

Organization Chart for Design Organization

Chief Engineer (Design), SSNNL, Gandhinagar						
Superintending Engineer, Narmada Project Design Circle, Gandhinagar						
	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5	Unit-6
Activities allotted	CR Planning Canal Bank Section Combined Structures Super Passage Aqueduct	Canal Syphon Drainage Syphon Head Regulator Cross Regulator Fall Escape	Gates Stop-logs Motors Gears Mechanical / Electrical	Bridges	Canal Automation Head Regulator Cross Regulator Escape	Working under the Chief Engineer (Main Canal)

Looking to the capacity of canals, the canal network is categories as under

Sr. No.	Canal
A	Narmada Main Canal
B	Saurashtra Branch Canal
C	Kachchh Branch Canal
D	Other Branch Canal
E	Distributory
F	Minor
H	Sub-Minor

(A) NARMADA MAIN CANAL

The Narmada Main Canal (NMC) is 458 km. long up to Gujarat-Rajasthan border. Its capacity at the head is 1133 cumecs (40,000 cusec) and taper down to about 71 cumecs (2500 cusec) at the Gujarat-Rajasthan border. The cross section at its head is 73 m. (240 ft.) bed-width and 7.6 m. (25 ft.) full supply depth.

The canal, in its journey up to Rajasthan border, traverses through regions with diverse agro-climatic and soil characteristics and crosses numerous streams and major rivers. In all 628 structures of various type viz. cross-drainage works, canal crossings, regulating and control structures, are proposed & constructed along the main canal.

Work of Narmada Main Canal is completed. The canal is operative since March 2008. Major Structures given here under are designed in-house with the help of advice and help of consultants.

(I) Major Structures

(i) Reach 0 km to 144.50 km of NMC

Sr.No	Name of River	Ch. Of NMC	Type of structure	Structure Details				Total length
				Nos. of Span	Length of span	Row of Barrels	Size of Barrels m x m	
1.	Men*	17.10	Syphon aqueduct	-	-	1 8 2 2 1 1 1	6.95x5.04 6.90x5.04 6.55x5.04 6.90x4.04 6.20x4.04 6.90x4.04 6.95x4.04	120.25
2	Ashwin*	21.45	Syphon aqueduct	-	-	2 6	6.95x8.30 6.90x8.30	60.20
3	Heran	29.83	Canal syphon	-	-	9	6.80x6.80	280.00
4.	Unch*	35.702	Syphon aqueduct	-	-	3+4+3=10	7.15x5.50	101.00
5.	Local kotar	36.105	Drainage culvert	-	-	1	3.50x3.50	167.00
6.	Maniyad*	42.842	Canal syphon Aqueduct	-	-	1x3	7.15x5.50	135.91
7.	Orsang*	48.59	Aqueduct	27	20.30	9	7.00x6.23	548.00

Sr. No	Name of River	Ch. Of NMC	Type of structure	Structure Details				Total Length
				Nos. of Span	Length of span	Row of Barrels	Size of Barrels m x m	
8.	Khutiya Khadi*	57.115	Syphon Aqueduct	-	-	3x3=9	5.0x4.0	136.30
9.	Deo	75.61	Aqueduct	6	23.00	8	7.40x8.95	138.00
10.	Karad	106.61	Aqueduct	5	20.12	8	6.50x8.85 6.50x9.05	100.60
11.	Meshri	122.70	Syphon aqueduct	-	-	12	6.50x8.25	94.20
12.	Kun	135.80	Aqueduct.	8	25.00	6	7.00x8.60	200.00
13.	Mahi	142.86	Aqueduct	24	25.00	8	6.10x7.60	600.00
14.	Shedhi	151.208	Canal syphon	10	15	2x5	7.0 x 6.75	153.06
15.	Saidak	159.843	Canal syphon	12	15	2x5	7.0 x6.75	170.00
16.	Mohar	184.926	Canal syphon	11	20	2x5	7.0 x 6.75	190.00
17.	Watrak	196.188	Canal syphon	23	20	2x5	6.0 x 7.25	410.00
18.	Meshwo	210.936	Canal syphon	16	20	3x4	6.0 x 6.75	290.00
19.	Khari	220.907	Canal syphon	12	20	3x4	6.0 x 6.75	211.89
20.	Sabarmati**	229.920	Canal syphon	26	20	3x3	6.25 x 6.50	518.00
21.	Rupen	310.256	Canal syphon	24	15	3 x 3	5.0 x 6.30	320
22.	Puspawati	314.696	Canal syphon	17	15	3 x 3	5.0 x 6.0	220
23.	Khari-I	321.115	Canal syphon	17	15	3 x 3	5.0 x 6.0	220
24.	Saraswati	348.577	Canal syphon	31	20	2 x 4	5.50 x 5.8	600
25.	Khari-II	356.422	Canal syphon	25	20	2 x 4	5.50 x 5.7	500
26.	Banas	362.011	Canal syphon	35	20	2 x 4	5.50 x 5.6	700

