



D. A. Diploma Engineering & Technology

Mahemdabad

A Visit Report

On

“ Sardar Sarovar Power Plant ”

Of

Department of

Civil Engineering

(On 26th July , 2018)

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Introduction:-

For the subject of “**Water Resource Management And Railway Harbor And Tunnel**” offered in 5th semester and 3rd of Civil Engineering, So improve their knowledge, We were arranged a technical visit on Sardar sarovar power plant project – Narmada on 26th , JULY 2018.

The visit was organized with the prior permission and guidance of I/C Principal Mr. Himanshu Patel and HOD of Civil Department Prof. Vinod Patel. Along with the staff members and students of Civil.Department. This made this visit a grand success.

History:-



It was the late **Sardar Vallabhabhai Patel** who conceived the idea of constructing a dam over the river Narmada in 1946-47 for the optimum use of Narmada waters for the welfare of the nation.

The Sardar Sarovar Dam is a gravity dam on the Narmada River near Navagam, Gujarat in India. It is the largest dam and part of the Narmada Valley Project, a large hydraulic engineering project involving the construction of a series of large irrigation and hydroelectric multi-purpose dams on the Narmada River. The project took from in 1979 as part of a development scheme to increase irrigation and produce hydroelectricity.

In 1969, the Government of India under Mrs. Indira Gandhi constituted the Narmada Water Disputes Tribunal (NWDT) to resolve this inter-state water dispute. The Tribunal itself was

subjected to a series wrangling between Gujarat & MP. While MP proposed a dam height 210 feet, Gujarat demanded that the height of dam be 530 feet. While Gujarat put its water requirement at 22 MAF. MP would concede only 4 MAF. Finally in 1979, after 10 years of deliberations, the Tribunal gave its award which consisted of clear compromises between the claims of Gujarat & MP. According they allocated 9 MAF of water to Gujarat & arrived at the 453 feet for the height of the dam. Subsequently, 2 extra feet were added to the dam height for completely unknown reason to bring the height to round figure of 455 feet. After a token show of resistance, the main political formations in MP accepted the award.

The Sardar Sarovar Project is an inter-state project, which has participation from the States of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan. The project has undertaken construction of a dam across Narmada River at Navegaon village of Bharuch District in the Gujarat State. It is on the border of Gujarat and Maharashtra states. The maximum height of the dam would be 138.68 meters. The height of dam is being increased in phases.

The Western Region of the country in particular has been facing shortage of peaking power. Actual shortage at the end of 8th Plan was assessed to be 3360 MW. The power generation in this region is predominantly thermal based and hence there is an urgent need to develop the hydroelectric resources to meet the peak load requirements.

Sardar Sarovar Project with its installed capacity of 1450 MW was initially envisaged to start yielding benefits during the 8th five-year Plan. But this could not be realised, because of slippage in the construction of the project.

Visit of a Dam:-

In accordance with the directions contained in the NWDT Award, the Govt. of Gujarat formulated the Interstate, multi-purpose Sardar Sarovar Project, which is now under construction by its company promoted under the Company Act, 1956 namely Sardar Sarovar Narmada Nigam Ltd (SSNNL). The Project envisages construction of:

Unit-I (DAM & APPURTENANT WORKS):



Comprising a 1210 m long and 163 m high (from deepest foundation) concrete gravity dam across the main Narmada River along with its appurtenant works near village Kevadia of Distt, Baroda,

Unit-II (CANALS):



Comprising 458 km long Narmada Main Canal (NMC) in Gujarat & 74Km in Rajasthan, 44 branch canals with gross length of 2500 km, 5500 km distributaries, nearly 30,000 km minors and sub minors. The vast network of distribution system, including field channels, will have an aggregate length of about 75,000 km. with CCA of 18.419 lakh ha in Gujarat.

Unit-III (HYDRO POWER):



Total Power Generation capacity of 1450 MW comprising an underground River Bed Power House (RBPH) with six units each of 200 MW reversible type Francis turbine, a surface Canal Head Power House (CHPH) with five units each of 50 MW conventional type Kaplan turbine, a GIS switch yard complex, and the 400 KV power transmission network up to MP-Gujarat and Maharashtra -Gujarat borders in Gujarat.

The reservoir formed by the main dam will have a gross storage capacity of 0.95 million hectare meters (7.70 MAF) and. a live storage of 0.58 million hectare meters (4.73 MAF) to provide irrigation to about 1.80 million hectares in about 3400 villages in Gujarat and in the arid areas of the Barmer and Jalore districts of Rajasthan, apart from providing drinking water to about 8215 villages and 135 urban centers of Gujarat. The annual power generation at the project is estimated at 5469 GWH in initial years.

