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A Case Study on Bhakra Dam, Himachal Pradesh

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Abstract: The accompanying contextual investigation is done by on a stretch of 74 km distance what begins from Bhakra dam in Bhakra Village, Himachal Pradesh. The motivation behind the review was to break down how stream water is utilized in Punjab for water system and power age purposes. The review includes definite contextual investigation of the Famous Bhakra Nangal Project and different specialized projects like Aqueducts and Diversion Headworks which are developed on the method of stream of waterway Sutlej. The review was likewise led to examine how the water from Sutlej stream is redirected in Nangal by developing Headworks and using that water for water system purposes.

Introduction

Under the Indus water deal endorsed in 1960 among India and Pakistan, the waters of the streams Ravi, Beas and Sutlej came solely to the portion of India. The country has/is going on to bridle the capability of these waterways completely.

Bhakra Beas Complex is one of the biggest Multipurpose River Valley Systems in India. It comprises of Bhakra and Nangal dam for water system and power age reason.

Bhakra Nangal Project contains the Bhakra Dam, Nangal Dam, Nangal Hydel Channel, Ganguwal and Kotla power houses. The development of the Bhakra Nangal project was begun in 1948 and was finished in 1963.

Figure 1- Bhakra Dam

Bhakra Nangal Project

Bhakra Dam-Bhakra dam is a straight gravity substantial construction transcending the most reduced establishment and spreading over the crevasse with 518.16m length at the top. It has two power generation units to be reckoned with on one or the other side. The lake made by the dam known as the popular Gobind Sagar named after Tenth Guru 'Master Gobind Singh' has 168.35 sq km region with gross capacity of 9621 million cum.

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The basic idea behind the construction of the dam was generated when in 1908 after hunting Sir Louis Dane ICS Officer saw a leopard jumping from one end of the George to the other end. He was so inspired that he said “A site made naturally made by God”. The following figures show the construction of the dam.

Figure – 2 Site selected for Bhakra Dam

Figure – 3 Blasting at the site of Bhakra Dam

Figure – 4 Foundation work at the site

DOI: 10.56452/2021SP-8-032

Figure – 5 Laying of Slab for the Dam

Figure – 6 final work at the site

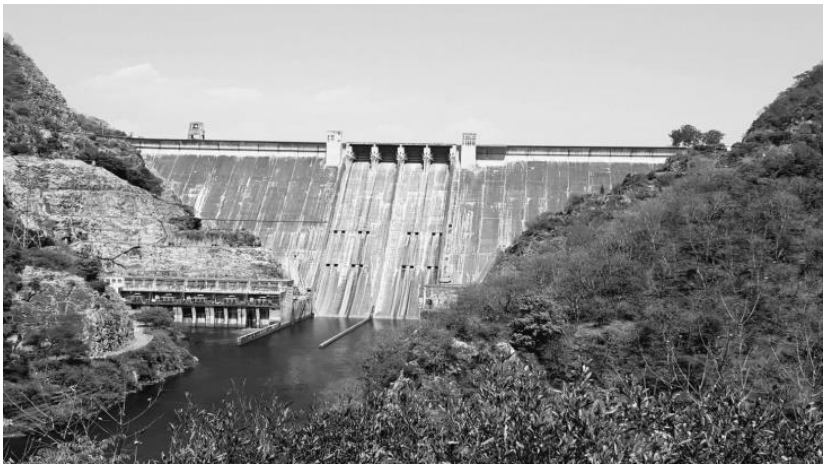

Figure – 7 The Bhakra Dam dedicated to the Nation

DOI: 10.56452/2021SP-8-032

Beneath the highest point of the dam a 79.25m long flood spillway has been given to pass the rising waters. The release of the spillway is constrained by four 15.24m long and 14.48m high spiral entryways. Sixteen stream outlets 2.64*2.64m each organized in two levels of eight outlets each in the focal spillway part of the dam, are utilized for arrival of extra water from the supply for water system necessities. The flood spillway and the waterway outlets together can release 8212 cumecs of rising waters.

Inside the dam around 5km long displays are given at different rises to establishment grouting and seepage and review at the inside of the dam. A 9.14m wide street has been given at the highest point of the dam.