Sr. No	Name of River	Ch. Of NMC	Type of structure	Structure Details				Total Length
				Nos. of Span	Length of span	Row of Barrels	Size of Barrels m x m	
27.	Kharia Kotar	367.267	Super Passage	10	6.40	5	5.925 x 5.30	72.92
28.	Rel	439.462	Canal syphon	21	20	1 x 4	5.0 x 4.50	400

* Consultant's Design

** Sabarmati canal siphon is designed by Central Water Commission (CWC), New Delhi. The design of this structure is carried out by exchanging the technical aspects among CWC and Design Organization.

(II) Cross Drainage Structures

Canal Syphon : Canal Syphons are provided to convey canal discharges under natural drains, highways, railways, canals, oil/gas pipe lines etc. In case of natural drains they are usually provided when the canal discharge is smaller than that of the drain or when it is not desirable to change the regime of the natural drain.

Aqueduct: Aqueduct is a bridge like structure wherein canal passes over the river or stream. Both the flows are at atmospheric pressure only.

Syphon Aqueduct (Drainage Syphon): In Siphon Aqueduct, the river or stream is siphoned below the canal flow and during this passage; its flow is a pressure flow.

Drainage Culvert: In Drainage Culvert, the river or stream flow passes below the canal flow and it is at atmospheric pressure.

Super Passage : Super Passage is a structure quite opposite to the aqueduct structure. Here the stream passes above the canal flow at atmospheric pressure.

Narmada Main Canal and its branches cross many drains, roads, railways, pipe lines etc enroute. Depending upon the site conditions, necessary changes in the layout are made in these structures. Model studies are also carried out where found necessary.

(III) Design of Gates:

The design of gates (for regulation) and stoplogs (for maintenance and repair of gates) for different types of regulating structures such as Cross regulators, Head regulators, Escapes etc. provided on Narmada Main Canal and its Branches (including Kachch Branch canal, Saurashtra Branch canals and its sub-branch canals) is carried out in-house and standardized .

Mainly two types of gates i.e. radial gates and vertical gates (open type and pipe type) are provided on the regulating structures depending upon the discharging capacity of the structure as under.

- (i) Radial gates of size varying from 12.2 m X 13.5 m to 2.15 m X 2.10 m.
- (ii) Open type vertical gates of size varying from 1.9 m X 3.35 m to 0.75m X 1.25 m.

- (iii) Pipe type vertical gates of size varying from 2.9 m X 2.6 m (fixed wheel type) to 0.70 m X 0.70 m
- (iv) Rope Drum type hoists (for radial gates) of various capacities i.e.90 MT, 40 MT, 30 MT, 25 MT, 20 MT , 18 MT, 15 MT, 13 MT, 8 MT, 7MT ,5 MT, 4 MT and 2MT and screw type hoists (for vertical gates) of various capacities i.e. 13 MT, 12 MT, 10 MT, 8 MT,6 MT, 4.5 MT, 3 MT and 1.4 MT.
- (v) Design of RCC brackets for various capacities, Design of Steel structures, determination of D.G. set.

(IV) Head Regulator (H.R.)

Head Regulator located on canals is the structure which acts as a controlling device for regulation of discharge.

Three types of H.R. are designed

- (1) Open type H.R. with Radial gates for discharge more than 8.5 cumecs,
- (2) Open type H.R. with Vertical gates for discharge more than 3.0 cumecs and up to 8.5 cumecs and
- (3) Pipe type H.R. for discharge less than and up to 3.0 cumecs using precast RCC pipes having diameter 450 mm to 1800 mm.

(V) Cross Regulator (C.R.)

For regulating the flow and discharge in canals and from its maintenance point of view, the Cross Regulators are proposed on the Narmada Main Canal and its network. As canals having discharges above 8.5 cumecs are to run on Controlled Volume Concept (CVC), cross regulators are essential for the effective operation of the canal system.

