colony, borrow area and submergence areas.

Thus the total cost of indirect charges works out to Rs.3123 lakhs.

## **12.5 Unit-II : Main canal and canal structures**

The estimates of Par-Tapi-Narmada link canal without considering Ukai water has been prepared in two parts i.e. i) Par-Tapi portion and ii) Tapi-Narmada portion including their structures. The total cost of the Unit-II main canal, feeder canals, branch canals including its command area development and canal structures works out to Rs.3,15,389 lakhs. The details of provision made in the estimate are furnished below:

### **12.5.1 Par-Tapi portion of Par-Tapi-Narmada link canal**

The estimate of Par-Tapi portion of the link canal covers cost of main canal, branches, distributaries, canal lining and cross drainage structures etc. which work out to Rs.1,17,481 lakhs. The schedule of rates considered in Damanganga project have been adopted to work out the cost estimate. This unit is sub divided into different heads/sub heads and the provisions made under each head/sub head are described below:

#### **12.5.1.1 Direct charges**

I - Works

A- Preliminaries

This sub-head covers the expenditure on investigations already done and yet to be conducted such as, soil surveys, investigation of foundation of C.D and C.M. works, preliminary soil tests and establishing laboratories etc. An amount of

Rs.2,102 lakhs at 2% on cost of I- Works i.e. Rs.1,05,105 lakhs has been provided under this sub head.

#### B- Land

A provision of Rs.2,307 lakhs has been made towards the cost of land acquisition along the main and feeder canals alignment and at the cross drainage works. This also includes land required for spoil banks and borrow area. A provision of 5% of land required is made for colonies etc. The number of trees is considered as 3 per ha and the number of wells considered is 1 number per 8 km length of canal. The total land required to be acquired is 2,367 ha. Out of which an area of 1,113 ha is considered as forest land and the remaining 1,254 ha is cultivated land. Provision for afforestation of 1,113 ha of the land acquired for forest at the rate of Rs.1,00,937 per ha as considered in unit – I 'Head works' has also been made in the estimate. Lumpsum provision of realigning of telephone and telegraph lines is also made in the estimate.

#### D- Regulators

There are 12 head regulators and 19 cross regulators on the main and feeder canals in Par-Tapi portion of link canal for which a provision of Rs.1,602 lakhs has been made in the estimate. The head regulators are proposed at off take points of distribution system for command area in the enroute of main link canal. The typical cost estimate for head regulator proposed at ch.164.40 km. has been estimated as per SOR of 1993-94. The cost of remaining head regulator has been estimated from the cost curves of head regulator developed for Bargi diversion project which is located in Madhya Pradesh, as on December 1987 and by applying escalation factor of 10% for the year 1993-94. Applying further escalation @ of 8% the total cost of head regulators works out to Rs.72 lakhs for the year 2004-05.

The cross regulators required for the main and feeder canals are planned to be combined with road bridges as far as possible to minimize the cost. The cross regulators have mostly been proposed at those places where canal discharge is diverted and main canal is joined by other canals. The typical cost estimate of cross regulator proposed at ch. 164.40 km has been estimated as per SOR 1993-94. The cost of remaining cross regulators have been estimated from the cost curves of cross regulators developed for Bargi diversion project, as on December 1987 by applying escalation factor of 10% for the year 1993-94. Applying further escalation @ of 8% the total cost of cross regulators works out to Rs. 1,530 lakhs for the year 2004-05.

## E - Falls

There is no canal drop on the main canal. However canal drops one each on Dabdar and Kelwan feeders have been provided to cope up with the topography and to join at suitable levels of main canal. Hydropower generation is proposed at these drops, but the cost of power component is not included under this head, which has been considered under Unit-III: Hydropower installation. The cost of canal drop proposed on Dabdar feeder at ch.14.10 km has been worked out as per SOR of 1993-94. The cost of canal drop on Kelwan feeder has been estimated from the cost curves of canal falls developed for Bargi project for December 1987 by applying escalation factor of 10% for the year 1993-94. Applying further escalation @ of 8% the total cost of canal drops works out to Rs.79 lakhs for the year 2004-05.