At full reservation level (EL138.68m) the submergence will effect 193 Villages of Madhya Pradesh, 33 villages of Maharashtra and 19 villages of Gujarat; likely total submergence of land will be of 37,533 ha which includes 13,385 ha of forest land. The number of families likely to be effected due to submergence, based upon 1991 census, are estimated as 40,727; out of these 33,014 are of Madhya Pradesh. Gujarat will be required to resettle 14124 families of

Madhya Pradesh in the command area of the project in Gujarat. Remaining 18890 families will be resettled in Madhya Pradesh.

The total cost of the project estimated at the 1986-87-price level is Rs. 6406.04 crore and it has been tentatively estimated as Rs. 28,613 crores at 2000-01 price level. Dam was constructed upto 110.64 m in June 2004 and is constructed upto 121.92 m in the year 2006-07. All the five units each of 50 MW of CHPH commissioned during Aug. 04 to Dec.04 and all the six units each of 200 MW of RBPH commissioned during Feb. 05 to Nov. 06. Therefore total capacity of SSP as 1450 MW is now installed and GoMP's 57 % share capacity thereof i.e. 826.5 MW is added into the Grid of MPSEB/ MPPTCL in M.P. State.

Visit to a Aqueduct:-

Narmada Canal Orsang River crossing at Bodeli

Coordinates: 22°15'35"N 73°42'23"E

Nearby cities: Vadodara, uchapah shahidkhan.m.hanif , Bodeli

Aqueduct is a bridge like structure wherein canal passes over the river or stream. Both the flows are at atmospheric pressure only. The construction of 1144 nos. of piles, each 1.5 m diameter, bored-cast-in-situ type and varying in depths from 6.5 to 23m, has been completed as foundation for 26 piers of 548 m long aqueduct across Orsang River to carry 1128 m³ water of Narmada Main Canal of the Sardar Sarovar Project in Gujarat.

These piles are socketed 1.5 m into foundation grade rock mass. The portal system of 44 nos. of piles and pile cap at the top for each pier is analyzed considering the portal fixed at bottom of piles. The borings for pile shaft were done deploying reverse mud circulation rigs and also by conventional chiseling and bailing operations. Besides vertical loading tests and lateral loading test on piles, dynamic tests such as low strain integrity testing on 290 piles and high strain pile testing on 17 piles were also conducted. The results indicated that (a) the settlement/displacement are much less than the prescribed limits (b) good quality of concrete (c) piles are firmly socketed and (d) piles have adequate structural capacity to withstand the design load.

Narmada River Construction Facts:-

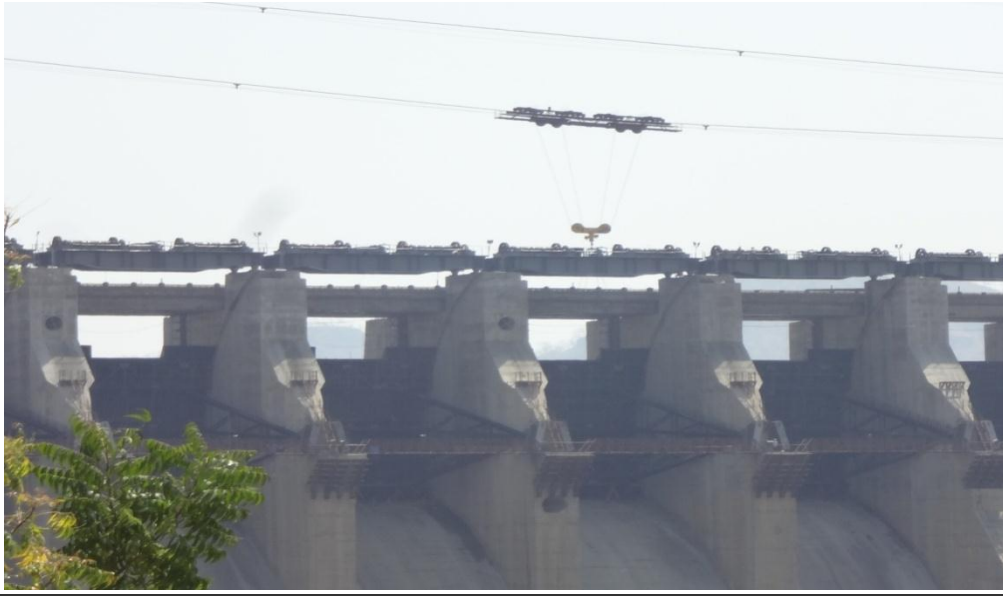
- ✓ The Sardar Sarovar Dam has a concrete gravity dam 3970 feet long.
- ✓ The dam has a spill way with capacity to discharge 87,000 cubic meters per second, the third highest rate in the world, Gazenba in China **Tucurri in Brazil** and being the first two.
- ✓ The canal is designed **to transport more than 11.5 billion cubic meters of water annually.**

