2007-08

# Field Training Report

Report submitted to-

## Executive Engineer,

**Gosikhurd Right Bank Canal Division,**
**Bramhapuri. Dist: Chandrapur**
**(22/10/2007-26/10/2007)**

# कार्यकारी अभियंता, गोसीखुर्द उजवा कालवा विभाग, ब्रम्हपुरी.

## Executive Engineer, Gosikhurd Right Bank Canal Division, Bramhapuri.

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: १ आठवडा (२२–२६ ऑक्टोंबर २००७)
Duration: 1 week (22 October -26 October 2007)

# "क्षेत्रीय प्रशिक्षण अहवाल"

# "FIELD TRAINING REPORT"


सादरकर्ता–
Submitted by-
**प्रविण कोल्हे**
(सहाय्यक कार्यकारी अभियंता)
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**Vidarbha Irrigation Development Corporation, Nagpur**

# Executive Summary

Maharashtra Engineering Training Academy (META), Nashik organized training program for direct recruits - Assistant Executive Engineer and Assistant Engineer (Grade 1) of Water Resource Department (WRD), in accordance with Maharashtra Engineering Service Examination-2004.

As per schedule of training program, first group of Assistant Executive Engineer's was directed to undergo field training under the guidance of Superintending Engineer, Gosikhurd Project Circle, Nagpur to observe & learn about dam, canals and rehabilitation work. After spending two week at Gosikhurd Rehabilitation Division, Nagpur and Ambadi, we joined Gosikhurd Right Bank Canal Division, Bramhapuri. The Gosikhurd Right Bank Canal Division consists of six subdivisions headed by Executive Engineer - Shri. Ramesh Vardhane (Recently awarded as 'उत्कृष्ट अभियंता'). This report consists of the abstract of the interaction with the officers and staff of this division as well as observations/study performed by us.

Proposed length of Gosikhurd Right bank canal was 107 km, but later revised as 97 km. The canal is lined, having discharge of 113.26 cumec. The canal is divided in two divisions- Wahi (1 to 25 km) and Bramhapuri (26 to 97 km). We visited various sites of the projects including canal excavation, lining, Ready mix concrete plant and various cross drainage works like Village Road Bridge, culverts, aqueduct, super-passage etc. We also visited the tunneling site, where construction of the shaft was in progress.

I am pleased to see well organized, efficient and helping nature of all the officers and staff in this division. 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

महाराष्ट्र लोकसेवा आयोगामार्फ़त घेण्यात आलेल्या 'महाराष्ट्र अभियांत्रिकी सेवा परिक्षा–२००४' च्या निकालाच्या अनुसंघाने 'सहाय्यक कार्यकारी अभियंता' आणि 'सहाय्यक अभियंता श्रेणी–१' या पदावर नियुक्ती दिलेल्या अधिकाऱ्यांसाठी 'महाराष्ट्र अभियांत्रिकी प्रशिक्षण प्रबोधिनी', नाशिक या संस्थेद्वारे एका वर्षाच्या प्रशिक्षण कार्यक्रमाचे आयोजन करण्यात आले.

या प्रशिक्षण कार्यक्रमांर्तगत, पहिल्या तुकडीतील सहाय्यक कार्यकारी अभियंत्यांचा पहिला गट क्षेत्रीय प्रशिक्षणासाठी अधीक्षक अभियंता, गोसीखुर्द प्रकल्प मंडळ, नागपूर यांच्याकडे दि. ०८ आँक्टोंबर २००७ रोजी चार आठवड्याच्या प्रशिक्षणासाठी रुजु 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 तिसऱ्या आठवड्यांमध्ये (२२–२६ आँक्टोंबर २००७) आम्हाला श्री. रमेश वर्धने कार्यकारी अभियंता, गोसीखुर्द उजवा कालवा विभाग, ब्रम्हपुरी यांचे बहुमोल मार्गदर्शन लाभले. या विभागाचे सहा उपविभाग असुन, श्री. रा. गो. पाटील, श्री. अ. ज. सांगोडे, श्री. मोरेश्वर सोरते, श्री. आर. पी. वऱ्हाडे, श्री. उरकुडे, श्री. ए. एस. गेडाम हे या उपविभागाचे उपविभागीय अभियंता/अधिकारी आहेत.. प्रस्तुत अहवालात या अधिकाऱ्यांबरोबर झालेल्या सुसंवादाचा सारांश आणि आम्ही केलेले निरिक्षण नोंदवले आहे.