## F - Cross drainage works

As both the main and feeder canals are proposed to be aligned as contour canals, they cross a number of natural streams. It is identified that 36 aqueducts, 17 drainage syphons and 4 canal syphons on main and 5 aqueducts and 4 drainage syphons on feeder canals are to be provided. Hydraulic designs are prepared for an aqueduct, a drainage syphon and a canal syphon. The cost estimates for aqueduct at ch 100 km and drainage syphon at ch.51.20 km have been worked out as per SOR of 1993-94. The cost of remaining aqueducts and drainage syphons has been estimated from the cost curves of aqueduct and drainage syphon of Bargi project by applying escalation factor for the year 1993-94. The total cost of aqueducts works out to Rs.15,716 lakhs and that of drainage syphons work out to Rs.1,083 lakhs after further escalation. The typical cost estimate of canal syphon proposed at ch 74.60 km has been estimated by considering SOR of 1993-94. The cost of remaining canal syphons has been worked out proportionately on product of span and discharge of structure. The total cost of all canal syphons works out to Rs.258 lakhs. A lump sum provision of Rs.389 lakhs has also been kept for diversion of drains to avoid number of C.D. works. The total cost under this sub head works out to Rs.17,446 lakhs.

## G - Bridges

The total number of road bridges proposed is 43, of which 40 are on the main canal and 3 are on the feeder canals. A typical road bridge at ch 54.40 km has been designed and using the dimensions, quantities and cost of each item have been worked out. The cost of remaining road bridges has been estimated from

the cost curve of Road bridge prepared for Bargi diversion project in December 1987 by applying escalation factor for the year 1993-94. The cost of all the road bridges works to Rs.1,246 lakhs after further escalation.

#### H - Escapes

It is identified that 6 canal escape are to be provided on the main canal. A typical canal escape proposed at ch 102.30 km has been designed and the cost estimate is worked out by considering SOR of 1993-94. The cost of remaining escapes has been estimated using the cost curves of Head regulators of Bargi project and applying escalation factor for the year 1993-94. The total cost of all the canal escapes works out to Rs.193 lakhs for the year 2004-05 after further escalating @ 8%.

#### K - Buildings

A lumpsum provision of Rs.3,258 lakhs at 3.1% of cost of I-Works has been made towards construction cost of permanent and temporary buildings.

#### L – Earth work

##### (i) Earth work

An amount of Rs.44,546 lakhs has been provided for earth work which includes excavation in case of cutting and filling in case of embankments. The soil strata has been classified into four categories namely 43% soil, 26% hard murrum, 20% soft rock and 11% hard rock. The hard rock available in excavation will be used in pitching works of embankment and canal structures.

##### (ii) Lining

The main canal and feeder canals are proposed to be lined by the concrete lining of 10 cm and 7.5 cm thickness respectively. A provision of Rs.11,927 lakhs has been made towards this. The rates are based on SOR 2004-05.

##### (iii) Service roads and inspection paths.

A provision of Rs.3,216 lakhs has been made towards service roads and inspection paths along the main canal and feeders.

#### (iv) Tunnels

There are two tunnels provided in Par-Tapi portion. First tunnel 5 km long will be connecting Mohankavchali reservoir and Paikhed diversion weir. Second tunnel is on the main canal and of length 500 m at RD 21.60 km. This has been proposed to avoid excessive cutting . These tunnels will be free flow tunnel with modified horse shoe section. The entire tunnel will be lined with 0.35 m thick M 15 grade R.C.C concrete in case of 1<sup>st</sup> tunnel where as 0.5 thick M 15 grade R.C.C concrete lining is provided in the 2<sup>nd</sup> tunnel on the main canal. Finished diameter of modified horse shoe tunnel for 1<sup>st</sup> & 2<sup>nd</sup> tunnels are 5.5.m and 8.0m respectively. The total cost of the two tunnels works out to Rs.4,356 lakhs.