- ✓ The project will contain more than 600 different structures such as head regulators, cross regulators and escapes.
- ✓ The Narmada river project will contain a 602.5 meter long Aqueduct; **the world's largest aqueduct** built using 3,870,000 m³ of concrete and 22,904 tons of steel.
- ✓ The entire length of the canal is more than 75,000 kilometers long, longer than the entire **Indian Railways network** the second biggest rail network in the world.
- ✓ The project will irrigate more than 1.9 million hectare of land.
- ✓ **The Narmada project can supply potable water to more than 9,500 communities and 131 cities.**
- ✓ Actual construction of SSP Dam, Power Houses, Main canal and Branch Canals began in 1980's.
- ✓ The River Bed Power House (RBPH) & Canal Head Power House (CHPH) will generate more than 1,450 MW.
- ✓ The dam foundation included more than 2,14,000 m³ of excavation, 2,50,000 m³ of rock excavation, 2,56,000 m³ of pre-cooled concrete and 53,000 tons of **reinforcement steel**.
- ✓ Two **Cable Cranes** used for placing the concrete, each having 28 ton capacity and spanning more than 1.5 km were the longest ever in the world.
- ✓ More than 2,500 construction machineries and 20,000 laborers are working on this Project.
- ✓ At present, works of more than 15,000 km length of canal network are in progress and construction is simultaneously going on at more than 600 different locations.

Sardar Sarovar Project Detail



Main narmada canal



I. LOCATION		
State	Gujarat	
District	Narmada	
Taluka	Rajpipla (Nandod)	
River	Narmada	
II. HYDROLOGY		
Watershed area of the river above dam site.	88000 sq. km.	
	(33970 sq.mile)	
Mean annual rainfall	1 120mm (44.10 inch.)	
Annual run-off at dam site		
at 50% dependability	4.10 Mha m (33.20 MAF)	
at 75% dependability	3.36 Mha m (27.22 MAF)	
at 90% dependability	2.44 Mha m (19.77 MAF)	
Designed flood (1 in 1000 years)	87000 Cumecs	
	(30.7 lakh cusecs)	
III. RESERVOIR		
Full Reservoir Level (<i>FRL</i>)	138.68 m (455 ft)	
Maximum Water Level (<i>MWL</i>)	140.21 m (460 ft)	
Minimum Draw Down Level (<i>MDDL</i>)	110.64 m (363 ft)	
Nonnal tail Water Level (<i>NTWL</i>)	25.91 m (85 ft)	
Gross Storage Capacity	0.95 Million ha m	
	(7.70 MAF)	
Dead Storage Capacity	0.37 Million ha m	
	2.97 MAF	
Live Storage Capacity	0.58 Million ha m	
	(4.73 MAF)	
Annual evaporation	0.06 Million ha m	
	(0.5 MAF)	
Submergence at FRL 138.68m(455 ft)	37533 ha	
<u>No. of villages affected</u>	Full	Partial
Madhya Pradesh	1	192
Maharashtra	-	33
Gujarat	3	19
Total	4	244

