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## Field Training Report



Report submitted to-  
**Executive Engineer,**  
Gosikhurd Left Bank Canal Division,  
Wahi, Pauni, Dist: Bhandara  
(12/11/2007-14/11/2007)

कार्यकारी अभियंता,  
गोसीखुर्द डावा कालवा विभाग, वाही, पवनी

**Executive Engineer,  
Gosikhurd Left Canal Division, Wahi, Pauni.**

सरळ सेवा भरतीने नियुक्ती दिलेल्या सहाय्यक कार्यकारी अभियंता/सहाय्यक अभियंता श्रेणी-१  
अधिकाऱ्यांसाठी प्रतिष्ठापन प्रशिक्षण कार्यक्रम, (भाग १), जलसंपदा विभाग  
Induction Training (Part I) for Direct Recruits (Assistant Executive Engineer and  
Assistant Engineer (Grade 1)) of Water Resource Department.

कालावधी: १२-१४ नोव्हेंबर २००७  
Duration: 12-14 November 2007

# “क्षेत्रीय प्रशिक्षण अहवाल” “FIELD TRAINING REPORT”

सादरकर्ता-

Submitted by-

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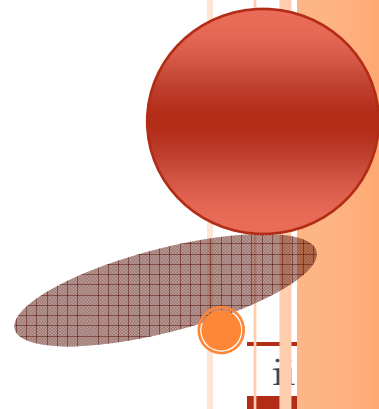
## Executive Summary

**M**aharashtra Engineering Training Academy (META), Nashik organized training program for direct recruits - Assistant Executive Engineer of Water Resource Department (WRD), in accordance with Maharashtra Engineering Service Examination-2004. As per schedule of training program, group of Assistant Executive Engineer's was directed to undergo field training under the guidance of Superintending Engineer, Gosikhurd Lift Irrigation Circle, Aambadi, Bhandara to grasp knowledge about lift irrigation schemes.

Gosikhurd project is one of the ambitious project in Vidarbha region. As per plan, it includes construction of main dam at Gosikhurd village, left and right bank canal, 4 Lift Irrigation Scheme (LIS) on reservoir, 2 LIS on left bank canal, renewal of Asolamendha project etc. Gosikhurd village is located in Pauni Tahsil of Bhandara district on Wainganga River. We visited Gosikhurd dam which is created by constructing a composite dam 11.35 km long across River Wainganga. i.e. earthen dam both the right and left bank flanks of central masonry gated Ogee spillway 773 m long in the river gorge and 14 m above foundation level. It has battery of 33 radial gates of 18.3x16.5 m (used first time in Maharashtra) to discharge a design flood of 67,300 m<sup>3</sup>/sec.

The Gosikhurd Left Bank Canal Division is headed by Executive Engineer-Shri. Gonnade and work of this division includes excavation and construction of structures on Gosikhurd Left Bank Main Canal (GLBMC) 1 to 22.93 km, Branch canal No. 1 from 1 to 8.23km, branch canal No.2 from 1 to 21.76 km and branch canal No.3 from 1 to 7.55 km. This report includes the study of Left Bank Canals and the hydraulics structures constructed over canal. GLBMC off takes from the head regulator at Ch. 820 m of the main dam of the project. The length of main canal is 22.93 km and its discharge at dam outlet is 45.22 cumecs. In all three branch canals are proposed on the GLBMC. There are two lift irrigation schemes Viz, Gosi(Bk) and Akot LIS on the GLBMC at Ch. 900m and Ch.4170m respectively.

While studying about the left bank canal, I realized the great technical and management skills involved during implementation of the project. It is biggest challenge to every engineer of the division, to convert all designs and drawings into reality, without entertaining any mistake or fault. Definitely, their contribution in the success of the entire project is uncountable. I am sure that completion of the project will bring green revolution in Vidarbha region.



## कार्य सारांश

**म**हाराष्ट्र लोकसेवा आयोगामार्फत घेण्यात आलेल्या ‘महाराष्ट्र अभियांत्रिकी सेवा परिक्षा-२००४’ च्या निकालाच्या अनुसंधाने ‘सहाय्यक कार्यकारी अभियंता’ या पदावर नियुक्ती दिलेल्या अधिकाऱ्यांसाठी ‘महाराष्ट्र अभियांत्रिकी प्रशिक्षण प्रबोधिनी’, नाशिक या संस्थेद्वारे एका वर्षाच्या प्रशिक्षण कार्यक्रमाचे आयोजन करण्यात आले. या प्रशिक्षण कार्यक्रमांतर्गत, पहिल्या तुकडीतील सहाय्यक कार्यकारी अभियंत्यांचा पहिला गट क्षेत्रीय प्रशिक्षणासाठी अधीक्षक अभियंता, गोसीखुर्द उपसा सिंचन मंडळ, आंबाडी, भंडारा यांच्याकडे दि. ०५ नोव्हेंबर २००७ रोजी तीन आठवड्यांच्या प्रशिक्षणासाठी रुजू झाला. बांधकाम प्रकल्पाचे सर्वेक्षण, अन्वेषण व प्रकल्प अहवाल तयार करणे, चालू प्रकल्पांचे प्रत्यक्ष मुख्यधरण, कालवा व वितरीकाचे कामाचे नियोजन करणे व चालू बांधकामावर प्रत्यक्ष देखरेख करणे असा या प्रशिक्षणाचा पोटविषय होता.

प्रशिक्षणाच्या पहिल्या आठवड्यांमध्ये (५-७ नोव्हेंबर २००७) आम्हाला श्री. पोहेकर साहेब, अधीक्षक अभियंता, उपसा सिंचन मंडळ, आंबाडी, यांचे बहुमोल मार्गदर्शन लाभले. नेरला उपसा सिंचन योजना, आंबोरा उपसा सिंचन योजना, मोखबर्डी उपसा सिंचन योजना, गोसीखुर्द डावा कालवा, बावनथडी प्रकल्प हे मोठे प्रकल्प, आणि ७ मध्यम व १३ लहान प्रकल्पांचे काम या मंडळाच्या माध्यमातून चालू आहेत. या मंडळाचे पाच विभाग आणि तेवीस उपविभाग आहेत.

गोसीखुर्द प्रकल्प हा विदर्भातील एक मोठा महत्वाकांक्षी प्रकल्प आहे. या प्रकल्पांतर्गत गोसीखुर्द गावाजवळ मुख्य धरण, डावा कालवा व उजवा कालवा, जलाशयावरील ४ उपसा सिंचन योजना, डाव्या कालव्यावरील २ उपसा सिंचन योजना, असोलामेंढा प्रकल्पाचे नुतनीकरण इत्यादी प्रमुख घटकांचा समावेश आहे. मुख्य धरणाचे बांधकाम भंडारा जिल्ह्यातील पवनी तालुक्यातील गोसीखुर्द गावाजवळ सुरू आहे. वैनगंगा नदीवरील मुख्य मातीधरणाची एकूण लांबी ११.३५ कि.मी. असून यात संधानकातील उत्सारीत भाग ७७३ मी. व अनुत्सारीत भाग १३० मी. यांचा समावेश आहे. उत्सारीत सांडव्यावर १८.३x१६.५ मी. आकाराचे ३३ वक्रद्वारे बसवले आहेत. या आकाराच्या वक्रद्वारांची उभारणी महाराष्ट्रात प्रथमच होत आहे. मुख्य धरणाचे सा.क्र. ८२० मी. व सा. क्र. ७८७५ मी. वर अनुक्रमे डावा व उजवा तीर विमोचके बांधण्यात आलेली आहेत.

गोसीखुर्द डावा कालवा विभाग, वाही, या विभागाचे कार्यकारी अभियंता- श्री. गोन्नाडे, यांच्या मार्गदर्शनाखाली आम्ही दि. १२ ते १४ नोव्हेंबर या कालावधीमध्ये डाव्या कालव्याच्या कामाची माहिती घेतली, तसेच विभागामधील विविध टिप्पणीच्या सहाय्याने हा अहवाल सादर करत आहोत. गोसीखुर्द प्रकल्पाच्या मुख्य धरणाच्या सा.क्र. ८२० मी. पासून २२.९३ कि.मी. लांबीचा डावा मुख्य कालवा प्रस्तावित आहे.