#### M - Plantation

A lumpsum provision of Rs.105 lakhs has been made for plantation for the total length of the canal. The provision includes the cost of maintenance and protection for 2-3 years. The provision made is 0.1% of the cost of I-Works.

#### O - Miscellaneous

An amount of Rs.2,102 lakhs at 2% of cost of I-Works is provided under this sub head.

#### P - Maintenance

A provision of Rs.1,007 lakhs has been made towards maintenance of canal structures at the rate of 1% of the cost of I-Works less A-Preliminary and B-Land.

#### Q - Special T & P

Provision for special T & P has been considered in the Tapi-Narmada portion of the link canal. These T & P can be utilized for Par-Tapi portion simultaneously.

#### R - Communication

The provision made under this sub head is Rs.2,838 lakhs for laying inspection roads along both the main and feeder canals which is 2.7% of cost of I - Works.

## U - Distributaries

A provision of Rs.6,198 lakhs has been made towards cost of distributaries and minor which includes cost of land acquisition, earth work excavation, cross drainage and cross masonry works. A rate of Rs.35,600 per ha of CCA is considered for working out the cost estimate under this sub head.

## V - Water course/field channels

A Provision of Rs.203 lakhs towards cost of water couse/field channels at the rate of Rs.1,166 per ha. of CCA has been made under this sub head.

## W - Drainage

A Provision of Rs.122 lakhs has been made towards cost of providing drainage net work in the command area. The rate adopted is Rs.700 per ha of CCA.

## Y - Losses on stock

A Provision of Rs.252 lakhs is made towards losses on stock at 0.25% of cost of I- Works less A- Preliminary and B- Land.

## II - Establishment

A provision of Rs.10,280 lakhs at 10% of the cost of I- Works less B-Land is made under this sub head including leave and pensionary charges.

## III - Tools and plants ( ordinary)

A provision of Rs.1,028 lakhs at 1% of cost of I- Works less B- Land is made under this head to cover survey instruments, office equipment and other small tools etc.

### **12.5.1.2. Indirect charges**

A provision of Rs.115 lakhs is made towards capitalised value of abatement of land revenue and Rs.1,051 lakhs is provided towards audit and account charges. The capitalised value of abatement of land revenue is assumed as 5% of cost of land required and the audit and account charges are assumed as 1% of cost of I-Works.

## **12.5.2 Tapi-Narmada portion of Par-Tapi-Narmada link canal**

The estimate of Tapi-Narmada portion of the link canal covers main canal, branches, distributaries, channels inclusive of all pucca works, canal lining and cross drainage structures etc. The total cost of this portion of link canal is estimated to Rs.1,97,908 lakhs. The rates adopted in the estimate are based on SOR 2004-05 for south Gujarat region, Damanganga Project Circle, Valsad. This unit is sub divided into different heads/sub-heads and the provisions made under each head/sub-head is described below:

### **12.5.2.1 Direct charges**

#### **I- Works**

Total cost of canal and command area development under I – Works, works out to Rs.1,80,452 lakhs. The details are described below.

#### **A- Preliminaries**

This sub head covers the expenditure on investigations already done and studies yet to be carried out such as soil survey investigation of foundation of cross drainage and cross masonry works, preliminary soil tests and other miscellaneous items etc. An amount of Rs.3,609 lakhs at 2% on cost of I- Works has been provided under this sub head.

#### **B – Land**

The provision under this sub head covers the cost of land acquisition for main canal. This also includes land required for spoil banks and borrow areas. A provision of 5% of land required is made for colonies. The total land to be acquired is 2,240 ha, out of which 564 ha is considered as forest land and the remaining 1,676 ha cultivated land. Provision for afforestation of 564 ha of land acquired for forest at the rate of Rs.1,00,937 per ha as considered in unit-I 'Head Works' has been made in the estimate. Lumpsum provision of realigning of telephone and power lines is also made in the estimate. Demarcation charges and legal charges have also been considered in the estimate. The total cost under this sub head works out to Rs.2,868 lakhs.