The information related to dam is-

1) Bhakra Dam

Type of Dam	Concrete straight gravity
Height above deepest foundation	226m(740ft)
Height above river bed	167.64m(550ft)
Length at top	518.16m(1700ft)
Width at top	9.14m(30ft)
Length at bottom	99.06m(325ft)
Width at base	190.5m(625ft)

2) River diversion Works

Number of tunnels	2
Length of each tunnel	0.805km(0.5 miles)

3) Reservoir-

Catchment area	56980 sqkm(22000sq mile)
Normal reservoir level	EL.513.58m EL.(1685ft)
Dead storage level	EL.445.62m EL.(1462ft)
Area of reservoir	168.35 sqkm(65 sq miles)
Length of reservoir	96.56 km(60 miles)
Live storage capacity at EL.1685ft	7191 million cum(5.83 million acre ft)
Gross storage capacity	9621 million cum(7.80 million acre ft)
Dead storage capacity	2430 million cum(1.97 million acre ft)
Total cost of project	Rs 245.28 crores

4) River outlets and Flood control gates-

Number of outltets	16 in two tiers of 8 each at EL. 1320and 1420ft
Size of outlets	2.64*2.64m (8.67ft*8.67ft)
Number and size of flood gates	4 no. 15.24m*14.5m(50ft*47.5ft)

5) Bhakra power plants-

Number of power houses	2
Installed capacity of left power house	450MW-5 units of 90 MW each
Increased capacity	540MW-5 units of 108MW each
Installed capacity of right power house	600MW-5 units of 120MW each
Increased capacity	785MW-5 units of 157MW each

DOI: 10.56452/2021SP-8-032

There are two power plants at Bhakra one on the right side and other on the left side. The all out introduced limit of these plants was 1050 MW. This has been as of late moved up to 1325MW.

Nangal Dam and Nangal Hydel Channel: Nangal dam is arranged on the waterway Sutlej about 13 km downstream of the Bhakra Dam. The dam is 29m high involves 26 coves of 9.14m length each. Its intended to pass a flood release of 9910 cumecs. The dam redirects the waters of waterway Sutlej into the Nangal Hydel Channel and Anandpur Sahib Hydel channel for power age and water system purposes. The Nangal lake goes about as an adjusting repository to smoothen out the diurnal varieties in lets out of bhakra power plants.

Nangal hydel channel a 61.06 km long lined channel, takes off from the left bank of waterway Sutlej. Its water is used at Ganguwal and Kotla power plant for producing power. From that point it is delivered for water system purposes.

1) Nangal Dam-

Height	29m (95ft)
Length	304.8m (1000ft)

Figure 8- Nangal Dam

2) Nangal Hydel Channel-

Length	61.06 km(37.94 miles)
Discharge	354 cumecs(12500 cumecs)

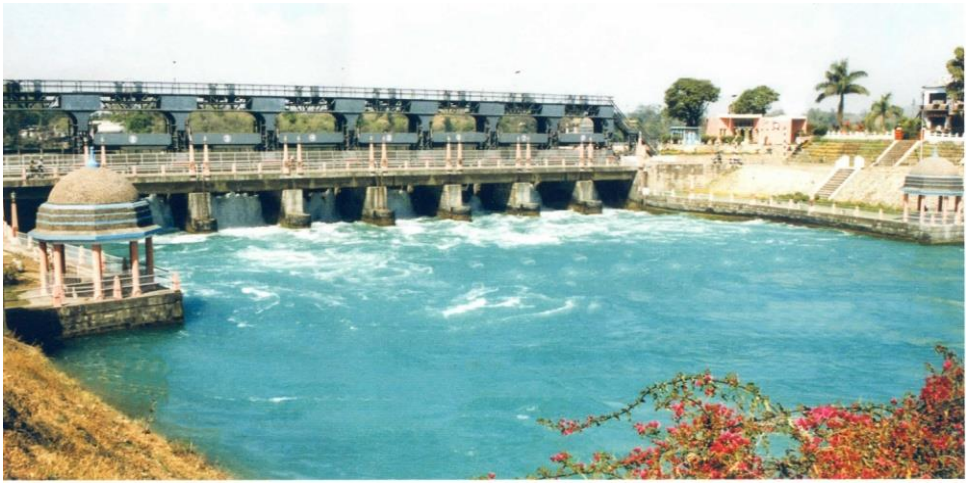

Figure 9- Nangal Hydel Channel

DOI: 10.56452/2021SP-8-032

3) Power houses on Nangal Hydel Channel-

Number	2
Generation capacity at Ganguwal and Kotla power house	77.65MW(2 units of 24.2MW each and one unit of 29.25 MW
Total generation capacity	155.30 MW
Head of Water	28.35 m (93ft)

3) Ganguwal and Kotla Power plants- Two electricity generation houses to be reckoned with are on the Nangal hydel Channel. One is the Ganguwal, 19km downstream Nangal and other is Kotla 10 km downstream Ganguwal. Both the forces to be reckoned with are indistinguishable having 3 units with age limit of 155.30MW.