सदर विभागाचे काम पाहून कालव्याच्या कामासंबंधीच्या आव्हानात्मक कामाची मला जाणीव झाली. या विभागाचे कार्यकारी अभियंता- श्री. गोन्नाडे साहेब, यांच्या मार्गदर्शनाद्वारे सर्व अधिकाऱ्यांच्या व कर्मचाऱ्यांच्या संघटनात्मक, कार्यक्षम आणि सदैव मदतीसाठी तत्पर असण्याच्या स्वभावामध्येच या विभागातील यशाचे गमक सामावले आहे. या प्रकल्पाच्या यशामध्ये त्यांचा वाटा निश्चितच मोलाचा आहे व त्यातूनच या भागामध्ये हरितक्रान्ती होवून या भागाचा विकास होईल असे मला वाटते.

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This report will be incomplete without a proper acknowledgment of the debt to many persons, who made it possible. It is my great pleasure to acknowledge those whose active help and support make this report possible in the present form. First of all I express my sincere gratitude to Shri. S.R. Suryavanshi- Chief Engineer and Superintending Engineer- Shri. Pohekar, for their guidance during field training.

It is the endless guidance and constant encouragement of **Executive Engineer- Shri. Gonnade Sir** and I would like to express my heartfelt gratitude to him for providing us necessary drawings and technical information along with the stay arrangements at Wahi rest house.

I am deeply indebted to all technical and non-technical staff of circle office for insisting in me the drive to work hard and for inculcating in me the discipline to think clearly. Definitely the knowledge, I received during this training session was a lifetime experience and it will serve as a foundation for my career.

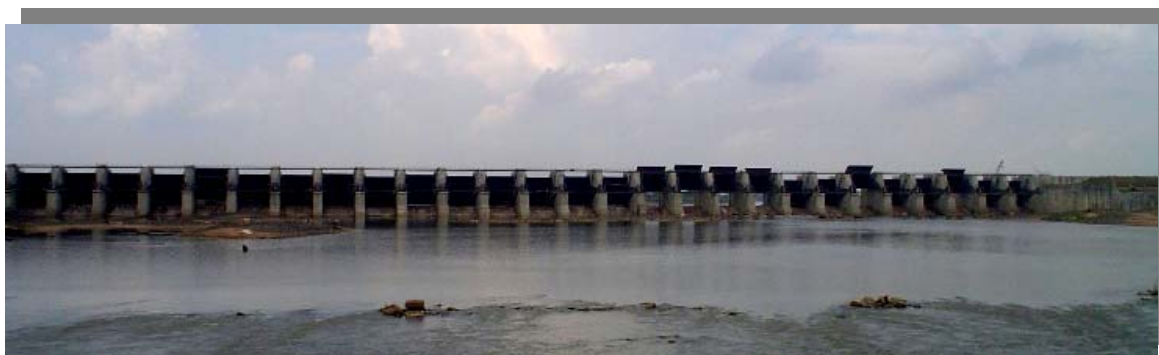
I am thankful to my colleagues who make the stay at Wahi Rest House enjoyable. Last, but not least, I wish to express my gratitude towards my parents- Shivaji and Rohini, my grandparents- Rangnath and Sitabai, my uncle Raosaheb and aunty Radhika who sacrificed a lot to give me a good education.

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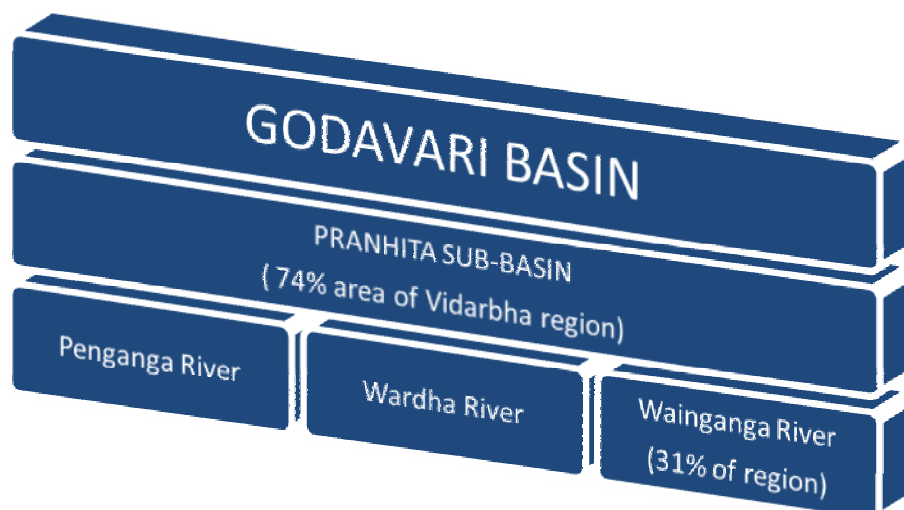




# Chapter 1. Gosikhurd Project

## 1.1 Introduction

The major part of Vidarbha region lies in Pranhita sub-basin of Godavari region. The tributaries finally contributing to form Pranhita river are Penganga, Wardha and Wainganga.



**Fig. 1.1.1 Details of contribution of rivers in Vidarbha region**

Wainganga originates near the village Pratapgarh at an elevation of 640 m RL in Seoni district of Madhya Pradesh and traverses almost North-South through Bhandara and Chandrapur district of Maharashtra state. Total length of Wainganga from its origin up to confluence with Wardha river is about 717 km. The total catchment area drained up to the proposed dam site of Gosikhurd project is 34,860 km<sup>2</sup>, out of which 24,261 km<sup>2</sup> lies in Madhya Pradesh and 10,627 km<sup>2</sup> in Maharashtra state. Wainganga river has following tributaries-

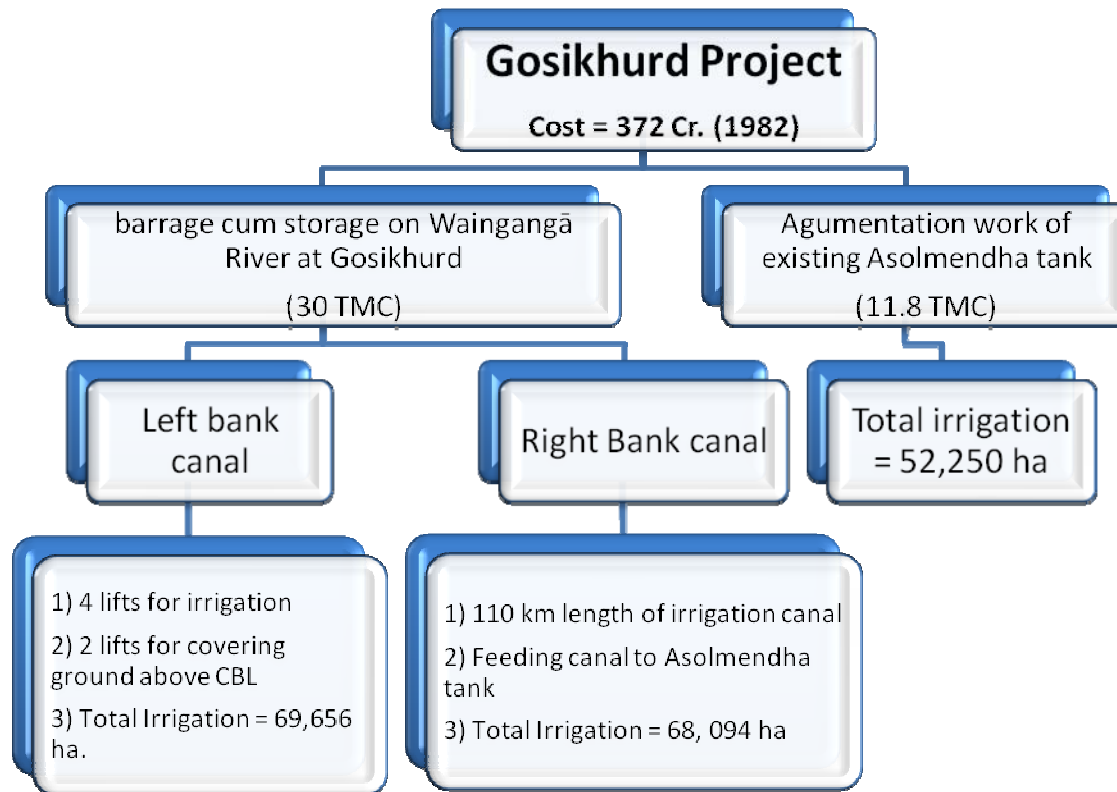
**Table 1.1.1 Tributaries of Wainganga river**

