ANNEXURE –

(Detailed Project Report of Karcham Wangtoo HEP in 6 (Six) Volumes)

VOLUME - VI

JAIPRAKASH
INDUSTRIES LIMITED

HYDRO POWER DIVISION

KARCHAM-WANGTOO HYDRO-ELECTRIC PROJECT (1000 MW)

HIMACHAL PRADESH

PROJECT REPORT

(REVISED)

VOLUME VI

REPLIES TO COMMENTS OF CWC/CEA AND HPSEB ON THE REVISED DPR OF APRIL 2000

CONSULTANTS

IDEA
INTERNATIONAL DESIGN ENGINEERING ASSOCIATES LIMITED

NEW DELHI

DECEMBER 2000

VOLUME VI

REPLIES TO COMMENTS OF CWC/CEA & HPSEB ON THE REVISED DPR OF APRIL 2000

LIST OF CONTENTS

APPENDIX 1(a)

Letter no. 2/HP/19/00-PAC/5217-28 dated July 2000 from CEA

OFFICE OF THE SECRETARY
CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN R.K. PURAM
NEW DELHI-110066
***

No.2/HP/19/00-PAC/ 5217-29 Dated: July, 2000.

To

The Chairman,
M/s Jaiprakash Industries Ltd.,
JA House, 63 vasant Lok,
Vasant Vihar,
New Delhi-57.

Subject: Proposal for setting up of Karcham Wangtoo H.E. Project (4x250MW) in Kinnaur District, Himachal Pradesh by M/s Jaiprakash Industries Limited (M/s JIL)-Techno-Economic Clearance- Regarding.

Reference: Your letter Nol.JIL/205 dated 18.4.2000.

Sir,

Please refer to your above referred letter forwarding 15 copies of Detailed Project Report (DPR) on the subject for Techno-Economic Clearance (TEC) of CEA. On scrutiny of the DPR, it has been observed that the following inputs/clearances/ details essentially required for TEC of CEA have not been tied-up:-

i) Land Availability.
ii) Water Availability (State & Centre).
iii) MOE&F Clearance.
iv) Clearance from State Forest Department.
v) Re-habilitation & Re-settlement Programme.
vi) Authorisation from State Government GOHP under Section 18 A of E(S) Act. 1948.
vii) Compliance of Section 29(2) and 29(3) of E(S) Act. 1948.
viii) Tentative Financial Package.

2 In view of the above, CEA is not in a position to process your proposal for Techno-Economic Clearance. The proposal is, therefore, not being persued further and may please be treated as returned. You may submit the fresh proposal/DPR (in sixteen copies) complete with all inputs/ clearances as per the guidelines of CEA/CWC

3. CEA's comments on Technical, Electro-Mechanical design, Civil works, Legal aspects and CWC's comments on Hydrology and CMDD aspects are enclosed as Annex I,II,III,IV,V and VI respectively which may suitably be taken care of while submitting fresh proposal/DPR for Technical-Economic Clearance of CEA.

Yours faithfully,

Encl: As above.

(G.R. SINGHAL)
DIRECTOR – PAC

Copy to:-

1. Commissioner-cum-Secretary, Government of Himachal Pradesh, Department of Power, Shimla-171002.

2. Chairman, Himachal Pradesh Electricity Board, Shimla-171004.

3. P.I. Suvrathan, Joint Secretary (IPC), Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi-110001.

4. Member (Planning & Chairman, SPAC), CEA.

5. Chief Engineer (HA/ SP&A/ F&CA/ TCD/ Legal/ IRP), CEA.

6. Chief Engineer (PAO), CWC - w.r.t. letter dated 8.6.2000 and 19.6.2000.

hp19karcham

Annex – I

Karcham-Wangtoo Hydro-electric Project (4x250 MW) in Kinnaur District of Himachal Pradesh by M/s. Jaiprakash Industries Ltd. (M/s. JIL).

The status of various inputs/clearances of the project is given below:

i) Compliance of Section 29(2) of Electricity (Supply) Act 1948 - Not Complied.

ii) Land availability Certificate from Government of H.P. – No Certificate is given. However, as per Item "4.3 Acquisition and transfer of land" of Implementation Agreement for Karcham Wangtoo HEP, signed between Govt of Himachal Pradesh and M/S Jaiprakash Industries Limited on 18.11.1999, the Government shall acquire, at the request and expense of the company, such private lands within the State of Himachal Pradesh as may be required by the Company for construction, operation and maintenance of the project (Acquired Land).

iii) Water availability Certificate from Govt. of H.P. – No Certificate is given.

iv) MOEF Clearance – Not available.

v) Interstate Aspects – No mention; Need to be clarified.

vi) Estimated cost of the project is Rs. 3875.11 crores at December 1999 Price Level (excluding escalation, IDC and financial charges). The completed cost of the project is Rs 7627 crore (in equivalent INR) (including IDC and financial charges).

ANNEX – II

Subject: Karcham Wangtoo Hydro Electric Project (4 x 250 MW, Capacity 1000 MW), Himachal Pradesh – Revised Project Report – Comments on Volume II – Electro Mechanical Works

General: Karcham- Wangtoo Hydro Electric Project is a run- of – the river Scheme, with provision for storage for meeting peak load demand, utilising the Hydro potential of river Satluj for Power generation. The project is envisaged to generate 1000 MW when all the units are in operation.

Generating plant equipment's comprising turbines, main inlet valves generators and auxiliaries shall be installed in an underground cavity. The generated power is proposed to be transmitted at 400 kV. Comments in respect of Electro Mechanical design only are given below:

A. Chapter 1: Generating Plant Equipment:

1 **Number and size of Unit:**

Clause 1.4: Number and capacity of generating units: Sl. No.1 indicate "For station installed capacity of 1000 MW, two alternatives were considered – 6x165 MW units, - 4x250 MW". Report mention and is based on obvious fact, "economic of scale and reduction of execution time in case of less units". Flexibility of operation and transport of higher size unit in segments are important points while deciding unit installation. It has been presumed that these may have been taken care at your end while deciding on installation.

2 **Transportation of equipment for Installation:**

a. Report mention of nearby another installation "Nathpa Jhakri, 6 (six) units of 250 MW" being installed nearby and indicate that transport up to Jhakri will not be problem and mention that road and bridges from Jhakri to Wangtoo will have to be modified to meet transport requirement. Transport sections to keep size and weight within limits has not been specified and report only indicates of "Suitable sections to keep transportation size and weight". In view of this it is requested that in chapter 1, Clause 1.4 Sl.No.2 please indicate
   i) Present transport weight and dimension limitations
   ii) Maximum dimension for 165 MW unit size and name of package
   iii) Maximum dimension for 250 MW unit size, and name of package.
   iv) Modifications required in Road/bridges from Jhakri to Wangtoo powerhouse site for 165 MW units and 250 MW units.
   v) Transport limits of weight and dimensions after modifications.

b. Clause 1.4, Sl.no.3 indicate "to keep transportation size and weight to minimum, stator core and winding would be built up at site. Please intimate number of segments with transportation weight.

It may also be intimated that though in Nathpa Jhakri to Karcham Wangtoo unit rating is same, however in Nathpa Jhakri the head on the unit is high therefore size of unit at Karcham Wangtoo will be higher in weight and dimensions. It is therefore requested that transportation of heavy equipment may be examined in detail, transport dimensions and weight presently and after modifications proposed which can be transported may be intimated to us.

3 Operating parameters of turbine:

a. **Output of unit** (Clause 1.1. General at Sl.No.1) indicate in report "During high inflow periods during monsoon, all the turbines are expected to generate maximum output continuously 24 hours/day, while in non-monsoon periods units will be expected to meet peak load as per grid requirement;" in this regard please intimate the following:
   i. Maximum output envisaged continuously 24 hours/day in monsoon period and operating head on the Generating unit.
   ii. In non monsoon period, peaking hours, output and expected head

b. **Head on the Unit** Clause 1.2): Hydraulic and other date in this indicate
   i. Weighted average reservoir level during 90% dependable discharge
   ii. Tail water level with 1 unit discharge and minimum tail water level

c. **Minimum head over unit:** Clause 12.5 Hydraulic Turbine, Sl.No.1 (Type of Turbine), Minimum head calculations has been based on minimum draw down level (EL 1799.0) minus maximum flood level (EL 1516.25) minus head losses. It may be intimated that in case of flood, water level at head works will be at maximum level. As already intimated earlier minimum head may be calculated based on minimum draw down level (EL 1799.0) minus maximum level with all unit operating at maximum load minus head losses.

4 **Integration of unit in system operation (System Stability):**

Clause 1.4 Sl. No. 4 mentions in report "System will be strong and capable enough to absorb load acceptance/rejection of 250 MW without causing grid disturbance". System studies may have been done to check behavior of unit in the system and these may be forwarded.

5 **Penstock Butterfly Valve:**

a. Clause 1.8 mention of Penstock valve located in underground BFV chamber of size 95m x 10m x 22m with installation of 4 valves one for each unit after Surge Shaft (SS) between Power House (PH) and SS for emergency. The valve arrangement from surge shaft to Power House is as under:
   i) Surge shaft gate (2 Nos) with radial traveling hoist.
   ii) Butterfly valves (4 Nos) in BFV chamber with hydraulic servomotor.
   iii) Main inlet valve (Spherical Type) at inlet of each unit in PH.

Length of Pressure Shaft between SS and PH as per report is 290.5m with steel liners in entire length. Emergency envisaged for operation has not been indicated in report. Please intimate:

   a) Purpose of providing this BF valve (Emergency situations in which this valve will be operated).
   b) Techno economic studies done to justify installation of Penstock Butterfly valve. It may also be specifically intimated whether alternative of four (4 nos.) surge shaft gate with individual hydraulic hoist was considered in place of Butterfly valves (4 Nos.) in valve chamber. In case it is decided not to provide these valves our observations on layouts may change.

6 Hydro Generator (Selection of design parameters):

a. **Rated output** (Clause 1.9.2.1): Generator rating specified is full gate output and in clause 1.5.3 of turbine this is at 90% gate out put. The operating parameters may be finalised and intimate maximum output of turbine at:

i. Rated Head ii. Minimum Head iii. Maximum Head
and select Generator output matching on above.

b. **Generator Voltage** (Clause 1.9.2.2): Generator voltage has been indicate as either 13.8 kV or above at 16.5 kV in report. Cost of Generator & other downstream equipment is dependent on selection of this voltage. This may be finalised at this stage.

c. **Short Circuit Ratio:** As already intimated above on "Integration of unit in system operation (System Stability) this may be taken from system studies.

d. **Line charging capacity:** Calculations for line charging requirement for proposed transmission lines may be submitted.

e. **General and Special** (Clause 1.9.4): Project report mention "the stator frame shall be in suitable sections as permitted by transport limitations. The stator core shall be built in – situ , in view of transport limitations; and stator winding comprising of bar type single turn coil) will also be built at site. Studies done in reaching to this arrangement may be submitted and also intimate number of sections considered as report mention only "suitable".

f. **Frequency varation:** Generator and other electrical and mechanical equipments shall be designed for frequency variation of (+) or (-) 5%

7 **Unit Spacing:**

As already intimated earlier calculations for unit spacing of 22m may be submitted.

B. Chapter 2: Generator Transformer:

1. **General (Clause 2.1):**

As already intimated earlier techno- economic merits of 13.8 kV vis- a- Vis 16.5 kV may be furnished and drawings & catalogues of transformer along with dimensions of half tunnels may be submitted.

C. Comments on other Chapters:

Deatils, pariculars and specifications of other equipments given in other chapters (chapter 3 to 11) will depend on finalisation of parameters of chapter 1 & 2. These will be forwarded after receipt of your reply & clarifications.

D. Location of Pothead yard & Transformer cavern & their connection:

The transformer cavern is on downstream size and Pothead Yard is on upstream. Justification for such arrangement may be forwarded. Two circuits of SF6 bus duct have been taken for connection outside on ground. As intimated earlier also comparative studies on use of bus duct and cable for such interconnection may be submitted.

6. Equity Structure:-In the revised DPR it is mentioned that under the Debt : Equity ratio of 70:30, M/s. JIL would contribute 26% of the total equity i.e. 8.66% of the total project cost. However, as per GOI guidelines the promoter has to contribute at least 11% of total project cost i.e. 36.66% of/equity (for Debt-Equity ratio of 70:30). M/s. JIL may, therefore, revise the equity structure so as to contribute at least 11% of total project cost and a confirmatory letter may be submitted to CEA.

∠ total

Annexure - III

KARCHAM-WANGTOO HYDRO-ELECTRIC PROJECT (4x250MW) IN HIMACHAL PRADESH BY M/S JAIPRAKASH INDUSTRIES LTD.

Legal aspects

1. Validity of MOU:-Govt. of Himachal Pradesh (GOHP) and M/s Jaiprakash Industries Ltd.(M/s JIL) had signed the MOU on 28.8.93 with a validity of 36 months for developing the subject project. This MOU has lapsed on 27.8.96 and the Implementation Agreement has been signed on 18.11.99 between GOHP and M/s JIL. The validity of MOU beyond 27.8.96 upto date of signing of Implementation Agreement may be got confirmed from Govt. of Himachal Pradesh.

2. Incorporation of Public Limited Company:

As per clause 8 of MOU and Implementation Agreement M/s JIL is to incorporate a new subsidiary Company for the implementation of the said project. The date of incorporation be intimated and certificate of commencement of business of the new company may be made available to CEA alongwith the Memorandum and Articles of Association. It may be ensured that objective of company, inter-alia, State to establish, operate and maintain the hydro power station. Article of Association must contain the qualification and experience criteria of a full/whole time Member of Board of Directors as per Section 15(A)5 of E(S) Act, 1948.

3. Section 18A:-The Generating Company may submit a copy of the authorisation from State Govt. to establish, operate & maintain the said project u/s 18-A of the E(S) Act,1948.

4. Section 29(2):-The company is to publish a notification in State Gazette and atleast two local newspapers giving salient features of the scheme such as installed capacity, type of turbines, estimated project cost, benefits available etc. giving 2(two) months notice to licencees/individuals inviting any representation/ objection in regard to the proposed scheme. Copies of the Gazette notification and newspaper clippings may be submitted.

5. Section 29(3):-In pursuance of the notification under Section 29(2) representations/objections, if received, are to be dealt with by the Generating Company. Copies of such representations/objections and the action taken to dispose off the same including cost implications may be made available to CEA. If no representation is received certificates from Generating Company and Govt. of Himachal Pradesh/HPSEB may be made available.

P.T.O.

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ANNEX-IV

CENTRAL ELECTRICITY AUTHORITY
THERMAL CIVIL DESIGN DIVISION
*****

Subject:- Karcham-Wangtoo HEP (4x250MW) in HP by M/s. JIL - Inputs regarding civil works.

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Please refer to your letter No. 2/HP/19/00/PAC/3628-37 dated 2nd May, 2000, various inputs/clearances in respect of civil works are as under:-

1. Land:

The requirement of land for the works and submergence in the reservoir is as under:-

i) Forest land/Govt. land - 95.22 ha.
ii) Private land - 3.79 ha.

In addition to the above requirement of the land for temporary quarters required during construction is 64.41 ha. which falls under forest and govt. land.

M/s. JIL have requested Chief Engineer, HPSEB, Shimla to give a certificate regarding the availability of land for infrastructure and various components of the project. This is awaited.

M/s. JIL be asked to pursue the matter with State Revenue authorities also in getting a commitment that the land particularly govt. and Forest land, would be made available to M/s. JIL.

. R&R Programme:

Not available. However, a provision of Rs. 6.09 cr. is earmarked for this item.

, Water Availability:

State: Not available. It is indicated that the scheme is a run of the river and hence no water shall be consumed. However, there will be consumption of water in township. In view of this the commitment of the State Water Resources Department is absoultely required.

Centre: The concurrence of CWC on the water availability as well as inter state matters are not available. This is absoultely required.

Clearance from State Forest Deptt. and MOE&F:

Both are not available. However, M/s. JIL have indicated that the case obtaining the above clearance is under preparation and will be submitted to MOE&F for clearance. This aspect needs to be expedited.

Geo-Technical Investigation:

Available.

Cost Estimate of Civil Works:

Available.

7. Environmental & Ecology Aspects:

A provision of Rs. 35.15 cr. is earmarked for environmental and ecology.

8. Geological Surprises:

The DPR indicated that no complex Geo-Technical problems are anticipated. It is presumed minor surprises are likely to occur.

ANNEX- V

Observations of Hyd (N) Dte.
On
KARCHAM WANGTOO HE PROJECT (4X250 MW)-REVISED-HP

The project report of Feb'96 prepared by M/S Jaiprakash Industries Ltd. on behalf of the Project authorities forwarded to this dte. through letter no. 29/55/96-PA (N)/500 DT. 16.4.96 was examined in this Dte. and views were communicated vide this office letter no. 1/HP/107/96/HYD (N)/340 DT. 12.11.98. Subsequently the state replies on observations were examined and further views were communicated vide T.O. letter No. 1/HP/107/96/HYD (N)/122 DT. 20.4.99.

Now a revised Project report with 5 volumes prepared by the same agency have been forwarded for technical examination. The present project report has been examined and it is found that is the same as prepared earlier by the firm in Feb'96. No further data, nor any further hydrological studies have been presented. In view of this the earlier observations made by this dte. will remain unchanged.

ANNEX- VI

Central Water Commission
CMDD(NW&S) DTE.

SUB : KARCHAM-WANGTOO H.E. PROJECT (4X250 MW)
- TECHNICAL EVALUATION

Karcham-Wangtoo H.E. Project received vide CWC No. 29/55/96/ PA(N)/795-99 dt 9.5.2000 has been technically examined for the portion pertaining to CMDD(NW&S) Dte. and our comments are as follow :

1. The geological mapping around the dam site indicates presence of schistose gneisses and Rampur quartzite along and upstream of dam axis. This type of rock does not appear tobe suitable for supports of nearly 100 m high dam. There is need for comprehensive foundation investigation and foundation competency study. Foundation grade duly approved by Geologist of GSI should be sent to this Directorate for comments. Reservoir competency study may be got approved by Geologist of G.S. I.

2. The design flood and sedimentation studies need to be approved by Hydrology Dte. of CWC.

3. The value of siesmic coefficient adopted for the design of may be got approved by the National Committee on Seismic Design Parameters.

4. The foundation gallery provided at the bottom of dam in block no. 8 & 9 is vertical as per Drg. No. 1200-04-02/03. This is not in accordance with the normal practice. For carrying out drilling and grouting operation, equipments are required to be transported throughout the length of foundation gallery. Hence, the lay out of foundation gallery needs modification to facilitate the movement of workers and equipment in the gallery.

5. Maximum height of the dam is about 100 m. Intermediate inspection Galleries need to be provided as per provision made in the IS code 12966 (part 1-1992)

6. The detailed design calculation for the stability of overflow and non-overflow has been done for D&G conditions only. This may be carried out for all the conditions as per provision made in IS-6512 1984 and furnished to this Directorate..

7. The computation of various type of energy dissipation arrangement may be carried out and most suitable EDA from view point of stability, efficiency and economy may be adopted. The performance of Energy dissipation arrangements adopted need to be confirmed through model studies

8. The water jet emerging from ski-jump bucket would be impinging on river bed, resulting in formation of plunge pool. In the project report, no provision has been made for the plunge pool. Water jet is also likely to hit the already fragile riverbanks, causing slope instability. This calls for proper and adequate strengthening measure for ensuring the stability of river banks. This aspect has not found a place in the project report.

9. No free board calculation has been done. This may be carried out and submitted for scrutiny.

10. Basis for adopting the value of 'C' & ϕ has not been furnished. The value of ϕ adopted in the design appears to be on higher side.

11. As the height of dam is more than 30m, dynamic analysis may be carried out for both overflow and non-overflow section after ascertaining the correct foundation grades and other parameters.

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APPENDIX 1(b)

Reply by JIL to CEA's letter No. 2/HP/19/00-PAC/5217-28 dated July 2000

Annexure I

KARCHAM -WANGTOO H.E. PROJECT (1000 MW)

Reply by JIL to CEA's letter no. 2/HP/19/00-PAC/5217-28 dated July 2000.

1. *Compliance of Section 29(2) of E.S. Act 1948*

Under Section 29(2) of E.S. Act 1948, a Notification dated 20.7.2000 of M.P.P. & Power Department , GOHP regarding Karcham- Wangtoo Scheme (4 x 250 MW) has been published in the Extraordinary Government Gazette (Copy enclosed as Annexure I/1) . A period of two months from the date of publication of the Notification has been given to any licensee or other interested person for making any representation in respect of the above Scheme.

As required u/s 29(2) of E.S. Act 1948, the Notification has also been published in two local newspapers of Himachal Pradesh viz Indian Express (English) and Dainik Tribune (Hindi) on 27.7.2000 (copies enclosed as Annexure I/2 & I/3).

2. *Land availability Certificate from GOHP*

The relevant Article 4 of the Implementation Agreement describing 'Obligations of the Government' signed with Govt. of Himachal Pradesh on 18.11.99 is enclosed as Annexure I/4. Clauses 4.3, 4.4 & 4.5 of the Article deal with the responsibility of the Govt. of H.P. regarding acquisition and transfer of land, lease of land for permanent works and lease of land for temporary works to the Company .

3. *Water availability Certificate*

A copy of GOI, Office Memorandum dated 19.1.1996 is enclosed as Annexure I/5 which clarifies that water availability clearance is required only for Thermal Power Stations.

4. *MOEF Clearances*

Case for obtaining forest clearance and environment clearance from MOEF is under preparation. For preparation of Environmental Management Plans (EMP) and Environment Impact Assessment (EIA), National Environmental Engineering Research Institute (NEERI) of Nagpur has been engaged. A number of visits have been made by NEERI officers to the Karcham- Wangtoo H.E. Project Site in connection with preparation of EMP & EIA.

5. ***Interstate aspects***

There is no interstate aspect involved in the Scheme . It is a run-of -the -river scheme and the waters of river Satluj shall be diverted through a tunnel for generation of power and shall be fed back into river Satluj in the State of Himachal Pradesh itself.

6. ***Estimated cost of the Project***

The Cost Estimates submitted in April 2000 at Dec.99 Price Level have been revised to account for the increase in the design flood at Karcham Dam site due to unprecedented flash floods in river Satluj in the night of 31.7.2000 and also to incorporate the effect of comments of CWC/CEA/HPSEB on the DPR of April 2000. In revising the Cost Estimates, CWC 'Guidelines for preparation of Project Estimates for River Valley Projects- March 1997' have been followed. The revised Cost Estimates are contained in Volume III of DPR (December 2000).

रजिस्टर्ड नं० HP/13/SML/2000.

हिमाचल प्रदेश

राजपत्र, हिमाचल प्रदेश

(असाधारण)

हिमाचल प्रदेश राज्य शासन द्वारा प्रकाशित

शिमला, शुक्रवार, 21 जुलाई, 2000/30 आषाढ़, 1922

हिमाचल प्रदेश सरकार

M. P. P. & POWER DEPARTMENT

NOTIFICATION

Shimla-171 002, *the 20th July*, 2000

No. MPP-F(2)15/93-III.—In pursuance of Section 29 of the Electricity (Supply) Act, 1948, it is hereby notified that Jaiprakash Industries Ltd., a generating company, within the meaning of Section 2(4A) of Electricity (Supply) Act, 1948 and registered under the Companies Act, 1956, proposes to undertake the following scheme :

Name of Scheme : Karcham –Wangtoo Hydroelectric Project (4×250 MW) in District Kinnaur, Himachal Pradesh.

1. Brief Description :

The project has been contemplated as a run-of-river power generation development on river Satluj in Kinnaur District of Himachal Pradesh. It is located at about 200 km from Shimla on Hindustan Tibet Road (NH-22). The project envisages the utilisation of 298.73 m gross head available between Karcham and Wangtoo to generate 4402 million KWh in 90% dependable year with 4×250 MW generating units located in an underground power house. The brief description of civil structures to be constructed is as detailed below :

(*i*) A 10.5 m dia and 456 m long diversion tunnel, alongwith upstream and downstream coffer dams.

1244-राजपत्र/2000-21-7-2000- 1,358. (2137) मूल्य : 1 रुपया।

The Indian EXPRESS
CHANDIGARH ■ THURSDAY ■ JULY 27, 2000

NOTIFICATION

M.P.P.& POWER DEPARTMENT
Govt of H.P., Shimla-2

NO. MPP-F(2) 15/93- III
20th July, 2000

In pursuance of section 29 of the Electricity (Supply) Act, 1948, it is hereby notified that, Jaiprakash Industries Ltd., a generating company within the meaning of section 2(4A) of Electricity (Supply) Act, 1948 and registered under the Companies Act, 1956, proposes to undertake the following scheme:

Name of Scheme: Karcham-Wanqtoo Hydroelectric Project (4 X 250 MW) in Distt. Kinnaur (Himachal Pradesh)

1. Brief Description

The project has been contemplated as a run-of-river power generation development on river Satluj in Kinnaur Distt. of Himachal Pradesh. It is located at about 200 km. from Shimla on Hindustan Tibet Road (NH-22). The project envisages the utilisation of 298.73 m gross head available between Karcham and Wanqtoo to generate 4402 million Kwh in 90% dependable year with 4 X 250 MW generating units located in an underground power house. The brief description of civil structures to be constructed is as detailed below :

i) A 10.5 m dia and 456 m long diversion tunnel, alongwith upstream and downstream coffer dams.

ii) A concrete gravity dam about 98 m high from deepest foundation level and 178 m long on top. The dam will have a spillway with 6 sluice bays and an auxiliary spillway having two bays. The total spillway capacity will be 6135 cumec.The dam will provide a live storage of 545 Ha.m for peaking purposes.

iii) Four intake bays alongwith sedimentation chambers and four flushing conduits for excluding sediment particles above 0.2 mm in size.

iv) A 17.2 km. long head race tunnel of 10.48 m dia circular shaped for carrying a discharge of 417 cumec for power generation. The tunnel will have 5 intermediate construction adits alongwith one adit near the inlet and one adit near the surge shaft.

v) A 185 m high and 16 m/ 27 m dia surge shaft alongwith 4 steel lined pressure shafts of 4.75 mm dia.

vi) An underground power house having installed capacity of 1000 MW and having four units of 250 MW. The power station will utilise a gross head of 298.73 m and net head of 275.93 m for generation of power. It will have four Francis turbines alongwith vertical synchronous generators and other equipment.

vii) A 909 m long tail race tunnel of 10.48 m dia circular shaped alongwith outfall work to discharge, the water in Satluj river.

2. For placing the wires, towers, wall brackets, apparatus and appliances for the transmission and distribution of electricity or for the transmission of telegraphic, telephonic communications, necessary for the purpose of the scheme, the company in accordance with provision of section 42(2) of electricity (Supply) Act, 1948 have and shall exercise all the powers which the Telephonic authority possesses under part-III of the Indian Telegraph Act 1885 (13 of 1885) with regard to a Telegraph establishment maintained and shall not be bound by the provision of section 12 to 16 and 18 and 19 of India Electricity Act, 1910 (9 of 1910) without prejudice to the requirement of Section 17 of that Act.

3. The estimated capital expenditure on the scheme (Karcham-Wanqtoo Hydroelectric Project) is Rs. 3,166 crores plus US$ 163.00 million equivalent to Rs.3875.11 crores (1 US$ = Rs. 43.50) as on December 1999 price level, excluding escalation & interest during construction.

4. Notice is hereby given that any licensee or other person interested may raise any objection and /or representation on the above scheme within two months of publication of this notice whereafter no objection and /or representation will be entertained and the scheme shall be sanctioned with or without notification as approved by the Company.

5. Necessary plans showing the project site etc. may be inspected on any working day in the office of Director, Jaiprakash Industries Ltd., Sholtu P.O., Tapri, District Kinnaur (HP) and objection and representation in respect of this scheme, if any, may be sent to the undersigned.

Director,
M/S Jaiprakash Industries Ltd.

Addl. Secretary MPP & Power
to the Government of
Himachal Pradesh.

दैनिक ट्रिब्यून, बृहस्पतिवार, 27 जुलाई, 2000 (5)

NOTIFICATION

M.P.P.& POWER DEPARTMENT
Govt of H.P., Shimla-2

NO. MPP-F(2) 15/93- III
20th July, 2000

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Name of Scheme: Karcham-Wanqtoo Hydroelectric Project (4 X 250 MW) in Distt. Kinnaur (Himachal Pradesh)

1. Brief Description

The project has been contemplated as a run-of-river power generation development on river Satluj in Kinnaur Distt. of Himachal Pradesh. It is located at about 200 km. from Shimla on Hindustan Tibet Road (NH-22). The project envisages the utilisation of 298.73 m gross head available between Karcham and Wanqtoo to generate 4402 million Kwh in 90% dependable year with 4 X 250 MW generating units located in an underground power house. The brief description of civil structures to be constructed is as detailed below :

i) A 10.5 m dia and 456 m long diversion tunnel, alongwith upstream and downstream coffer dams.

ii) A concrete gravity dam about 98 m high from deepest foundation level and 178 m long on top. The dam will have a spillway with 6 sluice bays and an auxiliary spillway having two bays. The total spillway capacity will be 6135 cumec The dam will provide a live storage of 545 Ha m for peaking purposes.

iii) Four intake bays alongwith sedimentation chambers and four flushing conduits for excluding sediment particles above 0.2 mm in size

iv) A 17.2 km long head race tunnel of 10.48 m dia circular shaped for carrying a discharge of 417 cumec for power generation. The tunnel will have 5 intermediate construction adits alongwith one adit near the inlet and one adit near the surge shaft

v) A 185 m high and 16 m/ 27 m dia surge shaft alongwith 4 steel lined pressure shafts of 4.75 mm dia.

vi) An underground power house having installed capacity of 1000 MW and having four units of 250 MW. The power station will utilise a gross head of 298.73 m and net head of 275.93 m for generation of power. It will have four Francis turbines alongwith vertical synchronous generators and other equipment.

vii) A 599 m long tail race tunnel of 10.48 m dia circular shaped alongwith outfall work to discharge, the water in Satluj river.

2 For placing the wires, towers, wall brackets, apparatus and appliances for the transmission and distribution of electricity or for the transmission of telegraphic, telephonic communications, necessary for the purpose of the scheme, the company in accordance with provision of section 42(2) of electricity (Supply) Act, 1948 have and shall exercise all the powers which the Telephonic authority possesses under part-III of the Indian Telegraph Act 1885 (13 of 1885) with regard to a Telegraph establishment maintained and shall not be bound by the provision of section 12 to 16 and 18 and 19 of Indian Electricity Act, 1910 (9 of 1910) without prejudice to the requirement of Section 17 of that Act.

3 The estimated capital expenditure on the scheme (Karcham-Wanqtoo Hydroelectric Project) is Rs. 3,166 crores plus US$ 163.00 million equivalent to Rs.3875.11 crores (1 US$ = Rs. 43.50) as on December 1999 price level, excluding escalation & interest during construction

4 Notice is hereby given that any licensee or other person interested may raise any objection and /or representation on the above scheme within two months of publication of this notice whereafter no objection and /or representation will be entertained and the scheme shall be sanctioned with or without notification as approved by the Company.

5 Necessary plans showing the project site etc. may be inspected on any working day in the office of Director, Jaiprakash Industries Ltd Shoinu P O Tapri District Kinnaur (HP) and objection and representation in respect of this scheme, if any may be sent to the undersigned

Director,
M/S Jaiprakash Industries Ltd

Addl. Secretary MPP & Power
to the Government of
Himachal Pradesh.

Article 4

OBLIGATIONS OF THE GOVERNMENT

4.1 Granting Consents/Permissions and Assistance in Obtaining Clearances

The Government hereby agrees to grant to the Company all consents, permissions, statutory/non-statutory, within its purview as required by the Company to undertake establish, operate and maintain the Project. The Government shall assist the Company for expediting the various statutory/non statutory clearances required for the implementation of the Project, from various competent authorities of the State Government/Central Government or the Board. The responsibility of obtaining these approvals/clearances shall, however, rest with the Company only.

4.2 Use of materials

The Government shall permit the Company, in accordance with the Law to collect and use boulders, stones, shingles, limestone and other building materials, except precious and semi-precious materials, from the river beds, and/or from the land acquired for or transferred to or leased out to the Company for the Project, on payment of royalty in accordance with the Government rules/rates in force from time to time.

4.3 Acquisition and transfer of land

(a) The Government shall acquire, at the request and expense of the Company, and in accordance with the provisions of Land Acquisition Act,1894 and other applicable laws, such private lands within the State of Himachal Pradesh as may be required by the Company for construction, operation and maintenance of the Project (Acquired Land). The Government may also allow the Company to acquire such land through direct negotiations with the owners in accordance with the prevailing laws, rules and regulations in the State.

(b) The Government shall provide necessary assistance to the Company in obtaining permission of the competent Authority for the removal of trees standing on the Acquired Land and on the Government lands which in its reasonable opinion are required to be felled or removed for the implementation of the Project.

4.4 Lease of land for Permanent Works

Upon the request of the Company and subject to the provisions of laws in force and the provision of Clause 5.24, the Government shall, on such terms and conditions and rates prescribed by the Government from time to time, provide for, on a long term lease, the Government land required for Permanent Works, as may be necessary for the construction, operation and maintenance of the Project.