## D - Regulators

There are 7 head regulators and 11 cross regulators on the main canal in Tapi-Narmada portion of link canal for which a provision of Rs.2,886 lakhs has been made in the estimate. The head regulators are proposed at offtake points of distribution system for command area in the enroute of main link canal. The typical cost estimate of head regulators proposed at Ch. 51.90 km has been carried out as per SOR 2004-05 for south Gujarat region, Damanganga Project Circle, Valsad. The cost estimate of remaining head regulators has been computed as per cost curves of Bargi diversion project. This cost curve pertains to December 1987 price, the same is escalated by using factor, which is arrived at by taking ratio between the actual estimated cost of head regulator at ch 51.90 km and the cost of the same, as per cost curve. The total cost of all the head regulators works out to Rs.260 lakhs.

The typical cost estimate for cross regulator proposed at ch 51.90 km has been estimated as per SOR 2004-05 for south Gujarat region, Damanganga Project Circle, Valsad. The cost of remaining cross regulators has been estimated from the cost curves of cross regulators developed for Bargi diversion project for December 1987 price. The same is escalated by applying escalation factor for the year 1993-94. Applying further escalation @ 8% the total cost of all the cross regulators works out to Rs.2,626 lakhs.

## E – Falls

There are no canal fall required to be provided on the main canal. Hence the estimated cost under this sub head taken to be Nil.

## F – Cross drainage works.

The main canal is proposed to be aligned as contour canal, it crosses number of natural streams/rivers. It is identified that 18 aqueducts, 67 drainage syphons on main canal are to be provided. A typical cost estimate for 5 aqueducts at ch. 2.075 km 134.34 km 148.90 km 176.083 km and 188.509 km have been estimated as per SOR 1993-94. The cost estimate for remaining aqueducts except 4 major aqueducts at ch. 134.34 km on Karjan at ch 148.90 Km on Narmada at ch. 176.083 km on Hiren and at ch 188.509 km on Orsang rivers have been carried out as per cost curves of Bargi diversion project by applying suitable escalation factor for the year 1993-94. Applying further escalation @ 8% the total cost of all the aqueducts workout to Rs. 20,687 lakhs. The cost of remaining drainage syphons has been carried out based on the number of

barrels required to pass the discharge. The total cost of all the drainage syphons works out to Rs.12,312 lakhs.

Apart from the above, a lumpsum provision of Rs.466 lakhs has also been kept for diverting the drain to avoid no. of cross drainage works.

Thus the total cost under this sub head works out to Rs.33,465 lakhs.

## G - Bridges

50 road bridges and 5 railway bridges have been proposed across Tapi-Narmada Portion. A typical road bridge at ch. 0.151 km has been designed and using the dimensions, quantities and cost estimate have been carried out by using SOR for 2004-05 south Gujarat region, Damanganga Project Circle, Valsad. The cost estimate for remaining bridges upto Miyagam branch canal of Sardar Sarover Project has been considered same as that cost of road bridge at ch. 0.151 km is worked out using SOR for 2004-05 south Gujarat region, Damanganga Project Circle, Valsad. However, beyond Miyagam branch canal the cost estimate of the road bridges has been computed considering the cost of road bridge at ch. 0.151 km on the basis of cost per span using SOR for 2004-05 south Gujarat region, Damanganga Project Circle, Valsad. The total cost of all the road bridged works out to Rs.1,239 lakhs.

The link canal also crosses the Railway line at various places. The cost of railway bridges has been assumed 1.5 times the cost of road bridges. The total cost of railway bridges works out to Rs.188 lakhs. Thus the total cost under this head works out to Rs.1,427 lakhs.

## H- Escapes

It is proposed that 3 canal escapes at ch. 36.013 km, 107.71 km, and 147.875 km are to be provided on the main canal. A typical cost estimate of canal escape proposed at ch 36.013 km has been worked out by adopting SOR of Damanganga Project. The total cost of all the three canal escapes works out to Rs.435 lakhs.