Left bank tributaries	Right Bank tributaries
1. Thel River (MP) joins at 71 km	1. Hirri River in MP joins at 183 km
2. Bagh River (MS) joins at 257 km	2. Mawanthadi River (MS) joins at 300km
3. Chulband River (MS) joins at 415 km	3. Kanhan River (MS) joins at 358 km
4. Khobragadi River (MS) joins at 450 km	4. Mayur River (MS) joins at 386 km
5. Kathani River (MS) joins at 470 km	5. Andheri River (MS) joins at 555 km
6. Dina River (MS) joins at 600 km	

Gosikhurd village is located in Pauni Tahsil of Bhandara district on Wainganga River. As per planning, Gosikhurd reservoir will be created by constructing a composite dam 11.35 km long with earth embankment across River Wainganga. i.e. earthen dam both the right and left bank flanks of central masonry gated Ogee spillway 773 m long in the river gorge and 14 m above foundation level. It will have



battery of 33 radial gates of 18.3x16.5 m size to discharge a design flood of 67,300 m<sup>3</sup>/sec. The maximum height of the dam will be 27 m above river bed. The barrage will submerge about 18,960 ha land of which 12,600 ha in Nagpur and Bhandara district (68 villages fully and 75 villages partially)



**Fig. 1.1.2 Details of Gosikhurd project**

The year wise percentage of development of irrigation potential –

**Table 1.1.2 Year wise percentage of development of irrigation potential-**

5 <sup>th</sup> year of construction	20 %
6 <sup>th</sup> year of construction	29 %
7 <sup>th</sup> year of construction	31 %
8 <sup>th</sup> year of construction	20 %

## 1.2 Salient features of Gosikhurd Project

- a) Cost of Gosikhurd project : 316.57 Cr. (1982)  
 b) Cost of Asolmendha Tank : 55.62 Cr. (1982)  
 c) Total cost of project : 372.22 C. (1982)  
 d) Total irrigation : 2,50,800 ha  
 e) Location of dam :

**Table 1.2.1 Details of dam location**

State	Maharashtra
District	Bhandara
Tahsil	Pauni
Village	Gosikhurd
Toposheet No.	55 P/9
Latitude	20° 52' 15" N
Longitude	79° 37' 0" E

- f) Name of river : Wainganga (Tributary of Pranhita)  
 g) Name of basin : Godavari  
 h) Catchment area :

	Madhya Pradesh	Maharashtra	Total
Gross	24,261 km <sup>2</sup>	10,627 km <sup>2</sup>	34,888 km <sup>2</sup>
Free			5,902 km <sup>2</sup>

- i) Availability of water

75 % dependable monsoon yield	501.33 TMC
Past monsoon flow (4.7 %)	23.56 TMC
Total annual yield	524.89MC

## 1.3 Utilization

- a) Irrigation utilization :

With flow canal on LBC	4.418 TMC
On lift canal	3.537 TMC
LB foreshore lift	5.610 TMC
Right bank flow canal	11.85 TMC
RC foreshore lift	6.75 TMC

- b) Water supply to ordnance factory, Bhandara : 0.837 TMC  
 c) Feeding to Asolamendha tank : 13.766 TMC  
 d) Annual evaporation loss : 7.107 TMC  
 e) Total utilization : 53.88 TMC  
 f) Balance spill over : 58.704 TMC

## 1.4 Dams and spillway details

**Table 1.4.1 Details of dam and spillway**

<b>Dam</b>	
Type of dam	Rolled filled earthen dam
Length of dam	11.35 km
Maximum height of dam	22 m
Free board	
Over MWL	3m
Over FRL	4.5 m
<b>Spillway</b>	
Type of spillway	Central gated Ogee shaped masonry spillway
Length of spillway	774 m
Maximum height	10.3 m
Crest level	232 m
Design flood	67,300 m <sup>3</sup> /sec
No. of gates	33
Size of gates	18.3x16.5m

## 1.5 Prominent features of irrigation by canal

**Table 1.5.1 Prominent features of irrigation by canal**

Sr. No	Canal	Capacity (m <sup>3</sup> /sec)	Length (km)	CCA (ha)	ICA (ha)	Lift head
1	Right Bank Canal	95	108	53,405	50,735	--
2	Left Bank Canal	40.50	27.5	35,860	34,067	--
3	Left bank fore shore lift- Paghora	21.11	45	21,284	20,223	35 m
4	Left bank fore shore lift- Jakh	4.47	4	4,000	3,800	35 m
5	Right bank fore shore lift- Mokhabardi	24.02	53	21,350	20,280	35 m
6	Right bank fore shore lift- Ambhora	10.24	9.10	9,100	8,645	18 m

## Chapter 2. Gosikhurd Dam

### 2.1 Introduction

As the part of training program, we already spend one week on the various activities of dam construction. We studied several reports and design notes related to the dam at Gosikhurd Dam division office, Wahi, Pauni and also visited dam site on 1<sup>st</sup> October 2007 to know about masonry dam and 2<sup>nd</sup> October 2007 to gather information about earthen embankment. Construction of dam is highly precious and important work, since it involves greater care to convert all drawings related to dam alignment and cross-section in to reality. It is very important to keep the designed bed level and cross-section as per specified, otherwise canal won't give its designed returns. The alignment of dam runs through soft as well as hard rock, sometimes in cutting, in banking, partial cutting and banking.

This chapter includes the abstract of the study and observations done by us.

### 2.2 General layout of Gosikhurd Project

Gosikhurd project consists of construction of a barrage-cum-storage on Wainganga river at Gosikhurd, in Pauni Tahsil of Bhandara district, Augmentation work of existing Asolamendha tank in Chandrapur district and remolding the entire canal system of Asolamendha irrigation tank. The proposed reservoir at Gosikhurd has been named as Indira Sagar. The total irrigation potential covered in this project is of the order of 2, 50,800 ha.

There are left and right bank canals and four foreshore LIS<sup>1</sup> at Tekepar, Mokhabardi, Ambhora and Paghora proposed on main reservoir at Gosikhurd. The right and left bank canals are 107km and 28 km in length respectively. The right bank canal is to carry surplus monsoon water at Gosikhurd to augment the Asolamendha tank project in 100<sup>th</sup> km of canal, in addition to irrigation in its own command. The river Wainganga is a major tributary of Godavari basin. The total catchment area intercepted at Gosikhurd dam site is 34,863 km<sup>2</sup>, out of which, 24,243 km<sup>2</sup> lies in Madhya Pradesh and 10,619 km<sup>2</sup> lies in Maharashtra.

The gross storage capacities of the reservoir viz. Gosikhurd and Asolamendha tank will be 1,146.075 Mm<sup>3</sup> and 334.14 Mm<sup>3</sup> respectively. The live storage capacity of the reservoir at Gosikhurd at 50 years silt planning will be 740.168 Mm<sup>3</sup>

The final proposal of general layout is –

Earthen embankment on left flank	RD -3150 to 5905m
Left side NOF <sup>2</sup> masonry portion	RD 5905 to 5970m
Central OF <sup>3</sup> spillway portion with 33 No. of radial gates of size 18.3x16.5	RD 5970 to 6767.2m
Right side NOF masonry portion	RD 6767.2 to 6832.2m
Earthen embankment on right flank	RD 6832.2 to 8056m
Envelope type junction for left and right NOF portion of masonry dam	
Left bank irrigation outlet	RD 820m
Right bank irrigation outlet	RD 7905m
Left bank irrigation cum power outlet	RD 780m
Right bank irrigation cum power outlet	RD 7911m

<sup>1</sup> Lift Irrigation Scheme

<sup>2</sup> Non Over Flow

<sup>3</sup> Over Flow

### 2.3 Geology at dam site

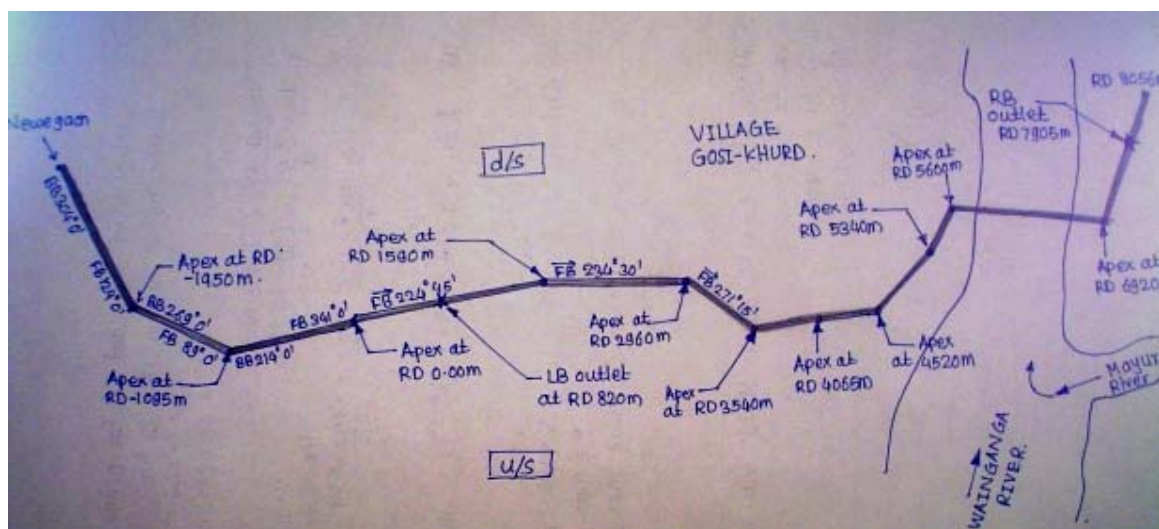
The geological investigation of the dam site has been carried out by Department of Geological Survey of India. In and around the project area, Archeean group of rocks represented by schist, phyllites and quartzite of Sakoli series are exposed. The basement rocks if arranges in increasing order of crushing strength fall in the manner of alluvium, schist, phyllites and amphibolites.