4.5 Lease of land for Temporary Works

Upon the request of the Company and subject to the provisions of laws in force and the provisions of Clause5.24, the Government shall provide, on such terms and conditions and rates as may be prescribed by the Government from time to time, on a short term lease for a period not exceeding fifteen (15) years, such Government

land required for Temporary Works, as is considered reasonably necessary by the Government

4.6 **Rehabilitation and Resettlement Plan**

The Government shall, subject to the approval of the GOI or any other competent authority, prepare a rehabilitation and re-settlement plan in association with the Company for local residents likely to be adversely affected or displaced due to construction of the Project at the Site as on the Effective Date. The cost of preparation and implementation of the above plan shall be borne by the Company.

4.7 **Upgradation of Roads and Bridges**

Government shall, at the request and cost of the Company, construct, widen and strengthen such roads or bridges within the State of Himachal Pradesh as are considered reasonably necessary by the Government. The Government permits the Company to construct roads, bridges, culverts as considered necessary for the Project in the Project lands. The Government may also permit the Company to construct roads, bridges, culverts as are considered reasonably necessary by the Government in the interest of the Project on a case-to-case basis.

4.8 **Approvals for Sale/Use of Energy**

4.8.1 The Company is entitled to sell the balance portion of the energy generated from the Project, excluding the Government Supply, to any other party/ consumer except those located in the State of Himachal Pradesh. The Company shall also be permitted to utilise this energy for their captive use for the new industry to be set up in the State.

4.8.2 Upon application therefor having been made, the Government shall, in accordance with the Law, promptly issue any approval required to be obtained from it in connection with the Power Purchase Agreement(s)/captive use, provided that all requirements and conditions for the grant of such approval have been duly and timely met by the Company.

4.9 Evacuation of Power

The Government shall provide necessary assistance to the Company in tying up the transmission system for evacuation of power from the Project out of Himachal Pradesh through the transmission system of the Power Grid Corporation of India Limited (PGCL) or any other such utility (ies).

4.10 Other Approvals

If any approval is required under the Law by the Company, the lenders, or Contractor(s) with respect to the Project, upon application therefor being made by the Company, Government shall take all reasonable and appropriate steps within its administrative power and as permissible by Law, to ensure that such approval is granted expeditiously

4.11 Communication

Government shall provide due assistance to the Company to obtain, in accordance with the prevailing Law and regulations, necessary permits to install and use suitable radio communication systems, including satellite communication equipment and walkie-talkies. Any system connecting with the national telecommunication system or any international telecommunication system will be subject to the

approval licence from the relevant authorities, for the issuance of which Government shall assist

4.12 **Explosives**
Government shall provide due assistance to the Company, under the Law and regulations,to obtain permission to procure, store and use such explosives which are required for the Project; provided that the responsibility of obtaining such a clearance and making the necessary arrangements rests with the Company.

4.13 **Import Licence**
Government shall provide due assistance to the Company in obtaining all necessary import licenses for the Project from the relevant GOI authorities to the extent permissible by Law. The Company shall submit a list of such equipment required to be imported for the Project to the Government for approval.

4.14 **Upstream/Downstream Projects**
The Government shall be entitled to survey, investigate and implement any river valley power generation scheme upstream or downstream of the Project. However, the Government shall ensure that the planning, design, construction of any other power project upstream, or downstream of the Project shall not be materially/adversely detrimental to the Project and to the annual energy generation from the Project.

4.15 **Monitoring Committee**
The Government shall constitute a multi-disciplinary committee comprising representatives of the Company and representatives from various departments of the Government to monitor the issues arising during the implementation of the Project. The committee shall also draw up the methodology to regulate the payments to be made by the Company to the various departments of the Government in connection with the implementation of the Project. The committee shall meet at such intervals and at such place as is decided by it. The committee or any of its members shall have no authority to alter, amend or modify in any manner whatsoever, the terms and conditions of this Agreement.

4.16 **Construction Power**
The Government shall cause the Board to provide adequate construction power to the Project at the cost of the Company. The construction power shall be supplied at the Board's bulk supply tariff as applicable from time to time. However, the Government makes no commitment to ensure un- interrupted power supply

4.17 The Government will provide all possible assistance to the Company in the incorporation of the new subsidiary Company provided that the registered office of such a Company is within Himachal Pradesh

JAIPRAKASH INDUSTRIES LTD

No.C-323/95-IPC.II
GOVERNMENT OF INDIA
MINISTRY OF POWER
New Delhi, the 19th January 1996

OFFICE MEMORANDUM

In continuation of the Guidelines for Formulation of Project Reports in the Private Sector, issued by the Central Electricity Authority (CEA) in June, 1995, it has been decided, in consultation with CEA, to minimise the number of major clearances from State/Central Government and their agencies required by CEA while according its techno-economic clearance to generation, supply and distribution projects proposed by a private sector registered company after due compliance of Section 29(2) of the Electricity (Supply) Act, 1948. The project-wise list of clearances that will be required by CEA will be as follows:

S.No	Item	Agency
HYDRO-ELECTRIC PROJECTS		
(i)	State Government and SEB clearance	SEB/State Government
(ii)	Water utilisation	Ministry of Water Resources, only if the project is inter-State/inter country
(iii)	Rehabilitation & Resettlement of displaced families by land acquisition	State Government and Ministry of Environment & Forests
(iv)	Environment & Forest clearance	Ministry of Environment & Forests
THERMAL POWER STATIONS		
(i)	State Government & SEB clearance	SEB/State Government
(ii)	Water availability	State Government/Central Water Commission/Ground Water Board
(iii)	Pollution clearance and E&F clearance	State/Central Pollution Control Board/ MoEF
(iv)	Chimney height clearance	National Airport Authority
(v)	Fuel linkage	Ministry of Petroleum & Natural Gas and Ministry of Coal
TRANSMISSION AND DISTRIBUTION SCHEMES		
(i)	State Government & SEB clearance	SEB/State Government
(ii)	Environment & Forest clearance	Ministry of Environment & Forests
LOAD DESPATCH AND COMMUNICATION SCHEMES		
(i)	State Government & SEB clearance	SEB/State Government

CEA's concurrence under Section 31 of the Electricity (Supply) Act, 1948, to all such schemes shall be issued after submission of the finalised package, duly approved by Ministry of Finance and the Foreign Investment Promotion Board, if required.

Sd/-
(V. V. PRASAD)
DIRECTOR (IPC), MINISTRY OF POWER

To,
Chief Secretary/Secretary(Energy) of all State Governments/UTs.
Chairman (All State Electricity Boards)
copy to: Secretary, Central Electricity Authority

Annexure II

Replies to comments received from CEA vide letter No.2/HP/19/00-PAC/5217-28 dated July 2000

A. Chapter 1 : Generating Plant Equipment

1. Number and size of unit

The selection of number and size of units (4x250 MW vis-a-vis 6x165 MW) has been done mainly on the economic consideration of reduced cost of civil and electro-mechanical works and duration of erection, testing and commissioning. To meet transport constraints, necessary provision has been made in the estimates for modification of road/bridge capable of transporting pay load of 70 tonnes. Selection of equipment, manufacture and supply shall be such that this transport limit shall be adhered to. Assembly of some major assemblies i.e. stator, spherical valve shall be done at site.

2. Transportation of Equipment for Installation

a) The required information in respect of transport limitation are as under:-

i) The present transport weight and dimensions limitations beyond Jhakri are 50 t by weight and 5000 mm (L) x 3000 mm (W) x 3000 mm (H) by dimensions. Roads and bridge between Jhakri and power house shall be upgraded for transportation of payload upto 70 tonnes.

ii) & iii) The maximum transport dimension and weight corresponding to 165 MW or 250 MW unit size are guided by the transformer size. The size and weight of a single phase, 93 MVA, 13.8/400/$\sqrt{3}$ kV generator-transformer corresponding to 250 MW unit size is estimated as 4.5 x 3.1 x 4.0 m (LxWxH) and 62 tonnes respectively. Wherever necessary, road will be modified to meet its transportation requirement.

Estimated weight and dimensions of major equipment are as under :-

a)	Runner	-	54 tonnes
b)	Stator frame	-	Four segments or more as per final dimensions and weight of each section estimated at 34 tonnes (total stator weight 250 tonnes)
c)	Generator shaft	-	40 tonnes
d)	Spherical valve	-	To be transported in three parts. Maximum transport weight 48 tonnes
e)	Stator core and winding	-	To be done at site
f)	Transformer	-	62 Tonnes

From above it will be seen that transport weight shall be within planned transport limits.

3. Operating parameters of Turbine

a) Required data is as under :-

i) Monsoon Period

Pond level	=	1804.50 m
Tail water level	=	1508.00 m
Head loss in tunnel	=	22.7 m
Efficiency	=	0.895
Discharge	=	417 cumec.
Power	=	1000 MW

ii) Non-Monsoon Period

Pond level	Max.	=	1810.00 m
	Min.	=	1799.00 m
	Average	=	1804.50 m
Tail water level (corresponding to 4 unit discharge)		=	1508.00 m
Head loss in tunnel		=	22.7 m

Keeping storage capacity of reservoir in view, minimum peaking capacity is 1000 MW for 4 hours.

b) & c) The minimum head as suggested by you shall be 268.3 m (i.e. 1799-1508-22.7) considering T.W.L.with discharge of all the 4 units.

4. Integration of Unit in system operation (system stability)

As per XV survey report of CEA, peak load forcast at end of 10th plan (2006-2007) shall be 44009 MW. Karcham Wangtoo unit size is less than 0.6% of this. In this vast grid, this size is insignificant. Already at Jhakri 250 MW unit size has been adopted. Keeping the same in view, unit size proposed is reasonable and economic and there shall be no problem in integration of the units in Northern grid.

5. Penstock butterfly valve

a) Butterfly valves have been proposed to provide emergency control in case of failure of MIV valve. This is the standard practice for major hydro electric power stations. For Nathpa Jhakri Power Station where unit size is same as for Karcham Wangtoo (250 MW) emergency valves have been provided in the valve chamber d/s or surge shaft. Stop log gates in surge shaft have been provided for maintenance of butterfly valve gates.

b) Alternative of providing fixed wheel gates with hydraulic hoists at the surge shaft was also considered. However it was not adopted due to

lack of sufficient feed back of operation of similar system on other projects.

On Baspa-II Project we are providing fixed wheel gate with hydraulic hoist located in the gate chamber just d/s of surge shaft. In addition a flap gate is also provided to isolate the fixed wheel gate for inspection and maintenance.

At the detailed design stage this alternative will also be studied in more detail and will be adopted if found cost effective.

6. Hydro Generator (selection of design parameters)

a) Rated output of generator corresponding to 255 MW turbine output at 90% gate opening shall be 277.77 MVA (at p.f. of 0.9). Full gate opening in clause 1.9.2.1 was mentioned inadvertently.

b) At this stage we have envisaged generation voltage of 13.8 kV only and the costing has been done accordingly.

c) Short circuit ratio of >1 as per DPR is tentative. Detailed system studies will be conducted to determine optimum short circuit ratio which will be adopted while ordering the equipment.

d) Line charging capacity of 200 Mvar will be adopted which is maximum for 250 MW generator. The capacity is sufficient to charge about 150 km line length.

e) Keeping transportation limits in view, stator frame shall be in four segments, stator core and winding shall be done at site as in case of Nathpa-Jhakri.

f) The ± 5% variation in the system frequency as suggested shall be taken into consideration while designing the electro-mechanical equipments for the station.

7. Unit spacing

As per enclosed calculation at Annexure-A, the unit spacing comes to 22 m

considering lowering of runner from bottom due to silt problem of Satluj basin. For this arrangement a suitable opening will be provided for lifting of runner to the erection bay.

B. **Chapter 2 : Generator Transformer**

General (clause 2.1

We have considered 13.8 kV as primary voltage. We do not have any drawings or catalogues for 93 MVA single phase transformers at this stage.

The drawing for half tunnels existing between Jhakri and Karcham Wangtoo is, however, enclosed at Annexure-B & C.

C. **Comments on other chapters**

Noted.

D. **Location of Pothead Yard and Transformer Cavern and their connection**

The orientation of outdoor GIS and potyard (w.r.t. underground GIS) has been decided on the upstream side of power house because of non-availability of space on the Bhaba river side.

In this arrangement busduct between indoor and outdoor GIS form extension of busbars from indoor to outdoor switchyard. Since their rating is 4000 Amp, busduct is necessary.

Annexure A

CALCULATION FOR UNIT SPACING

1. As per enclosed sketch, the longitudinal length of spiral casing is -

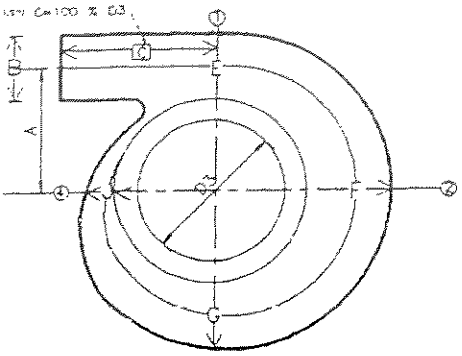
   E + G = 8498 + 6978
   = 15476 mm

2. Based on the experience and conventional practice, the concrete thickness on spiral casing varies with the capacity and size of the unit. For unit size greater than 200 MW, the spiral case concrete thickness is 2.5 m approx.

3. The Generator barrel inner dia (as per calculation sheet attached at the end of Chapter 1, Vol II) is 10.239 m. Added to this the Barrel Concrete thickness of approx 1.0 m the outer dia of generator barrel is 10.239 + 2 x 1.0 i.e. 12.239 m.

4. The Unit spacing is the largest of -

• Width of distributor plus concrete cover on both sides	=	(15476 + 2 x 2500) 20476 mm
• Outer Dia of Generator Barrel plus maintenance clearance	=	(12.239 + 2 x 3000) 18.239 mm
Larger of the two	=	20476 mm
(+) additional space required for lowering of runner from bottom	=	1500 mm
Total	=	**21976 mm**
Unit spacing Adopted		**22.0 m**



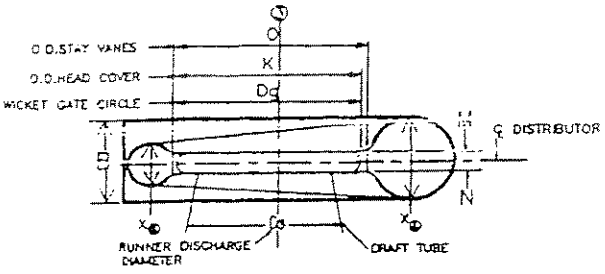


Figure-1: SPIRAL CASE DIMENSIONS

Project: KARCHAM-WANGTOO H.E.P.			
DIMENSIONS IN MM.			
SPIRAL CASE		DRAFT TUBE	
A	6142	A	3870
B	5111	B	6084.5
C	3870	C	3890
D_3	3870	D_3	3870
E	8494	E	14708
F	7495	F	
G	6978	G	
H		H	10780
I		I	
J	7284	J	
K		K	12169

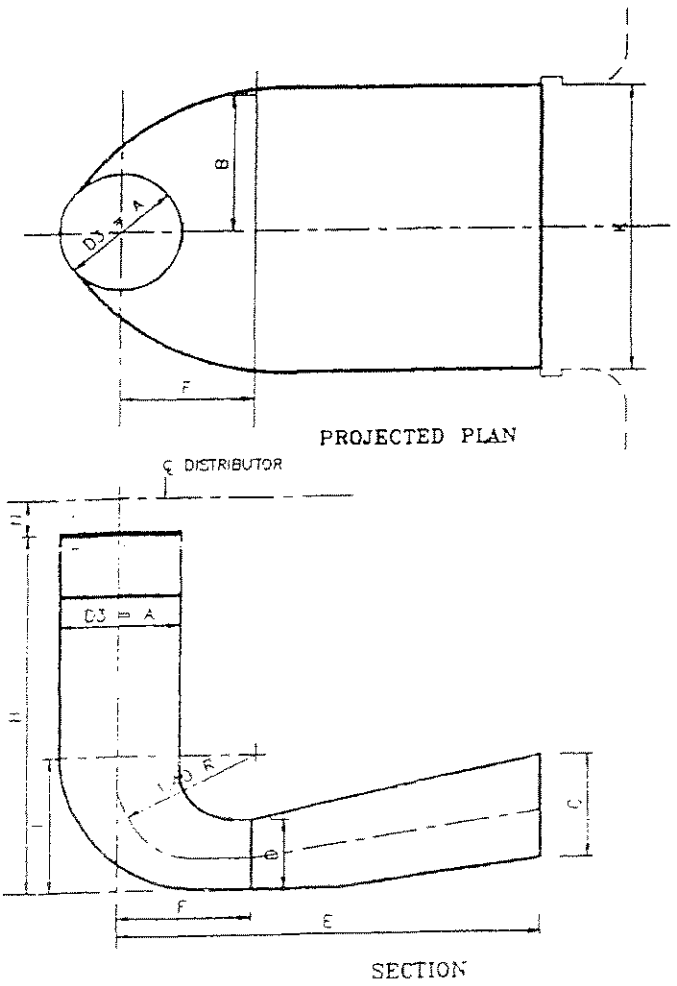
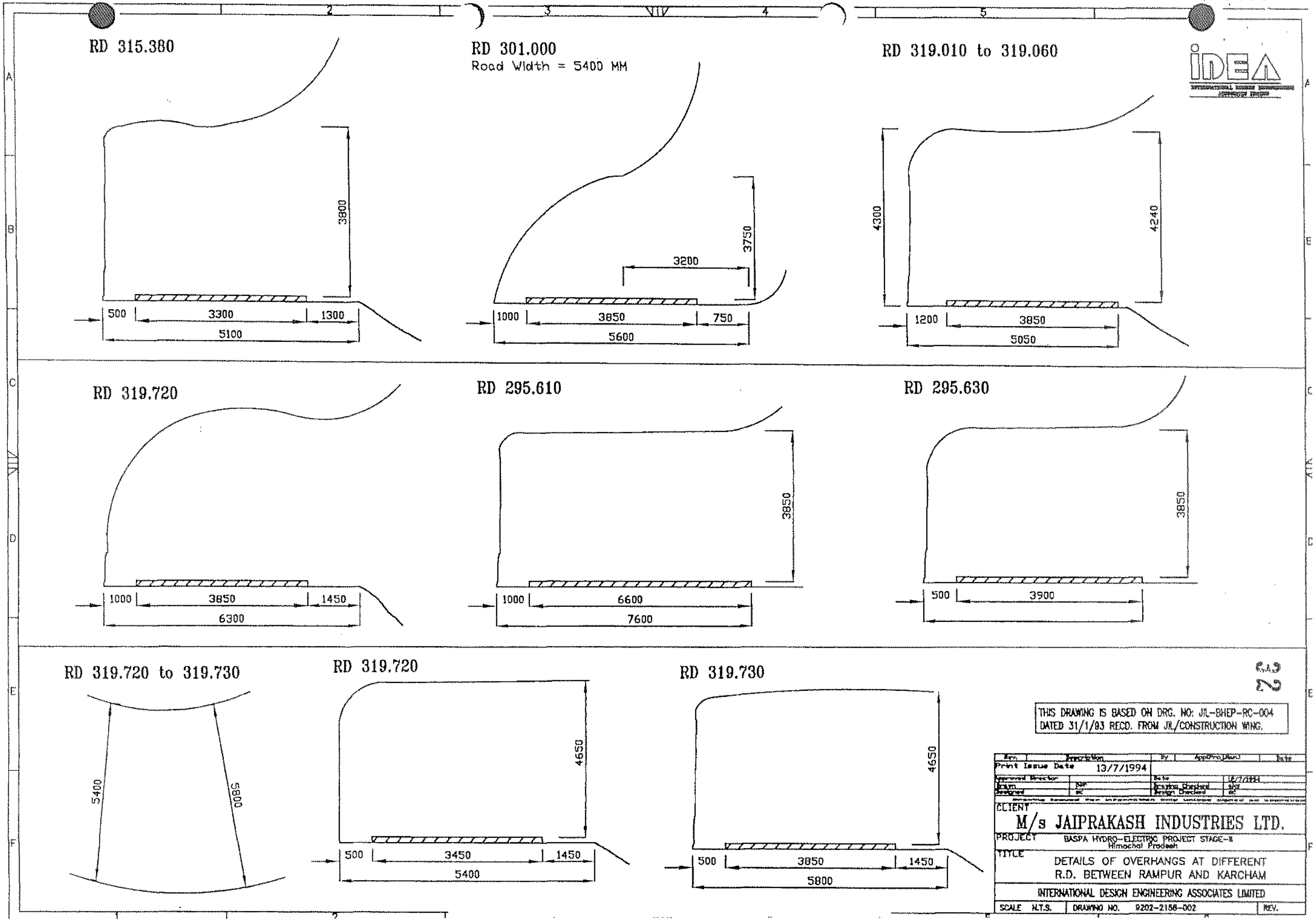
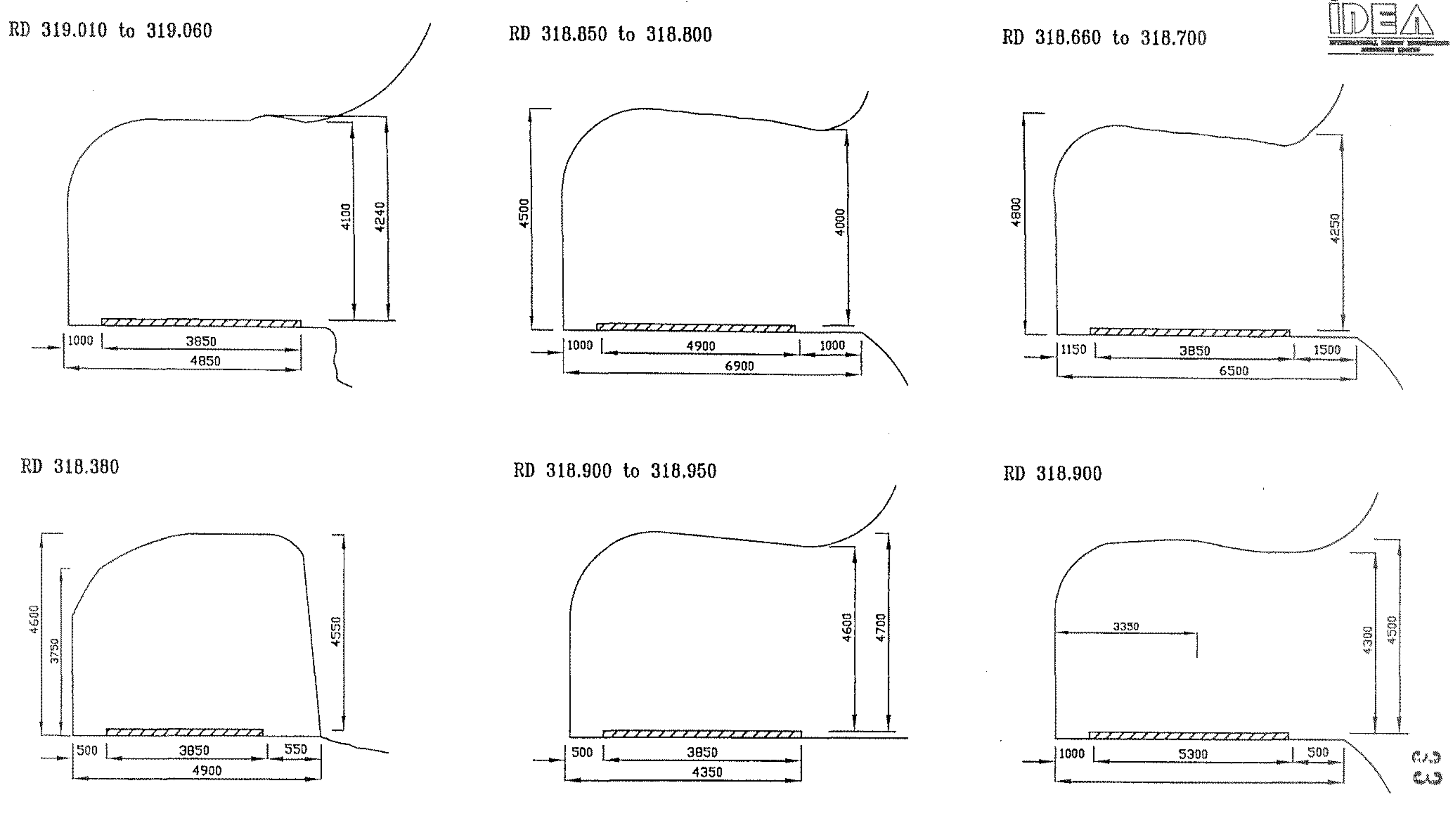


Figure-2: DRAFT TUBE DIMENSIONS


RD 315.380
3800
500
3300
1300
5100
RD 301.000
Road Width = 5400 MM
3750
3200
1000
3850
750
5600
RD 319.010 to 319.060
4300
4240
1200
3850
5050
RD 319.720
1000
3850
1450
6300
RD 295.610
3850
1000
6600
7600
RD 295.630
3850
500
3900
RD 319.720 to 319.730
5400
5800
RD 319.720
4650
500
3450
1450
5400
RD 319.730
4650
500
3850
1450
5800
THIS DRAWING IS BASED ON DRG. NO: JIL-BHEP-RC-004 DATED 31/1/93 RECD. FROM JIL/CONSTRUCTION WING.
Print Issue Date 13/7/1994
CLIENT
M/s JAIPRAKASH INDUSTRIES LTD.
PROJECT
BASPA HYDRO-ELECTRIC PROJECT STAGE-II
Himachal Pradesh
TITLE
DETAILS OF OVERHANGS AT DIFFERENT R.D. BETWEEN RAMPUR AND KARCHAM
INTERNATIONAL DESIGN ENGINEERING ASSOCIATES LIMITED
SCALE N.T.S.
DRAWING NO. 9202-2158-002
REV.

Annexure



THIS DRAWING IS BASED ON DRG. NO: JIL-BHEP-RC-003 DATED 31/1/93 RECD. FROM JIL/CONSTRUCTION WING.

Print Issue Date	13/7/1994
CLIENT	M/s JAIPRAKASH INDUSTRIES LTD.
PROJECT	BASPA HYDRO-ELECTRIC PROJECT STAGE-II Himachal Pradesh
TITLE	DETAILS OF OVERHANGS AT DIFFERENT R.D. BETWEEN RAMPUR AND KARCHAM
	INTERNATIONAL DESIGN ENGINEERING ASSOCIATES LIMITED
SCALE N.T.S.	DRAWING NO. 9202-2158-003

Annexure III

Replies to comments received vide CEA letter no. 2/HP/19/00-PAC/5217-28 dated July 2000

1. *Validity of MOU*

GOHP has signed the Implementation agreement (IA) on 18.11.99 with Jaiprakash Industries Ltd.(JIL) for carrying out the detailed investigations, techno-economic studies, submission of detailed Project report only after satisfying itself regarding compliance of conditions of MOU signed on 28.8.93. Consequent to signing of IA, which has reference of MOU also, the confirmation of validity of MOU from GOHP is not required.

2. ***Incorporation of Public Limited company***

JIL is in the process of incorporating a new subsidiary company for the implementation of proposed Project. The date of incorporation and certificate of commencement of business of the new Company alongwith Memorandum and Articles of Association which would include the suggestions made by you shall be sent to you soon after the incorporation of the new company.

3. ***Section 18 A***

A copy of letter no. MPP-F(2)15/93-III dated 15.7.2000 from Govt. of Himachal Pradesh issued in pursuance of Section 18-A of the Electricity (Supply) Act-1948 requiring Jaiprakash Industries Ltd. to establish , operate and maintain the Karcham- Wangtoo H.E. Project (1000 MW) in Kinnaur & Shimla Districts of H.P. is enclosed as Annexure III/1.

4. *Section 29(2)*

A notification in State Gazette and two local newspaper of H.P. giving salient features of the scheme and giving two months notice to licencees /individuals to make any representation/objection in regard to the proposed scheme has been published. Copies of MPP & Power Department 'Notification' No. MPP-F(2)15/93-III dated Shimla, 20.7.2000 published in the Extraordinary Government Gazette and two local newspapers of Himachal Pradesh viz Indian Express (English) and Dainik Tribune (Hindi) on 27.7.2000 u/s 29(2) of E.S. Act 1948 are enclosed as Annexures III/2, III/3 & III/4 respectively.

5. ***Section 29(3)***

A period of 2 months from the date of publication of MPP & Power Department Notification No. MPP-F(2)15/93-III dated Shimla, the 20th July 2000 in the State Gazette and two local newspapers of H.P. expired on 27.9.2000. In compliance of Sec29(3) of E.S. Act 1948, intimation has been received from Director, Jaiprakash Industries Ltd., Camp Sholtu, P.O. Tapri, District Kinnaur(H.P.) that no objection and/or representation has been received by them in respect of Karcham -Wangtoo H.E. Project. A copy of the letter received in this connection is enclosed as Annexure III/5.

6. *Equity structure*

The debt/ Equity ratio in DPR has been taken at 70:30, which is in line with guidelines/requirement of the financial institutions/lenders. As per the implementation agreement, GOHP has desired following equity structure :

JIL	Not less than 26 % of total equity
Public	Max. 25 % of total equity

FIs/Bank(s) Balance equity subject to none of the individual FIs/Bank would have equity more than 26 % .

While drawing the actual financial plan, in consultation and to the satisfaction of the lenders, it would be ensured that promoters(s)/JIL would have equity participation not less than 11 % of cost of Project which would not affect the Implementation Agreement as JIL/ promoters can have equity more than 26 % of total equity.

No.MPP-F(2)15/93-III
Government of Himachal Pradesh.
Department of MPP and Power.

From

F.C.-cum-Secretary(Power)to the
Govt.of Himachal Pradesh, Shimla-2.

To

Shri Jaiprakash Gaur,
Chairman,
M/S Jaiprakash Industries Ltd.,
JA House, 63, Basant Lok, Vasant Vihar,
New Delhi-110057.

Dated:Shimla-2, the 15th July, 2000.

Subject:- Karcham-Wangtoo Hydro-electric Project(1000MW) in Distt.Kinnaur, Himachal Pradesh-Order of the Govt. under Section 18-A of the Electricity (Supply) Act, 1948.

Dear Sir,

I am directed to inform you that in pursuance of Section 18-A of the Electricity(Supply) Act, 1948, the State Govt.requires you to establish, operate and maintain the Karcham-Wangtoo Hydroelectric Project (1000 MW) in Kinnaur Shimla Districts, Himachal Pradesh in accordance with the Implementation Agreement signed with the Company on 18.11.1999

Yours faithfully,

Additional Secretary(Power)to the
Govt.of Himachal Pradesh.

Endst.No.:As above. Dated:Shimla-2, the th July, 2000.

1. Copy forwarded to the Secretary, Central Electricity Authority, Sewa Bhawan, R.K.Puram, New Delhi-110066 for information alongwith a copy of the Project Implementation Agreement.

2. Copy to Chief Engineer(PSP&R), H.P.State Electricity Board, Vidyut Bhawan, Shimla-4 with reference to his letter No.HPSEB(SECTT)C2(PSP&R) 401(H)KW/2K-415-16 dated 30.6.2000 for favour of information.

Additional Secretary(Power)to the
Govt.of Himachal Pradesh.

रजिस्टर्ड नं० HP/13/SML/2000.

राजपत्र, हिमाचल प्रदेश

(असाधारण)

हिमाचल प्रदेश राज्य शासन द्वारा प्रकाशित

शिमला, शुक्रवार, 21 जुलाई, 2000/30 आषाढ़, 1922

हिमाचल प्रदेश सरकार

M. P. P. & POWER DEPARTMENT

NOTIFICATION

Shimla-171 002, *the* 20*th July*, 2000

No. MPP-F(2)15/93-III.—In pursuance of Section 29 of the Electricity (Supply) Act, 1948, it is hereby notified that Jaiprakash Industries Ltd., a generating company, within the meaning of Section 2(4A) of Electricity (Supply) Act, 1948 and registered under the Companies Act, 1956, proposes to undertake the following scheme :

Name of Scheme : Karcham –Wangtoo Hydroelectric Project (4×250 MW) in District Kinnaur, Himachal Pradesh.

1. Brief Description :

The project has been contemplated as a run-of-river power generation development on river Satluj in Kinnaur District of Himachal Pradesh. It is located at about 200 km from Shimla on Hindustan Tibet Road (NH-22). The project envisages the utilisation of 298.73 m gross head available between Karcham and Wangtoo to generate 4402 million KWh in 90% dependable year with 4×250 MW generating units located in on underground power house. The brief description of civil structures to be constructed is as detailed below :

(*i*) A 10.5 m dia and 456 m long diversion tunnel, alongwith upstream and downstream coffer dams.