सदर विभागाचे काम पाहून कालव्यांच्या आव्हानात्मक कामाची मला जाणीव झाली. या विभागाचे कार्यकारी अभियंता – श्री. रमेश वर्धने यांच्या मार्गदर्शनाद्वारे सर्व अधिकाऱ्यांच्या व कर्मचाऱ्यांच्या संघटनात्मक, कार्यक्षम आणि सदैव मदतीसाठी तत्पर असण्याच्या स्वभावामध्येच या विभागतील यशाचे गमक सामावले आहे. या प्रकल्पाच्या यशामध्ये त्यांचा वाटा निश्चितच मोलाचा आहे व त्यातुनच या भागामध्ये हरितक्रान्ती होवून या भागाचा विकास होईल असे मला वाटते.

# Acknowledgement

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 Shri. S.L. Kholapurkar-Superintending Engineer, for their guidance during field training.

It is the endless guidance and constant encouragement of Executive Engineer- Shri. Ramesh Vardhane (Recently awarded as 'उत्कृष्ट अभियंता'), Shri. R.G. Patil, (AEE) and all sub-divisional engineers/officers -Shri. A.J. Sangode, Shri. Moreshwar Sorate, Shri. R.P. Vharade, Shri. Urkude, and Shri. A.S. Gedamr and I would like to express my heartfelt gratitude to them.

I am deeply indebted to all technical and non-technical staff of division and sub-division 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 Bramhapuri 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.

# Content

# 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.

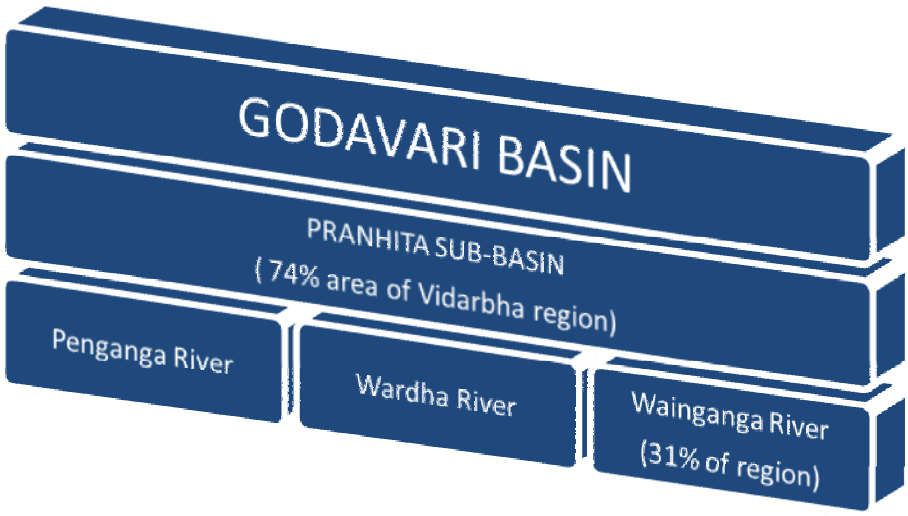


**Fig. 1.1.1 Details of contribution of rivers in Vidarbha region**

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 $km^2$, out of which 24,261 $km^2$ lies in Madhya Pradesh and 10,627 $km^2$ 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 at358 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 8 km long with earth embankment for 5.5 m across River Wainganga. i.e. earthen dam both the right and left ban flanks of central masonry gated Ogee spillway 777 m long in the river gorge and 14 m above

foundation level. It will have battery of 43 radial gates of 15x12 m size to discharge a design flood of 52,000 $m^3$/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)