Mylonitic characteristic of phyllite together with slicken slides, shearing and pyritisation etc. indirectly indicate that phyllite has suffered shearing and faulting. The water intake test results have brought the picture of underlying rock as leaky, necessitating the need of grouting for seepage arresting and for formation of monolithic nature.

## 2.4 Site selection and alignment of dam

The selection of site for irrigation project is governed by consideration of optimum utilization of yield available and availability of foundation bed rock at higher elevations for economizing the cost of headwork's.

Two sites near Bhandara town are investigated for this project; viz. Sawargaon and Gosikhurd. The site located near Gosikhurd is finally selected being quite suitable and feasible. It is about 45 km south of Bhandara town and 10 km upstream of Pauni, a Tahsil place. The dam site is immediately downstream of confluence of river Marur with river Wainganga. There are hillock on right and left flank of the rivers and the alignment follows a well defined ridge and passes through a pair of hillocks on left flank.



**Figure: General layout of Gosikhurd dam**

## 2.5 Layout of spillway

Relevant salient features of the project-

<b>TBL</b>	<b>250.05m</b>
<b>MWL</b>	245.70m
<b>FRL</b>	245.50m
<b>Length of spillway</b>	763.90m
<b>No. and size of gates</b>	33 No. (18.3x16.5)m

Occasional submergence of radial gate trunnion is allowed; provided that suitable precautions should be taken to avoid corrosion. IS 4623:1984 recommend 1.5m clear water profile. PoE suggested following precautions-

1. Provision of self lubricating bearing (LUBHTE or DEVA)
2. Provision of covers on both sides of bearing with spring actuated seals to avoid possibility of entry of silt, in the bearing.



**Figure: Cross section of spillway**

## **2.6 Design flood**

The original project report provided for a maximum peak flood of 52,000 cumecs based on study of 15 years observed flood data at Pauni. This flood corresponds to return period of 10,000 years. As per comments of CWC<sup>1</sup>, the storage at Gosikhurd being more than 61 Mm<sup>3</sup>, the dam should be designed for probable maximum flood. The CWC has also suggested revising storm value and reviewing the unit Hydrograph studies on better data base. The efforts of above changes were evaluated by water planning unit of CDO<sup>2</sup> and it was estimated that the design flood value will increase by 30% on ad-hoc basis. The peak value of probable maximum flood was then worked out to be 67,300 cumecs.

<sup>1</sup> Central Water Commission, New Delhi, Government of India.

<sup>2</sup> Central Design Organization, Nashik, Government of Maharashtra.



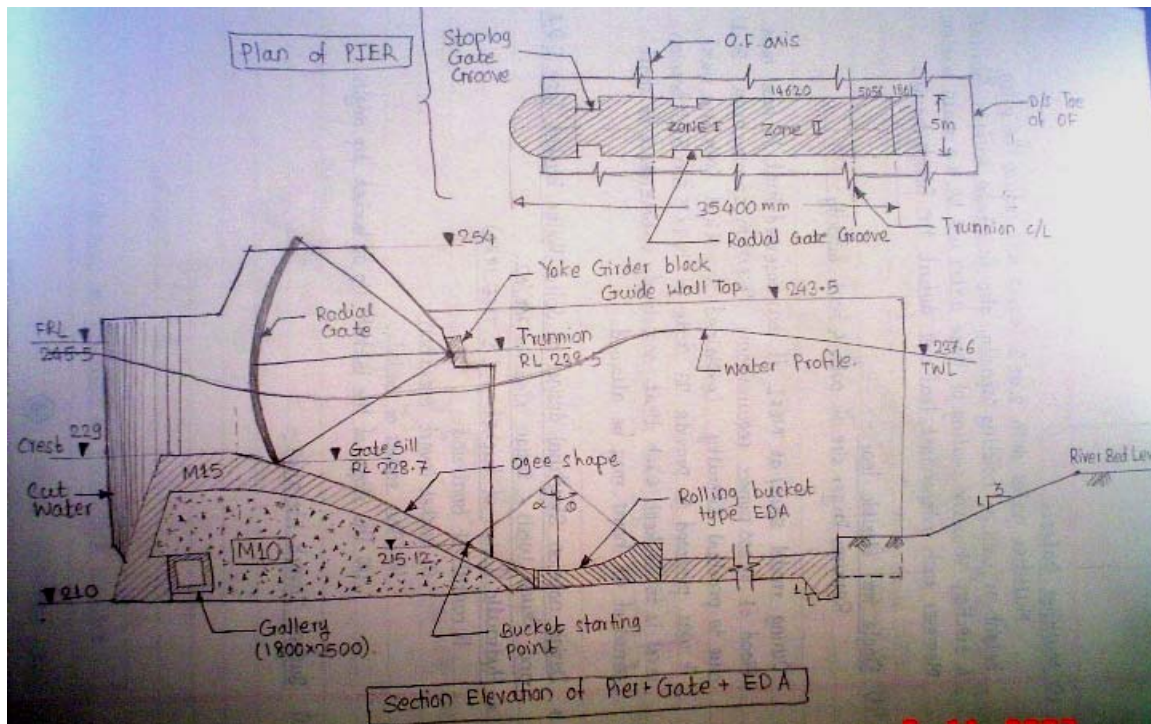


Figure: Spillway details

## 2.7 Selection of gate size

Flood routing has been done considering the design flood hydrograph with a peak of 67,000 cumecs with following two alternative gate sizes.

Size of gate (WxH) m	No. of gates	Crest RL of spillway	Bed RL of approach channel	MWL (RL)
18.3x16.76	30	228.74	228.70	246.128
18.3x16.76	31	228.74	228.70	245.688
18.3x16.76	28	228.74	228.70	246.871
15x12	62	233.50	233.40	245.652
15x12	56	233.50	233.40	246.578

It is proposed to provide 33 number of radial gates (including 10 % standby) of size 18.2x16.5 (MWL=245.70m) to reduce the probability of upward revision. The proposed size of gates is the largest in Maharashtra.



View of Gosikhurd dam



## 2.8 Energy Dissipater Arrangement

Certain hydraulic parameters have been specified in IS 12527:1985 for selection of suitable type of EDA i.e. - Bucket type and stilling basin type etc. In Gosikhurd project case, parameters are not suitable either for stilling basin or bucket type EDA. Due to large difference in River Bed Level (RBL) (224.00m) and foundation level (210.00m) model performance was studied by MERI<sup>1</sup>. 2D model studies of project was completed except for items of calibration and gate operation schedule. These schedules indicated that solid roller bucket type EDA is more appropriate instead of originally proposed stilling basin type. The final recommendations of 2D model study areas under-

<b>Type of EDA</b>	<b>Solid roller bucket type</b>
<b>Radius of bucket</b>	12 m
<b>Invert level</b>	212.00m
<b>Lip level</b>	216.52m

## 2.9 Flow Divide Walls

Flow divide walls are proposed when there is large difference in foundation level of OF/EDA. The length of spillway is very large (764m). Hence PoE<sup>2</sup> suggested to divide EDA in 3 equal bays in front of 11 openings each (i.e. about 252m length of each bay) so that gate operation during low flood can be managed and it will also facilitate maintenance and repair of stilling basin by dewatering bays one by one.