1244-राजपत्र-2000-21-7-2000 1,358. (2137) मूल्य : 1 रुपया।

The Indian **EXPRESS**
CHANDIGARH ■ THURSDAY ■ JULY 27, 2000

NOTIFICATION

M.P.P.& POWER DEPARTMENT
Govt of H.P., Shimla-2

NO. MPP-F(2) 15/93- III
20th July, 2000

In pursuance of section 29 of the Electricity (Supply) Act, 1948, it is hereby notified that, Jaiprakash Industries Ltd., a generating company, within the meaning of section 2(4A) of Electricity (Supply) Act, 1948 and registered under the Companies Act, 1956, proposes to undertake the following scheme:

Name of Scheme: Karcham-Wanqtoo Hydroelectric Project (4 X 250 MW) in Distt. Kinnaur (Himachal Pradesh)

1. Brief Description.

The project has been contemplated as a run-of-river power generation development on river Satluj in Kinnaur Distt. of Himachal Pradesh. It is located at about 200 km. from Shimla on Hindustan Tibet Road (NH-22). The project envisages the utilisation of 298.73 m gross head available between Karcham and Wanqtoo to generate 4402 million Kwh in 90% dependable year with 4 X 250 MW generating units located in an underground power house. The brief description of civil structures to be constructed is as detailed below:

i) A 10.5 m dia and 456 m long diversion tunnel, alongwith upstream and downstream coffer dams.

ii) A concrete gravity dam about 98 m high from deepest foundation level and 178 m long on top. The dam will have a spillway with 6 sluice bays and an auxiliary spillway having two bays. The total spillway capacity will be 6135 cumec.The dam will provide a live storage of 545 Ha m for peaking purposes.

iii) Four intake bays alongwith sedimentation chambers and four flushing conduits for excluding sediment particles above 0.2 mm in size.

iv) A 17.2 km. long head race tunnel of 10.48 m dia circular shaped for carrying a discharge of 417 cumec for power generation. The tunnel will have 5 intermediate construction adits alongwith one adit near the inlet and one adit near the surge shaft.

v) A 185 m high and 16 m/ 27 m dia surge shaft alongwith 4 steel lined pressure shafts of 4.75 mm dia.

vi) An underground power house having installed capacity of 1000 MW and having four units of 250 MW. The power station will utilise a gross head of 298.73 m and net head of 275.93 m for generation of power. It will have four Francis turbines alongwith vertical synchronous generators and other equipment.

vii) A 909 m long tail race tunnel of 10.48 m dia circular shaped alongwith outfall work to discharge, the water in Satluj river.

2. For placing the wires, towers, wall brackets, apparatus and appliances for the transmission and distribution of electricity or for the transmission of telegraphic, telephonic communications, necessary for the purpose of the scheme, the company in accordance with provision of section 42(2) of electricity (Supply) Act, 1948 have and shall exercise all the powers which the Telephonic authority possesses under part-III of the Indian Telegraph Act 1885 (13 of 1885) with regard to a Telegraph establishment maintained and shall not be bound by the provision of section 12 to 16 and 18 and 19 of India Electricity Act, 1910 (9 of 1910) without prejudice to the requirement of Section 17 of that Act.

3. The estimated capital expenditure on the scheme (Karcham-Wanqtoo Hydroelectric Project) is Rs. 3,165 crores plus US$ 163.00 million equivalent to Rs.3875.11 crores (1 US$ = Rs. 43.50) as on December 1999 price level, excluding escalation & interest during construction.

4. Notice is hereby given that any licensee or other person interested may raise any objection and /or representation on the above scheme within two months of publication of this notice whereafter no objection and /or representation will be entertained and the scheme shall be sanctioned with or without notification as approved by the Company.

5. Necessary plans showing the project site etc. may be inspected on any working day in the office of Director, Jaiprakash Industries Ltd., Sholtu P.O., Tapri, District Kinnaur (HP) and objection and representation in respect of this scheme, if any, may be sent to the undersigned.

Director,
M/S Jaiprakash Industries Ltd.

Addl. Secretary MPP & Power
to the Government of
Himachal Pradesh.

दैनिक ट्रिब्यून, बृहस्पतिवार, 27 जुलाई, 2000 (5)

NOTIFICATION

M.P.P.& POWER DEPARTMENT
Govt of H.P., Shimla-2

NO. MPP-F(2) 15/93- III
20th July, 2000

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Name of Scheme: Karcham-Wanqtoo Hydroelectric Project (4 X 250 MW) in Distt. Kinnaur (Himachal Pradesh)

1. Brief Description

The project has been contemplated as a run-of-river power generation development on river Satluj in Kinnaur Distt. of Himachal Pradesh. It is located at about 200 km. from Shimla on Hindustan Tibet Road (NH-22). The project envisages the utilisation of 298.73 m gross head available between Karcham and Wanqtoo to generate 4402 million Kwh in 90% dependable year with 4 X 250 MW generating units located in an underground power house. The brief description of civil structures to be constructed is as detailed below :

i) A 10.5 m dia and 456 m long diversion tunnel, alongwith upstream and downstream coffer dams

ii) A concrete gravity dam about 98 m high from deepest foundation level and 178 m long on top. The dam will have a spillway with 6 sluice bays and an auxiliary spillway having two bays. The total spillway capacity will be 6135 cumec. The dam will provide a live storage of 545 Ha m for peaking purposes.

iii) Four intake bays alongwith sedimentation chambers and four flushing conduits for excluding sediment particles above 0.2 mm in size

iv) A 17.2 km long head race tunnel of 10.48 m dia circular shaped for carrying a discharge of 417 cumec for power generation. The tunnel will have 5 intermediate construction adits alongwith one adit near the inlet and one adit near the surge shaft.

v) A 185 m high and 16 m, 27 m dia surge shaft alongwith 4 steel lined pressure shafts of 4.75 mm dia.

vi) An underground power house having installed capacity of 1000 MW and having four units of 250 MW. The power station will utilise a gross head of 298.73 m and net head of 275.93 m for generation of power. It will have four Francis turbines alongwith vertical synchronous generators and other equipment.

vii) A 975 m long tail race tunnel of 10.48 m dia circular shaped alongwith outfall work to discharge the water in Satluj river.

2. For placing the wires, towers, wall brackets, apparatus and appliances for the transmission and distribution of electricity or for the transmission of telegraphic, telephonic communications, necessary for the purpose of the scheme the company in accordance with provision of section 42(2) of electricity (Supply) Act, 1948 have and shall exercise all the powers which the Telephonic authority possesses under part-III of the Indian Telegraph Act 1885 (13 of 1885) with regard to a Telegraph establishment maintained and shall not be bound by the provision of section 12 to 16 and 18 and 19 of Indian Electricity Act, 1910 (9 of 1910) without prejudice to the requirement of Section 17 of that Act.

3. The estimated capital expenditure on the scheme (Karcham-Wanqtoo Hydroelectric Project) is Rs. 3165 crores plus US$ 163.93 million equivalent to Rs 3875.11 crores (1 US$ = Rs. 43.50) as on December 1999 price level excluding escalation & interest during construction.

4. Notice is hereby given that any licensee or other person interested may raise any objection and or representation on the above scheme within two months of publication of this notice whereafter no objection and or representation will be entertained and the scheme shall be sanctioned with or without notification as approved by the Company.

5. Necessary plans showing the project site etc. may be inspected on any working day in the office of Director, Jaiprakash Industries Ltd. Sholtu P.O. Tapri District Kinnaur (HP) and objection and representation in respect of this scheme may be submitted [illegible]

Director,
M.S Jaiprakash Industries Ltd

Addl. Secretary MPP & Power
to the Government of
Himachal Pradesh.

JAIPRAKASH INDUSTRIES LIMIED

From:	To: Shri Suresh Kumarji,
Baspa Unit.	Director,
	HO, New Delhi..

JIL/BASPA/KWP/00/- 2144
7th December, 2K.

Sub: Karchham Wangtoo H.E. Project (1000 MW) – Notification u/s 29(2) of Elec. Supply Act, 1948.

This is in reference to your letter dated November 27, 2000 on the subject. This is to be intimated that no objection and/ or representation has been received by us from any licensee or other person interested.

Regards,

(Har Prasad)

Annexure IV

Replies to points raised by Thermal Civil Design Division, CEA received vide CEA letter no. 2/HP/19/00-PAC/5217-28 dated July 2000

1. ***Land***

The details of the 95.60 ha of Forest land/ Govt. land as per Annexure C-2.2 R of DPR Volume III (Dec. 2000) required for the project have been worked out. We have contacted the Govt. authorities and a joint inspection of SDM, DFO concerned and our representative has been arranged. After inspection, enumeration of trees which are to be felled is to be carried out. DFO will thereafter prepare the case for compensatory afforestation and CAT Plan and forward the same to Principal Conservator of Forests who after scrutiny will send the case to Sec(Forests) GOHP. For diversion of forest land, the case shall then be sent to Ministry of Environment & Forests (MOEF) , Govt. of India, New Delhi. The case is being pursued vigorously at all levels.

For acquisition of 3.79 ha of private land , details of land have been submitted to Deputy Commissioner, Kinnaur District for acquiring the land at the earliest. Request has also been made to Deputy Commissioner, Kinnaur District for transferring 16.4 ha of specified Government Departmental land situated in Tehsils Sangla, Kalpa and Nichar in District Kinnaur essentially required for implementation of the Project. These cases are also being pursued with the concerned Govt. authorities.

Article 4 of the Implementation Agreement signed with the GOHP on 18.11.99 deals with the 'Obligations of the Govt' under which acquisition and transfer of land, lease of land for Permanent works, lease of land for temporary works, are also covered(copy enclosed as Annexure IV/1). We are confident that the land particularly Govt and Forest land required for the Project shall be made available to us after the necessary formalities are completed.

2 *R & R Programme*

As provided in clause 4.6 of the Implementation Agreement signed with GOHP on 18.11.99, the Government shall, subject to the approval of the GOI or any other competent authority, prepare a rehabilitation and re-settlement plan in association with the Company for local residents likely to be adversely affected or displaced due to construction of the Project at the Site as on the Effective Date (copy enclosed as Annexure IV/2). The cost of preparation and implementation of the above plan shall be borne by the Company for which a provision of Rs. 6.10 Crore has been made under B-Land.

3. ***Water availability***

GOI, Office Memorandum dated 19.1.96 clarifies that water availability clearance is required only for Thermal Power Stations(copy enclosed as Annexure IV/3).

There is no interstate aspect involved. The Scheme is a run-of-the-river Scheme and the water of river Satluj shall be diverted through a tunnel for generation of power and shall be fed back into river Satluj in the State of Himachal Pradesh itself.

The Satluj river flows in a narrow gorge and it has been seen that the river water is not being used for drinking or other household jobs in the township. The spring water and ground water has been tapped for meeting the domestic requirement. However, reference shall be made to State Water Resources Department as mentioned in the letter under reference .

4. ***Clearances from State forest Deptt. & MOEF***

Comments at Sl.1 may please be seen .

5. ***Geotechnical Investigations***

No comments

6. *Cost Estimate of Civil works*

Cost of Civil Works has been revised as stated in Para 6 of Annexure I of Appendix 1(b) and the details of Cost Estimates are contained in Volume III of DPR (Dec. 2000).

7. *Environmental & Ecology Aspects*

The provision against this item has slightly been modified to Rs.34.39 Crore from Rs. 35.15 Crore due to Cost of Civil Works being reduced from Rs.2612.50 Crore to Rs.2584 Crore at Dec.1999 Price Level and as given in DPR Volume III (Dec. 2000).

8. ***Geological surprises***

No comments

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No 159014 Himachal Government Judicial Paper

Article 4

OBLIGATIONS OF THE GOVERNMENT

4.1 Granting Consents/Permissions and Assistance in Obtaining Clearances

The Government hereby agrees to grant to the Company all consents, permissions, statutory/non-statutory, within its purview as required by the Company to undertake establish, operate and maintain the Project. The Government shall assist the Company for expediting the various statutory/non statutory clearances required for the implementation of the Project, from various competent authorities of the State Government/Central Government or the Board. The responsibility of obtaining these approvals/clearances shall, however, rest with the Company only.

4.2 Use of materials

The Government shall permit the Company, in accordance with the Law to collect and use boulders, stones, shingles, limestone and other building materials, except precious and semi-precious materials, from the river beds, and/or from the land acquired for or transferred to or leased out to the Company for the Project, on payment of royalty in accordance with the Government rules/rates in force from time to time.

4.3 Acquisition and transfer of land

(a) The Government shall acquire, at the request and expense of the Company, and in accordance with the provisions of Land Acquisition Act,1894 and other applicable laws, such private lands within the State of Himachal Pradesh as may be required by the Company for construction, operation and maintenance of the Project (Acquired Land). The Government may also allow the Company to acquire such land through direct negotiations with the owners in accordance with the prevailing laws, rules and regulations of the State.

(b) The Government shall provide necessary assistance to the Company in obtaining permission of the competent Authority for the removal of trees standing on the Acquired Land and on the Government lands which in its reasonable opinion are required to be felled or removed for the implementation of the Project.

4.4 Lease of land for Permanent Works

Upon the request of the Company and subject to the provisions of laws in force and the provision of Clause 5.24, the Government shall, on such terms and conditions and rates prescribed by the Government from time to time, provide for, on a long term lease, the Government land required for Permanent Works, as may be necessary for the construction, operation and maintenance of the Project.

4.5 Lease of land for Temporary Works

Upon the request of the Company and subject to the provisions of laws in force and the provisions of Clause5.24, the Government shall provide, on such terms and conditions and rates as may be prescribed by the Government from time to time, on a short term lease for a period not exceeding fifteen (15) years, such Government

1 9 9 8 Himachal Government Judicial Paper

land required for Temporary Works, as is considered reasonably necessary by the Government.

4.6 **Rehabilitation and Resettlement Plan**

The Government shall, subject to the approval of the GOI or any other competent authority, prepare a rehabilitation and re-settlement plan in association with the Company for local residents likely to be adversely affected or displaced due to construction of the Project at the Site as on the Effective Date. The cost of preparation and implementation of the above plan shall be borne by the Company.

4.7 **Upgradation of Roads and Bridges**

Government shall, at the request and cost of the Company, construct, widen and strengthen such roads or bridges within the State of Himachal Pradesh as are considered reasonably necessary by the Government. The Government permits the Company to construct roads, bridges, culverts as considered necessary for the Project in the Project lands. The Government may also permit the Company to construct roads, bridges, culverts as are considered reasonably necessary by the Government in the interest of the Project on a case-to-case basis.

4.8 **Approvals for Sale/Use of Energy**

4.8.1 The Company is entitled to sell the balance portion of the energy generated from the Project, excluding the Government Supply, to any other party/ consumer except those located in the State of Himachal Pradesh. The Company shall also be permitted to utilise this energy for their captive use for the new industry to be set up in the State.

4.8.2 Upon application therefor having been made, the Government shall, in accordance with the Law, promptly issue any approval required to be obtained from it in connection with the Power Purchase Agreement(s)/captive use, provided that all requirements and conditions for the grant of such approval have been duly and timely met by the Company.

4.9 **Evacuation of Power**

The Government shall provide necessary assistance to the Company in tying up the transmission system for evacuation of power from the Project out of Himachal Pradesh through the transmission system of the Power Grid Corporation of India Limited (PGCIL) or any other such utility (ies).

4.10 **Other Approvals**

If any approval is required under the Law by the Company, the Lenders / Contractor(s) with respect to the Project, upon application therefor being made by the Company, Government shall take all reasonable and appropriate steps within its administrative power and as permissible by Law, to ensure that such approvals are granted expeditiously.

4.11 **Communication**

Government shall provide due assistance to the Company to obtain, in accordance with the prevailing Law and regulations, necessary permits to install and use suitable radio communication systems, including satellite communication equipment and walkie-talkies. Any system connecting with the national telecommunication system or any international telecommunication system will be subject to the

approval/licence from the relevant authorities, [illegible] shall assist

4.12 Explosives

Government shall provide due assistance to the Company, under the Law and regulations,to obtain permission to procure, store and use such explosives which are required for the Project; provided that the responsibility of obtaining such clearance and making the necessary arrangements rests with the Company

4.13 Import Licence

Government shall provide due assistance to the Company in obtaining all necessary import licenses for the Project from the relevant GOI authorities to the extent permissible by Law. The Company shall submit a list of such equipment required to be imported for the Project to the Government for approval.

4.14 Upstream/Downstream Projects

The Government shall be entitled to survey, investigate and implement any river valley power generation scheme upstream or downstream of the Project. However, the Government shall ensure that the planning, design, construction of any other power project upstream, or downstream of the Project shall not be materially/adversely detrimental to the Project and to the annual energy generation from the Project

4.15 Monitoring Committee

The Government shall constitute a multi-disciplinary committee comprising representatives of the Company and representatives from various departments of the Government to monitor the issues arising during the implementation of the Project. The committee shall also draw up the methodology to regulate the payments to be made by the Company to the various departments of the Government in connection with the implementation of the Project. The committee shall meet at such intervals and at such place as is decided by it. The committee or any of its members shall have no authority to alter, amend or modify in any manner whatsoever the terms and conditions of this Agreement

4.16 Construction Power

The Government shall cause the Board to provide adequate construction power to the Project at the cost of the Company. The construction power shall be supplied at the Board's bulk supply tariff as applicable from time to time. However the Government makes no commitment to ensure un-interrupted power supply

4.17 The Government will provide all possible assistance to the Company in incorporation of the new subsidiary Company provided that the registered office of such a Company is within Himachal Pradesh

No C-323/95-IPC II
GOVERNMENT OF INDIA
MINISTRY OF POWER
New Delhi, the 19th January, 1996

OFFICE MEMORANDUM

In continuation of the Guidelines for Formulation of Project Reports in the Private Sector issued by the Central Electricity Authority (CEA) in June, 1995, it has been decided, in consultation with CEA, to minimise the number of major clearances from State/Central Government and their agencies required by CEA while according its techno-economic clearance to generation, supply and distribution projects proposed by a private sector registered company after due compliance of Section 29(2) of the Electricity (Supply) Act 1948. The project-wise list of clearances that will be required by CEA will be as follows

S.No	Item	Agency
HYDRO-ELECTRIC PROJECTS		
(i)	State Government and SEB clearance	SEB/State Government
(ii)	Water utilisation	Ministry of Water Resources, only if the project is inter-State/inter country
(iii)	Rehabilitation & Resettlement of displaced families by land acquisition	State Government and Ministry of Environment & Forests
(iv)	Environment & Forest clearance	Ministry of Environment & Forests
THERMAL POWER STATIONS		
(i)	State Government & SEB clearance	SEB/State Government
(ii)	Water availability	State Government/Central Water Commission/Ground Water Board
(iii)	Pollution clearance and E&F clearance	State/Central Pollution Control Board/ MoEF
(iv)	Chimney height clearance	National Airport Authority
(v)	Fuel linkage	Ministry of Petroleum & Natural Gas and Ministry of Coal
TRANSMISSION AND DISTRIBUTION SCHEMES		
(i)	State Government & SEB clearance	SEB/State Government
(ii)	Environment & Forest clearance	Ministry of Environment & Forests
LOAD DESPATCH AND COMMUNICATION SCHEMES		
(i)	State Government & SEB clearance	SEB/State Government

CEA's concurrence under Section 31 of the Electricity (Supply) Act, 1948 to all such schemes shall be issued after submission of the finalised package, duly approved by Ministry of Finance and the Foreign Investment Promotion Board, if required

Sd/-
(V V PRASAD)
DIRECTOR (IPC), MINISTRY OF POWER

To,
Chief Secretary/Secretary(Energy) of all State Governments/UTs
Chairman (All State Electricity Boards)
copy to Secretary, Central Electricity Authority

Annexure V

Replies to comments received from CEA vide letter no. 2/HP/19/00-PAC/5217-28 dated July 2000.

1. *Water Availability*

The ten daily discharge at Karcham dam site are available for a period of 34 hydrological years i.e from 1966-67 to 1999-2000 as shown in Table 3.8 of Chapter A-3 of Volume III of DPR (Dec. 2000)

Based on this series, the energy generation from Karcham-Wangtoo Project in a 90% dependable year i.e the year 1984-85 has been considered as 4228.50 million units. (Refer Chapter 5 of DPR Volume I- Dec.2000).

2. *Design Flood*

In the early hours of 1.8.2000, a flash flood of about 6500 cumec was recorded at Jhakri Power House Site. As no record of the flood of Karcham is available, a peak flood of 6500 cumec has been adopted at Karcham Dam site which is on conservative side.

Based on discharge data upto July 2000, a design flood of 8260 cumec for design of spillway at Karcham Dam has been adopted. The updated studies taking discharge upto July 2000, are contained in Chapter -A 5 of Volume III of DPR (Dec.2000).

3. *Sedimentation*

No Comments

4. *General*

It is confirmed that hydrology aspects particularly water availability and design flood will be reviewed in future also based on hydrological data collected in subsequent years. This has already been updated to account for discharges upto July 2000.

Annexure VI

Replies to Comments of CMDD (NW & S) Directorate CWC received vide CEA letter no. 2/HP/19/00-PAC/5217-28 dated July 2000

1. The exploratory drifts and drill holes have indicated that rocks encountered (schistose gneiss and quartzite) are fairly fresh and hard. However as suggested by CWC comprehensive foundation investigations will be carried out at the construction stage for evaluation of rock properties for detailed design of dam. It is also proposed to drill 12 additional holes as per details given in chapter 20 of vol. I of DPR.

   We do not anticipate any problem for which solution cannot be found as number of high dams have been constructed in the past in relatively much poorer foundation conditions.

   As suggested by CWC, GSI can be involved in foundation grade studies and reservoir competence studies.

2. The hydrological studies have been examined by Hydrology Directorate of CWC. The design flood adopted earlier was found reasonable. The procedure adopted for computing live storage has also been approved by Hydrology Directorate. However, the hydrological studies have been updated to account for discharges upto July 31, 2000. The design flood has now been worked out as 8260 cumec(Chapter A-5 of DPR Volume III- Dec.2000).

3. Detailed Seismic studies have been carried out at the DPR stage and report is included in Vol. IV of DPR. However as suggested by CWC Seismic coefficiencs adopted for design will be got approved by the National Commettiee on Seismic Design Parameters.

4. Due to very steep rock slopes on the right bank it may not be feasible to provide an inclined foundation gallery throughout the length. In any case the detailed layout of gallery will be carried out when the rock stripping is carried out. If a vertical limb is found necessary, arrangement of hoist for transport of grouting equipment will be provided.

5. As suggested by CWC, it is agreed to provide an intermediate inspection gallery.

6. The stability calculations have been made for all the conditions as per IS- 6512. However only calculations for condition D & G which are critical are included in the DPR.

7. The final energy dissipation arrangement will be finalised by model studies. The comparative cost studies for possible arrangements will also be carried out at the detailed design stage.

8. It will be seen from the drawings that a 22m long concrete apron with 6m long launching apron has been provided on the downstream of the bucket. Provision for slope protection works on river banks (concrete, shotcrete and rock bolts/anchors) has also been made in the estimates. Pre-formed plunge pool will also be provided based on model studies.

9. A free board of 3m has been provided. This meets the requirement of IS codes for concrete Dams. As the fetch of the reservoir is very small, the wave height will not govern the requirement of free board.

10. The c&ϕ values are based on the preliminary studies carried out by Geologists. Block shear tests will be carried out for determination of these parameters to be adopted in the final designs. Provision for carrying out these tests as also other insitu rock tests has been made in the DPR.

11. It is confirmed that dynamic analysis will be carried out for both overflow and non-overflow sections after ascertaining the correct foundation grades and other parameters.

APPENDIX 2(a)

Letter No. 2/HP/19/00-PAC/5588-90 dated 26.7.2000 from CEA

OFFICE OF THE SECRETARY
CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN R.K. PURAM
NEW DELHI-110066
***

No.2/HP/19/00-PAC/ 5588-90 Dated: 26th July, 2000.

To

The Chairman,
M/s Jaiprakash Industries Ltd.,
JA House, 63 vasant Lok,
Vasant Vihar,
New Delhi-57.

Subject: Proposal for setting up of Karcham Wangtoo H.E. Project (4x250MW) in Kinnaur District, Himachal Pradesh by M/s Jaiprakash Industries Limited (M/s JIL)-Techno-Economic Clearance- Regarding.

Reference: Your letter Nol.JIL/205 dated 18.4.2000.

Sir,

In continuation to our letter dated 5.7.2000, comments on Power Evacuation aspects are annexed. The same may please be kept in view while submitting the fresh proposal/DPR.

Yours faithfully,

26/7/2000

(AMARJEET SINGH)
DIRECTOR – PAC

Encl: As above.

Annexure

Comments for Karcham Wangtoo HEP (4x250 MW) in Himachal Pradesh – by M/s. Jaiprakash Industries Ltd.

Ref: 2/HP/19/00-PAC/3628-37 dated 2.5.2000

Power Evacuation Aspects:

The project authorities have indicated that the Power from Karcham-Wangtoo HEP(4x250 MW) would be stepped up at 400kV. The same is in order.

The project authorities have made a provision for double main bus scheme in their generation switchyard. Following bay arrangement have been kept for evacuation of power.

Generator Transformer [illegible]s	-	4 nos.
Bus coupler bays		1 no.
Line bays	-	6 nos.

The above provisions are in order .

In our earlier comments sent vide letter No. - 2/HP/19/96-PAC/7883-88 dated 8.8.96 the project authorities were advised to indicate the power beneficiaries from the project and power ~~the~~ evacuation system (by interacting with HPSEB). It is observed that these comments of CEA have not been addressed by the Project Authorities, while submitting the revised DPR. The project authorities are once again requested to furnish the letter of comfort from the beneficiaries, indicating their agreement for purchase of power from karcham wangtoo. The project authorities are also requested to interact with the HPSEB regarding the evacuation system.

-contd-

Cost Aspects:

IPP have proposed one Indoor 400 kV GIS of 5 bays & one outdoor 400 kV GIS of 6 bays, involving total GIS cost to Rs.35.5 Million US$. Taking 6%price escalation/yr they have worked out GIS cost of total 11 bays, to Rs.38 Million US $ equivalent to Rs.163.7 Crores. In addition to this, the cost of 400 kV SF6 Insulated bus ducts of 3500 meters lengths @ 2300 US $/ meter, amounting to 8.05 Million US $ equivalent to Rs 36.62 Crores (1 US$=Rs43.5). Total Switchyard cost thus works out to Rs 200.32 Crores, which is very high. No justification has been furnished by the IPP for adopting GIS type of Switchyard and also no reason submitted for separate indoor/outdoor switchyards.

Further, the budgetary support price offer of firm supplying GIS has also not been appended by the IPP. Instead of Escalation based calculate ' price, Latest budgetary support price offer of reputed firms may be furnis' by the Project Authority.

APPENDIX 2(b)

Reply by JIL to CEA Letter No. 2/HP/19/00-PAC/5588-90 dated 26.7.2000

KARCHAM- WANGTOO H.E. PROJECT (1000 MW)

Reply by JIL to CEA's letter No. 2/HP/19/00-PAC/5588-90 dated 26.7.2000

1. **Power Evacuation Aspects**

The Company is interacting (with assistance from HPSEB) with Power Grid for setting up of a power evacuation system for the Project and with Power Trading Corporation(PTC) for purchase of power. On company's request, Addl. Chief Secretary, GOHP, has also written to Secretary (Power) GOI and Director (Project) Power Grid, for setting up of Power Evacuation System vide his D.O.. Letter No. HPSEB(SECTT.)/401(H)/KW/2K-753-5 dated Nov.4/6, 2000(copy enclosed). The matter is being pursued further with Power Grid.

2. **Cost Aspects**

Indoor GIS of 400 kV consisting of 5 bays (1 for each unit and one bus coupler) and one outdoor 400 kV GIS has been planned keeping the topography of the area in view. There is no space to provide an outdoor type of switchyard in the vicinity of the power house and as such it is prudent to provide GIS. Further outdoor GIS has been necessitated because of termination of six feeders. In case all the 11 bays of GIS were installed underground , 6 circuits of busducts would have been required to connect the outdoor potheads, thereby increasing the SF_6 busduct length by 3 times and the corresponding cost. Keeping the same in view, indoor and outdoor gas-insulated switchgear connected by SF_6 busduct have been proposed.

The cost of GIS and GIB has been reduced and is now based on the cost of similar equipment for other projects.

57

SH.GUPTA
I.A.S.
CHIEF SECRETARY

Government of Himachal Pradesh
Deptt. of MPP & Power, Shimla-171002
Phones : Off.: (0177)- 221873 Res. : 203075
Fax : (0177)- 221154

D.O.No.HPSEB(Sectt)/401(H)/KW/2K-753-5

Dated Shimla,the 4th November, 2000

Subject: KARCHAM-WANGTOO HEP (1000 MW) – POWER EVACUATION SYSTEM.

Dear Dr.Basu,

As you are aware H.P. Govt. has signed an implementation Agreement with M/S Jaiprakash Industries Ltd. for implementation of the Karcham-Wangtoo HEP of 1000 MW capacity on Satluj river in Kinnaur Distt. Of Himachal Pradesh.

The detailed project report prepared by the IPP provides for the generation project only and envisages transmission of power through the existing/future transmission system of the Power Grid Corporation of India. In response to a request made by them to PGCIL for making necessary arrangements for evacuation of power from the project PGCIL have however responded that they have the responsibility to establish transmission system only for the central sector generating stations and made IPP projects having share more than one State.

Bulk of saleable power from the project shall have to be transmitted out of the State for consumption in northern region for which the IPP shall sign suitable Power Purchase Agreements with Power Trading Corporation or directly with the States requiring this power. Moreover, in view of the limitations of rights of way, it may be necessary to provide an integrated transmission system for evacuation of power from the project. In the given situation it may only be appropriate that suitable arrangement for evacuation of power from the project should be provided by the PGCIL. The charges for the same can however be recovered by them from the concerned beneficiaries as and when the power starts flowing.

I would, therefore, request you to authorise PGCIL to communicate its 'in-principle' consent to CEA and others to plan and provide suitable transmission system for evacuation of power from the project so as to facilitate techno-economic clearance of the project by CEA. Technical aspects and scope of such transmission system can however be sorted out mutually by the concerned agencies soon after receipt of such 'in principle' consent.

With best regards,

Yours sincerely,

Sd/-

(HARSH GUPTA)

Dr.A.K. Basu,
Secretary (Power),
Govt. of India,
Ministry of Power,
Shram Shakti Bhawan,
Rafi Marg, New Delhi-110 001

Copy to M/S Jaiparkash Industries Ltd., JA House, 63, Basant Lok, Vasant Vihar, New Delhi – 110 057 for information.

Copy to Director (Project). M/S PGCIL, 10 Floor, Hemkunt Chambers, 89, Nehru Place, New Delhi-110 019 for information and necessary action.

Copy to Commr-cum-Secretary(MPP&Power) to H.P.Govt. Shimla-4 for information.

Addl. Chief Secretary-cum-
Secretary(Power),Govt. of H.P.
Shimla-171002.

APPENDIX 3(a)

Letter No.2/HP/19/00-PAC/5999-6002 dated 10/14.8.2000 from CEA

OFFICE OF THE SECRETARY
CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN R.K. PURAM
NEW DELHI-110066

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No.2/HP/19/00-PAC/ 5994-6002 Dated: 10th/14 August, 2000.

To

The Chairman,
M/s Jaiprakash Industries Ltd.,
JA House, 63 vasant Lok,
Vasant Vihar,
New Delhi-57.

Subject: Proposal for setting up of Karcham Wangtoo H.E. Project (4x250MW) in Kinnaur District, Himachal Pradesh by M/s Jaiprakash Industries Limited (M/s JIL)-Techno-Economic Clearance- Regarding.

Reference: Your letter Nol.JIL/205 dated 18.4.2000.

Sir,

In continuation to our letter dated 5.7.2000, comments on following aspects are annexed:-

i.	Financial & Commercial aspects.	-	Annex-I
ii.	Cost of Civil works.	-	Annex-II

It is requested that the same may please be kept in view while submitting the fresh proposal/DPR.

Yours faithfully,

14/8/00

(AMARJEET SINGH)
DIRECTOR – PAC

Encl: As above.

Annexure – I

DPR for Karcham Wangtoo HEP (4x250 MW) in Himachal Pradesh by M/s Jaiprakash Industries Ltd - Comments on F&CA Aspects:-

The DPR submitted to CEA vide M/s JIL letter No.JIL/205 dated 18.4.2000 has been examined and the comments are listed below:-

Clarification sought from promoter

1. The tentative financial package has not been furnished by the IPP. The details of tentative financial package for the completed capital cost may be furnished in CEA's proforma nos.CEA/E&C/F&CA/1001 to 1004 (enclosed).

2. M/s JIL has indicated in Para 24.6 to 24.9 that the loan component (which will include term loan from IFI, Suppliers credit, ECB or such other instrument) will be finalised at the time of financial closure of the project. In this connection, it may be mentioned that tentative financial package alongwith supporting letters from lending agencies indicating their willingness to finance the project with their terms and conditions, quantum of debt being offered, interest rate, repayment period, moratorium period, various financing charges etc is necessary for issue of CEA's Techno-Economic Clearance of the scheme. It is, therefore, requested that this information may be arranged to be submitted.

3. M/s JIL have indicated in Para 24.5 of the DPR that their equity contribution shall not be less than 26% of the equity which imply that their contribution will not be less than 7.8% of the total project cost as against the minimum requirement of 11% of the Project cost as per GOI guidelines. The Company may therefore confirm that their contribution will not be less than 11% of the project cost.