No. of families affected	
Madhya Pradesh	33104
Maharashtra	3698
Gujarat	4728
Total	41440
IV. DAM	
Type	Concrete Gravity
Length	1210.02 m
Maximum height	163.00 m
Top of dam	EL 146.50 m
Crest	EL 121.92 m
Spillways	
Service spillway	23 bays
	60 ft (18.30 m) each
Auxiliary spillway	7 bays
	60 ft (18.30 m) each
Crest gates	
Type	Radial
Size	18.30 mx 16.76 m (23 Nos.)
	18.30 mx 18.30 m (7 Nos)
Construction sluices at EL. 18.0m	2.10 m x 2.74 m (10 Nos)
	Closed in Feb 94
River sluices at EL. 53.00m	2.5m x 3.6 m (4 Nos.)
V. POWER INSTALLATION (CHPH)	
General	
Location	Right bank
No. of units	5
Rated capacity of each unit	50 MW
Installed capacity	250MW
Type of turbines	Kaplan (Conventional)
Type of Power House	Surface
Turbine	
Rated speed	136.4 RPM
Dia. of runner	4.7 m
Max. head race level	138.20 m
Min. head race level	110.18 m
Max. tail water level	95.10 m
Min. tail water level	92.07 m
Output at 46.13 m head (Max.)	56.4 MW
Output at 36 m head (Design)	51.265 MW
Output at 18.12 m head (Min.)	18.575 MW
Discharge at 46.13 m head (Max.)	135.5 Cumecs
Discharge at 36 m head (Design)	157.6 Cumecs
Discharge at 18.12 m head (Min.)	118.5 Cumecs

Generator		
	Generator rated output	50.556 MVA (50MW)
	Max. cant. output	61.111 MVA (55 MW)
	Line voltage	11.0 $\pm$ 5% KV
	Power Factor	0.9 (lag)
	Frequency	50($\pm$ 3%) Hz
VI. POWER INSTALLATION (RBPH)		
General		
	Location	Right Bank
	No. of units	6
	Rated capacity of each unit	200 MW
	Installed capacity	1200 MW
	Type of turbines	Francis (Reversible)
	Type of Power House	Underground
Turbine		
	Rated speed	136.36 RPM
	Dia of runner	5.7 m
	Max. head race level	138.68 m (FRL)
	Min. head race level	110.64 m (MDDL)
	Max. tail water level	25.91 m
	Mill. tail water level	20.80 m
Turbine Mode		
	Output at 116.6 m head (Max.)	224.4 MW
	Output at 100 head (Design)	204 MW
	Output at 75 m head (Min.)	138 MW
	Discharge at 116.6 m head (Max.)	212.3 Cumecs
	Discharge at 100 m head (Design)	227.5 Cumecs
	Discharge at 75 m head (Min.)	219.1 Cumecs
Pumping Mode		
	Input at 114 m head (Max.)	204.5 MW
	Input at 100 m head (Design)	209.2 MW
	Input at 81 m head (Min.)	207.5 MW
	Discharge at 114 m head (Max.)	168.4 Cumecs
	Discharge at 100 m head (Design)	197.5 Cumecs
	Discharge at 81 m head (Min.)	233.4 Cumecs
Generator		
	Generator rated output	222.22 MVA
	Line voltage	13.8 $\pm$ 10% KV
	Power Factor (Generating Mode)	0.9 (lag)
	Power Factor (Motoring Mode)	0.95 (lead)
	Frequency	50 ($\pm$ 3% Hz)

VII. CANAL SYSTEM				
	FSL at head regulator of main Canal	91.45 m (300ft)		
	Type of Canal	Lined contour canal		
	Length	458 Km upto Rajasthan border and 74 Km in Rajasthan		
	Base width in head reach	73.1 m		
	FSD in head reach	7.6 m		
	Discharge capacity in head reach	1132.68 cumecs (40000 cusecs)		
	Gross Command Area (GCA)	34.286 lakh ha		
	Cuturable Command Area (CCA)	21.190 lakh ha		
	Annual Irrigation	17.92 lakh ha		
VIII. Cost (Rs. Crore)				
Price Level				
		1986-87*	1996-97**	2000-01***
Unit -I	(Dam & Appurtenant works)	1019.45	4473.75	6036.78^
Unit-II	Main Canal	1588.54	4410.00	5216.35
Unit-III	Hydro Power Works	979.95	2184.75	2728.07
Group-IV	Branches & Dist. System	2818.10	11850.00	14578.17
	Total Cost of the Project	6406.04	22918.50	28613.37

Photos Gallery of visit







Notes:-

- Full estimated cost at 1986-87 price level has been approved by the planning commission.
- Only the Unit-I estimate (partly) and Unit-III estimate at 1996-97 price level has approved by the SSCAC.
- (a) Unit-I includes share cost of Narmada Sagar Project in Madhya-Pradesh. (b) Revised Estimate at 2000-01 price level (furnished by Govt. of Gujarat) are approved by the SSCAC in its 71 st meeting held on 8 th September 2004.
- Unit-I cost includes Rs. 3000.57 crores approved by SSCAC and tentatively estimate of R&R fro Rs. 3033.21 crores.
- Unit-I includes share of Indira Sagar Project (M.P.) Rs. 464.51 crores ((@17.63% unit-1 of Indira Sagar amounting to Rs. 2634.77 crores). Break up of Unit-I cost Unit-I (excluding B-land) approved by SSCAC Rs. 3003.57 crores B-land (R&R) cost Rs. 3033.21 crores Total: Rs. 6036.78 crores