Three types of C.R. are designed

- (1) Radial gates for discharge more than 8.5 cumecs,
- (2) Vertical gates having discharge < 8.5 and >3.0 cumecs and
- (3) Pipe type having discharge less than and up to 3.0 cumecs

(VI) Cross Regulator with fall

They are essential when ground is undulating or canal is excessively in banking or to balance excavation and banking.

(VII) Escape

Escapes are the essential safety structures located on the Main canal & Branch canals to release excess water into the drain/nalla or river primarily to safeguard the canals from overtopping and in case of eventualities for emptying the canals. Also, when surplus water is available, these escapes release water normally into rivers/streams/tanks for their recharge purpose.

(VIII) ROAD BRIDGES

There are total 274 Nos. of Bridges on the Narmada Main Canal. Out of these, 7 are National Highway Bridges (NHB) and 28 are State Highway Bridges (SHB). The structures are designed as;

- a. Substructure - RCC piers and abutments with open foundation
- b. Superstructure - simply supported RCC T-beam Deck Slab type.
- c. Carriageway - 5.5 m /7.5 m is provided for Unclassified/Classified road bridges.
- d. For National Highway Bridges the carriage width is kept as per MOST/MoRTH, New Delhi.
- e. Standard Plans as per existing / proposed number of Lanes for which approval from Road & Building Department of GOG and Ministry of Road Transport & Highways (MoRTH).

(VIII) DESIGN OF CANAL BANK SECTION

Design and stability of Canal bank section

Looking to the size and magnitude of the Narmada Canal System, the design of canal section is carried out as an earthen dam. The zoned section consists of impervious and semi-pervious material to suit the technical requirement with a focus of utilizing the excavated soil to the maximum. Apart from the design and stability of canal bank section, various aspects (thickness, joints, contraction etc) of canal such as canal lining, canal under drainage and surface drainage arrangement requirements are considered during the design of canal bank section..

Earthen dowel towards water prism is now taken care by extending CC Lining to TBL and by providing CC Wall. In new constructions, the concrete dowel is considered.

Cross Regulator (C. R.) Planning

The scrutiny of C.R. planning in respect of type of structures, head loss Top of Lining, Top of Bank Level provided for various structures, draw down condition between two C.R. cutting and embankment proposed etc. is being carried out.

(B) Saurashtra Branch Canal (SBC)

Design of structures, on Saurashtra branch canal including seven sub-branch canals off taking from Saurashtra branch canals, are completed.

(C) Kachchh Branch Canal (KBC)

KBC is 357 km long. Work of KBC upto 32 km is completed. The works in reach 32 km to 190 km is in progress. There are three pumping stations on KBC. There are three pumping stations. The works of these pumping stations are also in progress. The canal works beyond 190 km is divided in to 23 slices (IR-0 to IR-22). In seven slices the work is awarded and is in progress. For remaining slices, tenders are at different stages of invitation.

(D) Branch Canals

Forty four (44) canals are off taking from Narmada Main Canal. Design of structures on branch canals is completed.

(E) Network Planning

It involves the work of survey for Block contouring, preparation of plans, planning and design of micro

level canal network system and structures right from distributary down to 5 to 8 ha. Sub-chak. Its main objective is to establish an efficient and reliable planning so as to ensure equitable supply of water to the farmers. It also takes care of effective drainage system in the command area. This work is carried out by field offices.

(F) Pressurized Irrigation Network System (PINS)

Responding to the State Government's campaign to introduce Micro Irrigation Systems (MIS) in the irrigated command area, SSNNL has conceptualized PINS. PINS acts as an interface between gravity based canal flow and MIS at the farm level and in turn would lead to savings of water and electricity (as compared to groundwater utilization). Irrigation block of about 50 ha works out to be an economical proposition. PINS envisages lifting of canal water, pressurizing it and eventually supplying it to MIS coupled with it. Such PINS interalia calls for implementation of an inlet structure, a storage structure, pumps, filters, conveyance pipes and pressurized pipe network to deliver water with approximately 20 m head at the sub-chak level. This being an innovative concept, Government has decided to undertake about 50 numbers of Pilot projects in different agro-climatic zones of SSP command area and execution of 25 projects is under progress in different agro-climate zones of the command of SSP.

These Pilot Projects after completion will be handed over to the respective Water User Associations (WUAs) for Operation & Maintenance.