4. Interest During Construction (IDC) : It is seen from Sheet 1&2 of Annexure 24.4 of the DPR that the IDC has been worked out considering a commissioning period of 6 years, phasing of expenditure on Annual basis and rate of interest for IFI loan as 17.5% p.a. and for foreign loan as 8% p.a. In this connection, it may be mentioned that the IDC needs to be calculated separately for each unit upto their respective commercial operation date (or upto the mean COD of the Project) and separately for each loan package. Further the phasing of expenditure and rate of interest should not be inferior to the terms of the debt financing. The IDC will be further subject to the Hard Cost and phasing of expenditure to be approved by Hydro Appraisal

Form No. CEA/E&C/F&CA/1001

FINANCIAL PACKAGE SUMMARY

1. Name of the Project

2. Capacity (MW)

3. Capital Cost of project

	Foreign Currency Component				Indian Rs. Compc-nent	Total
	Name of currency	Amount	Ex. Rate & date	Equiv. Indian		(4+5)
	(1)	(2)	(3)	(4)	(5)	(6)
i) Hard Cost i.e. Cost excluding IDC and financing fees/charges						
ii) Interest During Construction.						
iii) Financing fee/charges						
Total						

Form No.CEA/E&C/F&CA/1003

(Figures in the currency of loan in percentage and absolute amount)

FINANCIAL PACKAGE DETAILS

1. Name of the Project

2. Capacity (MW)

	PACKAGE			
I	II	III	IV	IV

3. Items

a) Name /source of debt

b) Amount

c) Interest rate
   i) Fixed
   ii) Floating

d) Repayment period

e) Moratorium period

f) Upfront Charges

   I) Closing fee
   II) Lawyer's fee
   III) Bank Engineer's fee
   IV) Syndicate charges
   V) Financial advisor's fee
   VI) Any other charges (Please specify)

* g) Commitment Charges/ Undisbursed amount fee

* h) Guarantee fee

i) I) Equity raising charges
   i) Lead Manager's fee
   ii) Underwriting charges

j) Any other fee/charges Not covered (Please specify)

Total

* Submit separate sheet with detailed calculation for guarantee fee and commitment fee.

Note : The above details should also be supported by the documents /Commitment letters from lenders,

ANNEXURE II

KARCHAM-WANGTOO HYDRO ELECTRIC PROJECT (4x250=1000 MW) - H.P.

Estimated Cost : (Price Level Dec.'99)	Civil Works	:	Rs.2112.50 crores
	Elect.Works	:	Rs.1262.61 crores
	Total	:	Rs.3875.11 crores

Comments on Civil Works Cost Estimate : (Vol.III)

1.0 General

The clearance on design & planning. gates, hydrological aspects etc. should be obtained before processing the cost estimate so as to avoid frequent changes while finalising it.

1.2 Since the project cost estimate is dependent upon the equipment planning and their capital cost, the adequacy, suitability and capital cost of Special T&P including the construction equipments used for calculation of hourly use rates may be got vetted in the CMC Dte. of CWC and the changes, if any, suggested by them may be reflected in the hourly use rate analysis as well as under the sub-head 'Q-Special T&P' and also under 'V-Receipts & Recoveries'.

1.3 For indirect charges on labour, 89% of direct charges has been proposed for all category of labourers which does not include accommodation to be provided to the labourers (P-D2.2 Vol.III). The indirect cost of labour may be taken as per CWC Guidelines i.e. 55% and 80% of the direct cost for casual/ semiskilled/unskilled and regular/skilled labour respectively including accommodation charges. It may also be noted that the weekly rest days i.e. 52 Nos. are supposed to be included in the wages itself and therefore should not be taken into account separately (P.66-67 of revised Guidelines). The provision for accommodation (Rs.625.00 lacs) which has been included under K-Buildings in the present estimate (P.C-25) may, therefore, be deleted.

2.0 A-Preliminary : (P.C-5 to C-6)

2.1 For geological investigations, the unit rates for drilling and drifting have been taken as Rs.4000 per m and Rs.12000 per m respectively (P.C-5 Vol.III). These rates may be supported by detailed rate analysis.

2.2 The lumpsum provision of Rs.100.00 lacs has been made for preparation and printing of reports, bulletins, completion reports and history of project (P.C-6). The provision for completion report and history of project may be separated out and shifted under the sub head O-Miscellaneous. The residual provision may, however, be retained under this sub-head.

2.3 Most of the provisions made under this sub-head are on lumpsum basis. Some broad details indicating unit rates and quantities involved, wherever possible, may be given.

3.0 B-Land : (P.C-7 to C-10)

3.1 The land rate certificate for permanent works and lease rent certificate for temporary works for each type of land from revenue authorities/State Govt. may be obtained and appended with the modified cost estimate.

3.2 A lumpsum provision of Rs.20.00 lacs (P.C-7) has been made for interest charges. This provision may be considered on 25% of the total compensation for a period of 2 years @ 12% per annum.

3.3 For legal charges, provision of RS.20.00 lacs has been made on lumpsum basis. This may be modified to 1% of total compensation.

3.4 Solatium charges @ 30% has been provided for acquisition of private land as well as private buildings. AS per CWC Guidelines for Preparation of Project Estimates for River Valley Projects, 1997, solatium charges should be provided for permanent acquisition of private land only. Hence, provision for solatium charges made for private building may be deleted.

3.5 For compensation for trees (P.C-8), sales tax @ 30% on compensation amount and income tax @ 15% and surcharge on income tax @ 15% amount have been taken. It may be confirmed if these taxes will have to be paid to forest department. A letter from the forest department to this effect should be furnished. Also, since loss of forest is being compensated through Compensatory Afforestation proposed to be taken up at cost of Rs.256.00 lacs (P.C-42), separate provision for compensation of trees need to be clarified.

3.6 For compensation for Government/private buildings (P.C-9,10), percentage provisions have been taken for internal electrical installation, water supply & sanitary fittings and external services & site development over plinth area rates. These percentage provisions are on higher side. These percentage provisions may be worked out separately for residential and non-residential buildings as per CWC Guidelines.

Over and above; 17.5% departmental charges for construction of new buildings has been taken which too is on higher side and may be reduced to 8.0%. Consequently the provision made for land acquisition charges @ 6.25% on compensation for buildings (P.C-7, Sl.No.8) may be deleted to avoid duplication of establishment charges on buildings compensation.

4.0 C-Works & J-Power Plant Civil Works : (P.C-11 to C-23)

4.1 Number of measures like rock bolt/anchors, grouting (contact and consolidation), shotcreting, reinforced shotcreting, shotcreting with steel fibres and steel rib supports have been proposed to be carried out (P.C-11 Vol.III) to give strength and stability to rock strata of diversion tunnel. Apart from all these measures, steel liners has also been proposed. The necessity of providing steel liner in diversion tunnel in addition to the above said measures may be justified and got confirmed by the concerned Design Directorate of CWC.

4.2 Since the diversion tunnel will be plugged after the completion of dam (P.8-4 Vol.I), necessary credit may be shown for reuse/resale of diversion tunnel gates and hoists.

4.3 Full concrete cutoff extending to the bed-rock level is proposed for both the coffer dams. The total estimated cost of this concrete cut-off is Rs.19.83 crores (P.C-12 Vol.III) which is nearly 70% of total cost of coffer dam. In view of this, the necessity and utility of providing concrete cut-off may be reviewed in consultation with the concerned design Directorate of CWC as this structure will not be required after completion of works.

4.4 The lumpsum provisions of Rs.120.00 lacs and Rs.360.00 lacs have been made for construction of temporary coffer dam for diverting water into tunnel and repair/reconstruction of U/S & D/S coffer dams after monsoons (3 times) respectively (P.C-12). Since the amount is quite substantial and the work involved is susceptible to measurements, the provisions may be supported by detailed sub-estimates indicating quantities and rates of items of work involved duly supported by rate analysis wherever necessary.

4.5 It is not clear whether the quantities of underground excavation (P.C-11, C-15, C-17 to C-20 & C-22) considered in various sub-estimates are inclusive of overbreaks or not. It is suggested that quantities upto payline and overbreaks should be indicated separately. Full rate as analysed is applicable upto payline only whereas the 2/3 of the applicable rate may be taken for overbreaks.

4.6 Combined provisions have been made for landscaping and architectural treatment (Rs.30.00 lacs) for diversion dam (P.C-14) and for landscaping outside approach area (Rs.30.00 lacs) for Power House Complex (P.C-21). The provision for landscaping may be deleted as all these will be taken care of by provision made under sub-head M-Plantation. However, the provision for architectural features may be retained.

4.7 Provision of Rs.195.00 lacs has been made each for remote control equipment for sluice spillway and auxiliary spillway gates (P.C-14) and for sedimentation chamber and flushing conduit gates (P.C-16). The basis for the above provision may indicated.

4.8 For intake trash cleaning, a provision of Rs.474.50 lacs has been made for machine saw type with grab winch (P.C-16). The basis for the estimated cost of machine may be provided.

4.9 The lumpsum provision of Rs.30.00 lacs made for other miscellaneous items for intake, sedimentation chamber (P.C-16) may be deleted.

4.10 The lumpsum provision of Rs.750.00 lacs for shear zones and bad reaches (P.C-17) may be substantiated with detailed plan of the works to be executed and related sub-estimate indicating quantities and rates of various items of work involved.

4.11 The basis for Rs.32.50 lacs made for embedded drain pipes and valves (P.C-17) may be furnished.

4.12 The basis or rate analysis for the unit rates of following items of works may be provided :

Sl.No.	Items of Work	Unit Rate	Page No.(Vol.III)
1.	Concrete reinforcement Grade Fe-500	Rs.27500/MT	C-15, 18
2.	Steel Platform at top	Rs.50000/MT	C-18?
3.	Fabrication steel works in cable shaft	Rs.75.00/kg	C-21

5.0 K-Buildings : (P.C-24 to C-27)

5.1 The various plinth area rates adopted under this sub-head (P.C-25) may either be substantiated with detailed sub-estimates or be got certified by State PWD authorities. The plinth area rate of Rs.7000/sqm. adopted for permanent residential buildings (P.C-25) is considered very high and needs to be reviewed and reasonably brought down.

5.2 For permanent residential buildings the provision for internal electrical installation may be modified from 1% to 7% of the cost of buildings (P.C-25).

5.3 The provision made for lawn, gardens & fencing @ 4% for all type of buildings may be modified to 2% of the cost of the buildings as per the CWC Guidelines (P.C-25).

5.4 Lumpsum provision has been made for guest house and offices at Shimla (Rs.200 lacs) and at Delhi (Rs.650 lacs) (P.C-24). These provisions may be made part of permanent non-residential buildings and may be related to plinth area rate and plinth area of the [illegible] buildings. However, the necessity of these buildings especially Delhi, may be fully justified. There seems no necessity of [illegible] buildings at Delhi at the project cost although head office of the company is at Delhi.

6.0 O-Miscellaneous : (P.C-29 to C-29)

6.1 Lumpsum provisions (P.C-29) have been made for capital cost for electrification & lighting (Rs.250 lacs), water supply, purification & distribution (Rs.180 lacs) and sewage disposal & storm water drains (Rs.180 lacs). The detailed analysis for all these may be provided.

6.2 The cost of maintenance of various services (P.C-29) seem to be on higher side. These may be reviewed and may be suitably reduced.

6.3 For running charges of transport vehicles (buses), the km/month and rate/km (P.C-31) for different vehicle seem to be on higher side. It may be ascertained that the rate per km for such vehicles does not include the depreciation cost of these vehicles. Beside, all the vehicles may not be running for the full six years. As such running changes may be reviewed and be suitably reduced.

6.4 The lumpsum provision of Rs.15.00 lacs made for anti-malaria measures (P.C-29) may be deleted as it is covered in the provision made for public health measures under the sub-head X-Environment & Ecology (P.C-42)

6.5 A lumpsum provision of Rs.500 lacs has been made for purchase of computer system (Hardware and software) for design offices (P.C-29) under this sub-head. On the other hand, under plant cost, Rs.40 lacs has been made for computer system, software etc. (P.D1-4). These provisions may be reviewed and duplicate provisions may be deleted. The provisions made under sub-head O-Miscellaneous may be substantiated with detailed analysis.

The above comment applies for telephone facilities where lumpsum provision of Rs.40 lacs has been made for installation of telephone facilities at the work sites & camp area under this sub-head (P.C-30) and provision of Rs.100 lacs has been made for communication system under plant cost (P.D1-4).

6.6 A lumpsum provision of Rs.1500 lacs made for insurance of civil works during construction period (P.C-30) may be deleted from this sub-head. However, it may be considered for addition while calculating the completion cost of the project in consultation with Central Electricity Authority (Annex 12 (i), P.116-117 of CWC Guidelines).

6.7 In the detailed analysis of construction power arrangements (P.C-32 to C-35), the provision made for spare & tools, jeep, miscellaneous items etc. may be deleted. Provision made for transportation of labour may also be deleted. The basis for capital cost of various equipments i.e. transformers, switchgear, D.G. sets etc. may be provided.

6.8 Credit on account of resale of 6 nos. D.G. sets have been taken under V-Receipts & Recoveries (P.C-43). Credit on account of resale of other equipments may also be explored and may be reflected under the head V-Receipts & Recoveries.

7.0 P-Maintenance : (P.C-36)

7.1 Provision made under this sub-head may be modified to 1% of cost of 1-Works less A-Preliminary, B-Land, D-Miscellaneous, M-Plantation, Q-Special T&P, X-Environment & Ecology and Y-Losses on
Stocks as per the CWC Guidelines.

8.0 Q-Special T&P : (P.C-37)

8.1 The total cost of transport and inspection vehicles have been charged under this sub-head (P.C-37). As per CWC Guidelines for privately owned projects, only the cost equivalent to its life in years as would be spent on the project should be booked under this sub-head. Necessary correction may be made.

9.0 R-Communication : (P.C-38 to C-40)

9.1 The total length of new roads to be constructed is 19.4 kms (P.C-39). The total estimated cost of this length of road works out as Rs.4562.98 lacs (P.C-38, Sl.No.A-1 to A-4) that too without cost of culverts. It gives a unit rate of Rs.2.35 crores per km. which is considered to be on higher side. The quantities for various items of works may be reviewed and be realistically estimated. Moreover, the rate for different items of work of road construction should be taken from local PWD schedule of rates and not from analysed rates for main works.

9.2 A lumpsum provision for Rs.400 lacs has been made for culverts and drains (P.C-38). This may be related with numbers of culverts and length of drains to be constructed and based on the unit cost for each culverts etc. which may be assessed based on local PWD schedule of rates for the different items of work involved.

9.3 The total span for the new bridges to be constructed is 531.4m (P.C-40) and its estimated cost is Rs.1116.58 lacs (P.C-38). It gives a unit rate of Rs.2.10 lacs per metre of span which is considered high. The quantities for various items of works may be reviewed and be realistically estimated and the cost reviewed accordingly.

9.4 The basis or rate analysis for the following unit rates adopted under this sub-head may be provided if these are not available in the local PWD Schedule of Rate.

Sl.No.	Items of Work	Unit Rate	Page
1.	Metalling & painting	Rs.250/sqm	P.C-38
2.	Steel work in sub-structure	Rs.53000/MT	
3.	Decking & road surface	Rs.5000/sqm	
4.	Construction of tunnel on NH22	Rs.250000/m	

10.0 X-Environment & Ecology : (P.C-42)

10.1 Provisions made for pisciculture, picnic spots under this sub-head (P.C-42) may be deleted as these should not be part of hydro projects. If provision for pisciculture is necessary, the funds for the same may be arranged from the concerned department to take up the work simultaneously. For picnic spots, provision already exists under O-Miscellaneous as recreation facilities. For landscaping, provision is covered under sub-head M-Plantation.

10.2 A provision of Rs.2993.23 lacs has been made for catchment area treatment (CAT) @ 1.5% of cost of C-Works and J-Power Plant Civil Works (P.C-42). The CAT provision is not related with provision made under C-Works and J-Power Plant Civil Works and hence percentage provision may not be acceptable. For CAT, a detailed plan of works to be done and detailed sub-estimate may be provided.

11.0 Y-Losses on Stock : (P.C-1)

11.1 Provision made under this sub-head may be modified to 0.25% of cost of I-Works less A-Preliminary, B-Land, O-Miscellaneous, M-Plantation, Q-Special T&P, X-Environment & Ecology and P-Maintenance as per the revised CWC Guidelines.

12.0 II-Establishment : (P.C-2)

12.1 The provision made under this head may be modified to 10% of I-Works less B-Land (P.C-2) against 11%.

13.0 V-Receipts & Recoveries : (P.C-43)

13.1 While calculating the resale/transfer of temporary residential/non-residential buildings, only the buildings' cost have been considered whereas cost on account of various services have been ignored (P.C-43). The resale/transfer value of these buildings may be calculated on total cost of buildings including various services.

13.2 In view of the comment at Sl.No.8.1 above, no recovery should be taken in respect of Special T&P (P.C-43).

14.0 Hourly Use Rates : (P.D3-1 to D3-22)

14.1 For most of the equipments, life in years and hours and repair and maintenance provision have not been taken as per the revised CWC Guidelines. These values may be adopted as given in the Guidelines for Preparation of Project Estimates for River Valley Project, 1997.

14.2 While calculating the depreciation of the equipments, depreciation in terms of hours only has been considered. As per the CWC Guidelines, depreciation shall be calculated based on total hours worked with reference to life in hours and also with reference to life in year and the actual depreciation shall be taken as the average of depreciation based on hours and year.

14.3 Insurance and taxes accounted for in the HUR analysis of the equipments like tractor, mixer, concrete pump and shotcrete (P.D3-16 to P.D3-) may be deleted.

14.4 Operators and maintenance crew required to handle equipments may also be provided as per the above said CWC Guidelines.

14.5 An abstract of hourly use rate may be provided with the modified estimate.

15.0 Analysis of Rates : (P.D4-1 to D4-27)

15.1 In the analysis of rates, a fixed cost has been taken which comprises depreciation charges of plant/machinery, cost of civil works for stationary plants, cost of idle plant & demobilisation, cost of site supervision & overheads, cost of various services like water, electricity, compressed air, dewatering etc. Then this fixed cost has been distributed on main item of works on proportional basis. This system of fixed cost & its proportional distribution may not be acceptable as per CWC Guidelines. Each and every item should be charged to that item of works where it is required. Depreciation of plant/machinery and civil works of plants may be charged to hourly use rate of that plant/machinery. Cost of site supervision and over-heads, forms part of provisions of 20% of basic cost made in the rate analysis for contractor's profit as well as overheads. Hence separate provision for site supervision and overheads may be deleted. The various services like water, electricity etc. may be charged to various items of works as per the requirement. In nutshell, it is suggested that the hourly use rate analysis and analysis of rates of various items of works may be prepared making reference to Report of Committee on Cost Control of River Valley Project Vol.II, 1981 as well as revised CWC Guidelines, 1997. An abstract of analysis of rates of different items of works may also be provided.

15.2 On account of wastage and incidentals, a uniform allowance of 5% of quantities in case of cement and 2.5% in case of steel may be taken. In case the cement is supplied in bulk or improved bags, the wastage may be taken @ 2%.

15.3 For various gates/hoists/cranes, total costs per set have been taken. The unit rate of these gates/hoists per MT may be analysed as per the Cost Committee Report Vol.II.

15.4 After incorporating the swell factor of 70%, the excavation rate should be divided by 0.7 instead of multiplying the rate by 1.70 (P.D4-5).

15.5 In the rate analysis of shotcrete, spares at batch plant (P.D4-9) may be deleted.

15.6 In the analysis of concrete cut off, provision has been made for salaries and transportation of expatriate personnel (P.D4-13). This may be deleted as it will be taken care of by provision made under the head-II Establishment.

15.7 For underground works, 10% to 20% extra cost has been added for that items of works (P.D4-14,19,21,23). This may be deleted.

15.8 In the analysis of bridge over spillway (P.D4-17), Rs.88000/- has been taken as contingencies. This may be deleted.

ANNEXURE – I

REPLY TO THE COMMENTS ON FINANCIAL AND COMMERCIAL ASPECTS RECEIVED VIDE CEA's LETTER NO.2/HP/19/00-PAC/5999-6002 DATED 10th /14th AUGUST, 2000 FROM DIRECTOR (PAC), CEA.

1. The details of tentative financial package for completed capital cost in CEA's Proforma No. CEA/E&C/F&CA/1001 to 1004 are enclosed.

2. The applications for financial assistance for the Project are considered by various Indian Financial Institutions / Foreign Lenders only after various clearances / approvals, inter alia Environment Clearance, Forest Clearance, availability of land, Techno-Economic Clearance (TEC) etc. are in place. The Financial Institutions will issue letters indicating their willingness to finance the project with terms and conditions only after due diligence in due course of time.

3. As per the financing norms of the Financial Institutions, the debt equity ratio of the Project has to be maintained as 2.33 : 1 and accordingly, the total debt and equity components shall be 70% and 30% respectively of the capital outlay. The promoters contribution is required to be minimum of 17.5% of the total project cost as per prevailing norms which shall represent approximately 58% of the total equity. This promoters' equity of 17.5% of total capital outlay shall be subscribed by Jaiprakash Industries Limited along with strategic partners. The balance equity shall be subscribed by others.

Contd. 2/p

4. As per the Construction Schedule, the commissioning of four (4) units has been planned as under :

Unit – I	-	69 months
Unit – II	-	70 months
Unit – III	-	71 months
Unit – IV	-	72 months

Interest during construction (IDC) has now been worked out considering the commissioning period upto the mean COD of the project i.e., upto for a period of 70 months.

5. Calculations for weighted average rate of depreciation in accordance with GOI notification are enclosed herewith.

6. The tariff for a period of 40 years has been computed as per provision of Implementation Agreement which provides that the agreement shall remain in force for 40 years from the date of Commercial Operation of the Project. However, the depreciation for the purpose of calculation of tariff has been considered at the rates based on the fair life of the Project as prescribed in the GOI notification. The PPA has not yet been signed.

7. The revised DPR containing the information regarding cost estimates etc. is also being simultaneously submitted to HPSEB and GOHP for their examination and GOHP shall be forwarding their recommendation to CEA shortly.

APPENDIX 3(b)

Reply by JIL to CEA's Letter No. 2/HP/19/00-PAC/5999-6002 dated 10/14.8.2000

FINANCIAL PACKAGE SUMMARY

1 Name of Project **KARCHAM WANGTOO HYDRO-ELECTRIC PROJECT**

2 Capacity ***1000 MW***

3 Capital Cost of Project Rs. ***7877*** ***Crores***

Sl. No.	Particulars	FOREIGN CURRENCY COMPONENT				INDIAN RS. COMPONENT	TOTAL
		Name of Currency	Amount MUS $	Exchange Rate & Date (Rs.=1US$)	Equivalent Indian Rs. (Rs. (Cr.)	Rs. (Cr.)	Rs. (Cr.)
		(1)	*(2)*	*(3)*	*(4) = (2) x (3)*	*(5)*	*(6) = (4) + (5)*
(i)	Hard Cost [Basic Cost]	US $	174.36	43.5	758.47	4,568.45	***5,326.92***
(ii)	Interest During Construction	US $	42.91	43.5	186.66	2108.01	***2,294.67***
(iii)	Total FInancial Charges	US $	21.50	43.5	93.53	160.90	***254.43***
TOTAL			***238.77***		***1038.66***	***6,837.36***	***7,876.02***

Say *Rs.* ***7877*** *Crores*

FINANCIAL PACKAGE ABSTRACT

1 Name of Project: KARCHAM WANGTOO HYDRO-ELECTRIC PROJECT

2 Capacity: 1000 MW

3 Capital Cost of Project Rs. 7877 Crores

Sl. No.	Name/ Source of Debt Financing	FOREIGN CURRENCY COMPONENT				INDIAN RS. COMPONENT	TOTAL	% of Total Debt + Equity
		Name of Currency	Amount M US $	Exchange Rate & Date (Rs.=1US$)	Equivalent Indian Rs. (Cr.)	Rs. (Cr.)	Rs. (Cr.)	
		(1)	(2)	(3)	(4) = (2) x (3)	(5)	(6) = (4) + (5)	(7)
1	DEBT FINANCING							
i)	Package - I (Rupee Loans from Indian Financial Institutions)	INR				4630.37	4630.37	58.79%
ii)	Package - II (F. C. Loan)	US$	202.95	43.5	882.83		882.83	11.21%
A	TOTAL DEBT		202.95		882.83	4630.37	5513.20	70.00%
2	EQUITY FINANCING							
i)	Equity Financing (Promoters)	INR				1378.48	1378.48	17.50%
ii)	Other Equity (From Public Issue)	INR				984.33	984.33	12.50%
B	TOTAL EQUITY	INR					2362.81	30.00%
3	TOTAL DEBT AND EQUITY		202.95		882.83	6993.18	7876.01	100.00%

SAY Rs. 7877 Cr.

Form No. CEA/E&C/F&CA/1003

FINANCIAL PACKAGE DETAILS

1 Name of Project — ***KARCHAM WANGTOO HYDRO-ELECTRIC PROJECT***

2 Capacity — ***1000 MW***

Sl. No.	Particulars	Package I	Package I I
		(1)	(2)
a)	**Name/Source of Debt**	Indian Financial Institutions	Indian Financial Institutions
b)	**Amount**	4630.37 Crores	882.83 MUS $
c)	**Interest Rate**		
i)	Fixed	16.50% (Payable Quarterly)	8.00% (Payable Half Yearly)
ii)	Floating	–	–
d)	**Repayment Period**	12 Years	12 Years
e)	**Moratorium Period**	Const. Period or 6 Years (Whichever is less)	Const. Period or 6 Years (Whichever is less)
f)	**Up Front Charges**		
i)	Up Front Charges	1.05%	
ii)	Management/ Commitment/ Arrangement Charges	Nil	1%
iii)	Other Financing Charges	0.35%	8%
iv)	Bank EngineersFee/Agency Fee	Nil	
v)	Syndicate Charges	Nil	
vi)	Financial Adviser's Fee	Nil	
vii)	Management Fee on DPG	Nil	1.05%
viii)	Guarantee Commission on DPG		3.5% p.a
g)	**Commitment Charges/ Undisbursed Amount Fee**	Nil	0.50%
h)	**Equity Raising Charges**		Nil
i)	Lead Manager's Fee	Nil	
ii)	Underwriting Charges	Nil	
i)	**Any Other Fee/Charges not Covered (Please Specify)**		

PHASING OF EXPENDITURE & DRAWL OF FUNDS STATEMENT

1 Name of Project: KARCHAM WANGTOO HYDRO-ELECTRIC PROJECT

2 Capacity: 1000 MW

Phasing of Hard Cost Expenditure (% of Total Hard Cost)

	Year						Total
	1	2	3	4	5	6	
Civil Works	30%	10%	15%	20%	15%	10%	100%
Electro-mechnical Works	25%	5%	10%	25%	25%	10%	100%
Total % of total Hard Cost	25%	8%	13%	22%	20%	12%	100%

S. No.	PARTICULARS	Year 1	2	3	4	5	6	Total
1	**Hard Cost Expenditure**							
	Currency 1 (Rs. in Crore)	1142.36	383.80	634.99	1000.56	857.20	549.54	4568.45
	Currency 2 (MUS$)	41.46	8.46	17.25	44.00	44.88	18.31	174.36
	Total Hard Cost in equv INR	1322.71	420.60	710.03	1191.96	1052.43	629.19	5326.92
2	**Drawl of funds for Hard Cost**							
	Debt 1 (Rs. in Crore)	772.61	263.14	433.25	671.68	570.75	372.74	3084.17
	Debt 2 (MUS$)	35.24	7.19	14.66	37.40	38.15	15.56	148.20
	Equity (Rs. in Crore)	396.81	126.18	213.01	357.59	315.73	188.76	1598.08
	Total Drawl of Funds for Hard Cost	1322.71	420.60	710.03	1191.96	1052.43	629.19	5326.92
3	**Financing Charges (FC)**							
	Debt 1 (Rs. in Crore)	24.31	24.31	0.00	0.00	0.00	0.00	48.62
	Debt 2 (MUS$)	5.39	0.95	1.69	3.83	4.16	2.25	18.27
	Total Financing Charges (FC)	47.76	28.44	7.35	16.66	18.10	9.79	128.10
4	**IDC**							
	Debt 1 (Rs. in Crore)	70.44	174.17	258.28	387.08	543.99	674.05	2108.01
	Debt 2 (MUS$)	1.68	3.84	5.16	7.91	11.91	12.41	42.91
	Total IDC	77.75	190.87	280.73	421.49	595.80	728.03	2294.67
	Total IDC & FC (3+4)	125.51	219.31	288.08	438.15	613.90	737.82	2422.77
5	**Drawl of funds for IDC and FC only**							
	Debt 1 (Rs. in Crore)	81.20	140.41	182.74	273.50	385.98	482.37	1546.20
	Debt 2 (MUS$)	6.78	4.73	6.41	10.42	13.89	12.52	54.75
	Equity (Rs. in Crore)	47.45	68.99	90.27	136.64	191.32	230.06	764.73
	Total Drawl of funds for IDC & FC	158.143	229.98	300.89	455.467	637.722	766.892	2549.09
6	**Final Phasing of funds (2+5)**							
	Debt 1 (Rs. in Crore)	853.81	403.55	615.99	945.18	956.73	855.11	4630.37
	Debt 2 (MUS$)	42.02	11.92	21.07	47.82	52.04	28.08	202.95
	Equity (Rs. in Crore)	444.26	195.17	303.28	494.23	507.05	418.82	2362.81
	Total Final Phasing of Funds	1480.86	650.57	1010.92	1647.43	1690.15	1396.08	7876.01

Calculation of Depreciation

(Rs. Lacs)

Sl.No.	Item	Life	Yearly rate of Dep (Straight Line)*	Cost	Depreciation
(A)	CIVIL WORKS				
	1 Diversion Barrage Intake & Sed. Chamber	50	1.95%	73437.42	1432.03
	2 Head Race Tunnel	35	3.40%	86550.85	2942.73
	3 Surge Shaft	35	3.40%	7085.13	240.89
	4 Pressure Shaft	35	3.40%	6088.41	207.01
	5 P.H. Complex (Incl. TRT)	35	3.40%	24856.57	845.12
	6 Buildings	50	3.02%	5309.75	160.35
	7 Roads (communication)	50	3.20%	8718.72	279.00
	Total OF A			**212046.85**	**6107.13**
(B)	ELECTRICAL WORKS				
	1 Gen Plant & Equipment	35	3.40%	67402.74	2291.69
	2 Transformers	25	7.84%	3865.55	303.06
	3 Switchgear	25	7.84%	21717.11	1702.62
	4 Control & Protection	15	12.77%	3547.51	453.02
	5 Batteries & DC Equipment	5	33.40%	185.00	61.79
	6 Auxillary Equipment	25	7.84%	5277.9	413.79
	7 Special T&P	5	33.40%	1329.91	444.19
	TOTAL OF B			**103325.72**	**5670.16**

Average Rate of Depreciation $= \frac{5670.16 + 6107.13}{103325.72 + 212046.85} \times 100$

$= \frac{11777}{315373} \times 100 = 3.73\%$

Say 4%

* As per norms prescribed by the Dept. of Power notification dated 29/3/94

Annexure II

Reply to comments on Civil Works Cost Estimate (Vol.III) received vide CEA's letter No.2/HP/19/00-PAC/5999-6002 dated 10th/14th Aug.2000 from Director (PAC), CEA, New Delhi

1.0 General

1.1 Comments received from different Directorates of CWC on design and planning, gates, hydrological aspects etc. are being looked into concurrently and the effect of these comments on cost estimates has been taken into consideration.

1.2 Comments of CWC on construction machine aspects have been received vide Director PAC letter no.2/HP/19/00-PAC/8455-57 dated 4th Oct.2000. As suggested, hourly use rate has been worked out as per "Guide lines for preparation of Project Estimates for River Valley Projects (Second revised edition - March 1997" published by Govt. of India, CWC, in March 1997.

1.3 The indirect cost of labour has been taken as per CWC guide lines in the revised cost estimates being submitted now i.e. 55 % & 80 % of the direct cost for casual/ semiskilled/unskilled and regularly skilled labour respectively including accommodation charges. As per Pages 66-67 of the revised guidelines, weekly rest days have been taken to be included in the wages itself and therefore have not been taken separately. As suggested , the provision for accommodation (Rs. 625 lacs) included under K -Buildings (Item No.2 of Annexure C-2.12.1) given on Page C-25 has been deleted.

2.0 A- Preliminary

2.1 Analysis of rates for drilling & drifting for geological investigations which has been taken as Rs. 4000/- per metre & Rs. 12,000/- per metre is given as under:

2.1.1. Rate Analysis for Core Drilling 'Ex' Size

A. Cost of Drilling

Average rate of drilling = 0.42 m/hour (Based on site data)

Use rate of Diamond core Drilling Machine	= Rs. 1230.77 /hour	
Hence rate /m of Drilling	= 1230.77/ 0.42	
		= Rs. 2930.04

B. **Cost of Drill Steel Consumables**

Cost of drilling accessories, consumables and tools		
for 100 mm deep hole drilling	= Rs. 59830	
Hence, cost of drill streel/m	= 59830/100	
		= Rs.598.30

C. **Cost of Water for Flushing**

45 litres/min or 2700 lit/hour		
@ Rs. 31.5/1000 lit/hour	= 2700 x 3.15 / 1000	= Rs.8. 51

D. **Cost of shifting Diamond Drilling Machine**

@ 40 % of cost of drill steel (B) above	= Rs. 239.32

E. **Lighting, Ventilation and Work shops charges**

@ 40 % of cost of drill steel (B) above	= Rs. 239.32
Prime Cost(Direct Cost)	**Rs. 4015.85**
	Say Rs. 4000
Total Rate/Metre	**Rs. 4000**

2.1.2 **Rate Analysis for Drifting**

4m/ Cum drilling @ Rs.100 m 4.00 x 100	400.00
2.50 kg explosive @ Rs.60 /kg	150.00
2 Detonators 2 x 17	34.00
Wire LS	35.00
Blasting	40.00
Ventilation	100.00
Lighting	50.00
Mucking including cost of labour + trolleys	
+ rail tracks etc.	500.00
Supporting temporary/ permanent items	480.00
	1789.00

Contractors Profit @ 20% 358.00

2147.00

Rate = Rs. 2417/M^3

Qty. Of U/G excavation in Drifting/m (2.50 M D-Shaped) = 5.59 m^3

Rate of Drifting/m = 5.59 x 2147 = 12001.73

Say Rs. 12000.00

2.2 The lumpsum provision of Rs.100 lacs made for preparation & printing of reports, bulletins etc. (Page C-6) has been split into two parts as given below.