<b>Flow divide walls</b>	<b>2 No.</b>
	1 <sup>st</sup> at RD 6252.10 m
	2 <sup>nd</sup> at RD 6531.70m
<b>Foundation level for reach No. 1</b>	Varying (on bucket portion)
<b>Foundation level for reach No. 2 and 3</b>	211.50m
<b>Foundation level for reach No. 4</b>	211.5/215.00m
<b>Type of walls</b>	224.50m
<b>Wall thickness</b>	Reach No. 1 = 5m
	Reach No. 2 = Varying from 5 to 3 m
	Reach No. 3 = 3m
	Reach No. 4 = Varying from 3 to 1.5 m

**Structural aspect of flow divide wall:** Plane C.C. or masonry gravity wall, requiring larger base width is out of consideration, hence RCC M-15 wall is proposed. As the wall starts from the downstream face of the pier (i.e. 5m) the foundation level of wall varies in bucket portion and it is uniform in apron portion.

<sup>1</sup> Maharashtra Engineering Research Institute, Nashik, Government of Maharashtra.

<sup>2</sup> Panel of Experts

## 2.10 Piers

- a. **Thickness of Pier:** As per IS 13551:1992, the thickness of 4.75m is required for radial gates of size 18.5x16.75m, which is matching with the size of 18.3x16.5m of Gosikhurd radial gates. So even size of 5m thick is proposed for all piers including abutment piers.
- b. **Cut water and ease water:** Semi circular cut water of 5.0 m diameter equal to pier thickness is provided as per normal practice. Ease water is not proposed on downstream side
- c. **Length and top level of pier:** Initially length of pier on downstream side as measured from axis of overflow was assumed as 24.0m as per original layout. An offset of 1.86m from downstream face was proposed at RL 227.3m during first revision of the layout which resulted in considerable economy. Another offset of 750mm was introduced at RL 229.30m as per final layout (2<sup>nd</sup> revision). This further reduced the pier concrete. The top level of pier is at RL 250.50m.
- d. **Stop logs:** MDDL<sup>1</sup> of the project is 241.29m (i.e. more than 12 m above the crest RL 229m). Hence provision of stop log gate is absolutely essential and made accordingly.
- e. **Trunnion level:** Trunnion level at RL 239.50m is proposed to ensure 1500mm clearance above nappe profile (Ref: IS 4623:1983) for restricted outflow of 34,000 cumecs.

## 2.11 Design considerations of Piers

Following considerations are taken into account while designing the spillway pier-

1. The pier has to provide adequate support for Spillway Bridge at top.
2. The pier has to take the thrust of water from spillway gate and transfer the same to the concrete below by means of anchor girder and yoke girder.
3. Pier has to ensure smooth flow of water over the spillway crest with serious end contraction.

### Scope of design:

1. The intermediate piers resting on OF section and both end piers are resting on NOF section. The pier concrete and reinforcement will be taken below the ogee surface to a depth of 5m, which is equivalent to one thickness of the pier.
2. The structural design of pier is done according to the design procedure laid down in IS 13551:1992.

### Forces considered:

1. Dead load
  - a. Self weight of pier
  - b. Weight of spillway bridge
  - c. Weight of hoist
  - d. Weight of radial gates, acting through vertical anchors of the hydraulic hoist girder.
2. Live load: Single lane class AA loading of IRC code acting at centre line of Spillway Bridge.
3. Water pressure

---

<sup>1</sup> Maximum Draw Down Level

- a. Horizontal water pressure on the portion the pier u/s of the gate sill
- b. Water pressure on radial gates leaf transmitted to the pier through the horizontal and vertical anchors of the anchor girder.
4. Uplift pressure
5. Wind loads
6. Seismic forces for zone II
7. Frictional force
8. Braking force
9. Radial gate weight and forces

## 2.12 Design considerations of Spillway crest

While analyzing the structural stability of spillway crest, the mass of concrete up to the plane of checking is only stabilizing force. The total disturbing force comprises of-

1. Trapezoidal hydrostatic pressure on crest thickness
2. Uplift pressure

These two forces are higher than stabilizing force.

To avoid tension on u/s side of pie section, RCC is provided in the spillway crest portion of overflow dam.

## 2.13 Structural details of drainage gallery

A foundation cum drainage gallery is proposed for following purpose-

1. Tapping, collection and disposal of water seeping through body of dam.
2. For drilling drainage holes for release of uplift pressure at dam foundation.
3. For drilling and providing grout curtain to control under seepage.
4. Providing access and space for instrumentation and monitoring dam behavior.
5. Facilitating inspection of dam.

<b>Details of drainage gallery</b>	
<b>Clear opening size of gallery</b>	1.8x2.5m (WxH)
<b>Gutter size</b>	0.3x0.3m
<b>RCC lining in M20 at top and bottom to take care of tensile stresses</b>	750mm thick

Ventilation shafts are proposed through alternate piers. 450 mm diameter NP3 class RCC hume pipe are proposed as ventilation shaft.

## 2.14 Ring COT<sup>1</sup> and bund for reducing possible water seepage through Mendha Hillock and Rajiv Hillock

There are two hillocks on centre line of the dam from Rd 4200 to 4520m (Mendha hillock) and from RD 5227 to 5440 (Rajiv hillock) where GL<sup>2</sup> is above TBL<sup>3</sup> of earth dam. So no special attention was given during earth dam design. After detailed study, it was noticed that the rock present in the hillock is pervious. The result of permeability test at these regions shown the permeability through the mica schist strata is from 0 lugeon to 166 lugeon from both the hillocks. Though both the

<sup>1</sup> Cut Off Trench

<sup>2</sup> Ground Level

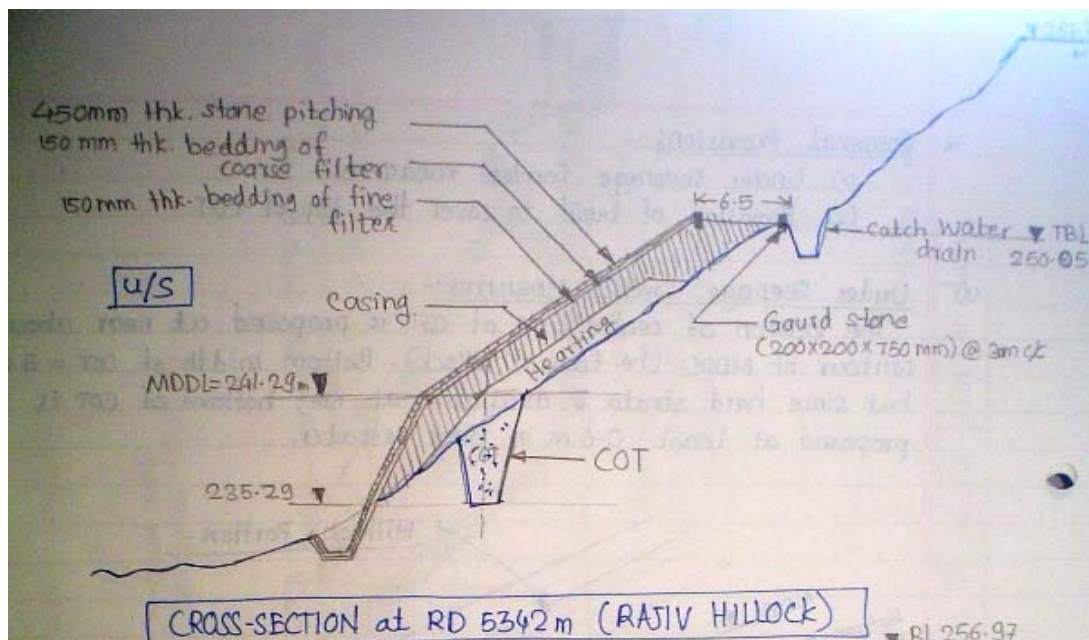
<sup>3</sup> Top Bund Level

hillocks are steady and stable from the stability point of view, to reduce seepage, continuity of COT along with impervious blanket is found necessary.

To reduce possibility of leakage through existing Mendha Hillock and Rajiv Hillock, the gap between the earth dam due to hillock should be treated so as to stop leakage through hillock-

To reduce the same, the design has to cover-

- a. **Under seepage control Measures:** To reduce probable seepage through the foundation of dam, i.e. hillock, the best suitable provision is open COT. The location of the centre line of COT is proposed at near about contour of MDDL. Bottom of COT is 5m, but hard strata is available at 6m, therefore bottom of COT is proposed at least 0.6m in hard strata.
- b. **Provision of bunds to cover the top of COT:** To reduce possible seepage through hillock, the excavated top of COT should be covered with the same impervious material which is used for COT filling and minimum required cover of casing should be provided. Hearting and casing zones are provided for the construction of bunds.



**Figure: Under Seepage Control Measures at Rajiv Hillock**

## 2.15 Fixing of Outlet sill levels

The new zero sill elevation for 100 years and 50 years are at RL 241.29m and 235.88m respectively. Outlet sill levels of the left and right bank outlets are proposed at RL 238.5m and 235.5m respectively. CBL<sup>1</sup> of left and right bank canals are at RL 238m and 235m respectively. Thus left and right bank outlets are about 2.79m and 5.79 m lower than 100 years zero sill elevation respectively. It is, therefore reposed to construct a well type structure around outlets with its top @ RL 241.79m.