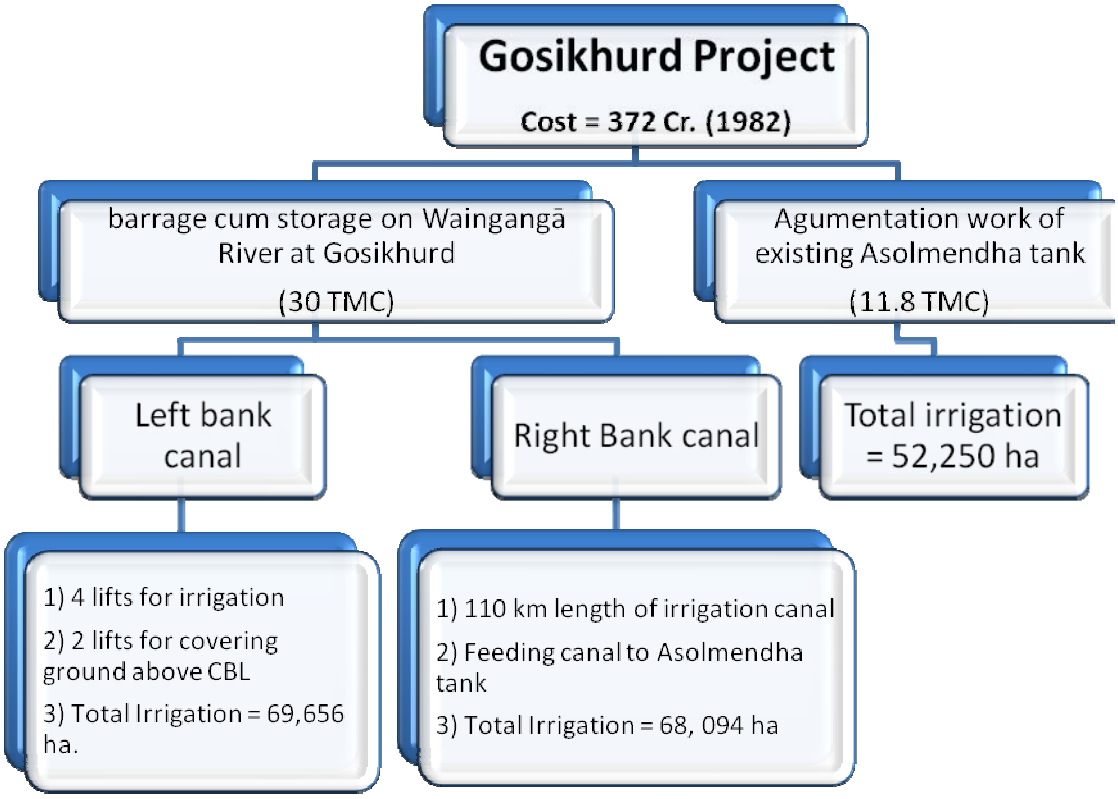


**Fig. 1.1.2 Details of Gosikhurd project**

The year wise percentage of development of irrigation potential –

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

| | |
|---|---|
| 5th year of construction | 20 % |
| 6th year of construction | 29 % |
| 7th year of construction | 31 % |
| 8th 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 : 1,90,000 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 | $20^{o}$ 52' 15'' N |
| Longitude | $79^{o}$ 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 $km^2$ | 10,627 $km^2$ | 34,888 $km^2$ |
| Free | | | 5,902 $km^2$ |

i) Availability of water

| | |
|---|---|
| 75 % dependable mansoon yield | 501.33 TMC |
| Past mansoon 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**

| | |
|---|---|
| **Dam** | |
| Type of dam | Rolled filled earthen dam |
| Length of dam | 7.8 km (excluding spillway) |
| Maximum height of dam | 22 m |
| Free board | |
| Over MWL | 3m |
| Over FRL | 4.5 m |
| **Spillway** | |
| Type of spillway | Central gated Ogee shaped masonry spillway |
| Length of spillway | 777 m |
| Maximum height | 10.3 m |
| Crest level | 232 m |
| Design flood | 52,000 $m^3$/sec |
| No. of gates | 43 |
| Size of gates | 15x12 m |