(i) Preparation of printing of reports & bulletins Rs. 50 lacs (Under A-Preliminary)

(ii) Preparation & printing of completion report & history of Project Rs.50 lacs(Under O-Misc.)

2.3 Broad details for Item No. 21 of Annexure C-2.1. "Consultants fees for preparation of Project report and other reports" are being given as under:

S.No.	Items	Number of reports	Period for one report	Consultants reqd. For each report	Consultant Rate per day (Rs.)	Amount (Rs.)
1	Preparation of Project report					
	(a) Sr. Consultant	1	300 days	3	5000	45,00,000
	(b) Consultant	1	300 days	12	2500	90,00,000
	(c) Secretarial assistance including computers, zerox machines, CAD D/Man, DTP operators etc.					75,00,000

	Sub-total					**210,00,000**
2	Other reports (a)Sr. Consultant (b)Secretarial assistance including computers, zerox machines, CAD D/Man, DTP operators etc.	100	30 days	1	5000	150,00,000 40,00,000
	Sub -total					**190,00,000**
	Total(1+2)					**400,00,000**

Other L.S. items are of minor nature and as such their break up is not being given.

3.0 B-Land (Page C-7 to C-10)

3.1 The land rate certificate for permanent works & lease rent certificate for lumpsum works for each type of land are being enclosed as **Annexure 1** based on details received from revenue authorities, State Govt. etc. The lease rent being taken as 18% of actual cost of land is based on Himachal Pradesh Lease Rules, 1993, a copy of which is enclosed as **Annexure 2.**

3.2 As per CWC Guidelines, provision for interest charges (Item 6 of Annexure C-2.2) has been revised at the rate of 12% per annum for a period of 2 years calculated on 25 % of total compensation as per details given below.

Compensation for the buildings

a	Govt. Buildings(Details as per Annexure C-2.2.2)	Rs. 400.06 Lacs
b.	Private Buildings (Details as per Annexure C-2.2.3)	Rs. 209.76 Lacs
	Total	----------
		Rs. 609.82 Lacs
	(i) 25 % of total compensation	Rs. 152.455 lacs

(ii) Interest charges @ 12 % per annum

for 2 years on Rs. 152.455 lacs

= Rs. 152.455 x (12 /100) x 2

= Rs. 36.589 lacs

Say Rs. 36.59 lacs Rs.36.59 lacs

3.3 Legal charges have been modified to 1 % of total charges as per details given below:

Total compensation	=	Rs. 609.82 lacs
1% of 609.82 lacs	=	Rs. 6.1 lacs

3.4 Solatium charges have been provided for permanent acquisition of private land only as per CWC guidelines for preparation of Project estimate for River Valley Projects, March 1997 as per details given below:

Cost of Private Land Rs.22.81 lacs

Solatium charges @ 30 % of Rs. 22.81 lacs Rs.6.84 lacs

= Rs. 6.84 lacs

Item No.9 of Annexure C-2.2 (R)has been corrected accordingly

3.5 The provision for the compensation of the trees, sales tax @ 30 % on compensation amount , income tax @ 15 % and surcharge on income tax @ of 15 % has been made as per prevailing practice of the Forest Department of Himachal Pradesh. Copy of one of the Bills of Forest Department, H.P. is enclosed for ready reference as **Annexure 3**. The rates in the cost estimate have been taken as applicable in HP Forest Department during the period from April 1999 to March 2000.

Separate provision for compensation of trees has been made for the trees which are required to be cut during the execution of the Project. Provision for compensatory afforestation is as per MOEF guidelines which requires compensatory afforestation in an area equal to 2 times the Forest land being acquired for temporary and permanent works . Hence the provision of Rs.256 lacs (Page C-42) made for compensatory afforestation is in order.

3.6 The percentage provisions for Internal electric installation , water supply and sanitary fittings and site development for Govt/Private buildings (Page C-9, C-10) have been taken as per H.P. PWD rates where rehabilitation plan is to be implemented by the State Govt. Copies of Engineer- in-Chief , HP PWD, Shimla letter no. PW(B) Plinth Area/WS(S)-4089-4129 dated 9/7/1998 and even file no. 3413-3512 dt. 8/1/1989 are enclosed herewith as **Annexure 4 and 5** respectively for ready reference. Similarly, Departmental charges @ 17.5 % for construction of new buildings are as per the State Govt. norms. The provision of 17.5% is for departmental charges for construction of new buildings in lieu of Govt. Buildings required to be dismantled due to the Project . A copy of certificate dated 8/11/2000 issued by the Assistant Engineer, Peo Subdivision, Himachal Pradesh (PWD) Rekong Peo , District Kinnaur (H.P.) is enclosed as **Annexure 6** vide which departmental charges are 17 % for Deposit works which are nearly the same as taken in the estimate. The land acquisition charges @ 6.25 % provided under Item 8 of Annexure C-2.2(R) are for acquisition of land and buildings covered under items 1 to 4 of Annexure C-2.2(R) and as such these are not being deleted.

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4.0 **C-Works & J- Power Plant Civil Works (P.C.-II to C-23)**

4.1 16 mm thick steel liner has been provided in bottom 90^0 in diversion tunnel. During the construction period of 6 years, the diversion tunnel will carry lot of sediment as bed load specially during the rainy season. The velocity in the diversion tunnel when the tunnel is running full is of the order of 13 m/ sec. The steel liner in bottom 90^0 has been provided to safeguard the concrete lining against abrasive action of fast moving sediment as bed load.

4.2 For plugging of diversion tunnel, the diversion tunnel gate shall be dropped and plugging of the tunnel will be carried out. As soon as the gate is dropped , the water level in the reservoir will start raising up and it will be difficult for the gate to be taken out for reuse. As such credit has not been shown for reuse/ resale of diversion tunnel gate and hoist.

4.3 The provision of full concrete cut off extending to the bed rock level for both the coffer dams is essential to prevent seepage of water in the dam area during construction and is considered essential.

4.4 The details of the lumpsum provision of Rs.120.00 lacs & Rs, 360.00 lacs for construction of temp. coffer dam for diverting water into tunnel & repair /reconstruction of u/s and d/s coffer dams after monsoons (3 times) respectively (Page C-12) shall be worked out and submitted separately.

4.5 Quantities of underground excavation have been split in quantity upto payline and quantity beyond pay line. For overbreak beyond payline, 2/3 rd of the applicable rate of underground excavation has been taken.

4.6 Provision for landscaping (Page C-14) under diversion dam has been deleted and a lumpsum provision of Rs. 15 lacs has been retained for Architectural treatment (Item No.27 of Annexure of C- 2.4) out of a total provision of Rs.30.00 lacs for 'Landscaping and Architectural Treatment'. Similarly ,a provision of Rs. 30 lacs made for landscaping outside approach adit (Page C-21) has been deleted. However, a token provision of Rs. 10.0 lacs has been made for architectural treatment outside approach adits .(Item no. 27 of Annexure C- 2.9- Page C-21).

4.7 Provision of Rs. 195.00 lacs has been made for remote control equipment for sedimentation chamber and flushing conduit gates (P-C-16) based on prevalent market rates.

4.8 For intake trash cleaning machine (P.C.-16) , a provision of Rs. 474.50 lacs has been made on the basis of prevalent market rates.

4.9 A L.S. provision of Rs. 30.00 lacs made for other misc. Items for Intake, Sedimentation chamber (Item No.26) on page C-16 has been deleted.

4.10 The justification for the L.S. provision of Rs. 750.00 lacs for shear zone & bad reaches (Pages C-17) is given below.

(i) **Extra over break beyond excavation line** = Assumed 20% of area within payline

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(ii) **Area up to payline (poor rock)**

Excavated size = 10.48 + 1.00 + 0.30 = 11.78

(Lining thickness as 0.5 m in DPR)

r = $\frac{11.78}{2.00}$ = 5.89 m

Area of excavated section = 3.25 r^2

= 112.873 sqm

Overbreak = 112.87 x 0.2

= 22.57 sqm

(iii) **Extra volume of excavation(overbreak) per m** = **22.57 Cum/m**

Extra volume of concrete per m = Assumed 20% of area within payline

(iv) **Extra volume of concrete per m** = **22.57 Cum/m**

(v) **Extra 25 dia,Tensioned & giruted rockbolts per m** = Assumed 6 nos. Extra per m

Length of each bolt = 5.00 m

Total running metre length of Rockbolt per m = 30.00 m

(vi) **Extra rib support per m** = Assumed 3 nos. Extra per m

Using ISHB 150 @ 34.6 kg/m @ 0.33 m c/c

Weight of one rib = 1.30 tonne (As per DPR)

Total weight of rib per m = **3.90 tonne/m**

Total cost per m in shear zone

Sl.No.	Item	Qty.	Rate (Rs.)	Amount (Rs.)
1	Excavation (Cum)	22.57	1121.00	25306.18
2	Rockbolts(m)	30.00	674.00	20220.00
3	Steel rib support (tonne)	3.90	40260.00	157014.00
4	Concrete (cum)	22.57	4422.00	99825.10
			Total	302365.28

Say Rs. 30 lakhs/m

(vii) For 250 m length of shear zone

reach of tunnel, extra amount required = Rs. 250 x 3 lacs = Rs. 750 lacs

4.11 The provision of Rs. 32.5 lacs made for embedded drain pipes and valves (Page -17) is based on our experience on other underground works.

4.12 The basis of rate analysis of rates of following items is given below:

1. **Concrete reinforcement**

Grade Fe-500 **Page C-15, 18**

Cost of reinforcement Grade Fe-415	=	24940 per tonne
Adding 10% extra for Grade Fe-500 steel	=	2495
Total	=	27434 per tonne

2. **Steel platform at top** **Page C-18**

Steel Ex-Kalka /tonne	20000.00	
Sales tax @ 4%	800.00	
Transport (250 kmx 2 x30/8)	1875.00	
Loading and unloading	1000.00	
	23675.00	
Cost of steel Ex-site		23675.00
5 % Wastage		1183.75
Fabrication cost @ 40% of steel cost		8000.00
Erection cost (@ 35 % of steel cost)		7000.00
Cost of painting@ 10% of steel cost		2000.00
		Rs.41858.75
Contractor's profit @ 20%		8371.75
		Rs. 50230.50

Say Rs. 50,000.00/ tonne

3. **Fabrication steel works in cable shaft** — Page C-21

Steel Ex-Kalka /tonne	20000.00	
Sales Tax @ 4%	800.00	
Transport (250 km x 2 x 30/8)	1875.00	
Loading and unloading	1000.00	
	23675.00	
Cost of steel Ex-site		23675.00
25 % wastage		5918.75
Fabrication cost @ 100% of steel cost		20000.00
Erection cost (55 % of cost of steel)		11000.00
Cost of painting @ 10% of steel cost		2000.00
		Rs.62593.75
Contractor's profit @ 20%		12518.75
		Rs.75112.50

Say Rs. 75,000/ tonne

Say 75.00/kg

5.0 K-Buildings

5.1 The plinth area rate of Rs. 7000/sqm adopted for permanent residential buildings at Sholtu Camp site is quite reasonable as it involves a lead of about 300 km from Kalka for all materials and deployment of skilled labour from outside as it is not locally available.

5.2 For permanent residential buildings, the provision for internal electrical installation has been modified from 1 % to 7% of the cost of buildings (Page C-25) as per CWC Guidelines.

5.3 The provision for lawns, gardens & fencing @ 4% for all types of buildings has been modified to 2% of the cost of the buildings as per CWC guidelines.(Page C-25).

5.4 A lumpsum provision of Rs.200 lacs for guest house at Shimla and of Rs.650 lacs for offices at Delhi has been made in the cost estimate. As suggested, these provisions have been made a part of permanent non-residential buildings and related to plinth area rate and plinth area of the buildings.

The office accommodation at Delhi is fully occupied by ongoing projects. For Karcham-Wangtoo H.E. Project (1000 MW), we need additional office accommodation for officers and other staff for inhouse Design Section of Civil, E-M & H-M works with fully computerised systems for designs and drawings, typing and printing facilities, communications, conference rooms and space for providing other related backup facilities like purchase section, personnel department, taxation etc.

6.0 O-Miscellaneous (Page C-29 to C-29)

6.1 Broad details of lumpsum provision providing camp facilities like electricity and lighting (Rs. 250 lacs), water supply purification and distribution(Rs. 180 lacs), and sewage disposal and storm water drains (Rs.180 lacs) in various residential and non-residential areas are given as under :

6.1.1 **Electrification and Lighting**

(i) Installation of Electrical line and lighting arrangements	= 60 lacs
(ii) Maintenance of distribution system and replacement of Consumables	= 50 lacs
(iii) Energy charges for 80,000 units @ Rs.2.50 uni i.e. 200,000/month for six years (200,000 x 12 x 6)	= 144 lacs
	254 lacs
	Say 250 lacs

6.1.2 **Water supply, Purification and Distribution**

(i) Total value under K-Building = 5309.75 lacs

(ii) Provision for Water supply,

Purification and Distribution

@ 3.5 % of K-Building = $\frac{5309.75 \times 3.5}{100}$ = 185.84 lacs

Say Rs. 180 lacs

6.1.3 **Sewage Disposal and storm water drains**

(i) Total value under K-Building = 5309.75 lacs

(ii) Provision for sewage disposal and storm water

Drains @ 3.5 % of K-Building = $\frac{5309.75 \times 3.5}{100}$ = Rs. 185.84

Say Rs. 180 lacs

6.2 Cost of maintenance of various services under item 2 of Annexure C-2.14 are based on our experience on other Projects.

6.3 The running charges of transport vehicles (buses) have been taken as the prevalent market rates in the Project area which is about 200 km from Shimla. Even if we assume that a bus runs for 100 km per day in 3 shifts , in a month of 25 working days, average total running comes to 2500 km.

The Project area is spread in a length of about 30 km which includes roads to all the adits to 17.2 km/ m long head race tunnel, power house, surge shaft etc. The number of vehicles has been worked out as the average required per year for working in 3 shifts including period required in workshop for proper maintenance and replacements of vehicles needed due to a construction period of 6 years.

6.4 As suggested , a lump-sum provision of Rs.15.00 lacs (Item 7 of Annexure C-2.14) made for anti-malaria measures (Page C-29) has been deleted.

6.5 A provision of Rs. 500 lacs in respect of purchase of computer system i.e hardware (Rs.300 lacs) and software (Rs.200 lacs) has been made specifically for the Design offices which shall be located in Delhi. As suggested, a lumpsum provision of Rs.40 lacs under Plant cost (P D_1-4) has been deleted.

Broad breakup of the provisions made for Design office is given below:

HARDWARE

Sl.No.	Item	Unit price (Rs. Lacs)	No.	Total Cost (Rs. Lacs)
1	Compaq professional workstation AP550	2	60	120
2	System P-III,128 RAM,20GB HDD, 15 " Colour Monitor	1	10	10
3	Printer for DTP Operator	0.3	10	3.0
4	A3 Laser Printer	1	5	5
5	A0 Laser Printer		2	20
6	A0 Inkjet Printer		1	10
7	A0 Photocopier		1	2
8	A0 Colour Scanner		1	10
9	A3 Laser Colour Printer		1	10
10	A3 Photo Copier	3.5	2	7
11	Compaq proliant 8000 Server with dual P-III Xeon 700, 1MB Cache, 1 GB RAM	18.25	4	73
12	Backup Devices(40 MB)		4	5
13	CD Server for installation of S/W		1	5
14	VSAT at Design office/site	7.5	2	15
15	Network component			5
16	Power Eqpt.(UPS, Servo, Isolation Transformer etc.)			5
			TOTAL	Rs. 300.00 Lacs

SOFTWARE

1	O/S for servers NT + Unix			3
2	O/S for client		70	10.5
3	MS Office		70	11.2
4	MS Project		10	2
5	Drafting S/W	1.9 lac	60	114
6	Design Analysis S/W			5
7	Finite element design S/W			20.0

8	Digitization, Terrain model/earth work Analysis Primavera Project Planner, Bar bending Schedule etc.			10
9	Software for Electrical/mechanical/ Instrumentation -design analysis			15
10	Auto CAD-2000		10	10
			TOTAL	200.70

Say Rs. 200 lacs

A lumpsum provision of Rs.40.00 lacs was made in DPR of April 2000 under Item 19(Annexure C-2.14) on page C-30 for 'Installation of telephone facilities at the work sites and camp area'. As per comments made by CWC to avoid duplicacy , the provision of Rs.100 lacs made for communication systems at the Project site (Item 68 on Page D_1-4) has been deleted. Accordingly, the provision under Item No.19 (Annexure C-2.14) on page C-30 for 'Installation of telephone facilities at the work sites and camp area ' has been increased to Rs.80 lacs from Rs.40 lacs.

6.6 A lumpsum provision of Rs.1500 lacs has been made for insurance of civil works during construction period only as per CWC guidelines being relevant to the Project. It will not be provided while working out the completion cost of the Project.

6.7 The provision made for spares and tools (Rs.6.00 lacs), jeeps (Rs.40.0 lacs) and other miscellaneous (Rs.11.0 lacs) under construction Power Arrangements (Annexure C-2.14.2- Page C-32) has been deleted. The provision of Rs.50.40 lacs is not only for transportation of labour but is inclusive of cost of labour also required for the Transmission line. This has therefore been retained. The capital cost of various equipments i.e. transformers (IMVA), Switchgear (22 kV) , D.G. Sets (IMVA) etc. is based on the prevalent market rates of standard manufacturers of these items.

6.8 A Credit of Rs.240.00 lacs on account of resale of 6 No, D.G. Sets has been taken under V- Receipts and Recoveries (Page C-43) .

7.0 **P- Maintenance (Page C-36)**

Provision under this subhead has been modified as under to conform to CWC Guidelines :

1% of [Cost of I.Works- (A -Preliminary + B-Land + O-Misc. +M-Plantation + Q-Spl T & P + X - Environment & Ecology + Y- Losses on Stocks.)]

8.0 **Q-Spl T & P**

As per CWC Guidelines (Page 75), the life of light transport vehicles is 1,60,000 km. The construction period of the Project is 6 years. If average running of each vehicle @90 km/day is taken , it would run for about 2250 km in a month and about 27,000 km in a year. In 6 years time, the vehicle will exceed its specified mileage. It has been our experience that after running for about 1,00,000 km in hills, the vehicle becomes unserviceable and needs replacement. As such, charging of total cost of transport and inspection vehicles to the Project is in order.

9.0 **R- Communication (Page C-38 to 40)**

9.1 The total length of new roads to be constructed is 19.4 km(P. C-39). The quantities for various items of work for construction of these roads have been reviewed and found to be in order as per the existing site conditions. These are all hill roads in difficult terrain and will have to be constructed by using mechanised equipment in a short period of time. For such items and for the conditions under which these roads are to be constructed, PWD schedule of rates will not be workable.

9.2 A lumpsum provision of Rs.400 lacs has been made for culverts and drains (P.C-38). The culverts are generally provided at about 250 m c/c spacing. This gives number of culverts of about 75. Besides this, a concrete drain of size 0.3 m x

0.45 m is proposed to be provided along the length of the roads. This gives an average cost of about 5 lacs for 1 culvert & about 250 m long drain which seems to be in order.

9.3 The total span for the new bridges to be constructed is 531.4 m (P. C-40) and its estimated cost is Rs. 1116.58 lacs. This gives a unit rate of Rs.2.10 lacs and is not considered high. A number of bridges are being presently constructed by the Company across Satluj. Out of these bridges, the cost per metre of a 70 m span Class R-70 bridge including the cost of the abutments comes to Rs. 3.25 lakhs/m as per details given below:

(i) **Bridge span**	=	70.00 m
(ii) **Steel required per m for bridge as per design**	=	4.50 per tonne
(iii) **Excavation for abutments**		
Assuming excavation = 8m (W) x 5m(h) x 10 m(L)	=	8 x 5 x 10
Volume of excavation	=	400.00 cum
Total volume of excavation for both abutments	=	800.00 cum
Excavation per m bridge length	=	800.00
		70.00
	=	11.43
		Say 11.40 Cum/m
(iv) **Concreting in Abutment**		
Assuming abutment size approx. 8m(W) x 15 m(H) x 10 m(L)		
Volume of concrete	=	8 x 15 x 10
	=	1200 .00 cum
Total volume of concrete for both abutments	=	2400 .00 cum
Concrete per m bridge length	=	2400 .00
		70.00
	=	34.29
		Say 34.30 Cum/m
(v) **Bearings**		
4 no. Bearings @ Rs. 20000 per bearing	=	80,000.00
Bearing per m bridge length	=	80,000.00
		70.00
	=	1142.86
		Say **1142.90** per m

Total cost of Bridge per m length

Sl.No.	Item	Qty.	Rate (Rs.)	Amount (Rs.)
1	Excavation (Cum)	11.40	370.00	4218.00
2	Concrete	34.30	3844.00	131849.20
3	Steel fabrication /erection	3.50	53000.00	185500.00
4	Bearings per m			1142.90
5	Guide bund & other protection works	L.S.		1000.00
6	Expansion joint, Joint sealent , electrical wire conduits, Lamp post etc.	L.S.		1000.00
	TOTAL			**324710.10**

= Rs. 3.25 Lacs/m

As against this, in the Project estimate, an average cost of bridges comes to Rs. 2.10 Lacs/m

9.4 The rate analysis for the following items is given below:

9.4.1. Metalling & Painting (Page C-38)

200 mm thick metalling by 20-40mm aggregate @ Rs.600 per cum =0.2 x 600 = 120.00 per sqm

Consolidation @ Rs.200 per cum = 0.2 x 200 = 40.00 per sqm

Premixing with 10-20mm aggregate(50mm thick)=0.05 x 600 = 30.00 per sqm

Labour cost (L.S.) = 60 per sqm

Rs.250.00 per sqm

Say Rs. 250.00/sqm

9.4.2. Steel work in sub- structure (Page C-38)

Steel Ex-Kalka/tonne	20000.00
Sales tax @ 4 %	800.00
Transport (250 km x 2 x 30/8)	1875.00

Loading and unloading	1000.00	
	23675.00	
Cost of steel Ex- site		23675.00
5% wastage		1183.75
Fabrication cost @ 40% of steel cost		8000.00
Erection cost @ 50% of steel cost		10000.00
Cost of painting @ 10% of steel cost		2000.00
		Rs. 44858.75
Contractor's profit @ 20%		8971.75
		Rs. 53830.50

Say Rs.53,000/tonne

9.4.3 **Decking & road surface (Page C-38)**

1	Concrete Pavement	= 150 mm	
(i)	Depth of concrete pavement	= 1 x 0.15	
(ii)	Volume of concrete per sqm	= 0.15 cum	
(iii)	Volume of concrete required for footpath /kerbs per sqm	= 0.2 cum (L.S.)	
(iv)	Total volume of concrete per sqm of concrete pavement	= 0.35 cum	
2.	Cost of concrete in pavement	= 0.35 x 4035 = 1412.25 per sqm (@Rs.4035/cum)	
3.	Extra cost for camber on pavement per sqm	= L.S.	= 100.00 per sqm
4.	Cost of electrical conduit per sqm	= L.S.	= 200.00 per sqm
5.	Cost of drainage spout per sqm	= L.S.	= 200.00 per sqm
6.	Cost of expansion joint, transverse joint & water tight joint sealent	= L.S.	= 1000.00 per sqm
7.	Cost of other misc. items like electrical cables, lamp post & other embedments etc.	= L.S.	= 1600.00 per sqm
8.	Contractors's profit @ 20% of item 3 to 7 = 0.20 x 3100		= 620.00 per sqm
			Rs. 5132.25 per sqm

Say Rs. 5,000 /sqm

9.4.4 **Construction of tunnel on NH22 (Page C-38)**

1. **Excavation of 7 m D-shaped tunnel**

Finished Cross sectional area of tunnel $= 7 \times 3.5 + \frac{3.14 \times 7^2}{4 \times 2}$

$= 43.74$ cum/m

	Excavation of 7.6 m D-shaped tunnel with lining	$= 7.6 \times 3.8 + \frac{3.14 \times 7.6^2}{4 \times 2}$
		= 51.55 cum/m
		Say 52.00 cum/m
	with 10% overbreak on the excavated area upto payline	= 52.00 + 5.2
		= 57.20 cum/m
2.	**Concrete lining**	= 13.46 cum/m
3.	**Steel rib support**	= 3.5 x 2 +3.14 x 3.5
	Total length of steel rib	= 17.99 m
		Say 18.00 m
	Using ISHB150 @34.6 kg/m @ 1 m c/c	
	Total weight of steel rib	=622.8 kg
		Say 0.62 tonnes
4.	**Shotcrete including cost of cement**	= 18.00 x 0.1
	Area of 100 mm thick shotcrete	= 1.8 cum/m
5.	**Concrete in portals**	L.S. 100 cum
	Quantity per metre(700 m tunnel length)	= 0.14 cum/m
6.	**Slope protection works at both end**	= 100 m high x 50 m width x 2 Nos.
		= 10000 sqm
	100 mm thick shotcrete volume	= 1000 cum
	Quantity per meter (700 m tunnel length)	= 1.43 cum/m
7.	**Weld mesh**	
	Quantity for weld mesh	= 10000 x 2.53 (kg/sqm)
		= 25300 kg
	Quantity per metre (700 m tunnel length)	= 36.14 kg/m
8.	**Drainage holes**	
	6 nos. Drainage holes of length 10 m	
	Total quantity of drainage holes	= 60 m
9.	**Rock bolts**	
	Total quantity of 2 nos. Rock bolts of 25 mm dia and 5 m long	= 10 m

Total cost per meter of tunnel

Sl.No.	Item	Unit	Qty.	Rates as per DPR (Rs.)	Amount (Rs.)
1	Excavation	cum	57.20	1682.00	96210.40
2	Concrete lining	cum	13.46	4422.00	59520.12
3	Steel rib supports	t	0.62	40260.00	25073.93
4	Shotcrete	cum	1.80	11396.00	20512.80
5	Concrete in portals	cum	0.14	3844.00	549.14
6	Slope protection works				
i)	Shotcrete	cum	1.43	11396.00	16280.00
ii)	Weld mesh	kg	36.14	71.00	2566.14
7	Drainage holes	m	60.00	409.00	24540.00
8	Rock bolts	m	10.00	674.00	6740.00
				TOTAL	251992.53 **Say 250000**

10.0 X-Environment & Ecology (Page C-42)

10.1 As suggested provisions made under items 1(c), 1 (d) & 1(e) for pisciculture, picnic spots, and landscaping respectively have been deleted.

10.2 A provision of Rs.2972.83 lacs for Catchment Area Treatment (CAT) has been made @ 1.5% of cost of C-Works & J-Power Plant Civil Works (P.C-42) on an adhoc basis. The provision will be modified upwards or downwards after Catchment Area Treatment plan (CAT) is approved by Ministry of Environment & Forests(MOEF). Presently a detailed plan of works for CAT is not available. The same shall be submitted to CEA also while submitting the same to MOEF.

11.0 Y-Losses on Stock(Page C-1)

11.1 Provision made under this subhead has been modified to 0.25% of cost of I-Works less A- Preliminary, B-Land, O-Miscellaneous , M-Plantation , Q- Special T & P, X-Environment & Ecology and P-Maintenance as per the revised CWC Guidelines.

12.0 **II- Establishment (Page C-2)**

12.1 As per CWC Guidelines, the provision for establishment has been given as 10-12% for scattered works. In the case of Karcham-Wangtoo Project (1000 MW), the works are scattered in a length of about 25km starting from the dam site at Karcham upto tail race tunnel(TRT) at Wangtoo. This is a mega Project and would require huge establishment for execution of works in a hostile terrain. As the Project is to be completed in a period of 6 years, an average provision of 11% of the cost of I-Works less B-land has been made for establishment which includes design establishment, construction supervision, construction monitoring and coordination with different agencies.

13.0 **V- Receipts & Recoveries (Page C-43)**

13.1 As per observations of CWC, the resale/transfer value of temporary residential/non-residential buildings has been calculated on total cost of buildings including various services.

13.2 In view of our reply to para 9.1 hereinbefore , recovery taken in respect of Special T & P(P.C-43) has been retained.

14.0 **Hourly Use Rates (P. D 3-1 to D 3-22)**

14.1 For the construction equipment , life in years and hours and repair and maintenance provision has now been taken as per the Guidelines for Preparation of Project Estimates for River Valley Projects(Second Revised Edition)- March, 1997.

14.2 As per the CWC Guidelines, depreciation has been calculated based on total hours worked with reference to life in years and the actual depreciation has been taken as the average of depreciation based on hours and years.

14.3 Insurance and taxes accounted for in the Hourly Use Rate analysis of the equipments like transit mixer, concrete pump and shotcrete (P D3-16 to 18) have been deleted.

14.4 Operators and maintenance crew required to handle equipments has been provided as per the revised CWC Guidelines.

14.5 An abstract of hourly use rate of the machines has been provided on Page D_{1-0}.

15.0 **Analysis of Rates (P. D 4-1 to D 4-27)**

15.1 As per observations of CWC and as per revised CWC Guidelines 1997, a fixed cost comprising depreciation charges at plant/machinery, cost of civil works for stationery plants, cost of civil works for stationery plants, cost of idle plant and demobilisation, cost of site supervision and overheads, cost of various services like water, electricity, compressed air, dewatering etc. has been deleted. Hourly use rate analysis and analysis of rates of various items of works has been prepared making reference to Report of Committee on Cost Control of River Valley Project, Vol.II, 1981 as well as revised CWC Guidelines, 1997 . An abstract of analysis of rates of different items of works has been provided on page D 4-1.

15.2 On account of wastage and incidentals , a uniform allowance of 5% of quantity in case of cement supplied in bags and 2.5 %in case of steel has been taken.

15.3 For various gates/hoists/ cranes, total costs per set have been taken based on budgetary prices received from suppliers. It is very difficult to analyse the unit rate of these gates/hoists as per the Cost Committee Report Vol. III.

15.4 After incorporating the swell factor of 70% , the excavation rate has been divided by 0.7 . (P. D 4- 9).

15.5 In the rate analysis of shotcrete, spares at Batch Plant (P. D 4- 9) have been deleted.

15.6 As suggested in the analysis of concrete cut off, provision made for salaries and transportation of expatriate personnel (P D 4-13) has been deleted.

15.7 For underground works, extra cost over the rate for tunnel excavation taken in diversion tunnel, sedimentation chambers,head race tunnel & power house cavity has been taken to account for the difficult nature of underground excavation mainly in surge shaft and pressure shafts.