<sup>1</sup> Canal Bed Level

<b>The CBL of GRBC at start (0km)</b>	<b>235m</b>
<b>Head loss in bed gradient</b>	10m
<b>Head loss for all CD work</b>	2.77m
<b>Head loss per aqueduct</b>	0.122m
<b>Head loss per siphon</b>	0.15m

### 2.16 Spillway Junction studies

Junction between OF section of spillway and earthen embankment are done both for the divide wall type junction and envelope type junction for left and right banks. The divide wall section was considered with a top width of 1.5m waterside vertical and back batter as follows-

Height	Back batter
30-40m	1:1.5
20-30m	1:1.25
Up to 20m	1:1

Envelope type junction is economical, since quantities of masonry requires is less hence same are proposed for left and right junctions of spillway.

NOF masonry with an envelope type junction will be between RD 5905 to 5970 on the left side and between RD 6767.2 to 6832.2m on right side of spillway.

### 2.17 Dam instrumentation

Provision of instruments- IS 7436 (Part II):1976 has recommended two types of measurements-

#### a. Obligatory measurements

- i. Measurement of uplift
  1. Uplift pressure at base of dam
  2. Uplift pressure at different horizontal planes inside the dam body
- ii. Seepage measurement: V-notch and weirs
- iii. Temperature measurement: (Resistance type and vibrating wire type thermometers)
- iv. Displacement measurement
  1. Conventional plumb line
  2. Inverted plumb line
  3. Joint meters

#### b. Optional measurements

- v. Stress-strain measuring instruments
  1. Stress meter
  2. Strain meter
  3. No-stress-strain meter
- vi. Tilt measuring instruments (Tilt meter/clino meter)
- vii. Seismic instruments
  1. Structural response recorder
  2. Accelerograph
  3. Strong motion accelerograph
  4. Peak accelerograph
  5. Acceleration column

## Chapter 3. Gosikhurd Lift Irrigation Circle

### 3.1. Introduction

The Gosikhurd Lift Irrigation Circle, headed by Superintending Engineer- Shri. Pohekar carrying out the construction work of Lift Irrigation Schemes, proposed under Gosikhurd Project. Fore foreshore LIS were suggested while preparing the project for Administrative Approval. This chapter includes the basic study of these LIS and other major projects coming under Gosikhurd Lift Irrigation Circle. Following major projects are ongoing under the supervision of this circle-

1. Ambhora Lift Irrigation Scheme
2. Mokhabardi Lift Irrigation Scheme
3. Nerala Lift Irrigation Scheme
4. Gosikhurd Left Bank Canal
5. Bawanthadi Project

Other 7 medium and 13 minor irrigation projects are also coming under this circle. To cater these vast volumes of work efficiently there are 5 divisions and 23 subdivisions, and during our training session, we planned to visit most of the projects, as per direction of Superintending Engineer- Shri. Pohekar Sir.

### 3.2. Ambhora Lift Irrigation Scheme

Ambhora Lift Irrigation Division includes Ambhora Lift Irrigation Scheme, stage I and stage II and Mokhabardi Lift Irrigation Scheme as major schemes, and Ambhora Lift Irrigation Scheme, stage I is completed and operated to create irrigation potential. Remaining two schemes are in progress and there are four subdivisions to cater the construction work activities-

1. Ambhora Lift Irrigation Subdivision No. 1, Veltur
2. Ambhora Lift Irrigation Subdivision No. 2, Veltur
3. Ambhora Lift Irrigation Subdivision No. 3, Bhivapur
4. Ambhora Lift Irrigation Subdivision No. 4, Tiroda

Ambhora Lift Irrigation scheme is one of the four LIS proposed under Gosikhurd project. 35 villages from Kuhi Tahsil will be benefited from this scheme.

It is planned to complete this scheme in tow stages to cater the irrigation needs of the farmers, drinking water demand and fishery. The first sage of the project was completed in Dec 2005 and benefited to 2825 ha land under irrigation. The second stage of the project will be completed in June 2008 and planning is done accordingly, to cater irrigation potential of 5656 ha.

### 3.3. Salient features of Ambhora LIS

Table: Details of the Ambhora LIS			
Sr. no.	Particulars	Stage 1	Stage 2
1	No. of pumps	Total=10 (9+1 stand bye)	Total=4 (3+1 stand bye)
2	Capacity of pumps	850 HP (each)	650 HP (each)
3	Size of pump house	42x22m	21x25m
4	Rising main		
	a. Length	2690m	1750m
	b. Diameter	1600mm	1899mm
	c. Thickness	10mm	14mm
	d. Rows	3No.	2No.
	e. Type of pipes	SWMS	SWMS
4	Static head	28.9m	17.4m
5	Friction head	7.1m	7.1m
6	Total head	36m	24.5m
7	Length of canal	6km	10km
8	Discharge in canal	12.02 m <sup>3</sup> /sec	7.34 m <sup>3</sup> /sec
9	Water Utilization	56.147 Mm <sup>3</sup>	
10	Command area		
	a. GCA	3818 Ha	7600 ha
	b. CCA	2988 ha	5956 ha
	c. ICA	2825 ha	5656 ha
11	Power demand	955 MVA	
12	BC Ratio	1.67	1.67
13	Controlling levels		
	a. River Bed	RL 229.00m	
	b. MDDL (River)	RL 233.00m	
	c. Bed RL at Pump house	RL 227.00 m	RL 252.85m
	d. MDDL in pump house	RL 231.19m	RL 255.05m
	e. Delivery floor of pump house	RL 253.00m	RL 258.60m
	f. Motor floor of pump house	RL 253.80m	RL 258.60m
	g. Bed RL of delivery chamber	RL 260.80m	RL 267.02m
	h. Bed RL of main canal	RL 260.00m	RL 269.00m

### 3.4. Mokhabardi Lift Irrigation Scheme

Mokhabardi LIS is one of the major LIS on the foreshore of the Gosikhurd dam, which will provide maximum irrigation potential among all the LIS's. This scheme will irrigate 24,343 ha land from 123 villages of Nagpur, Bhandara and Chnadrapur district.

Mokhabardi LIS is planned on river Maru near village Mokhabardi, Tal: Bhiwapur of Nagpur district. It is planned to take water from Gosikhurd dam by extracting approach canal of about 1380m from river Maru. Then lifting water by 17 pumps of 1500 HP each and delivering water by four rising mains of 4515 m long and 2500mm dia.



### 3.5. Mokhabardi LIS : Original project cost

Gosikhurd project was Administratively approved by Government of Maharashtra vide GR No. GOS-1081/(2381)-WR-1 dtd. 31/03/1983. As per this approval, total cost of project was 372.22 Cr, out of which the cost of Mokhabardi LIS was 18.65 Cr. But this was approximately calculated on the basis of proposed HP of system.

Due to escalation of rises and to know the exact cost of project, detailed revised estimates of Gosikhurd Project was prepared in 1995-96 and as per this revised estimate, the total cost of Gosikhurd project was worked out to Rs. 2091.13 Cr. Out of this cost, the cost of Mokhabardi LIS was Rs. 212.84 Cr. According to this revised estimate the Government of Maharashtra has give therevised AA to this project, vide letter no. Gosikhurd/1096/1500/234/96/GP2 dt 3/7/1999.

Again as per rates of year 2000-01, the second revised estimate of Mokhabardi LIS was prepared and accordingly the revised cost of project was 468.18 Cr.

Total expenditure on Mokhabardi LIS up to Oct 2006 is Rs 54.90 Cr, which included Rs. 7.20 Cr. Deposits to MSEB<sup>1</sup>

### 3.6. Mokhabardi LIS : Various components of project

#### A. Pump house and Rising main:

1. Location of pump house was selected after studying various alternatives and field data of finally selected site was given to CDO<sup>2</sup>.
2. The general layout prepared by CDO was aroved by standing committee in their meeting held on 07/12/2000. As per this general layout it is proposed to provide 17 pumps (16+1 Stand bye) of 1500 HP each, for rising mains of 2.5m dia and 16mm thick.
3. As per letter No. 899/CEGP/P-2 dt.1/4/2003, Chief Engineer, Gosikhurd Project Irrigation, Nagpur has approved that the discharge of 1.703 m<sup>3</sup>/sec per 1000 ha of shall be considered for further calculations of designing the pumps machinery and rising mains.
4. At present the work of pump house and rising main are in progress.