## 1.5 Prominent features of irrigation by canal

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

| Sr. No | Canal | Capacity ($m^3$/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. Site Visits

## 2.1 Introduction

As the part of training program, we spend one week on the various activities of canal construction. Construction of canal is highly precious and important work, since it involves greater care to convert all drawings related to canal alignment and cross-section in to reality. It is vey important to keep the designed bed level and cross-section as per specified, otherwise canal wont give its designed returns. The alignment of canal runs trough soft as well as hard rock, sometimes in cutting, in banking, partial cutting and banking. If depth of cut is higher than some specified value, then it is optimum to provide tunnel, instead of cutting the soil.

## 2.2 Shaft No. 5 @ RD 18208.600 m

The construction of Ghodazahi branch canal involves tunneling and we visited some tunneling sites, where construction of shafts was in progress. The most difficult and unpredictable part of the excavation procedure is the tunneling, which requires greater care during construction. Following figure shows the details of the shaft

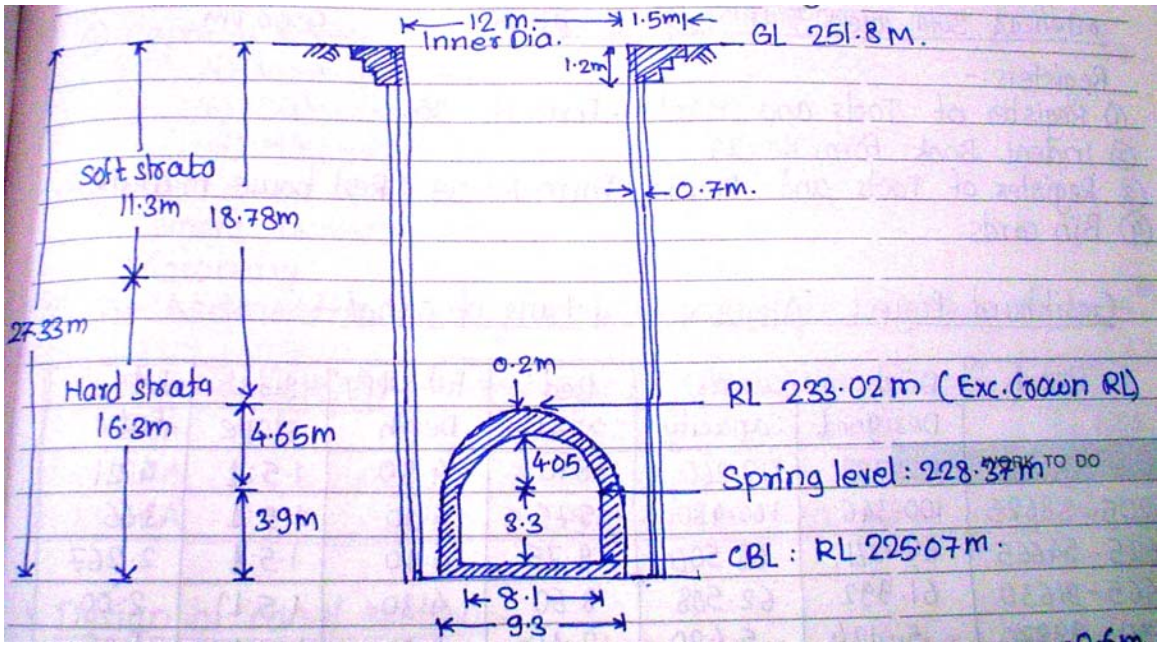


**Figure: Details of Shaft No. 5 @ RD 18208.600 m**

The depth of the shaft is 27.33 m, having soft strata up to 11.3 m and hard strata for next 16.3 m. The inner diameter of the shaft is 12m, and thickness is 0.7m.