15.8 In the analysis of bridge over spillway (P. D4-17), Rs.88,000 taken as contingencies has been deleted.

Annexure I

KARCHAM-WANGTOO H.E PROJECT (1000 MW)

1(a) The details of lease rent for Govt/Forest land for 7 years at different location as given in Annexure C-2.2(R) Volume III of DPR are given as under:

Sl.No.	Item of work/Location	Rate taken in Annexure C-2.2(R) of Vol.III of DPR	Ref. To Annexure
(i)	Reservoir submergence	121,982	1.1
(ii)	Realignment of NH 22	43,967	1.1
(iii)	HPPWD Karcham Sangla Road	205,506	1.2
(iv)	Approach Road to Baspa Power House	204,460	1.2
(v)	Road to Surge Shaft	994595	1.3
(vi)	Surge Shaft Area	315000	1.3
(vii)	Permanent Camp at Sholtu	251090	1.4
(viii)	Power House Area	315595	1.5
(ix)	TRT Outfall structure	316190	1.5
(x)	Portal of adit to sedimentation chamber	18739	1.6
(xi)	Outfall structure of flushing conduit	18900	1.6

(b) The details of compensation based on rates of Private land at different locations are as under :

Sl.No.	Item of work/Location	Rate taken in Annexure C-2.2(R) of Vol.III of DPR	Ref. To Annexure
(i)	Reservoir submergence	2348265	1.7
(ii)	Permanent Camp at Sholtu	315100	1.7
(iii)	For dumping area	283620	1.8

2. The basis for rates taken for lease rent of land for temporary works (for 7 years) at different locations is given below:

Sl.No.	Item of work/Location	Rate taken in Annexure C-2.2(R) of Vol.III of DPR	Ref. To Annexure
(i)	Adit to middle of sedimentation chamber	18900	1.9
(ii)	Inlet Adit to HRT	18824	1.9
(iii)	Intermediate adit to HRT No.1	18630	1.9
(iv)	Intermediate adit to HRT No 2	46589	1.9
(v)	Intermediate adit to HRT No.3	47031	1.9
(vi)	Intermediate adit to HRT No.4	315000	1.9
(vii)	Intermediate adit to HRT No.5	315000	1.9
(viii)	Aggregate processing plan at Jangi	82152	1.9
(ix)	Aggregate processing plant at Tapri	315000	1.9
(x)	Quarry site at Jangi	82111	1.9
(xi)	Quarry site at Morang	82316	1.9
(xii)	Quarry site at Wangtoo	315000	1.9
(xiii)	Quarry site at Choling	18908	1.9
(xiv)	Surge shaft camp area	2997887	1.9
(xv)	Dumping area (Govt. Land)	594650	1.9

1. COMPENSATION FOR LAND FOR PERMANENT WORKS

S.No.	Name of Up Mohal	Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
a)	**Govt. /Forest Land (7 years)**						
(i)	**Reservoir submergence**						
	Up Mohal Kanae	64527	16.31	1052435.37	189438.37	189438.37	Annexure 1.1.1
	Up Mohal Shanandan	45184	16.31	736951.04	132651.19	132651.19	Annexure 1.1.1
	Up Mohal Rali	61522	6.52	401123.44	72202.22	72202.22	Annexure 1.1.2
	Up Mohal Dakhai	224557	4.45	999278.65	179870.16	179870.16	Annexure 1.1.3
	Up Mohal Dharwadang	140000	16.31	2283400.00	411012.00	411012.00	Annexure 1.1.4
	Up Mohal Runang	35108	1.50	52662.00	9479.16	9479.16	Annexure 1.1.5
	Total Amount	**570898**		5525850.50	994653.09	994653.09	

Total Area = 570898 Centare = **57.08 Ha**
Lease rent/annum/ha = 994653.09 /57.08 = **Rs. 17425.59 Say Rs. 17426**
Lease rent for 7 years/ha = Rs. 17426 x 7 = **Rs. 121982**

S.No.	Name of Up Mohal	Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per Centare
(ii)	**Realignment of NH 22**						
	Up Mohal Runang	32568	1.5	48852.00	8793.36	8793.36	Annexure 1.1.5
	Up Mohal Dakhai	67432	4.45	300072.40	54013.03	54013.03	Annexure 1.1.3
	Total Amount	**100000**		348924.40	62806.39	62806.39	

Total Area = 100000 Centare = **10 Ha**
Lease rent/annum/ha = 62806.39 /10 = **Rs. 6280.639 Say Rs. 6281**
Lease rent for 7 years/ha = Rs. 6281 x 7 = **Rs. 43967**

S.No.	Name of Up Mohal	Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
(iii)	**HPPWD Karcham Sangla Road**						
	Up Mohal Kanae	15000	16.31	244650.00	44037.00	44037.00	Annexure 1.1.1
	Up Mohal Shanandan	7500	16.31	122325.00	22018.50	22018.50	Annexure 1.1.1
	Up Mohal Dharwadang	7500	16.31	122350.00	22018.50	22018.50	Annexure 1.1.4
	Up Mohal Shanandan	18750	16.31	305812.50	55046.25	55046.25	Annexure 1.1.1
	Total Amount	**48750**		795137.5	143120.25	143120.25	

Total Area = 48750 Centare =**4.875 Ha** **Say 4.88 Ha**

Lease rent/annum/ha = 143120.25 /4.875 = **Rs. 29358**

Lease rent for 7 years/ha = Rs.29358 x 7 = **Rs. 205506**

S.No.	Name of Up Mohal	Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
(iv)	**Approach Road to Baspa Power House**						
	Up Mohal Dharwadang	18750	16.31	305812.50	55046.25	55046.25	Annexure 1.1.4
	Total Amount	**18750**		305812.5	55046.25	55046.25	

Total Area = 18750 Centare =**1.88 Ha**

Lease rent/annum/ha = 55046.25 /1.88 = **Rs. 29279.90 Say Rs.29280**

Lease rent for 7 years/ha = Rs.29280 x 7 = **Rs. 204960**

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S.No.	Name of Up Mohal		Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs)	Lease rent per annum (Rs.)	Annexure for rate per centare
(v)	**Road to Surge Shaft**							
	Rarang	Road to Surge Shaft	15336	237.80	3646900.80	656442.14	656442.14	Annexure 1.1.6
	Dharysang	Road to Surge Shaft	45150	25.00	1128750.00	203175.00	203175.00	Annexure 1.1.7
	Total amount		**60486**		**4775650.8**	**859617.14**	**859617.14**	

Total Area = 60486 Centare = **6.05 Ha**

Lease rent/annum/ha = 859617.14 /6.05 = **Rs.142085.47 Say Rs.142085**

Lease rent for 7 years/ha = Rs. 142085 x 7 = **Rs. 994595**

S.No.	Name of Up Mohal		Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
(vi)	**Surge Shaft Area**							
	Dharysang	Job facility Area	10000	25.00	250000.00	45000.00	45000.00	Annexure 1.1.7
	Total Amount		**10000**		**250000.00**	**45000.00**	**45000.00**	

Total Area =10000 Centare = **1.0 Ha**

Lease rent/annum/ha = 45000 /1.00 = **Rs.45000**

Lease rent for 7 years/ha = Rs. 45000 x 7 = **Rs.315000**

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S.No.	Name of Up Mohal	Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
(vii)	**Permanent Camp at Sholtu**						
	UP Mohal Punang						
	Bagicha Kulahu Awal	34267	46.67	1599240.89	287863.36	287863.36	Annexure 1.1.8
	Bagicha Kulahu Doyam	677	37.14	25143.78	4525.88	4525.88	Annexure 1.1.8
	Kulahu Awal	9448	17.02	160804.96	28944.89	28944.89	Annexure 1.1.8
	Bakhal Doyam	805	12.38	9965.90	1793.86	1793.86	Annexure 1.1.8
	Banjer Kadeem	850	2.32	1972.00	354.96	354.96	Annexure 1.1.8
	Gair Mumkin	19939	2.32	46258.48	8326.53	8326.53	Annexure 1.1.8
	Approach Road						
	Tapri Bridge to old camp Sholtu	15000	2.32	34800.00	6264.00	6264.00	Annexure 1.1.8
	Tapri Bridge to Forest Rest House	15000	2.32	34800.00	6264.00	6264.00	Annexure 1.1.8
	Total amount	**95986**		**1912986.01**	**344337.48**	**344337.48**	

Total Area =95986 Centare = **9.599 Ha Say 9.6 Ha**

Lease rent/annum/ha =344337.48 /9.6 = **Rs.35872.20 Say Rs. 35870**

Lease rent for 7 years/ha = Rs. 35870 x 7 = **Rs.251090**

JAIPRAKASH INDUSTRIES LIMITED
KARCHAM-WANGTOO H.E. PROJECT(1000 MW)

S.No.	Name of Up Mohal		Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
(viii)	**Power House Area**							
	Dharysnag	Approach road to Power House	20000	25.00	500000.00	90000.00	90000.00	Annexure 1.1.7
	Dharysang	Job facility area	6650.00	25.00	166250	29925.00	29925.00	Annexure 1.1.7
	Total Amount		**26650**		**666250**	**119925**	**119925**	

Total Area =26650 Centare =**2.66 Ha**

Lease rent/annum/ha =119925/2.66 = **Rs.45084.50 Say Rs.45085**

Lease rent for 7 years/ha = Rs. 45085 x 7 = **Rs 315595**

S.No.	Name of Up Mohal		Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
(ix)	**TRT outfall structure**							
	Dharysang	T.R.T. Outfall Structure	10439	25.00	260975.00	46975.50	46975.50	Annexure 1.1.7
	Total Amount		**10439**		**260975.00**	**46975.50**	**46975.50**	

Total Area = 10439 Centare = **1.04 Ha**

Lease rent/annum/ha =46975.50/1.04 = **Rs. 45168.75 Say Rs .45170**

Lease rent for 7 years/ha = Rs. 45170 x 7 = **Rs. 316190**

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JAIPRAKASH INDUSTRIES LIMITED

KARCHAM-WANGTOO H.E. PROJECT(1000 MW)

S.No.	Name of Up Mohal		Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
(x)	**Portal of adit to sedimentation chamber**							
	Runang	Portal of adit to Sedimentation chamber	4560	1.50	6840.00	1231.20	1231.20	Annexure 1.1.5
	Total Amount		**4560**		**6840.00**	**1231.20**	**1231.20**	

Total Area = 4560 Centare = **0.46 Ha**
Lease rent/annum/ha =1231.20/0.46 = **Rs. 2676.52 Say Rs 2677**
Lease rent for 7 years/ha = Rs. 2677 x 7 = **Rs. 18739**

S.No.	Name of Up Mohal		Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
(xi)	**Outfall structure of flushing conduit**							
	Runang	Approach road	4500	1.50	6750.00	1215.00	1215.00	Annexure 1.1.5
	Runang	Job facility area	5000	1.50	7500.00	1350.00	1350.00	Annexure 1.1.5
	Total Amount		**9500**		**14250.00**	**2565.00**	**2565.00**	

Total Area =9500 Centare =**0.95 Ha**

Lease rent/annum/ha =2565/0.95 = **Rs. 2700 Say**

Lease rent for 7 years/ha = Rs. 2700 x 7 = **Rs 18900**

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S.No.	Name of Up Mohal	Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Acquisition chg. @ 30 % of actual cost (Rs.)	Annual chg. @ 12% of actual cost (Rs.)	9% Intt. On colmn. (5 +6+7) (Rs.)	Total cost (5+6+7+8) (Rs.)	Annexure for rate per centare
b)	**Private Land**								
(i)	**Reservoir submergence**								
	Up Mohal Shanandan	3214	16.31	52420.34	15726.10	6290.44	6699.32	81136.20	Annexure 1.1.1
	Up Mohal Kanae	2490	326.25	812362.50	243708.75	97483.50	103819.93	1257374.68	Annexure 1.1.1
	Total Amount	**5704**		**864782.8**	**259434.85**	**103773.94**	**110519.25**	**1338510.9**	

Total Area =5704 Centare = **0.57 Ha**

Lease rent for 7 years/ha = 1338510.88/0.57 = **Rs. 2348264.70 Say Rs. 2348265**

(ii)	**Permanent Camp at Sholtu**								
	Up Mohal Punang								
	Banjer Kadeem	796	2.32	1846.72	554.02	221.61	236.01	2858.35	Annexure 1.1.8
	Gair Mumkin	81 4	2.32	1888.48	566.54	226.62	241.35	2922.99	Annexure 1.1.8
	Bakhal Doyam	114	12.38	1411.32	423.40	169.36	180.37	2184.44	Annexure 1.1.8
	Kulahu Awal	5606	17.02	95414.12	28624.24	11449.69	12193.92	147681.97	Annexure 1.1.8
	Bagicha Kulahu Awal	1868	46.43	86731.24	26019.37	10407.75	11084.25	134242.61	Annexure 1.1.8
	Total Amount	**9198**		**187291.88**	**56187.57**	**22475.03**	**23936**	**289890.36**	

Total Area = 9198 Centare = **0.92 Ha**

Lease rent for 7 years/ha = 289890.37/0.92 = **Rs. 315098.2 Say Rs. 315100**

JAIPRAKASH INDUSTRIES LIMITED

KARCHAM-WANGTOO H.E. PROJECT(1000 MW)

S.No.	Name of Up Mohal	Description	Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Acquisition chg. @ 30 % of actual cost (Rs.)	Annual chg. @ 12% of actual cost (Rs.)	9% Intt. On colmn. (5 +6+7) (Rs.)	Total cost (5+6+7+8) (Rs.)	Annexure for rate per centare
(iii)	**For Dumping area**									
	Panvi	Bakhal doyam	7500	12.38	92850.00	27855.00	11142.00	11866.23	143713.23	Annexure 1.1.8
		Gair Mumkin	12500	2.32	29000.00	8700.00	3480.00	3706.20	44886.20	Annexure 1.1.8
	Burcha	Gair Mumkin	230	12.38	2847.40	854.22	341.69	363.90	4407.21	Annexure 1.1.8
	Dharyash ang	Bakhal Awal	1815	150.00	272250.00	81675.00	32670.00	34793.55	421388.55	Annexure 1.1.9
		Gair Mumkin	980	25.00	24500.00	7350.00	2940.00	3131.10	37921.10	Annexure 1.1.9
Total Amount			**23025**		**421447.4**	**126434.22**	**50573.69**	**53860.98**	**652316.29**	

Total area = 23025 Centare = **2.3 Ha**

Lease rent for 7 years/ha = 652316.29/2.3 = **Rs. 283615.77 Say Rs.283629/ha**

Annexure 1.9

JAIPRAKASH INDUSTRIES LIMITED
KARCHAM-WANGTOO H.E. PROJECT(1000 MW)

2. LEASE RENT OF LAND FOR TEMPORARY WORKS(for 7 years period)

S.No.	Name of Up Mohal	Area in Centare	Area in Hactare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Lease rent for 7 years	Lease rent for 7 years per hactare	Annexure for rate per centare
(i)	**Adit to middle of sedimentation chamber**									
a	Road to sedimentation chamber	4500		1.5	6750.00	1215	1215			Annexure 1.1.5
b	Job facility	3000		1.5	4500	810	810			Annexure 1.1.5
	Total	**7500**	**0.75**				**2025**	**14175**	**18900**	
(ii)	**Inlet Adit to HRT**									
a	Road to inlet adit	1500		1.5	2250	405	405			Annexure 1.1.5
b	Job facility	3679		1.5	5518.50	993.33	993.33			Annexure 1.1.5
	Total	**5179**	**0.52**				**1398.33**	**9788.31**	**18824**	
(iii)	**Intermediate adit to HRT No.1**	2760	0.28	1.5	4140	745.20	745.20	5216.40	18630	Annexure 1.1.5
(iv)	**Intermediate adit to HRT No.2**	3451	0.35	3.75	12941.25	2329.43	2329.43	16306.01	46589	Annexure 1.1.10
(v)	**Intermediate adit to HRT No.3**									
a	Road to adit no.3	2250		3.75	843.75	1518.75	1518.75			Annexure 1.1.10
b	Job facility	3125		3.75	11718.75	2109.38	2109.38			Annexure 1.1.10
	Total	**5375**	**0.54**				**3628.13**	**25396.91**	**47031**	

(vi)	**Intermediate adit to HRT No.4**									
a	Road to adit No.4	15000		25	375000	67500				Annexure 1.1.7
b	Job facility	3000		25	75000	13500				Annexure 1.1.7
	Total	**18000**	**1.8**				**81000**	**567000**	**315000**	
(vii)	**Intermediate adit to HRT No.5**	3300	0.33	25	82500	14850	14850	103950	315000	Annexure 1.1.7
(viii)	**Aggregate processing plant at Jangi**	**5000**	0.5	6.52	32600	5868	5868	41076	85152	Annexure 1.1.2
(ix)	**Aggregate processing plant at Tapri**	19400	1.94	25	485000	87300	87300	611100	315000	Annexure 1.1.7
(x)	**Quarry site at Jangi**									
a	Land for quarry site	24880		6.52	162217.60	29199.17	29199.17			Annexure 1.1.2
b	Approach road	15000		6.52	97800	17604	17604			Annexure 1.1.2
	Total	**39880**	**3.99**				**46803.17**	**327622.19**	**82111**	
(xi)	**Quarry site at Morang**	23647	2.36	6.52	154178.40	27752.12	27752.12	194264.84	82316	Annexure 1.1.2
(xii)	**Quarry site at Wangtoo**									
a	Land for quarry site	16300		25	407500	73350	73350			Annexure 1.1.7
b	Approach road	7500		25	187500	33750	33750			Annexure 1.1.7
	Total	**23800**	**2.38**				**107100**	**749700**	**315000**	
(xiii)	**Quarry site at Choling**									
a	Land for quarry site	53527		1.5	80290	14452.29	14452.29			Annexure 1.1.5
b	Approach road	7500		1.5	11250	2025	2025			Annexure 1.1.5
	Total	**61027**	**6.1**				**16477.29**	**115341.03**	**18908**	

(xiv)	**Surge shaft camp area**	37320	3.73	237.8	8874696	1597445.28	1597445.28	11182117	2997887	Annexure 1.1.6
(xv)	**Dumping area (Govt.)**	388460	38.84		18335038	3300306.84	3300306.84	23102148	594650	Annexure 1.10

Dumping Area (Land Details) **Annexure 1.10**

S.No.	Name of Up Mohal	Area in Centare	Rate Per Centare	Actual Cost (Rs.)	Lease rent @ 18% of actual cost (Rs.)	Lease rent per annum (Rs.)	Annexure for rate per centare
	Kanae	25570	16.31	417046.70	75068.41	75068.41	Annexure 1.1.1
	Runang	13488	1.50	20232.00	3641.76	3641.76	Annexure 1.1.5
	Choling	4226	1.50	6339.00	1141.02	1141.02	Annexure 1.1 5
	Urni	1518	3.75	5692.50	1024.65	1024.65	Annexure 1.1.10
	Tapri	31342	3.75	117532.50	21155.85	21155.85	Annexure 1.1.10
	Dharyasang	64717	25.00	1617925.00	291226.50	291226.50	Annexure 1.1.7
	Panvi	80057	2.32	185732.24	33431.80	33431.80	Annexure 1.1.8
	Jungata Ring	12000	2.32	27840.00	5011.20	5011.20	Annexure 1.1.8
	Burcha	13098	2.32	30837.36	5469.72	5469.72	Annexure 1.1.8
	Nichar	20000	10.00	200000.00	36000.00	36000.00	Annexure 1.1.8
	Rarang	64194	237.80	15265333.20	2747759.98	2747759.98	Annexure 1.1.6
	Dharwadhang	6250	16.31	101937.50	18348.75	18348.75	Annexure 1.1.4
	Rali	21000	6.52	136920.00	24645.60	24645.60	Annexure 1.1.2
	Tangling	15000	6.52	97800.00	17604.00	17604.00	Annexure 1.1.2
	Sharbo	16000	6.52	104320.00	18777.60	18777.60	Annexure 1.1.2
	Total Amount	**388460**		**18335488**	**3300306.84**	**3300306.84**	

नकल औसत बै एक साला [illegible] [illegible] पटवार हल्का [illegible] तहसील [illegible]
जिला [illegible] ([illegible]) जनवरी 1998 ता 31 ~~[illegible]~~ दिसम्बर 1999

नं. [illegible]	[illegible]	[illegible]	[illegible]	कुल्लाह [illegible]	कुल्लाह अव्वल	कुल्लाह दोयम	[illegible] अव्वल	[illegible] दोयम	[illegible] कदीम	[illegible]	[illegible] गैर मुमकिन	जोड़	[illegible]	जो [illegible]
1	107	25 4/99	-	-	-	-	-	-	0-53-96	-	-	0-53-96	0-40	8700/-
पड़ता प्रति हैक्टर			15000	12000	4-20	3-50	3-00	2-50	0-75	0-50	0-40	-	-	-
कीमत प्रति हैक्टर			326125	2,18000	7,135,00	7612-50	6525-00	5437-50	1631-25	1087-50	870-00	-	-	-
कीमत प्रति [illegible]			326-25	261-00	91-35	76-13	65-25	54-38	16-31	10-88	8-70	-	-	-

नोट – वर्ष 1998-99 में पटवार हल्का [illegible]
में कोई भी खरीद फरोख्त नहीं हुआ
इसलिए मुलहका पटवार हल्का [illegible]
के उप महाल [illegible] का औसत बै
एक साला जारी किया।

नकल औसत बै एक साला
के असल व सही है।
पटवारी [illegible]
31-1-2000

उप महाल [illegible] और उप महाल
[illegible] मे 1 जनवरी 1999 से 31 दिसम्बर 1999
तक कोई भी खरीद या बेची नहीं गई इसलिए
इन उप महाले के नजदीक के उपमहाल [illegible] का एक साला औसत लगाया गया।

[illegible] 1-2-99 [illegible] 31-1-2000 [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
111	24-5-99	—	—	—	5-21	—	—	1-08	—	—	—	0.23	20,000/-
[illegible]		15/-	13/-	12/-	4.50	2.80	3.00	0.75	0.50	0.60			
[illegible]		130.43	113.04	104.34	39.13	24.34	26.08	6.52	4.34	3.47			

[illegible] :- 1-2-99 [illegible] 31-1-2000 [illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
110	1-3-99	-	-	-	-	-	[illegible]2096	-	[illegible]20-96	[illegible]16	[illegible]
[illegible]		15.00	13.00	12.00	5.40	3.35	0.75	-			
[illegible]		8906	7719	71.25	3206	1939	4.45				

[illegible]

[illegible]

नक्शा औसत मैं एक साला बा महाल चांदू परगना ब्रत कोटगढ़ तहसील [illegible]
जिला शिमला (हिमाचल) ~~जनवरी~~ 1998 ता 31 ~~[illegible]~~ दिसम्बर 1999

नम्बर इन्तखाल	तारीख इन्तकाल	[illegible] कुल्लाहु अव्वल	[illegible] कुल्लाहु दोयम	कुल्लाहु अव्वल	कुल्लाहु दोयम	बारानी अव्वल	बारानी दोयम	बंजर कदीम	घासनी	गैर मुमकिन	जोड़	माल	जरे समन
109	25/99 X	-	-	-	-	-	-	0-53-96	-	-	0-53-96	0-40	87000/-
परता प्रति हैक्टेयर		15-00	12-00	4-20	3-50	3-00	2-50	0-75	0-50	0-40	-	-	-
कीमत प्रति हैक्टेयर		326250-00	261000-00	9,135,00	7612-50	6525-00	5437-50	1631-25	1687-50	870-00	-	-	-
कीमत प्रति [illegible]		326-25	261-00	91-35	76-13	65-25	54-38	(16-31)	10-88	8-70	-	-	-

महाल धार बांवड़ा में 1 जनवरी 1998 से 31 दिसम्बर 1999 तक कोई भी खरीद व बेची नहीं गई इसलिए नजदीक के उप महाल बांसू का औसत एक साला लगाया गया।

महाल धार बांवड़ा का एक साला औसत शून्य है अतः उप महाल बांसू का जारी किया।

नकल मुताबिक असल
के अनुसार है
[signatures]
[illegible]/11/2000

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...काल से औसत एक साला फरवरी 1999 ता जनवरी 2000 उप महाल ... खास तहसील निचार जिला किन्नौर हिमाचल प्रदेश।

नम्बर शुमार	नम्बर इन्तकाल	तारीख फैसला	बागीचा कुलाहू अव्वल	बागीचा कुलाहू दोयम	कुलाहू अव्वल	कुलाहू दोयम	बारवल अव्वल	बारवल दोयम	बंजर कदीम	घासनी	बनी	गैर मुमकिन	मिजान अराजी	माल	जरे समन	विव[illegible]
1.	125.	10/11/99	—	—	0-04-89	—	—	—	—	—	—	—	0-04-89	0.25	5000/-	
	परता प्रति हैक्टेयर		15.00	12.00	5.20	4.30	4.30	3.80	0.75	0.50	0.40	—	-	-	-	
	कीमत प्रति ~~हैक्टेयर~~ हैक्टेयर		300000	240000	10400	8600	8600	7600	1500	1000	800	—	—	—	—	
	कीमत प्रति सैन्टीयर		30.00	24.00	10.40	8.60	8.60	7.60	1.50	1.00	0.80	—	—	—	—	

नोट:- उप महाल चौलिंग/रुनङ/कुमसोलिंग में उपरोक्त दौरान वर्ष में कोई भी किस्म की भूमि बै नहीं हुई। अत: औसत एक साला मुताबिक गांव मौजा का तैयार करके जारी किया गया।

प्रमाणित किया जाता है कि औसत बै एक साला मुताबिक बै शुद्धा इन्तकालात के सही है। उजरत वसूल शुद्धा।

(हस्ताक्षर) 7/2/2000
नायब तहसीलदार
निचार

Annexure 1.1.

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नकल औसत के 5 साला इन्तकाल बाबत पटवार परिक्षेत्र [illegible]
तहसील [illegible] जिला बिजनौर बाबत फरवरी 1999 से 31 जनवरी 2000

नम्बर शुमार	नम्बर इन्तकाल	तारीख तस्दीक	बागी/बाकलत अव्वल	बाकलत दोयम	बागी/बाकलत सोयम	बंजर कदीम	[illegible]	[illegible]	गैर मुमकिन	कुल रकबा	माल	जरे समन	रजिस्ट्री नम्बर व तारीख	विवरण
1	213	9/7/99	0.070	-	-	-	-	-	-	0.070	0.3	5,000/-	79/98 10/7/98	
2	253	5/7/99	-	0.248	-	-	-	-	-	0.248	0.54	2,000/-	66/99 12/6/99	
3	250	9/10/99	-	0.198	-	0.23	-	-	-	0.43.25	1.03	15,000/-	48/99 2/6/99	
4	256	-do-	[illegible]	-	-	-				[illegible]	[illegible]	30,000/-	85/99 16/6/99	
योग			0.1.70	0.3.74	-	0.23	-	-	-	0.57.43	1.84	52,000/-	—	
रकबा प्रति किस्मवार हेक्टेयर			14	4.14	13	0.5	0.50	4	0.50	—	—	[illegible]		
रु. [illegible] की कीमत			[illegible]	3451	4124	2378.48	1565	1388	1555.85	— [illegible]				
रु. किस्मवार की कीमत			[illegible]	1345	4121.95	237.80	1555	[illegible]	1555.54	— [illegible]				

विवरण: [illegible]

उप मौजा में 1-02-99 से 31-01-2000 तक कोई भूमि खरीदी न बेची नहीं गई इसलिए समीप के उप महाल [illegible] का औसत एक साला लगाया गया।

PATWARI [illegible]
[illegible] 3/3/[illegible]

Annexure 1.1.7

122

... की औसत एक साला ... बाबत ... मौजा ... तहसील ... जिला ...

क्रमांक	नम्बर इन्तकाल	तारीख फैसला	बागायत ... अव्वल	बागायत चाखल ...	बागायत ... दोयम	कुसाड़ अव्वल	कुसाड़ दोयम	चाखल अव्वल	चाखल दोयम	बंजर कदीम	...	...	...	...	साल	...
1	106	23/6/99	—	—	—	0-01-87	—	—	—	—	—	—	0-00-48	0-01-[illegible]	0.54	16000/-
2	112	11/12/99	—	—	—	—	—	—	—	0-46-36	—	—	—	0-46-36	0.30	15,000/-
	मिजान		—	—	—	0-01-87	—	—	—	0-46-36	—	—	0-00-48	0-50-21	0.84	26000/-
	परता फी हैक्टेयर		15.00	14.00	12.00	5.50	4.50	4.50	4.00	0.75	0.50	0.40	—	—	—	—
	कीमत फी हैक्टेयर		46.93	43.33	37.14	17.02	13.93	13.93	12.38	2.32	1.55	1.24	—	—	—	—

प्रमाणित किया जाता है कि औसत व एक साला मुताबिक असल के सही है।

महाल पानमी, कुरना,
जंगटारिंग से 1-02-1999 से 31-01-2000
तक कोई भी खरीदी व बेची नहीं गई
इसलिए समीप के उप महाल ... का औसत एक साला लगाया गया।

नकल औसत एक साला 1-2-99 ता० 31-1-2000 उप महाल थापरी तहसील निचार जिला किन्नौर

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] 1/99	—	—	—	—	—	[illegible]	—	0-02	1000/-	1/99
[illegible]	5-20	3-45	15-00	12-00	2-30	0-75	0-50	—	—	—	
[illegible]	260000/-	172500/-	750000/-	600000/-	115000/-	37500/-	25000/-	—	—	—	
[illegible]	26-00	17-25	75-00	60-00	11-50	3-75	2-50	—	—	—	

नकल मुताबिक असल
के [illegible]
[illegible] पटवारी
[illegible]
10/2000

Annexure 2

126

राजस्व विभाग

हिमाचल प्रदेश सरकार

हिमाचल प्रदेश पट्टा नियम, 1993

नियन्त्रक, मुद्रण एवं लेखन सामग्री, हिमाचल प्रदेश, शिमला-5 द्वारा मुद्रित ।

[*Authoritative English text of Government Notification No. Rev. D(G)6-33/86-II, dated 20th October, 1993 as required under clause (3) of Article 348 of the Constitution of India.*]

HIMACHAL PRADESH LEASE RULES, 1993

1. *Short title and extent.*—(1) These rules may be called the Himachal Pradesh Lease Rules, 1993.

(2) They shall extend to whole of the State of Himachal Pradesh.

2. *Definition.*—In these rules unless there is anything repugnant in the subject or context—

(*a*) "Competent authority" means an authority to grant land on lease under rule 7;

(*b*) "demarcated protected forest" means forest declared as such under section 30 of the Indian Forest Act, 1927 ;

(*c*) "Director Country and Town Planning" means Director of Town and Country Planning appointed under the Himachal Pradesh Town and Country Planning Act, 1977;

(*d*) "eligible institution" means institution which is eligible to get land on lease mentioned in rule 6 of these rules ;

(*e*) "Form" means a form appended to these rules;

(*f*) "public purpose" means the purposes as defined in clause (*f*) of section 3 of the Land Acquisition Act, 1894 (1 of 1894);

(*g*) "Planning Area" means any area declared to be a planning area under the Himachal Pradesh Town and Country Planning Act, 1977 ;

(*h*) "Reserved Forest" means a forest declared as such under section 20 of the Indian Forest Act, 1927 ;

(*i*) "State Government" means the Government of Himachal Pradesh.

3. *Grant of land on lease.*—(1) The land may be granted on lease to eligible institutions and persons mentioned in rule 6 with the sanction of the competent authority out of:—

(*i*) Government lands owned by the State Government outside the reserved and demarcated protected forests and out-side such other areas as may be notified from time to time by the State Government in this behalf :

Provided that if the State Government desires, lease in any demarcated protected forest may be allowed subject to the rules framed under clause (*g*) of section 32 of the Indian Forest Act and subject to the permission of the Central Government under Forest Conservation Act, 1980; and

(*ii*) lease may be granted to any person out of lands vested in the State Government under section 3 of the Himachal Pradesh Village Common Lands Vesting and Utilisation Act, 1974 and the lands vested under section 11 of the Himachal Pradesh Ceiling on Land Holdings Act, 1972, in the interest of the development of the State, if the State Government is satisfied that there are sufficient reasons to do so :

Provided that land vested in the State Government under the Himachal Pradesh Village Common Lands Vesting and Utilisation Act, 1974 shall not be leased out in contravention of the provisions of section 8 of the said Act :

Provided further that no land shall be leased out in a town :

Provided further that no forest land surrendered under the provisions of Himachal Pradesh Ceiling on Land Holdings Act, 1974 or where there are more than 40 trees per acre of valuable species shall not be granted on lease.

(2) Government land which is encroached, shall not be leased to the encroacher. However, the encroached land can be leased out to any eligible person or institutions after ejecting the encroacher.

(3) Except with the previous sanction of the State Government leases of Government lands may not be granted in any tract of country included in any colonization scheme established for lands commanded by State Government canal or in any large tract of country for which there is a prospect of perennial canals being confronted by the State Government.

(4) Lands on lease shall not be granted in contravention of Forest Conservation Act, 1980.

(5) Lease, in planning areas shall not be granted in contravention of the provisions regarding land use contained in the Himachal Pradesh Town and Country Planning Act, 1977 and scheme/rules framed thereunder.

(6) Lands acquired for public purposes shall not be granted on lease.

(7) No government land shall be granted on lease in contravention of Himachal Pradesh Roadside Land Control Act, 1968.

(8) No Government land with a slope of more than 15% shall be granted on lease for cultivation purposes.

(9) Notwithstanding anything contained in this rule, no land shall be leased out in contravention of section 118 of the Himachal Pradesh Tenancy and Land Reforms Act, 1972 in favour of a person who is not an agriculturist within the meaning of sub-section (2) of section 2 of the said Act.

4. *Purposes for which the lease may be granted.*—The lease may be granted for one or more of the following purposes, namely:—

(*i*) establishment/ extension of Educational Institutions ;
(*ii*) installation of Petrol Pumps by individuals/companies ;
(*iii*) construction of temporary sheds by ex-servicemen, I.R.D.P. families and handicapped persons having disability by more than 50%;
(*iv*) construction of stair cases, minor link roads/approach roads/paths, septic tanks, garages, stores and godowns etc. by individuals/local bodies ;
(*v*) establishment/extension of society registered under Societies Registration Act for literary scientific and charitable purposes;
(*vi*) for meritorious public services rendered to the State of Himachal Pradesh ; and
(*vii*) any other public purpose in the interest of the development of the State.

5. *Maximum limit of grant.*—Maximum limit to sanction lease shall be as under:—

(1) Establishment/extension of Educational Institutions,—	
(*a*) For Primary School	2 bighas
(*b*) For Middle School	5 bighas
(*c*) For High School/Higher Secondary/Senior Secondary School/College.	10 bighas
(2) Installation of Petrol Pump	2 bighas
(3) Construction of Gas Godown	1 bigha
(4) Construction of stair cases, link roads/approach roads/ paths, septic tanks, garages, stores and godowns etc.	Actual area required or 1 bigha whichever is less.
(5) Construction of temporary sheds	25 sq. metres.