#### B. Electricity substation and switchyard

Rs. 7.20 Cr. have already deposited to MSEB for the 132 KV substation and switchyard, required for the Mokhabardi LIS.

#### C. Canal Distribution Network

Length of main canal	:	43 km
Discharge of main canal	:	35 cumecs
Water utilization	:	134.167 Mm <sup>3</sup>
GCA	:	34350 ha
CCA	:	25350 ha
ICA	:	202280 ha

<sup>1</sup> Maharashtra State Electricity Board

<sup>2</sup> Central design Organization, Nashik

### 3.7. Tekepar Lift Irrigation Scheme

Tekepar LIS is one of the important LIS under Gosikhurd project. As this scheme is proposed on the river, it does not require the storage of Gosikhurd dam. Therefore the first priority was given to this scheme for completion and now scheme is complete and under working condition.

About 6824 ha of area is under irrigation, causing benefits to 7198 ha from 41 villages of Bhandara district. Now as per GR 1/07/2005, the Tekepar LIS has been handed over to the Minor Irrigation division for further maintenance and operation.

#### Present status of various works under Tekepar LIS:

- |                                |   |                                    |
|--------------------------------|---|------------------------------------|
| i. Administrative Approval     | : | Year 1983,                         |
| j. Project cost                | : | Rs. 3.51 Cr. (as per 1982-83 DSR)  |
| k. Revised cost of project     | : | Rs. 74.93 Cr. (as per 1995-96 DSR) |
| l. Revised cost of project     | : | Rs. 96.04 Cr. (as per 2004-05 DSR) |
| m. Expenditure upto year 2004: | : | Rs. 81.11 Cr.                      |

#### Physical progress of work:

Most of the work of this LIS has been completed and their progress is as under-

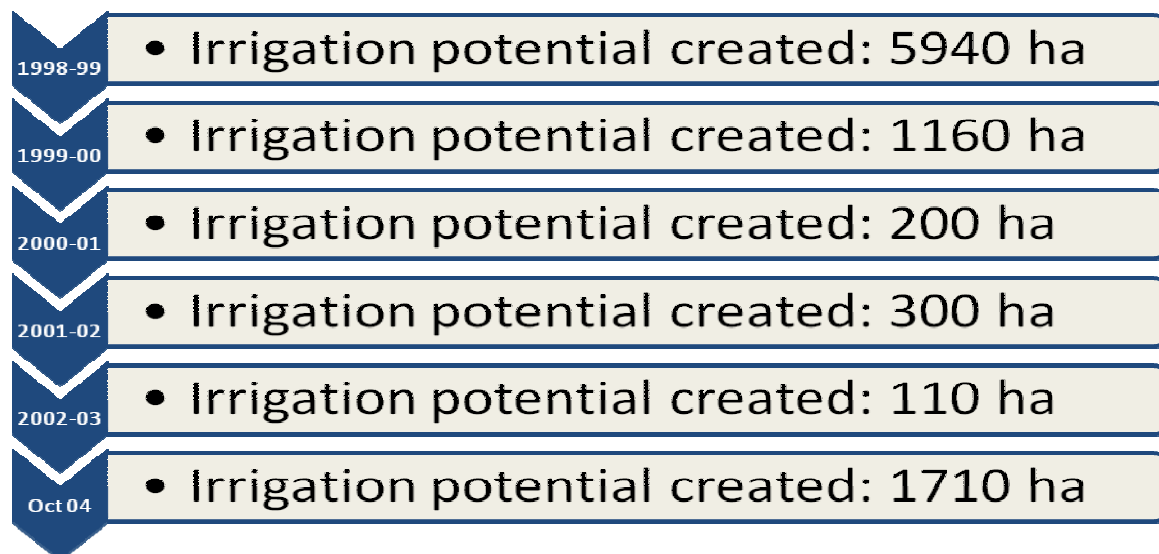
- |                            |   |                |
|----------------------------|---|----------------|
| Pump house                 | : | 100 % complete |
| Main canal and distributor | : | 100 % complete |
| Distribution network       | : | 100 % complete |
| Land Development (Part I)  | : | 70 % complete  |

#### Command Area details

The command area of Tekepar LIS is as under-

- GCA: 9340 ha
- CCA: (as per project report)= 7375 ha  
CCA: (actual)= 6315 ha
- ICA: (as per project report)= 6824 ha  
ICA: (actual)= 5841 ha

#### Development of Irrigation Potential:



**Land Acquisition proposal's:**

1. Forest land: For this scheme, @ 36.36 ha of forest land was acquired from Forest department and @ Rs. 22 Lakhs have been deposited.
2. Private Land: For this scheme, @ 237 Ha of Private Land is acquired.

**3.8. Salient features of Tekepar LIS**

- a. Location : Near Village Tekepar, Tal and district: Bhandara
- b. Controlling Levels:
  1. RBL : 230.73m
  2. MDDL in River:
  3. Foundation Level of pump house :
  4. Motor floor level of pump house :
- c. Details of pumps
  1. Type : Vertical Turbine
  2. Number of pumps : 9 No. (including 2 stand by)
  3. Capacity : 850 HP each
  4. Pump speed : 740 rpm
  5. Size of pump house :
- d. Rising main details: 1.6m diameter, 2 rows, 10mm thick, 1400 m long
- e. Size of delivery chamber:
- f. Main canal details:
  1. Length: 16.5m
  2. Discharge:
  3. Bottom width of canal: 4.5m
  4. Slope of canal: 1:7500
  5. Discharge: 8.93 m<sup>3</sup>/sec
  6. Side slope: 2:1 (H:V)
  7. Water depth in canal: 1.8m
  8. Free Board: 0.6m
  9. Velocity of water: 0.6416m
  10. Length of distributaries : 13.93 km
  11. Type of main canal: Lined
- g. Command area details:
 

Command area	As per project report	Actual
GCA	9340 ha	9340 ha
CCA	7375 ha	6315 ha
ICA	6824 ha	5841 ha
- h. Approx. cost of project: 96.04 Cr.
- i. BCR: 1.54

**3.9. Gosikhurd Lift Irrigation Division, Ambadi (Bhandara)**

There are five sub-divisions under Gosikhurd Lift Irrigation Division, Ambadi and following works are in progress-

1. Nerala LIS
2. Karajkheda LIS
3. Dhapewada LIS
4. Sodyatola LIS etc.

The Tekepar LIS is already completed by this division and currently irrigation potential is possible under this scheme.

### 3.10. Nerala Lift Irrigation Scheme

Nerala LIS is proposed on reservoir of Gosikhurd project. As per revised estimate prepared for second AA the cost of this project is Rs. 318.99 Cr. This scheme will start functioning only after completion of Gosikhurd dam. After completion of this scheme about 21627 ha of area from 116 villages from Lakhani, Bhandara, Pauni, and Lakhandur tahsils will come under irrigation.

CDO, Nashik has proposed four rising mains of 2.5 m dia and 13 pumps of 1000 HP capacity. Water will be lifted from Gosikhurd dam/reservoir and will be delivered in delivery chamber by about 690m long rising main. After delivery chamber water will be supplied to field by gravity canals.

As per availability of funds and land acquisition status this project has been divided in two stages. In first stage, six pups of 1000 HP each and two rising mains of 2.5 m dia. will be constructed. Then water will be supplied to fields by 8.58 km long canals. In first stage about 9204 ha area will come under irrigation. Up to March 2007, Rs. 84.26 Cr. have been spend on this project.

### 3.11. Salient features of Nerala LIS

1. Cost of project	:	As per original AA: 1.68 Cr. As per revised AA: 158.82 Cr.
2. Pumps	:	13 pumps of 1000 HP each.
3. Size of pump house	:	54mx10m
4. Rising main	:	4 Nos, 2.5m dia, 690m long and 16mm thick
5. Static head	:	18.96m
6. Friction head	:	1.43m
7. Total head	:	20.33m
8. Canals: Length of main canals:	:	45 km
9. Discharge of main canal	:	37 cumecs
10. Water Utilization	:	143.88 Mm <sup>3</sup>
11. GCA	:	24673 ha
12. CCA	:	22870 ha
13. ICA	:	21727 ha
14. Power demand	:	1255 MWA
15. BC Ratio	:	1.67

### 3.12. Salient features of Dhapewada LIS (Stagel)

Lift Irrigation Project Division, Tiroda is headed by Executive Engineer- Shri. P.V. Morghade 2007 and includes five sub-divisions as-

1. Lift Irrigation Subdivision No.1, Tiroda
2. Minor Irrigation Investigation subdivision, Bhandara
3. Medium Project Subdivision, Arjuni Morgaon
4. Gosikhurd Left Canal subdivision No. 5 (Tiroda)
5. Dhapewada Lift Irrigation Subdivision No. 2, Tiroda