Summary of visit plan

- Going at 05:00 am.
- Reach at 1:00 pm.
- Lunch time 2:00 pm to 3:00 pm.
- Getting gate pass and doing paper work.
- Visit started at 01:00 pm Toward the Sardar Sarovar.
- Visit To Tunnel & Power Control Point.
- Visit to View Point Near to Dam.
- Going on the dam to know the level & area of water in the dam.
- Visit to canal Distribution water Point.
- Tea time 03:45 pm.
- Visit to nilkanthdham
- Visit Finish at 05:00 pm.
- We arrive at college at 12:00 pm.

Students Feedback:-

A visit to saradar sarovar was organized by DADET for Final Year Students of MECHANICAL Engineering Department. The guiding staff on site was very supportive to all students.

We are sure that this visit will help us in our future and bring a positive change in our thinking and practical behavior regarding Education and specially Engineering.

We, the Students of 5TH And 3rd Civil Engineering are extremely thankful to Principal of DADET, Assistant prof./C **Himanshu Patel** and Lec. **Vinod Patel**, HOD Civil Department. We would like to specially thank Lec. **Akbar balluwala**, Chief Co-ordinator of this visit and all staff & student coordinators for providing a full-fledged support in all aspects during the entire visit.

Visited Students List With Faculty Member

SR.NO	EN. NO	NAMEOF STUDENTS
1	176820306014	CHAUHAN URMILABEN J
2	176820306018	DABHI DHRUV K
3	176820306029	KANANI DHRUVIL S
4	176820306040	MORE JAINEE S
5	176820306042	NAMESHA LAXMAN B
6	176820306063	PARMAR KRUNAL M
7	176820306078	PATEL ABHI K
8	176820306080	PATEL HEMISHA A
9	176820306081	PATEL MANKUMAR J
10	176820306083	PATEL YAX H
11	176820306087	RASANIYA NIKUNJ D
12	176820306114	VAGHELA DHARMESH B
13	176820306116	VAGHELA KUNJALBEN D
14	176820306118	VAKIL DEEPKUMAR N
15	156820306017	CHAVDA ANKIT
16	166828306003	MAHIDA PRADIP
17	166820306001	ANSARI MOHAMMED MUNIR J
18	166820306002	ASHWANI VISHAL S
19	166820306004	BHAVISKAR DHANRAJ V
20	166820306006	BHOJANI AKASH B
21	166820306008	CHAUHAN PRAKASH B
22	166820306013	DABHI NIKUL D
23	166820306018	MAHIDA ABHIRAJ SINH G
24	166820306020	MAKAWANA BHAVESH B
25	166820306021	MALEK UBED F
26	166820306023	MISTRY DEVANG D
27	166820306037	PATEL MAULIK K
28	166820306041	PATEL SMIT U
29	166820306042	PATEL VIVEK S
30	166820306043	PATHAN AVESHKhan M
31	166820306044	PATHAN MOHAMMED KAIF N
32	166820306046	PRAJAPATI BINDYA B
33	166820306048	RANA YOGESH J
34	166820306050	RATHOD DISHA V
35	166820306052	RATHODSHIVAM B
36	166820306057	SARVAIYA SHAILESH T
37	166820306058	SODHA NESH S
38	166820306030	PARMAR PRAKASH
39	166820306035	PATEL CHINTAN
40		VOHRA NEHAL S.
39		PATEL TIRTH
40		PARMAR CHIRAG

41		PPATEL VRAJ
42		PATEL SHIVAM
43		PARMAR AKSHAY
44		DARUWALA ZUBIN
45		PATIL NISHA
46		MARWADI KAMAL
47		BARIYA PRATHAM
48		ZALA KULDEEP
49		THAKKER AKSH
50		PATEL ARPIT
51		PATEL DIVYESH
52		SONI VANDAN
53		MACKVAN SHERIN
54		
55		

FACULTY MEMBER:

1	PATEL VINOD
2	BALLUWALA AKBAR
3	DALWADI PREKSHA

SIGN OF HOD

SIGN OF PRINCIPAL