(6) Establishment/extension of activities of Society for literary, scientific and charitable purposes.	2 bighas
(7) For meritorious public services rendered to the State of Himachal Pradesh.	3 bighas
(8) Other public purposes not specified above in the interest of the development of the State.	20 bighas:

Provided that in the case of an individual applicant if he holds some land under him, the grant of lease for one or more purposes shall be restricted to the extent by which his total holding falls short of 20 bighas.

6. *Eligibility for the grant of land on lease.*—Except as otherwise provided in rule 3, the following institutions/persons will be eligible for the grant of land on lease in the following preference, namely:—

(1) Educational institutions;
(2) Panchayats;
(3) Notified Area Committees, Municipal Committees and Municipal Corporations beyond 2 kilometres from the Municipal limits;

(4) Statutory corporation set up under any enactment of State and Central Government;

(5) Universities of Himachal Pradesh;
(6) Societies of literary, scientific or charitable purposes registered under Societies Registration Act, 1860;

(7) Ex-servicemen, I.R.D.P. families and handicapped persons having disability by more than 50%.
(8) Persons who rendered meritorious public service to the State of Himachal Pradesh.

(9) Others.

7. *Sanction of grant.*—The lease shall be granted by the following authorities to the extent given below:—

(1) By Financial Commissioner (Revenue) upto 5 bighas for a period upto 50 years:

Provided that the lease may be granted for life time for the construction of temporary sheds by ex-servicemen.

(2) By the State Government exceeding 5 bighas but not exceeding 20 bighas for a period upto 99 years or in perpetuity:

Provided that the State Government may grant lease of an area exceeding 20 bighas for public purposes in the public interest.

8. *Lease amount.*—(1) The lease amount (fresh or renewal of existing lease) shall be charged rom the eligible institutions and persons per annum as under:—

(i) Individuals/Private Companies	18% of the latest highest market value of the land leased or double the average market value of five years, whichever is less;

(*ii*) Societies of any litrary, scientific and charitable purposes registered under Societies Registration Act, 1860.	8% of the latest highest market value of the land leased or double the average market value of five years, whichever is less;
(*iii*) Petrol Pumps/Gas godown	18% of the latest highest market value of the land leased or double the average market value of five years, whichever is less;
(*iv*) Persons who rendered meritorious service to the State of Himachal Pradesh.	5% of the latest highest market value of the land leased or double the average market value of five years, whichever is less ;
(*v*) Educational Institutions	5% of the latest highest market value of the land leased or double the average market value of five years, whichever is less ;
(*vi*) Panchayats, Notified Area Committees, Municipal Committees and Municipal Corporations.	5% of the latest highest market value of the land leased or double the average market value of five years, whichever is less.
(*vii*) Boards set up under any enactment of the Himachal Government and Central Government.	5% of the latest highest market value of the land leased or double the average market value of five years, whichever is less;
(*viii*) Statutory Corporations set up under any enactment of State and Central Government.	5% of the latest highest market value of the land leased or double the average market value of five years, whichever is less;
(*ix*) Universities of Himachal Pradesh	5% of the latest highest market value of the land leased or double the average market value of five years, whichever is less;
(*x*) Ex-servicemen, I.R.D.P. families and handicapped persons having disability by more than 50%.	5% of the latest highest market value of the land leased or double the average market value of five years, whichever is less ; and :

Provided that the State Government may reduce the amount for special reasons in deserving cases.

(2) Notwithstanding anything contained in sub-rule (1), the competent authority may charge the latest highest market value or double the average market value of five years whichever is less of the demised land in lump sum and charge Re. 1/- as token lease money per month for the period for which the land is granted on lease.

9. *List of Government lands to be maintained.*—(1) Lists of Government lands excluding lands acquired for public purposes, Nazul lands and encamping grounds in each district shall

Annexure-E

SPECIE-W ISE DETAILS OF THE TREES ALONGWITH COST WHICH REQIRED FELLING IN THE CONSTRUCTION OF 400 KV TRANSMISSION LINES FROM KARCHAM TO JHAKRI IN Nichar FOREST DIVISION.

Div	Species	Sub	V	IV	III	IIA	IIB	IA	IB	IC	ID	IE	Total	Vol. (in cum)
Nichar	Deo.(wetzone)	0	3	5	0	0	0	2	0	4	1	0	15	39.39
	Rate		839	3914				51436		85121	85121			
	Amount	0	2517	19570	0	0	0	102872	0	340484	85121	0	550564	
	Deo.(Dry Zone)	0	9	7	7	11	1	1	1	1	1	0	39	45.37
	Rate		419	3215	9924	23761	35642	47523	59403	67230	67230			
	Amount	0	3771	22505	69468	261371	35642	47523	59403	67230	67230	0	634143	
	Kail (wet zone)	0	2	0	2	4	6	3	9	0	0	0	26	92.37
	Rate		744		12277	24553	38566	52702	70187					
	Amount	0	1488	0	24554	98212	231396	158106	631683	0	0	0	1145439	
	Kail(dry zone)	0	8	2	2	1	0	0	1	0	0	0	14	8.92
	Rate		372	2852	8804	21081			63243					
	Amount	0	2976	5704	17608	21081	0	0	63243	0	0	0	110612	
	Kail (D.S)	0	0	0	0	0	1	0	0	0	0	0	1	2.26
	Rate						14013							
	Amount	0	0	0	0	0	14013	0	0	0	0	0	14013	
	Ash	0	7	4	2	0	0	1	0	0	0	0	14	1.1
	Rate		375	1599	3680	7793	13594	17125						
	Amount	0	2625	6396	7360	0	0	17125	0	0	0	0	33506	
	Chilgoza	0	6	4	5	4	1	1	1	0	0	0	22	25.75
	Rate		375	1599	3680	7793	13594	17125	26720					
	Amount	0	2250	6396	18400	31172	13594	17125	26720	0	0	0	115657	
	Bray	0	0	2	2	0	1	0	0	0	0	0	5	0.9
	Rate			452	1111		3639							
	Amount	0	0	904	2222	0	3639	0	0	0	0	0	6765	
	Brass	0	2	8	2	3	1	0	2	0	0	0	16	3.42
	Rate		47	134	309	633	1015		2031					
	Amount	0	94	804	618	1899	1015	0	4062	0	0	0	8492	
	Siris	0	0	0	0	1	0	0	0	0	0	0	1	0.23
	Rate	0	0	0	0	2346	0	0	0	0	0	0		
	Amount	0	0	0	0	2346	0	0	0	0	0	0	2346	
	Ban	0	0	9	4	4	0	2	1	1	1	0	22	6.95
	Rate			452	1111	2346	3639	5098	6554	7414	8058			
	Amount	0	0	4068	4444	9384	0	10192	6554	7414	8058	0	50114	
	Chil	0	1	1	1	2	0	0	0	0	0	0	5	4.748
	Rate		453	1671	3947	9056	12580							
	Amount	0	453	1671	3947	18112	0	0	0	0	0	0	24183	
Grand total Tree		0	38	40	27	30	11	10	15	6	3	0	180	231.408
Grand Total amount		0	16174	66018	148621	443577	299299	352943	791665	415128	160409	0	2695834	
											S.T. 30%=		808750.2	
											Total		3504584	
											Income tax @ 15%		525688	
											15%surcharge on income tax		78853	
											Grand total Nichar Forest Div.		4109125	

Conservator of Forests,
Rampur Forest Circle,Rampur

Annexure 4

132

HIMACHAL PRADESH
PUBLIC WORKS DEPARTMENT

NO.PW(B)PLINTH AREA/WS(S)- 4089-4129 Dated:- 9/7/98

TO

THE CHIEF ENGINEER(SOUTH),
H.P.W.D.,SHIMLA- 171 001.

THE CHIEF ENGINEER(NORTH),
HPPWD.,DHARAMSHALA.

THE CHIEF ENGINEER(CENTRAL ZONE),
HP.P.W.D.,MANDI.

ALL THE SUPERINTENDING ENGINEERS
IN HIMACHAL PRADESH,P.W.D..

Subject: Plinth Area Rates for preparation of rough cost estimates of buildings.

Jai Hind.

The average Plinth Area Rates for the preparation of preliminary estimates for various buildings were fixed and circulated vide this office letter No. PW(B)Plinth Area/WS(S)-5803-84 dated 27.4.95.

Due to further rise in the cost of materials and also tender rates for the construction of buildings during the last three years, it has been decided to enhance plinth area rates fixed vide above referred letter. The undermentioned Plinth Area Rates will now be applicable for preparation of preliminary estimates for obtaining Administrative Approval & Expenditure Sanctions only:-

i) All types of Residential Buildings Rs.4,200/-P.Sqmtr.

ii) All types of Non-Residential Buildings Rs.3,800/-P.Sqmtr.

However, in case of buildings having richer specifications such as Hospital buildings, Circuit Houses etc., corresponding provision thereof may also be

....Contd...P....2...

(2)

taken into account while framing the preliminary estimates.

The above rates will not be adopted for any other purposes such as assessment of rent/ evaluation of buildings etc..

Engineer-in-Chief,
HP.P.W.D., Shimla-1.

Copy forwarded to:-

1. The Chief Engineer(D), HP.P.W.D., Shimla-1.
2. The Superintending Engineer(Design)I,II & III,HP.P.W.D., Shimla-171 001.
3. All the Executive Engineers(D)(with 5 spare copies each)E.E.(NH), E.E.(SP), E.E.(M) in this office.
4. All Dealing Assistants in works Section in this office.

Engineer-in-Chief,
HP.P.W.D., Shimla-1.

Verma

No SE XI, WS-Misc-3/88 5747-49/D1 - 18-8-88

Copy of above is forwarded to All the EE's working under this Circle for information. Copy to DPB for information.

Annexure E

134

13R-1
16/12/89

HIMACHAL PRADESH
PUBLIC WORKS DEPARTMENT.

No. PW(B)Plinth area/89-3413-3512 Dated Shimla, 8-1-89
To

All the Superintending Engineers,
in Himachal Pradesh, P.W.D.

Subject:- Yard stick Rate for preliminary estimates in respect of buildings.

Enclosed please find a copy of yard stick rates worked out at par with HPSR 1987, for adoption in preparation of preliminary estimates for buildings. In future all preliminary estimates for buildings may be based on these rates plus approved cost Index over HPSR-1987.

In case approved Cost Index is considered not workable or has not been finalised yet premium as per latest approved tender for works in your Circle having similar specification, can be applied giving reference suitably in the remarks column of abstract. Percentage charges for services may please also be applied as indicated in the enclosures.

1: As above.

Engineer-in-Chief,
Himachal Pradesh, PWD;
Shimla-1.
8-1-89

Copy to:

1. All the Superintending Engineers in Head Office for information please.
2. All the Executive Engineers in H.P.P.W.D; for information and necessary action please.

CE Karcham Division

Engineer-in-Chief,
Himachal Pradesh, PWD;
Shimla-1.
8-1-89

No. HOM-BCR-DB-Test Circular/89 Cost Index

Copy to all the AE's under this Division for info & nec.

Copy to 3 spare copies for D/Man/HO

To Whom it may be Concerned.

Certified that the departmental charges for the construction of new buildings in HPPWD is as under :-

(1) For the Deposited works @ 17%

(2) For the Budgeted works @ 15%

Assistant Engineer
Peo. Sub-Division
HPPWD Rekong Peo.

6/11/2000

APPENDIX 4(a)

Letter No.2/HP/19/00-PAC/6239-40 dated 22/24.8. 2000 from CEA

OFFICE OF THE SECRETARY
CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN R.K. PURAM
NEW DELHI-110066

***

No.2/HP/19/00-PAC/ 6239-41 Dated: 22nd August, 2000.

To

The Chairman,
M/s Jaiprakash Industries Ltd.,
JA House, 63 vasant Lok,
Vasant Vihar,
New Delhi-57.

K/A: Shri M.K. Gupta

Subject: Proposal for setting up of Karcham Wangtoo H.E. Project (4x250MW) in Kinnaur District, Himachal Pradesh by M/s Jaiprakash Industries Limited (M/s JIL)-Techno-Economic Clearance- Regarding.

Reference: Your letter Nol.JIL/205 dated 18.4.2000.

Sir,

In continuation to our letter dated 5.7.2000, comments of CWC on environmental impact aspects are annexed. It is requested that the same may please be kept in view while submitting the fresh proposal/DPR.

Yours faithfully,

(AMARJEET SINGH) 22/8/2000
DIRECTOR - PAC

Encl: As above.

Sub:- Karcham- Wangtoo. H.E.P (4x250mW) - H.P

137

Comments of C.W.C on E.I Aspects

On scrutiny of EIA Studies included at Appendix-3 of Vol.IV of the above report, the following comments/observations are made:

The study covers all the aspects of EIA but the information given under "Resettlement" at P-58 is too sketchy. The submergence area is stated to be 59 ha and the people likely to be affected 100 to 150. Even a preliminary survey of the proposed reservoir area does not seem to have been carried out. This should be carried out and if Himachal State Govt. has an R&R policy, the same should be followed in making provisions under R&R. Otherwise, R&R Policy of Nathpa Jhahri Project may be followed and required cost aspects worked out. This is all the more necessary since cost provision made against M-Plantation and X-Environment & Ecology do not include R&R aspects at all.

For the impact evaluation Asian Development Bank format has been adopted. However attempts to attach weights to different impacts and to arrive at quantitative appreciation has not been made. Thus the evaluation remained qualitative

APPENDIX 4(b)

Reply by JIL to CEA's Letter No.2/HP/19/00-PAC/6239-40 dated 22/24.8. 2000

KARCHAM-WANGTOO H.E. PROJECT (1000 MW)

Reply by JIL to CEA's letter NO. 2/HP/19/00-PAC/6239-40 dated 22/24.8. 2000

An 'Implementation Agreement' for execution of this Project has been signed by JIL on 18/11/1999 with GOHP. As per Clause 4.6 of this Agreement, the Government shall , subject to the approval of the GOI or any other competent authority, prepare a rehabilitation and re-settlement plan in association with the Company for local residents likely to be adversely affected or displaced due to construction of the Project at the site as on the Effective date i.e. 18/11/1999. The cost of preparation and implementation of the above plan shall be borne by the Company for which a provision of Rs. 6.10 Crore has been made under B-Land. (Item 4 of Annexure C-2.2(R) on Page C-7).

For the environmental impact evaluation, and preparation of Environmental Management Plans for this Project , National Environmental Engineering Research Institute(NEERI), Nagpur has been assigned the job on Consultancy basis. They have already commenced the field work and detailed EMP has been planned to be submitted to MOEF by end of Dec.2001.

APPENDIX 5(a)

Letter No.2/HP/19/00-PAC/8245-47 dated 22/25.9. 2000 from CEA

GOVERNMENT OF INDIA
CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN R.K. PURAM
NEW DELHI-110066

***

No.2/HP/19/00-PAC/ 8245-47 Dated: 22nd September, 2000.

To

The Chairman,
M/s Jaiprakash Industries Ltd.,
JA House, 63 vasant Lok,
Vasant Vihar,
New Delhi-57.

Subject: Proposal for setting up of Karcham Wangtoo H.E. Project (4x250MW) in Kinnaur District, Himachal Pradesh by M/s Jaiprakash Industries Limited (M/s JIL) - Techno-Economic Clearance - Regarding.

Reference: Your letter Nol.JIL/205 dated 18.4.2000.

Sir,

In continuation to our letter dated 4.9.2000, comments of CWC on Gates aspects are annexed. It is requested that the same may please be kept in view while submitting the fresh proposal/ DPR.

Yours faithfully,

(AMARJEET SINGH)
DIRECTOR – PAC

Encl: As above.

Sub:- Karcham - Wangtoo -- HE (4x250 MW) - H P

Comments on gate aspects

Reference is invited to above letter forwarding therewith five volumes of revised project report of Karcham –Wangtoo H.E Project (H.P.) for technical examination from the viewpoint of provision of Hydromechanical equipment. It may be noted that the original project report was examined and commented vide this office letter No.27/1/96-GD(NW&S)/436 dt.10.10.96. However, the consultants have not given any point-wise reply to this letter.

The present project report has been revised due to relocation of some project works and escalation of costs. The revised project report has been examined and our comments are as under:

1. Vide drg no.1200-05-04-Intake structure, a provision of air vent for intake gates shall be made (Refer this office letter of even No. dt.10.10.96)
2. Vide para 16.6 of Vol-I, make provision of one set of stoplog for intake in line with the estimate vide item no.18 of page C-16 of Vol-III, in place of 2 sets as proposed.
3. Vide Para 16.8 of Vol. I, flushing conduit gates are required to regulate the flow through the conduit and also to isolate the conduit from the river side. The mechanism for wheel load transfer and sealing arrangement as proposed in Drg. No. 1200-006-05 should be modified to suit the condition of water thrust acting from either side of the gate at detailed design stage.

   Also, the consultants be asked to spell out the provisions made for attending to repairs and maintenance requirements of flushing conduit gates.
4. Vide page 16-10 of Vol-I, sill elevation of diversion tunnel gate shall be corrected to read as 1772.00 as per drg no.1200-03-03 of Vol-V in place of 1722.0.
5. Vide page 16-18 of Vol-I, size of outlet gate(at the end of tail race tunnel) shall be corrected to read as 5.250mx10.30m as per drg no.1200-11-01 of Vol.-V in place of 6mx10.5m.
6. Max TWL, Min TWL and normal TWL shown in drg. no.1200-11-01 of Vol-V shall be corrected as per drg. no.1200-10-02 (Rev.2).

Subject to satisfactory compliance of above observations, the project report may be treated as accepted in so far as this Dte is concerned.

Adequacy of cost estimate for Gates and Hydromechanical equipment may be examined by Cost Appraisal (HWF) Dte, CWC.

21/2 91

APPENDIX 5(b)

Reply by JIL to CEA's Letter No.2/HP/19/00-PAC/8245-47 dated 22/25.9.2000

KARCHAM-WANGTOO H.E. PROJECT (1000 MW)

Reply by JIL to CEA's Letter No.2/HP/19/00-PAC/8245-47 dated 22/25.9.2000

1. Drg. No. 1200-05-04 (Intake Structure), has been revised as Drg. No.1200-05-04(Rev.1) to incorporate the comments made by CWC.

2. Para 16.6 of Volume I of DPR has been corrected to conform to one set of stoplogs for intake as provided in Item No.18 of Page C-16 of Volume III.

3. Dr. No.1200-006-05 has been modified to Drg. No.1200-006-05(Rev.1) to incorporate the comments made by CWC.

4. On page 16-8 of Volume I of revised DPR(Dec.2000), the sill elevation of diversion tunnel gate has been corrected to read as El.1772.00.

5. On page 16-13 of Volume I of revised DPR(Dec.2000), the size of outlet gate at the end of tail race tunnel has been corrected to read as 5.25 m x 10.30 m.

6. Maximum TWL, Minimum TWL and normal TWL have been corrected and the revised Drg. No. 1200-11-01(Rev.1) is being enclosed in Volume V of DPR (Dec.2000)

APPENDIX 6(a)

Letter No.2/HP/19/00-PAC/8455-57 dated 4.10.2000 from CEA

GOVERNMENT OF INDIA
CENTRAL ELECTRICITY AUTHORITY
SEWA BHAWAN R.K. PURAM
NEW DELHI-110066
***

No.2/HP/19/00-PAC/ 8455-57 Dated: 4th October, 2000.

To

The Chairman,
M/s Jaiprakash Industries Ltd.,
JA House, 63 vasant Lok,
Vasant Vihar,
New Delhi-57.

Subject: Proposal for setting up of Karcham Wangtoo H.E. Project (4x250MW) in Kinnaur District, Himachal Pradesh by M/s Jaiprakash Industries Limited (M/s JIL) - Techno-Economic Clearance - Regarding.

Reference: Your letter Nol.JIL/205 dated 18.4.2000.

Sir,

In continuation to our letter dated 22.9.2000, comments of CWC on Construction Machinery aspects are annexed. It is requested that the same may please be kept in view while submitting the fresh proposal/ DPR.

Yours faithfully,

(AMARJEET SINGH)
DIRECTOR – PAC

Encl: As above.

Comments on Plant Planning aspects of Karcham-Wangtoo HE Project (4x250 MW), Himachal Pradesh.

1. It is observed that CWC guidelines for working out hourly use rates of construction equipment have not been followed. Under the use rate calculations individual depreciation charges for the equipment have not been included. Instead total depreciation charges of construction equipment have been estimated separately and apportioned to different items of the civil works (chapter D1 of volume-III). The basis for arriving at the depreciation rates for each item of construction equipment has not been indicated in the report.

However, the above method has resulted in very high amount of depreciation charges on account of construction equipment. This is elaborated as follows by taking an example of 3 boom hydraulic jumbos, which are to be deployed for HRT excavation:

As per method adopted in the Report (Chapter D1- Vol.III)

No. of drill jumbo to be deployed for excavation of HRT	12
Life of each machine to be utilised on the project	5000 hrs.
Total hours for drilling in respect of Excavation of HRT	12x5000=60,000
Hours for which depreciation cost charged to the project.	60,000 hr ------(i)

As per equipment Planning (Chapter 21 - Vol.I)

Pull per cycle of excavation	3 mtrs
Time of drilling in each cycle	110 minutes or Say 2 hrs.
Time for which drill jumbo deployed in each cycle including travelling to the face and return	say, 3 hours
Total length of HRT (17,200 m) and cons. Edits (2235 m)	19,435 mtr
No. of cycles for excavation	19435 / 3 = 6479
Total hrs. for which drill jumbos are to be deployed	6479x3= 19435
Depreciation to be charged for Drill jumbos	19,435 hr --------(ii)

Contd...2/-

APPENDIX 6(b)

Reply by JIL to CEA's Letter No.2/HP/19/00-PAC/8455-57 dated 4.10.2000

KARCHAM-WANGTOO H.E. PROJECT (1000 MW)

Reply by JIL to CEA's letter No. 2/HP/19/00-PAC/8455-57 dated 4.10.2000

1. The hourly use rates of construction equipment have been worked out as per 'CWC Guidelines for preparation of Project Estimates for River Valley Projects(Second Revised Edition)- March 1997'. These are contained in Chapter D3 of Revised DPR-Volume III(Dec.2000)

2. While working out the hourly use rate of equipment, depreciation for individual equipment has been worked out as per CWC Guidelines of March 1997.

3. As per CWC Guidelines, no provision has been made on account of 'idle plant and demobilisation' . Also, method of apportioning fixed cost to different item rates adopted in DPR- Volume III (April 2000) has not been followed in the Revised DPR -Volume III(Dec.2000)

APPENDIX 7(a)

Letter No. HPSEB (SECTT.)4019 H/KW/2K/424-25 dated 1.7.2000
from HPSEB

HIMACHAL PRADESH STATE ELECTRICITY BOARD

No.HPSEB(SECTT)4019H)/[illegible]/2K 424-25 Dated: 1.7.2K

To

The Chief Engineer (Projects),
HPSEB, Shimla-4.

Sub: Karcham Wangtoo HEP (1000 MW)

This refers to your office letter No.HPSEB:CEP:35-256/2K-2820 dt. 6.6.2000.

In this regard you are requested to furnish your office comments on other chapters of the DPR submitted by the Company and certificates as per Approach laid down by CEA as desired vide this office letter of even file NO.139-40 dt. 4.5.2000 may also be provided.

The matter may be treated as most urgent.

Chief Engineer (PSP&R),
HPSEB, Shimla-4.

NOO

Copy to M/S Jai Parkash Hydro Power Ltd, JA Annexe, 54 Basant Lok, Vasant Bihar, New Delhi alongwith comments of HPSEB on the Hydrology & Electro-mechanical chapter of the DPR for furnishing replies thereto please..

Encl:As above.

Chief Engineer (PSP&R),
HPSEB, Shimla-4.

BPA

Comments of HPSEB on the Hydrology & Electromechanical Chapter of the DPR.

(A) Hydrology

It has been observed that the following data/information have not been given which may be supplied immediately.

(i) Rainfall-run off correlation studies.

(ii) Ten daily discharges observed at Karcham-Wangtoo for complete period not given in the dPR.

(iii) Regression analysis tabulated in the DPR Vol.III at Table 3.3, 3.4 & 3.5 does not indicate the year/month/block adopted in the analysis.

(iv) In table 3.8 at Page A-3-28, the constituted discharge data for the period 1968-69 to 1993-94 has been tabulated but original ten daily data is missing. The data series are required to be extended upto year, 1999.

(B) Electromechanical Chapter of the DPR

i) The firm may review the erection and commissioning charges on TG set as 7% instead of 10% in view of M/S BHEL's offer to NJPC.

ii) Firm may also review the erection and commissioning charges on Generator Transformer from 10% to 6% on the basis of M/S BHEL's offer to NJPC.

iii) Firm may also review establishment charges from 8% to Rs. 25 crores (to be revised at 12/97 level) on the basis of NJPC.

In addition following deviations from the earlier estimate approved by this office have also been observed.

1. On the imported equipment of 400 KV GIS inland transportation & insurance (including port handling) were agreed at 2% of the basic cost of GIS. However, in the revised cost estimate these charges have been jacked upto 5% and insurance charges @ 1% have been added extra to it.

2. In the earlier estimate (Feb, 96 level) erection and commissioning charges on imported item under Sub-station equipment were agreed at 5% of the basic co of the GIS. However, in the revised esti e, these charges have again been jacked up 10%.

However, the transmission system which may involve inter state issues has not been incorporated in the project report. In this regard, a reference may be made to Firm's letter No.JIL:HPD:96/140 dated 6.12.97 (copy enclosed) vide which they had conveyed that after conclusion of Implementation Agreement, beneficiary to purchase power from Karcham Wangtoo shall be identified. Now that the implementation agreement has been signed, the firm may finalize the purchase agreement.

KW

APPENDIX 7(b)

Reply by JIL to HPSEB'S Letter No. HPSEB(SECTT.) 4019 H/KW/2K /424-25
dated 1.7.2000

KARCHAM-WANGTOO H.E. PROJECT (1000 MW)

Reply by JIL to HPSEB letter No.HPSEB(SECTT.)4019 H/KW/2K/424-25 dated 1.7.2000

A. Hydrology

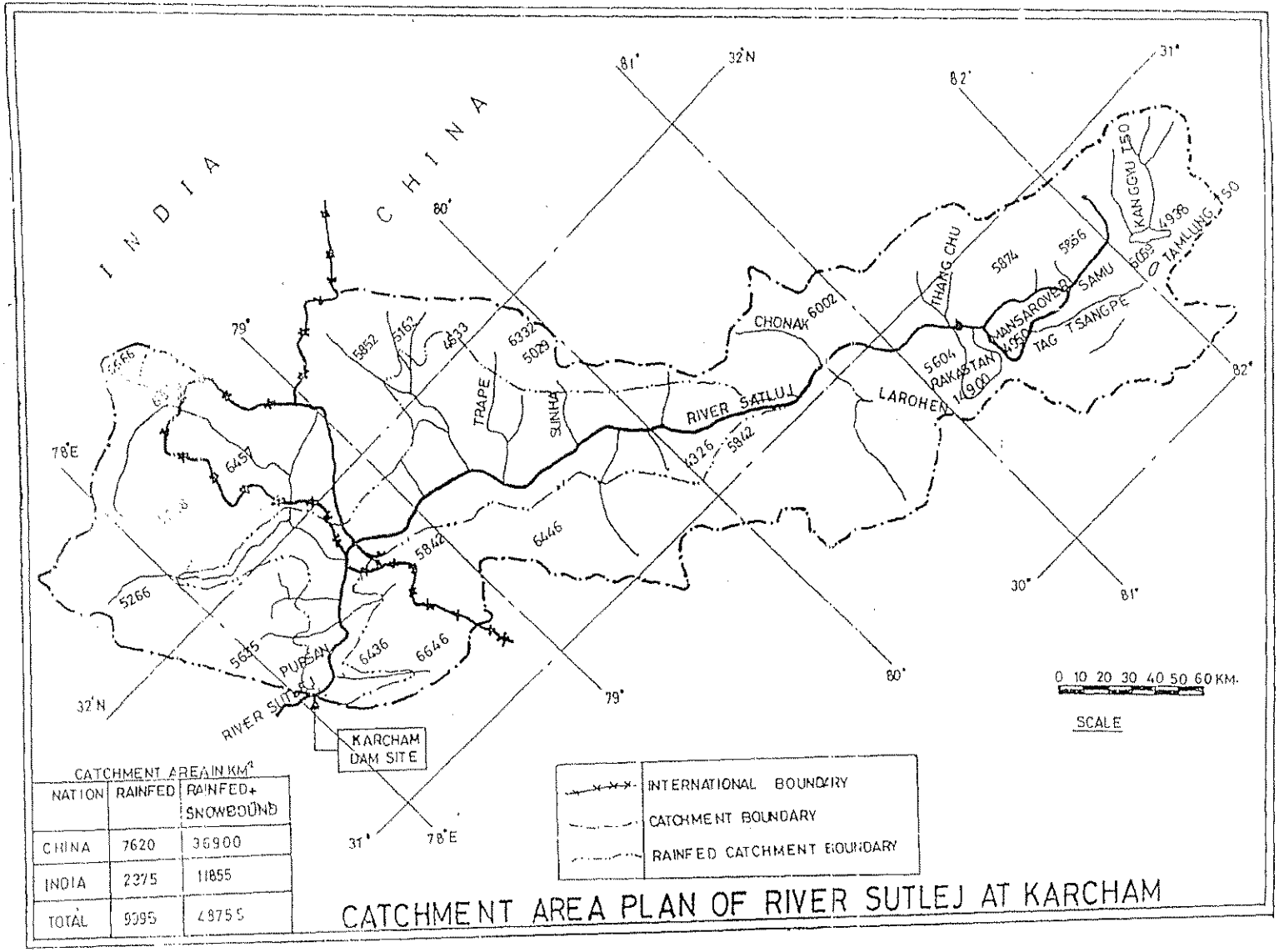
(i) Rainfall-run off correlation studies cannot be provided as more than 75% of the total catchment area lies in Tibet (China) for which no rainfall data is available. Figure showing Catchment area is enclosed for your kind reference.

(ii) A copy of daily discharges data observed at Karcham and Wangtoo is available in our office for reference.

(iii) Regression analysis Tabulated in the DPR Vol.III(Dec.2000) at Tables 3.3, 3.4 and 3.5 has been revised and now indicates the year/ month/block.

(iv) Ten daily discharges at Karcham given in the DPR were worked out on the basis of discharges observed at Wangtoo(90 % of discharge observed at Wangtoo has been taken as discharge at Karcham). However as desired by you, we are enclosing the Ten daily discharge data for Wangtoo for your reference. The data series could not be extended upto 1999 due to non availability of discharge data as the gauge station at Wangtoo bridge site was washed away in the flash floods of 1997. However this data series will be extended as and when more data is obtained.

FIGURE A-3



CATCHMENT AREA IN KM²

NATION	RAINFED	RAINFED+ SNOWBOUND
CHINA	7620	36900
INDIA	2375	11855
TOTAL	9995	48755

CATCHMENT AREA PLAN OF RIVER SUTLEJ AT KARCHAM

AND RUNOFF VOLUMES

1966-67 DISCHARGE

WANGTOO BRIDGE

S.NO. M	YEAR	RUNOFF CUMEC-DAY	RUNOFF HA-M	PROBABILITY % M/(N+1)X100
1.	1972-73	62764.64	542286.50	3.45
2.	1967-68	57520.28	496975.30	6.90
3.	1987-88	55851.32	482555.40	10.34
4.	1989-90	53164.15	459338.30	13.79
5.	1992-93	52166.80	450721.20	17.24
6.	1990-91	51517.20	445108.60	20.69
7.	1988-89	50486.63	436204.50	24.14
8.	1991-92	47771.76	412748.00	27.59
9.	1974-75	46953.26	405676.20	31.03
10.	1983-84	46369.00	400628.20	34.48
11.	1975-76	44702.64	386230.80	37.93
12.	1993-94	44655.43	385822.90	41.38
13.	1978-79	44162.23	381561.70	44.83
14.	1982-83	41649.91	359855.30	48.28
15.	1980-81	40940.02	353721.80	51.72
16.	1977-78	39687.16	342897.10	55.17
17.	1969-70	38814.21	335354.80	58.62
18.	1985-86	37095.70	320506.80	62.07
19.	1979-80	36778.51	317766.30	65.52
20.	1971-72	34869.15	301269.50	68.97
21.	1973-74	33352.80	288351.20	72.41
22.	1984-85	33460.71	289100.60	75.86
23.	1966-67	33405.54	288623.90	79.31
24.	1981-82	33006.16	285173.30	82.76
25.	1968-69	31897.15	275591.40	86.21
26.	1976-77	31849.38	275178.70	89.66
27.	1986-87	31762.14	274424.90	93.10
28.	1970-71	28710.38	248057.70	96.55

N = 28.