Salient features of Dhapewada LIS-

- a. Location : Near Village Kawalewada, Tal: Tiroda, Dist: Gondia
- b. Controlling Levels:
  1. RBL : 251.00m
  2. MDDL in River: 251.50m
  3. Foundation Level of pump house : 241.00m
  4. Motor floor level of pump house : 271.70m

## c. Details of pumps

1. Type : Vertical Turbine
2. Number of pumps : 6 No. (including 1 stand bye)
3. Capacity : 800 HP each
4. Pump speed : 742 rpm
5. Static head : 35.50 m
6. Friction head : 7.44 m
7. Total head : 42.94 m
8. Size of pump house :

## d. Rising main details: Length 4.361km, 2 rows, Dia-1400mm, 10mm thick,

## e. Size of delivery chamber:

## f. Main canal details:

1. Length: 11.8m
2. Discharge: 4.42 cumecs
3. Bottom width of canal: 4.2m
4. Slope of canal: 1:3000
5. Discharge: 8.93 m<sup>3</sup>/sec
6. Side slope: 1:1.5 (V:H)
7. Water depth in canal: 1.02m
8. Free Board: 0.75m
9. Type of main canal: Lined

## g. Command area details:

Command area	As per project report
GCA	7104 ha
CCA	6253 ha
ICA	5000 ha

## h. Approx. cost of project: 24.01 Cr.

## Chapter 4. Gosikhurd Left Bank Canal

### 4.1 Introduction

The Gosikhurd Left Bank Division is headed by Executive Engineer- Shri. Gonnade and work of this division includes excavation and construction of structures on Gosikhurd Left Bank Main Canal (GLMBC) 1 to 22.93 km, Branch canal No. 1 from 1 to 8.23km, branch canal No.2 from 1 to 21.76 km and branch canal No.3 from 1 to 7.55 km.

GLBMC<sup>1</sup> off takes from the head regulator at Ch. 820 m of the main dam of the project. The length of main canal is 22.93 km and its discharge at dam outlet is 45.22 cumecs. In all three branch canals are proposed on the GLBMC.

**Table: Details of the branch Canal**

Particulars	Chainage	Discharge (m <sup>3</sup> /sec)	Length of branch canal
Branch Canal No. 1	@ Ch. 8250 m of LBC	4.98	8.23
Branch Canal No. 2	@ Ch. 11130 m of LBC	18.58	22.76
Branch Canal No. 3	@ Ch. 18260 m of LBC	4.53	7.55

### 4.2. Lift Irrigation Schemes

There are two lift irrigation schemes Viz, Gosi(Bk) and Akot LIS<sup>2</sup> on the GLBMC at Ch. 900m and Ch.4170m respectively. The details are given in following table-

**Table: Details of the LIS**

Particulars	Chainage	Discharge (m <sup>3</sup> /sec)	Command Area
Gosi (Bk) LIS	@ Ch. 900 m of LBC	8.223	5963 ha
Akot LIS	@ Ch. 4170m of LBC	0.787	575

The total command area of GLBMC and the LIS on LBC is 30519 ha. Out of this 23981 ha is flow irrigation while remaining 6538 ha will be covered by two LIS mentioned above. The command area of GLBMC and LIS is mainly in Pauni and Lakhandur talukas of the Bhandara district. There are about 90 villages which will get irrigation benefits, out of which about 46 villages are from Pauni Taluka and 44 villages from Lakhandur Taluka and @ 14553 ha area from Pauni Taluka and @ 15966 ha area from Lakhandur talukas will get irrigation benefits.

### 4.3. Cost of the Project

The original AA<sup>3</sup> estimates cost of the project (including GLBC and LIS on GLBS) was about Rs. 24.81 Crore (as per 1989 rates)

In 1999, revised estimates were prepared for the first AA project which was about 148.09 crore.

<sup>1</sup> Gosikhurd Left Bank Main Canal

<sup>2</sup> Lift Irrigation Schemes

<sup>3</sup> Administrative Approval

Now as per estimates prepared for second AA, the cost of the project is as Rs. 272.66 crore.

The expenditure at the end of July 2007 on the LBC and LIS on LBC is Rs. 76.97 crore.

#### 4.4. Present status of the work

The work of the main dam of the Gosikhurd Project is in full swing and the work of fixing the radial gates in the spillway portion is likely to be completed by Dec-2007.

The earthwork and structures in the LBC is around 30% complete. The concrete lining work is in progress from ch. 0m to 10,000m. The tender procedure for the canal lining work for the remaining length of the main canal is in progress.

The earthwork and the structure of branch canal NO. 1 is also 20% completed. The lining work is 90% completed. The work of distribution system is in progress.

The earthwork and structures on the branch canal No. 3 are in progress and tender process for the structures, earthwork of the branch canal No.3 is completed and the work is likely to be started after this monsoon season.

It is propose to create irrigation potential of 7000 ha from the LBC in year 2007-08 and to create full irrigation potential in the year 2010-2011.

#### 4.5. Salient features of GLBC (Ch. 0 to 11130m)

1. LBC out let : @ Ch.820m of the dam
2. Canal type : Lined canal (Cement Concrete)
3. Canal discharge : at outlet 45.22 cumecs
4. Bottom width : 16m
5. FSD<sup>1</sup> : 2.7m
6. Free Board : 1m
7. Canal slope : 1:10,000
8. Side slope : 2:1 (H:V)
9. Branch canal No.1 @ Ch. 8250m on main LBC
10. Branch canal no.2 @ Ch. 11130m on main LBC

#### 4.6. Salient features of GLBMC (Ch. 11130m to 22930m)

Table: Details of the main Canal

Particulars	Ch. 11130- 12870m	Ch. 12870- 14400m	Ch. 14400- 18160m	Ch. 18160- 19280m	Ch. 19280- 22930m
Type of canal	Lined	Lined	Lined	Lined	Lined
Length (km)	1.74	1.53	3.76	1.12	3.65
Discharge (m <sup>3</sup> /sec)	10.30	8.20	7.24	6.19	4.51
Bottom width (m)	4.3	3.8	3.5	3.05	2.75
FSD (m)	1.85	1.70	1.65	1.45	1.30
Free Board (m)	0.9	0.90	0.90	0.75	0.75
Canal bed slope	1:5000	1:5000	1:5000	1:3500	1:3500
Side slope (H:V)	2:1	2:1	2:1	2:1	2:1

<sup>1</sup> Full Supply Depth



**4.7. Salient features of branch canal No. 2 and 3****Salient features of branch canal's**

Particulars	Branch canal No. 2	Branch Canal No. 3
<b>Originates at</b>	Ch. 11130m of GLBMC	Ch. 18260m of branch canal No. 2
<b>Length (km)</b>	21.76	7.55
<b>Discharge (m<sup>3</sup>/sec)</b>	18.58	4.53
<b>Bottom width (m)</b>	13	5.95
<b>Canal Type</b>	Lined	Lined
<b>FSD (m)</b>	2.2	1.35
<b>Bed slope</b>	From 1:6000 to 1:2500	From 1:3500 to 1:2500
<b>BRL<sup>1</sup> At Ch. 0m</b>	235.533m	228.344
<b>Side slope (H:V)</b>	2:1	2:1
<b>Irrigation (ha)</b>	9349	2964

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<sup>1</sup> Bed Reduced Level

## Conclusion

During our training session, we studied most of the important reports/documents related to canals at Gosikhurd Left Bank Canal Division, Wahi. It was great experience for me, since I could realize the design of structures and various components which are associated with irrigation canal.

The Gosikhurd project is one of the ambitious projects and since it is spread over thousands of hectare of land, it created social and environmental impacts. The Lift Irrigation Schemes are implemented when the level of land to be irrigated is above supply level in canal or MDDL in case of dam. Under such circumstances, it is mandatory to lift the water using motors and pipes and then feed to the canal or field. Several LIS are under construction and some LIS like, Tekepar is under working condition. Even though the lift irrigation is costly than gravity irrigation, it causes increase in the irrigation potential and ultimately the improvement of the region.

At the end of training at this division, I felt that the half week period of training is not sufficient to get in-depth knowledge regarding canal and its components, and the subject is very vast. Still, I tried my best to gather maximum knowledge through observation and discussion with the officers and staff, and it will be helpful throughout my career.

We are thankful to Superintending Engineer, Shri. Pohekar, Executive Engineer of Gosikhurd Left Bank Canal Division- Shri. Gonnade, and all the officers and staff of division office for their guidance and co-operation during this training session. After going through details of the project, I am sure that the completion of the project will bring green revolution in Vidarbha region.

**-Pravin Kolhe**  
(Assistant Executive Engineer)