## 2.3 Tunnel RD 18208.600 m

Following figure shows the details of the tunnel, which is having CBL at 225.07 m, spring level at 228.37 m, and reduced Level of Exc. Crown is 233.02 m, with thickness 0.6 m.

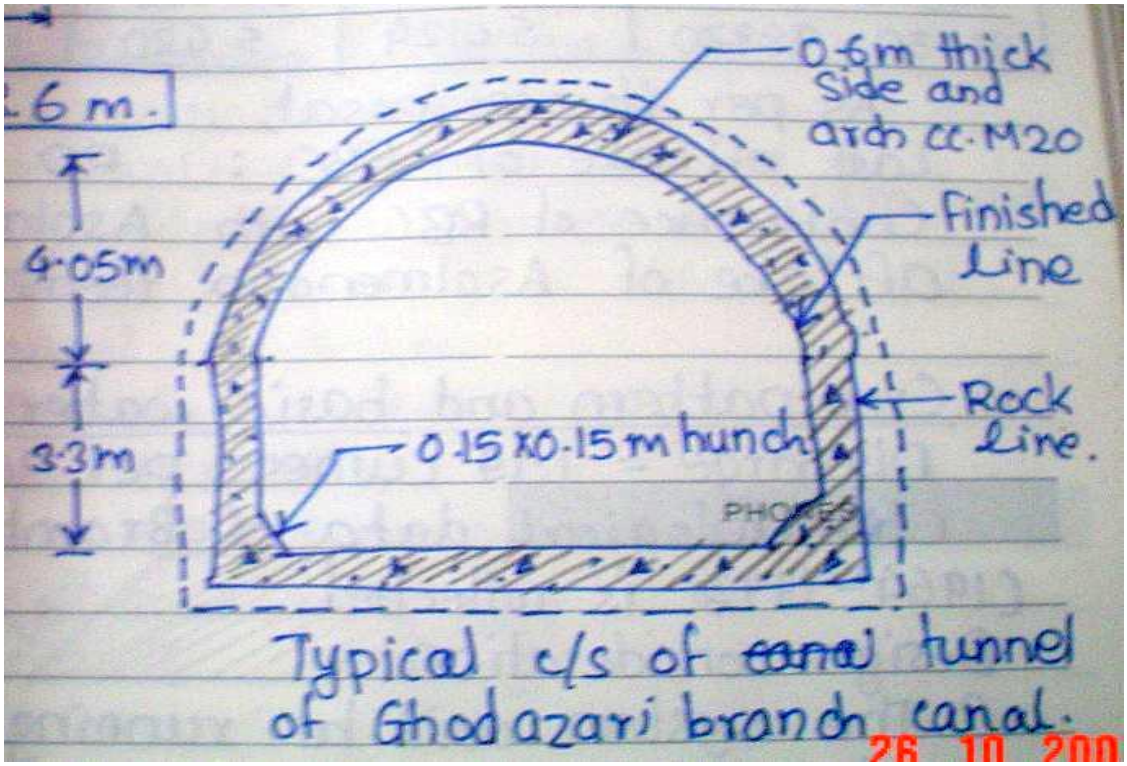


**Figure: Details of Tunnel @ RD 18208.600 m**

## 2.4 Cavity formation at @ RD 17212.921m

When we visited one of the sites, we saw cavity formation due to loose saturated soil, which falls in the excavated shaft. During excavation, soil looses its strength when it gets saturated. Working in saturated soil is very dangerous, since it is non-supporting soil, which could not take the overburden pressure. Following photo shows the cavity formation due to saturation of soil-


**Figure: Cavity formation at @ RD 17212.921m**

That was the critical moment for us, since it was horrible experience for all of us, as we faced to such rare situation, first time in our life. The site engineer has greater responsibility to avoid loss of property as well as life. As soon as soil started collapsing in the shaft, the work was stopped and then they were planning to grout the cavity to avoid further cavity formation.