Figure – 10 Ganguwal Power House

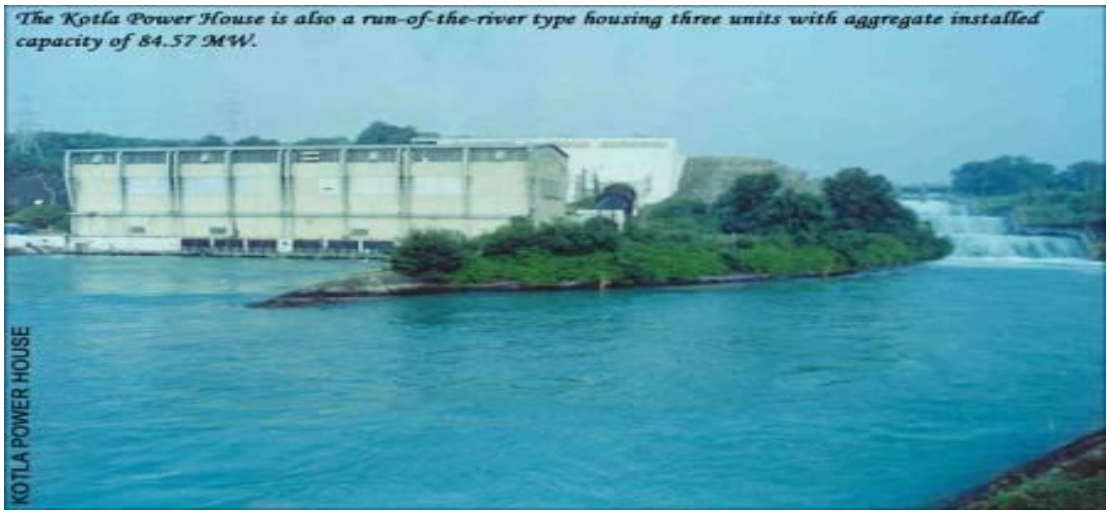

Figure – 11 Kotla Power House

DOI: 10.56452/2021SP-8-032

4) Benefits of the Project-

New areas irrigated	26 lakh hectares(65 lakh acres)
Area where irrigation improved	9 lakh hectares(22 lakh acres)
Number of towns electrified	128
Number of villages electrified	13000

Cross Drainage Works: The design which is developed at the intersection of a waterway and a characteristic in order to securely arrange off the seepage water intruding on the consistent channel supplies is known as a cross drainage works.

A cross drainage work is for the most part an expensive development and to keep away from its development to an absolute minimum channels are adjusted along water shed lines

Cross drainage works are of two types
1) Aqueduct
2) Superpassage and Syphon Aqueduct

1) **Lahond Syphon Aqueduct**-In the event that High Flood Level(HFL) of the regular drain is higher than the lower part of channel with the goal that the drain water goes through the reservoir conduit barrels under syphonic activity, the construction is known as Siphon reservoir conduit. The best illustration of the siphon water system is Lohand Siphon reservoir conduit arranged at 5kms from Sri Anandpur Sahib. For this situation the water from anandpur sahib hydel channel joins with Yamuna trench and structures Sutlej Yamuna Link(SYL) and it is this channel which goes about as channel and the Bhakra Main Line(BML) waterway which goes about as waterway. Here the HFL of SYL channel is above BML waterway and the BML trench goes beneath the SYL trench by pipes which are called siphons.

Figure 12- Lohand Syphon

The detail of the lohand syphon is given below-

Number of barrels	9 barrels are there
Dimension of barrels	12*12
Discharge	12500 cs
Escape regulator span	24 each

2) **Sirsa Aqueduct** - The design which is developed for the movement of trench supply over a characteristic drain is called a water channel. It is favored when the bed level of the channel is at a more significant level

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than the most noteworthy flood level(HFL) in the normal seepage. For this situation the bed level of the Bhakra Main Line(BML) channel is at more elevated level than the sirsa water system. The BML waterway passes over the Sirsa stream. The detail of the sirsa water channel is given underneath

Number of barrels	5 number
Length of aqueduct	500 meter
Depth of canal before and after aqueduct	30-35 ft
Depth of canal at aqueduct	9 ft

Figure 13- Sirsa Aqueduct

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