## K- Buildings

A lumpsum provision of Rs.5,594 lakhs at 3.10% of cost of I- works has been made under this sub head towards construction of permanent and temporary buildings.

## L- Earth work

### (i) Earth work

An amount of Rs.33,981 lakhs has been provided for earth work which includes both cutting and filling.

### (ii) Lining

It is proposed that the main canal is to be lined with cast in-situ cement concrete of M 10 grade over 100 micron polythelene film. The thickness of lining is 10cm. A provision of Rs.12,262 lakhs has been made in the estimate towards this. The rates adopted in the estimate are based on SOR for 2004-05 south Gujarat region, Damanganga Project Circle, Valsad..

### (iii) Service roads and inspection paths

A provision of Rs.3,112 lakhs has been made towards service roads and inspection paths along the main canal.

## M- Plantation

A lumpsum provision of Rs.180 lakhs has been provided for plantation for the total length of the canal in Tapi-Narmada reach. The provision includes the cost of maintenance and protection for 2-3 years. The provision made is 0.1% of the cost of I-Works.

## O - Miscellaneous

An amount of Rs.3,609 lakhs at 2% cost of I-Works is provided under this sub head.

## P- Maintenance

A provision of Rs.1,680 lakhs at 1% of cost of I-Works less A-Preliminary, B-Land and Q-special T & P has been made in the estimate towards maintenance of canal and canal structures.

#### Q - Special T & P

A provision of Rs.19,353 lakhs is made for purchasing earth moving machinery and other ancillary machinery and equipment as per Table-10.1,10.2 and 10.3 given in Chapter-10. The net amount charged to 'Q' – special T & P is 25% of the capital cost of machinery i.e. Rs. 4,838.3 lakhs and the entire cost of inspection and transport vehicles. The provision made for purchase of inspection and transport vehicles is Rs.1,147.3 lakhs. Thus a total provision of Rs.5,986 lakhs is made under this sub head.

The resale value of the machinery is taken as 75% of the amount chargeable to special T & P (i.e. Rs.3,629 lakhs), 20% of the capital cost of inspection and transport vehicles has also been considered as resale value (i.e. 229 lakh). Thus the total resale value works out to Rs.3,858 lakhs.

#### R - Communication

The provision made under this sub head is Rs.4,872 lakhs for laying inspection roads along the main canal which is 2.7% of the cost of I- works.

#### U - Distributaries

A provision of Rs.60,877 lakhs has been made towards cost of distributaries and minors which includes cost of land acquisition, earth work excavation, cross drainage and cross masonry works. A rate of Rs. 35,600 per ha of CCA is considered for working out the cost estimate under this sub head.

#### V - Water course/field channels

A provision of Rs.1,994 lakhs has been made under this sub head towards cost of water course/field channels at the rate of Rs.1,166 per ha of CCA.

#### W - Drainage

A provision of Rs.1,195 lakhs has been made towards cost of providing drainage net work in the command area. The rate adopted is Rs.699 per ha of CCA.

Y - Losses on stock

A provision of Rs.420 lakhs is made towards losses on stock at 0.25% of cost of I-Works less A-Preliminary, B-Land and Q-Special T & P.

II- Establishment

A provision of Rs.17,758 lakhs at 10% of the cost of I-works less B- Land is made under this sub head including leave and pensionery charges.

III – Tools and plants (ordinary)

A provision of Rs.1,776 lakhs at 1% on cost of I-Works less B-Land is made under this head to cover survey instruments, office equipment and other small tools etc.

IV - Suspense

The provision made under this head is Nil.

V - Receipts and recoveries

The estimated recoveries by way of resale or renting of temporary buildings, resale of special tools and plants and miscellaneous receipts would be of the order of Rs.4,026 lakhs.

#### **12.5.2.2 Indirect charges**

A provision of Rs.143 lakhs is made towards capitalized value of abatement of land revenue and Rs.1,805 lakhs is provided towards audit and account charges. The capitalised value of abatement of land revenue is assumed as 5% of cost of land required and the audit and account charges are assumed as 1% of cost of I-Works.