## 2.5 Village Road Bridge

As a component of the cross-drainage work, Village Road Bridge (VRB) is provided at required sites, when village road crosses canal. As per design and requirement, the 3-4 span of RCC bride rests on 2-3 piers and abutments. We visited some of the sites of village Road Bridge and learned about this important component.

**Photo: Village Road Bridge**

## 2.6 Super-passage

Super-passage is a cross drainage work, to be provided on canal, when-
***Bed level of natural drain is above the Full Water Level (FWL) of canal***
We visited site of super-passage, where natural drain is allowed to cross the canal, by grade separation, as shown in following photo-

**Photo: Super-passage**

## 2.7 Culverts

Culverts are small structures, divided in two groups, based on the structural design viz. Box culvert and slab culvert. They are located on canal sections to allow flow of natural drain from one bank of canal to another, without interrupting the canal flow. Culverts are provided, when Canal Bed Level (CBL) is above Highest Flood Level (HFL) of the natural drain. Symphonic action could be used to allow flow of natural water drain, if CBL is just below the HFL.

**Photo: Box culvert**

## 2.8 Aqueduct

Aqueduct is provided at the intersection of natural drain with canal. It is provided when- ***Canal Bed Level (CBL) is above the Highest Flood Level (HFL) of natural drain.***

It is very costly structure, since flow of canal water has to pass through artificial RCC canal, which is designed as uncracked section of several meters in length as well as width and height. We visited site of aqueduct and learned about its components. There are three compartments of the canals to allow flow of water. The two side compartments are encased in box since on either side there are inspection path and service road. To allow the movement of traffic they provided slab at the top of the box. Middle compartment is open to sky, and only transverse beams are provided at top.. Following photo shows the view of aqueduct-

**Photo: Aqueduct**

Since length of aqueduct is large, expansion joints are provided at two sections, to avoid the stress due to expansion and contraction of concrete members.

I am impressed to see the some circular columns, which are placed on inner side of the structure to avoid water loss and there by loss of head.

This huge structure rests on pier foundations and abutments through elastomeric bearings. Anti-seismic arrangement is also provided at the resting point to arrest the structure, and to avoid it form any displacement in case of earthquake.

**Photo: Aqueduct resting on piers**

## 2.9 Canal Lining

Complete reach of excavated canal is lined with concrete of thickness 10 cm, to avoid wear and water loss. We visited the site, where paver is used to line the canal, as shown in following photo-

**Photo: Canal Lining**

# Photo Gallery

**Batch of Assistant Executive Engineer's with Chief Engineer, Superintending Engineer, and Executive Engineer's of VIDC.**


**At Tunnel Shaft site of Ghodazari branch canal**

**Village Road Bridge site Visit**


**Excavation from Shaft of Tunnel**

**Excavation of Canal**

**Discussion at site**

# Conclusion

During our training session, we visited most of the important sites of the canal construction process. It was great experience for us, since we could see the structures which we studied in books. Construction of canal involves cutting, banking, partial cut-and-banking as well as tunneling, and at Gosikhurd project we experienced all these features. We visited sites of Cross Drainage (CD) works like, Village Road Bridge (VRB), culverts, super-passage, aqueduct etc. The work is going in full swing.

Most difficult part of the canal construction includes tunneling, and at this division, we could visit the remotely located tunneling sites. At some places, depending on site condition, cut-and-cover method of tunneling is preferred; while at some localities tunneling through soft/hard rock was executed.

I also learned about canal excavation and lining. Before lining of canal, porous hole were provided to reduce seepage pressure on banks, while longitudinal and transverse drains were provided to drain out the water below the lining. 10 cm thick Ready Mix Concrete (RMC) was laid on the surface of excavated canal with the help of paver. To mix the huge quantity of the concrete, RMC plant was installed at the site, to maintain the quality of the construction.

At the end of one week, I felt that the one week period of training is not sufficient to get complete knowledge of the canal, 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 Executive Engineer- Shri. Ramesh Vardhane, and all the officers and staff of division and subdivision 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.