### **12.6 Unit- III Hydro-electric installations**

This unit covers the power component of the project, comprising a total of six power houses. Out of these power houses 4 are proposed at the toe of dams viz. Jheri, Paikhed, Chasmandva and Chikkar and the remaining 2 power houses are proposed at the canal drops on the feeder canals of Dabdar and Kelwan dams.

The total installed capacity of all the power houses is 32.50 MW and the energy generation that could be achieved from power station is 92.975 Mkwh.

The power houses have been designed on the lines of Surya Hydroelectric project across Surya river. However the cost adopted in the estimate is based on the rates available in SOR 2004-05 of Damanganga project and remaining cost is escalated @ 8% from 1993-94 to year 2004-05. The total cost of all the six power houses and their components is worked out to Rs.25,035 lakhs. The provisions made under each sub head are at follows :

### **12.6.1 Direct charges**

#### I - Works

##### A – Preliminaries

A provision of Rs.447 lakhs has been made in the estimate at 2% of the cost of I-Works

##### B – Land

The land required for power house installation at the toes of dams has already been considered in the land acquisition of head works. However for installation of power houses at the canal drops on the feeders of Dabdar and Kelwan, land to an extent of 2 ha is required to be acquisitioned. Adopting the prevailing rate of Rs.19,822 per ha the cost of land acquisition works out to 0.4 lakhs. In addition Rs.1.60 lakhs is provided for land acquisition and demarcation works at all the six power houses. Thus the total provision under this sub head works out to Rs. 2 lakh.

##### C – Works

A provision of Rs.2,739 lakhs has been made for all the civil works involved in the installation of power plants, which includes the cost of penstock, trashrack, stopping and power houses including switch yards.

##### S - Power plant and electrical system

A provision of 17,750 lakhs has been made towards installation of power generating equipment and plant installation for working out cost estimate at a

rate of Rs.546.15 lakhs per MW of installed capacity has been considered in the estimate.

#### K - Building

A lumpsum provision of Rs.671 lakhs at 3% of cost of I-Works has been made towards construction of buildings.

#### P - Maintenance

A provision of Rs.219 lakhs has been made towards cost of maintenance of power installation at 1% of the cost of I-Works less the cost of A-Preliminary and B-Land.

#### O - Miscellaneous

A provision of Rs.447 lakhs at 2% cost of I-Works has been provided under this sub head.

#### M - Plantation

A lumpsum provision of Rs.22 lakh has been made for plantation. The provision includes the cost of maintenance and protection for 2-3 years. The provision made is 0.1% of the cost of I-Works.

#### Y - Loss on stock

A provision of Rs.55 lakhs has been made towards losses on stock which is Rs.0.25% of cost of I-Works less A-Preliminary and B-Land.

#### II - Establishment

A provision of Rs.2,235 lakhs has been made at 10% of the cost of I-Works less B-Land under this sub head.

#### III - Tools and plants (ordinary)

A provision of Rs.224 lakhs at 1% of cost of I-Works less B-Land is made under this head.

### **12.6.2 Indirect charges**

A provision of Rs.224 lakhs is made towards audit and account charges at 1% of cost of I-Works.

### **12.7 Unit – VI Command area development**

The cost of command area development under Par-Tapi-Narmada link project without considering Ukai water has been estimated separately for Par-Tapi and Tapi-Narmada portions based on SOR 2004-05. The total cost under this head works out to Rs.67,075 lakhs.

The cost per ha of command area development for Tapi-Narmada portion has been estimated based on the study made on the command area development of Sardar Sarovar Project. The total cost of command area development of each block has been worked out by project authorities. On this basis, the average cost per ha of CCA has been worked out which works out to Rs.35,600. The cost of command area development for Par-Tapi and Tapi-Narmada portions of the link canal works out to be Rs.6,198 lakh and Rs.60,877 lakh. Thus, the total cost of command area development in Par-Tapi-Narmada link project for 1,88,414 ha of CCA works out to Rs.67,075 lakhs.