1966-67		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	266.051	
	II.	217.317	
	III.	192.557	6951.807
NOV	I.	151.985	
	II.	167.984	
	III.	159.404	4793.730
DEC	I.	136.926	
	II.	121.541	
	III.	116.954	3871.164
JAN	I.	115.026	
	II.	120.531	
	III.	115.172	3622.462
FEB	I.	108.428	
	II.	80.760	
	III.	81.804	2546.312
MAR	I.	84.288	
	II.	86.814	
	III.	90.565	2707.235
APR	I.	91.299	
	II.	108.833	
	III.	128.836	3289.680
MAY	I.	161.018	
	II.	186.160	
	III.	195.579	5623.149
JUN	I.	645.187	
	II.	1291.411	
	III.	1339.765	32763.630
JUL	I.	1480.449	
	II.	1458.633	
	III.	1436.999	45197.810
AUG	I.	1217.694	
	II.	1125.486	
	III.	1062.408	35118.290
SEP	I.	570.805	
	II.	436.243	
	III.	297.850	13048.980
	NON-MON=	33405.540	TOT= 159534.300

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1967-68		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	235.488	
	II.	180.523	
	III.	168.910	6018.120
NOV	I.	154.245	
	II.	136.193	
	III.	106.151	3965.890
DEC	I.	102.818	
	II.	99.265	
	III.	96.473	3082.033
JAN	I.	94.799	
	II.	92.726	
	III.	91.968	2886.898
FEB	I.	93.213	
	II.	93.559	
	III.	94.191	2621.248
MAR	I.	94.830	
	II.	97.554	
	III.	100.810	3032.750
APR	I.	95.479	
	II.	102.379	
	III.	220.455	4183.130
MAY	I.	692.459	
	II.	974.218	
	III.	1369.404	31730.210
JUN	I.	1069.682	
	II.	1450.314	
	III.	1548.517	40685.130
JUL	I.	1218.133	
	II.	1128.060	
	III.	787.156	32120.650
AUG	I.	1060.429	
	II.	1044.890	
	III.	656.041	28269.640
SEP	I.	327.089	
	II.	266.972	
	III.	253.647	8477.080
	NON-MON=	57520.280	TOT= 167072.800

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1968-69		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	151.281	
	II.	130.484	
	III.	92.375	3833.775
NOV	I.	73.116	
	II.	71.351	
	III.	58.597	2030.640
DEC	I.	59.993	
	II.	56.934	
	III.	54.905	1773.225
JAN	I.	53.021	
	II.	50.337	
	III.	51.211	1596.901
FEB	I.	52.453	
	II.	67.382	
	III.	108.289	2064.662
MAR	I.	109.559	
	II.	122.090	
	III.	115.332	3585.142
APR	I.	107.879	
	II.	173.647	
	III.	169.634	4511.600
MAY	I.	244.024	
	II.	369.075	
	III.	579.111	12501.210
JUN	I.	1287.247	
	II.	1337.803	
	III.	1252.553	38776.030
JUL	I.	1356.272	
	II.	1477.041	
	III.	1386.356	43583.050
AUG	I.	1404.297	
	II.	1189.714	
	III.	702.621	33668.940
SEP	I.	604.495	
	II.	468.469	
	III.	302.545	13755.090
	NON-MON=	31897.150	TOT= 161680.300

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1969-70		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	211.421	
	II.	194.271	
	III.	163.778	5858.478
NOV	I.	135.595	
	II.	117.886	
	III.	113.323	3668.040
DEC	I.	113.241	
	II.	102.764	
	III.	96.064	3216.754
JAN	I.	91.206	
	II.	89.959	
	III.	92.025	2823.925
FEB	I.	92.196	
	II.	89.569	
	III.	85.720	2503.410
MAR	I.	75.479	
	II.	78.465	
	III.	97.649	2613.579
APR	I.	114.528	
	II.	168.139	
	III.	240.187	5228.540
MAY	I.	223.760	
	II.	379.033	
	III.	624.869	12901.490
JUN	I.	215.972	
	II.	341.250	
	III.	382.244	9394.660
JUL	I.	682.435	
	II.	618.156	
	III.	555.010	19111.020
AUG	I.	624.689	
	II.	607.591	
	III.	638.831	19349.940
SEP	I.	546.868	
	II.	446.052	
	III.	290.927	12838.470
	NON-MON=	38814.210	TOT= 99508.300

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1970-71		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	210.183	
	II.	170.053	
	III.	135.604	5294.004
NOV	I.	120.864	
	II.	104.768	
	III.	94.089	3197.210
DEC	I.	85.353	
	II.	83.309	
	III.	78.548	2550.648
JAN	I.	76.472	
	II.	74.448	
	III.	72.500	2306.700
FEB	I.	71.249	
	II.	73.241	
	III.	72.332	2023.556
MAR	I.	70.516	
	II.	75.077	
	III.	102.073	2578.733
APR	I.	132.241	
	II.	135.293	
	III.	149.288	4168.220
MAY	I.	183.952	
	II.	200.790	
	III.	249.444	6591.304
JUN	I.	696.733	
	II.	741.766	
	III.	828.843	22673.420
JUL	I.	722.119	
	II.	683.639	
	III.	898.472	23940.770
AUG	I.	1047.120	
	II.	741.956	
	III.	636.398	24891.140
SEP	I.	463.988	
	II.	253.967	
	III.	201.287	9192.420
	NON-MON=	28710.380	TOT= 109408.100

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1971-72		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	171.827	
	II.	162.135	
	III.	131.814	4789.574
NOV	I.	113.492	
	II.	108.614	
	III.	104.847	3269.530
DEC	I.	88.537	
	II.	78.195	
	III.	76.369	2507.379
JAN	I.	71.511	
	II.	72.175	
	III.	72.737	2236.967
FEB	I.	61.309	
	II.	61.709	
	III.	68.733	1780.044
MAR	I.	74.605	
	II.	80.460	
	III.	95.552	2601.722
APR	I.	114.121	
	II.	124.218	
	III.	146.032	3843.710
MAY	I.	195.907	
	II.	355.345	
	III.	757.064	13840.220
JUN	I.	561.833	
	II.	886.961	
	III.	933.085	23818.790
JUL	I.	823.191	
	II.	861.041	
	III.	930.018	27072.520
AUG	I.	890.500	
	II.	842.949	
	III.	681.944	24835.870
SEP	I.	661.336	
	II.	365.127	
	III.	247.525	12739.880
	NON-MON=	34869.150	TOT= 123336.200

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1972-73		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	228.573	
	II.	176.971	
	III.	143.824	5637.504
NOV	I.	121.408	
	II.	107.430	
	III.	104.176	3330.140
DEC	I.	103.962	
	II.	93.095	
	III.	82.579	2878.939
JAN	I.	82.440	
	II.	78.509	
	III.	74.347	2427.307
FEB	I.	81.394	
	II.	78.277	
	III.	77.612	2217.606
MAR	I.	75.657	
	II.	79.233	
	III.	117.414	2840.454
APR	I.	157.914	
	II.	250.967	
	III.	891.962	13008.430
MAY	I.	1452.265	
	II.	629.415	
	III.	873.406	30424.270
JUN	I.	1398.186	
	II.	2078.313	
	III.	1729.973	52064.720
JUL	I.	1482.893	
	II.	1568.606	
	III.	1393.364	45841.990
AUG	I.	987.102	
	II.	992.397	
	III.	1081.007	31686.070
SEP	I.	899.735	
	II.	735.257	
	III.	444.747	20797.390
	NON-MON=	62764.640	TOT= 213154.800

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1973-74		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	297.453	
	II.	231.684	
	III.	179.643	7267.443
NOV	I.	152.670	
	II.	137.713	
	III.	124.070	4144.530
DEC	I.	106.639	
	II.	97.452	
	III.	91.183	3043.923
JAN	I.	85.081	
	II.	77.053	
	III.	79.059	2490.989
FEB	I.	74.647	
	II.	76.181	
	III.	76.553	2120.704
MAR	I.	81.292	
	II.	88.439	
	III.	119.317	3009.797
APR	I.	114.207	
	II.	129.194	
	III.	163.796	4071.970
MAY	I.	292.020	
	II.	253.730	
	III.	213.257	7803.327
JUN	I.	316.540	
	II.	505.408	
	III.	469.066	12910.140
JUL	I.	561.776	
	II.	1069.643	
	III.	965.325	26932.760
AUG	I.	990.447	
	II.	893.992	
	III.	659.396	26097.750
SEP	I.	447.326	
	II.	301.793	
	III.	232.836	9819.550
	NON-MON=	33952.680	TOT= 109712.900

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1974-75		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	148.096	
	II.	132.419	
	III.	114.726	4067.136
NOV	I.	98.537	
	II.	86.457	
	III.	78.719	2637.130
DEC	I.	72.462	
	II.	84.742	
	III.	84.551	2502.101
JAN	I.	83.208	
	II.	81.846	
	III.	99.555	2745.645
FEB	I.	112.655	
	II.	110.546	
	III.	109.622	3108.986
MAR	I.	113.890	
	II.	137.497	
	III.	141.985	4075.705
APR	I.	214.442	
	II.	232.941	
	III.	364.080	8114.630
MAY	I.	444.645	
	II.	753.497	
	III.	701.865	19701.940
JUN	I.	927.862	
	II.	1558.868	
	III.	1253.076	37398.060
JUL	I.	983.916	
	II.	1432.348	
	III.	1194.856	37306.050
AUG	I.	1324.554	
	II.	1486.969	
	III.	859.306	37567.600
SEP	I.	655.799	
	II.	472.399	
	III.	328.281	14564.790
	NON-MON=	46953.260	TOT= 173789.800

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1975-76		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	263.122	
	II.	233.433	
	III.	163.704	6766.294
NOV	I.	143.289	
	II.	121.061	
	III.	103.963	3683.130
DEC	I.	97.399	
	II.	90.863	
	III.	88.049	2851.159
JAN	I.	86.278	
	II.	81.010	
	III.	80.518	2558.578
FEB	I.	84.337	
	II.	87.628	
	III.	81.190	2369.170
MAR	I.	92.032	
	II.	89.917	
	III.	111.375	3044.615
APR	I.	127.416	
	II.	161.660	
	III.	389.226	6783.020
MAY	I.	366.760	
	II.	526.714	
	III.	701.085	16646.680
JUN	I.	1198.717	
	II.	719.463	
	III.	628.155	25463.350
JUL	I.	975.438	
	II.	1213.613	
	III.	1349.789	36738.190
AUG	I.	1005.250	
	II.	835.040	
	III.	651.062	25564.580
SEP	I.	619.517	
	II.	418.845	
	III.	360.827	13991.890
	NON-MON=	44702.640	TOT= 146460.700

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1976-77		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	307.744	
	II.	261.049	
	III.	229.829	8216.049
NOV	I.	167.934	
	II.	143.396	
	III.	129.054	4403.840
DEC	I.	126.780	
	II.	108.652	
	III.	100.289	3457.499
JAN	I.	92.053	
	II.	84.740	
	III.	83.583	2687.343
FEB	I.	82.689	
	II.	81.687	
	III.	81.626	2296.768
MAR	I.	83.226	
	II.	86.795	
	III.	102.457	2827.237
APR	I.	113.115	
	II.	92.077	
	III.	101.639	3068.310
MAY	I.	106.176	
	II.	125.877	
	III.	233.801	4892.341
JUN	I.	427.529	
	II.	234.480	
	III.	1105.757	17677.660
JUL	I.	1589.125	
	II.	1521.348	
	III.	1166.957	43941.260
AUG	I.	1372.633	
	II.	791.754	
	III.	750.224	29896.330
SEP	I.	696.169	
	II.	434.249	
	III.	262.203	13926.210
	NON-MON=	31849.380	TOT= 137290.800

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1977-78		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	176.441	
	II.	148.284	
	III.	132.063	4699.943
NOV	I.	120.254	
	II.	114.798	
	III.	108.583	3436.350
DEC	I.	97.041	
	II.	91.920	
	III.	87.436	2851.406
JAN	I.	83.437	
	II.	80.181	
	III.	78.009	2494.279
FEB	I.	76.172	
	II.	75.695	
	III.	75.394	2121.822
MAR	I.	76.720	
	II.	80.813	
	III.	89.363	2558.323
APR	I.	94.443	
	II.	123.764	
	III.	151.458	3696.650
MAY	I.	303.957	
	II.	680.477	
	III.	725.823	17828.390
JUN	I.	980.633	
	II.	763.411	
	III.	1267.666	30117.100
JUL	I.	1249.661	
	II.	1126.391	
	III.	1085.883	35705.230
AUG	I.	1238.592	
	II.	1135.025	
	III.	855.023	33141.420
SEP	I.	604.788	
	II.	411.398	
	III.	263.313	12794.990

NON-MON= 39687.160 TOT= 151445.900

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1978-79		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	199.139	
	II.	175.801	
	III.	163.400	5546.800
NOV	I.	157.238	
	II.	143.593	
	III.	135.117	4359.480
DEC	I.	128.518	
	II.	123.701	
	III.	119.627	3838.087
JAN	I.	114.538	
	II.	113.116	
	III.	114.554	3536.634
FEB	I.	115.190	
	II.	114.700	
	III.	111.037	3187.196
MAR	I.	110.247	
	II.	119.941	
	III.	125.383	3681.093
APR	I.	182.778	
	II.	229.430	
	III.	365.291	7774.990
MAY	I.	431.153	
	II.	418.400	
	III.	340.220	12237.950
JUN	I.	431.324	
	II.	958.485	
	III.	2064.170	34539.790
JUL	I.	1192.576	
	II.	1350.037	
	III.	1090.701	37423.840
AUG	I.	1026.182	
	II.	929.510	
	III.	644.478	26646.180
SEP	I.	542.789	
	II.	333.884	
	III.	232.196	11088.690
	NON-MON=	44162.230	TOT= 153860.700

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1979-80		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	196.543	
	II.	179.235	
	III.	150.717	5415.667
NOV	I.	136.674	
	II.	127.361	
	III.	112.792	3768.270
DEC	I.	101.468	
	II.	92.016	
	III.	84.423	2863.493
JAN	I.	81.601	
	II.	80.889	
	III.	83.763	2546.293
FEB	I.	76.192	
	II.	71.408	
	III.	76.170	2085.360
MAR	I.	78.687	
	II.	81.385	
	III.	92.443	2617.593
APR	I.	106.975	
	II.	143.824	
	III.	219.484	4702.830
MAY	I.	356.050	
	II.	410.127	
	III.	465.203	12779.000
JUN	I.	672.247	
	II.	770.694	
	III.	1029.065	24720.060
JUL	I.	938.094	
	II.	1085.576	
	III.	963.095	30830.750
AUG	I.	1014.707	
	II.	618.220	
	III.	617.869	23125.830
SEP	I.	435.901	
	II.	348.600	
	III.	250.470	10349.710
	NON-MON=	36778.510	TOT= 125804.900

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1980-81		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	225.715	
	II.	178.443	
	III.	159.552	5796.652
NOV	I.	137.756	
	II.	129.562	
	III.	113.570	3808.880
DEC	I.	101.923	
	II.	93.604	
	III.	91.587	2962.727
JAN	I.	89.152	
	II.	81.458	
	III.	82.836	2617.296
FEB	I.	83.169	
	II.	86.398	
	III.	87.924	2399.062
MAR	I.	89.944	
	II.	93.848	
	III.	107.470	3020.090
APR	I.	115.242	
	II.	175.065	
	III.	235.070	5253.770
MAY	I.	432.705	
	II.	452.526	
	III.	566.294	15081.540
JUN	I.	436.708	
	II.	455.607	
	III.	931.754	18240.690
JUL	I.	704.431	
	II.	934.845	
	III.	1124.646	28763.870
AUG	I.	1110.940	
	II.	900.843	
	III.	617.926	26915.020
SEP	I.	477.175	
	II.	312.554	
	III.	229.044	10187.730
	NON-MON=	40940.020	TOT= 125047.300

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1981-82		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	163.723	
	II.	124.556	
	III.	110.969	4103.449
NOV	I.	114.376	
	II.	109.710	
	III.	100.185	3242.710
DEC	I.	92.999	
	II.	89.385	
	III.	82.626	2732.726
JAN	I.	80.683	
	II.	79.685	
	III.	80.901	2493.591
FEB	I.	85.230	
	II.	82.055	
	III.	83.533	2341.114
MAR	I.	89.274	
	II.	92.111	
	III.	101.635	2931.835
APR	I.	139.121	
	II.	146.313	
	III.	221.493	5069.270
MAY	I.	347.682	
	II.	257.301	
	III.	367.421	10091.460
JUN	I.	645.046	
	II.	1156.272	
	III.	922.313	27236.310
JUL	I.	1300.702	
	II.	1377.899	
	III.	1462.700	42875.710
AUG	I.	1266.532	
	II.	1160.318	
	III.	719.543	32183.470
SEP	I.	519.421	
	II.	422.385	
	III.	283.398	12252.040
	NON-MON=	33006.160	TOT= 147553.700

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1982-83		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	222.332	
	II.	196.793	
	III.	174.439	6110.079
NOV	I.	142.000	
	II.	126.893	
	III.	113.072	3819.650
DEC	I.	104.206	
	II.	95.068	
	III.	87.867	2959.277
JAN	I.	85.423	
	II.	79.519	
	III.	77.508	2502.008
FEB	I.	77.789	
	II.	79.491	
	III.	80.929	2220.232
MAR	I.	81.938	
	II.	90.498	
	III.	92.526	2742.146
APR	I.	125.653	
	II.	131.393	
	III.	191.609	4486.550
MAY	I.	331.969	
	II.	651.593	
	III.	634.032	16809.970
JUN	I.	873.455	
	II.	777.733	
	III.	1182.423	28336.110
JUL	I.	1114.629	
	II.	824.665	
	III.	1356.839	34318.170
AUG	I.	1396.636	
	II.	1154.573	
	III.	1222.674	38961.500
SEP	I.	906.385	
	II.	644.069	
	III.	429.827	19802.810
	NON-MON=	41649.910	TOT= 163068.500

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1983-84		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	324.004	
	II.	268.936	
	III.	231.047	8470.917
NOV	I.	192.758	
	II.	147.216	
	III.	119.299	4592.730
DEC	I.	111.194	
	II.	100.094	
	III.	90.650	3110.030
JAN	I.	88.210	
	II.	86.664	
	III.	84.894	2682.574
FEB	I.	84.056	
	II.	78.987	
	III.	83.557	2298.886
MAR	I.	96.492	
	II.	108.153	
	III.	127.984	3454.274
APR	I.	123.999	
	II.	151.877	
	III.	222.012	4978.880
MAY	I.	333.671	
	II.	492.330	
	III.	774.609	16780.710
JUN	I.	1068.525	
	II.	878.038	
	III.	879.571	28261.340
JUL	I.	885.895	
	II.	656.638	
	III.	870.214	24997.680
AUG	I.	835.823	
	II.	902.012	
	III.	865.211	26895.670
SEP	I.	686.282	
	II.	372.349	
	III.	213.232	12718.630
	NON-MON=	46369.000	TOT= 139242.300

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1984-85		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	175.366	
	II.	127.450	
	III.	121.339	4362.889
NOV	I.	105.503	
	II.	95.845	
	III.	86.111	2874.590
DEC	I.	85.741	
	II.	81.167	
	III.	78.763	2535.473
JAN	I.	74.351	
	II.	80.613	
	III.	85.915	2494.705
FEB	I.	87.444	
	II.	87.573	
	III.	86.524	2442.362
MAR	I.	90.356	
	II.	95.053	
	III.	98.906	2942.056
APR	I.	98.888	
	II.	106.932	
	III.	133.927	3397.470
MAY	I.	176.367	
	II.	237.027	
	III.	752.474	12411.150
JUN	I.	1000.000	
	II.	946.032	
	III.	979.451	29254.830
JUL	I.	1044.604	
	II.	1007.998	
	III.	1106.708	32699.810
AUG	I.	894.719	
	II.	1066.220	
	III.	923.217	29764.780
SEP	I.	718.315	
	II.	386.933	
	III.	251.942	13571.900
	NON-MON=	33460.710	TOT= 138752.000

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1985-86		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	189.874	
	II.	189.485	
	III.	159.124	5543.954
NOV	I.	147.500	
	II.	140.591	
	III.	128.604	4166.950
DEC	I.	120.553	
	II.	111.542	
	III.	93.862	3353.432
JAN	I.	77.985	
	II.	81.297	
	III.	82.346	2498.626
FEB	I.	83.436	
	II.	81.133	
	III.	81.217	2295.426
MAR	I.	83.628	
	II.	86.995	
	III.	92.434	2723.004
APR	I.	111.249	
	II.	151.165	
	III.	227.275	4896.890
MAY	I.	319.031	
	II.	557.012	
	III.	259.727	11617.430
JUN	I.	372.636	
	II.	1246.181	
	III.	1839.696	34585.130
JUL	I.	1367.846	
	II.	1541.826	
	III.	1670.602	47473.340
AUG	I.	1408.284	
	II.	1221.957	
	III.	862.213	35786.750
SEP	I.	704.288	
	II.	226.462	
	III.	121.091	10518.410
	NON-MON=	37095.700	TOT= 165459.300

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

86-87		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
CT	I.	109.741	
	II.	83.632	
	III.	83.462	2851.812
OV	I.	78.518	
	II.	86.194	
	III.	69.912	2346.240
EC	I.	81.157	
	II.	87.873	
	III.	87.985	2658.135
AN	I.	82.890	
	II.	97.670	
	III.	106.470	2976.770
EB	I.	96.350	
	II.	94.510	
	III.	86.180	2598.040
AR	I.	93.720	
	II.	137.800	
	III.	138.940	3843.540
PR	I.	145.390	
	II.	135.130	
	III.	240.130	5206.500
AY	I.	236.880	
	II.	200.850	
	III.	445.800	9281.100
UN	I.	1193.830	
	II.	970.310	
	III.	1130.760	32949.000
UL	I.	1662.530	
	II.	1325.290	
	III.	1606.470	47549.370
UG	I.	1075.780	
	II.	925.290	
	III.	864.690	29522.290
EP	I.	649.280	
	II.	463.420	
	III.	391.680	15043.800
	NON-MON=	31762.140	TOT= 156826.600

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

87-88		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	267.190	
	II.	211.620	
	III.	197.060	6955.760
NOV	I.	168.010	
	II.	104.160	
	III.	130.410	4025.800
DEC	I.	128.810	
	II.	123.320	
	III.	184.890	4555.090
JAN	I.	99.970	
	II.	102.150	
	III.	88.570	2995.470
FEB	I.	85.830	
	II.	83.020	
	III.	89.300	2402.900
MAR	I.	91.060	
	II.	96.670	
	III.	107.040	3054.740
APR	I.	126.630	
	II.	328.390	
	III.	463.360	9183.800
MAY	I.	566.820	
	II.	774.250	
	III.	842.460	22677.760
JUN	I.	797.400	
	II.	909.550	
	III.	1494.080	32010.300
JUL	I.	1423.240	
	II.	1520.820	
	III.	1543.950	46424.050
AUG	I.	1453.150	
	II.	1274.470	
	III.	957.400	37807.600
SEP	I.	706.410	
	II.	523.810	
	III.	520.240	17504.600
	NON-MON=	55851.320	TOT= 189597.800

DAILY DISCHARGE AND RUNOFF VOLUMES

		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
	I.	394.620	
OCT	II.	309.780	
	III.	272.780	10044.580
	I.	308.560	
NOV	II.	305.360	
	III.	264.080	8780.000
	I.	224.350	
DEC	II.	214.760	
	III.	203.670	6631.470
	I.	187.310	
JAN	II.	179.190	
	III.	151.330	5329.630
	I.	128.120	
FEB	II.	122.790	
	III.	121.530	3481.340
	I.	125.220	
MAR	II.	118.680	
	III.	122.890	3790.790
	I.	129.200	
APR	II.	142.230	
	III.	151.570	4230.000
	I.	159.670	
MAY	II.	231.410	
	III.	389.820	8198.820
	I.	723.340	
JUN	II.	506.930	
	III.	579.550	18098.200
	I.	583.630	
JUL	II.	957.140	
	III.	1069.160	27168.460
	I.	425.720	
AUG	II.	426.060	
	III.	522.780	14268.380
	I.	261.630	
SEP	II.	213.450	
	III.	188.970	6640.500

NON-MON= 50486.630 TOT= 116662.200

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1989-90		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	176.320	
	II.	165.200	
	III.	150.200	5067.400
NOV	I.	151.560	
	II.	140.680	
	III.	126.080	4183.200
DEC	I.	114.950	
	II.	107.530	
	III.	101.990	3346.690
JAN	I.	93.640	
	II.	87.630	
	III.	75.930	2647.930
FEB	I.	80.310	
	II.	85.230	
	III.	83.460	2323.080
MAR	I.	85.190	
	II.	104.560	
	III.	118.250	3198.250
APR	I.	125.200	
	II.	156.480	
	III.	243.520	5252.000
MAY	I.	428.350	
	II.	1242.080	
	III.	949.210	27145.610
JUN	I.	943.590	
	II.	861.590	
	III.	1709.070	35142.500
JUL	I.	1430.970	
	II.	1262.800	
	III.	1128.570	39351.970
AUG	I.	1111.160	
	II.	819.430	
	III.	845.160	28602.660
SEP	I.	633.190	
	II.	481.770	
	III.	349.100	14640.600
	NON-MON=	53164.150	TOT= 170901.900

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1990-91		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	280.350	
	II.	245.820	
	III.	213.590	7611.190
NOV	I.	192.450	
	II.	181.590	
	III.	160.630	5346.700
DEC	I.	157.140	
	II.	138.660	
	III.	126.760	4352.360
JAN	I.	113.720	
	II.	98.920	
	III.	89.340	3109.140
FEB	I.	88.940	
	II.	79.750	
	III.	94.770	2445.060
MAR	I.	104.680	
	II.	119.580	
	III.	151.250	3906.350
APR	I.	206.710	
	II.	163.170	
	III.	235.610	6054.900
MAY	I.	425.670	
	II.	621.230	
	III.	747.500	18691.500
JUN	I.	1248.420	
	II.	1374.520	
	III.	1292.310	39152.500
JUL	I.	1518.340	
	II.	1321.250	
	III.	1159.260	41147.760
AUG	I.	909.110	
	II.	719.710	
	III.	754.150	24583.850
SEP	I.	630.500	
	II.	504.745	
	III.	517.980	16532.250
	NON-MON=	51517.200	TOT= 172933.600

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1991-92		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	351.890	
	II.	289.780	
	III.	281.810	9516.610
NOV	I.	359.340	
	II.	289.800	
	III.	298.390	9475.300
DEC	I.	264.670	
	II.	235.330	
	III.	169.000	6859.000
JAN	I.	128.230	
	II.	118.800	
	III.	112.580	3708.680
FEB	I.	116.700	
	II.	115.670	
	III.	119.900	3282.900
MAR	I.	116.860	
	II.	132.320	
	III.	132.090	3944.790
APR	I.	145.630	
	II.	142.380	
	III.	180.220	4682.300
MAY	I.	171.750	
	II.	177.440	
	III.	255.480	6302.180
JUN	I.	287.710	
	II.	426.670	
	III.	427.790	11421.700
JUL	I.	524.900	
	II.	864.930	
	III.	1056.610	25521.010
AUG	I.	671.810	
	II.	1134.870	
	III.	1242.730	31736.830
SEP	I.	983.550	
	II.	783.450	
	III.	735.410	25024.100
	NON-MON=	47771.760	TOT= 141475.400

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1992-93		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	628.390	
	II.	386.970	
	III.	314.170	13609.470
NOV	I.	315.920	
	II.	309.220	
	III.	292.090	9172.300
DEC	I.	270.210	
	II.	251.060	
	III.	235.970	7808.370
JAN	I.	216.390	
	II.	178.600	
	III.	135.920	5445.020
FEB	I.	114.710	
	II.	112.050	
	III.	122.570	3248.160
MAR	I.	124.390	
	II.	128.670	
	III.	125.130	3907.030
APR	I.	122.910	
	II.	127.180	
	III.	130.130	3802.200
MAY	I.	124.990	
	II.	135.310	
	III.	233.750	5174.250
JUN	I.	408.720	
	II.	238.050	
	III.	480.680	11274.500
JUL	I.	511.500	
	II.	797.610	
	III.	682.350	20596.950
AUG	I.	830.370	
	II.	1031.020	
	III.	666.040	25940.340
SEP	I.	766.750	
	II.	588.120	
	III.	574.650	19295.200
	NON-MON=	52166.800	TOT= 129273.800

TEN-DAILY DISCHARGE AND RUNOFF VOLUMES

1993-94		DISCHARGE (CUMEC)	RUNOFF (CUMEC-DAY)
OCT	I.	463.480	
	II.	386.440	
	III.	247.590	11222.690
NOV	I.	201.860	
	II.	184.250	
	III.	171.970	5580.800
DEC	I.	166.450	
	II.	163.070	
	III.	159.280	5047.280
JAN	I.	156.650	
	II.	150.570	
	III.	146.220	4680.620
FEB	I.	138.480	
	II.	130.360	
	III.	129.310	3722.880
MAR	I.	139.520	
	II.	141.130	
	III.	126.070	4193.270
APR	I.	134.920	
	II.	157.100	
	III.	170.810	4628.300
MAY	I.	172.200	
	II.	168.640	
	III.	197.380	5579.580
JUN	I.	336.990	
	II.	413.330	
	III.	896.040	16463.600
JUL	I.	1163.130	
	II.	1027.550	
	III.	1936.800	43211.600
AUG	I.	1986.380	
	II.	1695.040	
	III.	1921.000	57945.200
SEP	I.	1796.640	
	II.	1247.510	
	III.	1366.480	44106.300
	NON-MON=	44655.430	TOT= 206382.100

B. Electro- Mechanical Chapter of the DPR

1. The erection and commissioning charges on TG set has been taken as 10% in line with the CEA/CWC guidelines for cost estimates, which has been adopted for various projects.

2. The erection and commissioning charges for generator-transformer has also been taken as 10%. The CEA/CWC guideline recommends a uniform centage of 10% for erection and commissioning for all equipment.

3. The establishment charge of 8% is also adopted in line with the above guidelines.

4. We have reassessed the various cost i.e. freight, insurance and erection and commissioning charges. These costs are estimated as under :-

- Freight including port handling and storage - 2%
- Transit insurance including insurance to cover erection, testing and commissioning - 1%
- Erection and commissioning - 5%

5. Power Evacuation Aspects

The company is interacting with various parties who intend to purchase power generated from this Project. As soon as the Beneficiary(ies) is/are finalised we shall interact with HPSEB, Powergrid and CEA for setting up of a power evacuation system and also to enter into a Power Purchase Agreement with the Beneficiary. In this connection, our reply to Appendix 2(b) of Volume VI of DPR (Dec.2000) may also be seen.

APPENDIX 8(a)

Letter No. MPP-F(2)15/93-II dated 21.7.2000 from Additional Secretary(Power), GOHP

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MOST IMMEDIATE

No.MPP-F(2)15/93-II
Government of Himachal Pradesh,
Department of MPP and Power.

...

From

F.C.-cum-Secretary(Power)to the
Govt.of Himachal Pradesh, Shimla-2.

To

The Chairman,
M/S Jaiprakash Industries Ltd.,
JA House, 63 Vasant Lok,
Vasant Vihar, New Delhi-110057(India).

Dated: Shimla-2, the 21th July, 2000.

Subject:- Proposal for setting up of Karcham Wangtoo E.Project(1000 MW) in Kinnaur Distt., Himachal Pradesh by M/S Jaiprakash Industri Limited(M/S JIL)- Techno-Economic clearance

Sir,

I am directed to invite your attention to letter No.2/HP/19/00-PAC/5217-28 dated nil from Sh.G.R. Singhal, Director(PAC) O/O The Secretary, CEA, Sewa Bhawan, R.K.Puram, New Delhi addressed to you and copy thereof endorsed to this Deptt.among others on the subject cited above and to request you to please supply the requisite information to the Central Electricity Authority as desired under intimation to this Deptt.

Yours faithfully,

Additional Secretary(Power) to the
Government of Himachal Pradesh.

...

copy to S. MK Chal ji

APPENDIX 8(b)

Reply by JIL to GOHP Letter No. MPP-F(2)15/93-II dated 21.7.2000

KARCHAM- WANGTOO H.E. PROJECT (1000 MW)

Reply by JIL to GOHP Letter No.MPP-F(2)15/93-II dated 21.7.2000

The requisite information desired by CEA vide their letter no.2/HP/19/00-PAC/5217-28 dated July 2000 is contained in Appendix 1(b) of Volume VI of DPR (Dec.2000)

APPENDIX 9(a)

Letter No. HPSEB(SECTT.) 101 (H)/KW/2000-722-24 dated 25.10.2000
from HPSEB

HIMACHAL PRADESH STATE ELECTRICITY BOARD

NO.HPSEB(SECTT)401(H)/KW/2000-722-24 DATED: 25/10/2K

To

M/S Jai Prakash Industries Ltd.,
JA Annexe, 54 Basant Lok,
Vasant Bihar, New Delhi-110057.

Sub: Implementation of Karcham Wangtoo HEP (1000 MW).

Dear Sirs,

In continuation of this office letter of even file No.774 dated 6.9.2K on the cited subject it is to intimate that the replies to the Board comments on the hydrological and Electro-mechanical aspects of the project are still awaited.

On examination of the data obtained after drilling a hole at dam site indicates an over burden in the river bed for a depth of about 50m. You will appreciate that it would be a costly proposition to excavate for such a depth to reach the bed rock. Such excavation would then have to be necessarily filled back with concrete to obtain sound foundation for a concrete dam. This will add to the cost and may render the proposal of the concrete dam as un-economical. It is therefore suggested that a techno-economic analysis of this proposal vis-a-vis an alternative of having barrage with suitable storage to create appropriate peaking capacity may be carried out by M/S JIL and then the most suitable techno-economic alternative could be adopted. In this connection it would be pertinent to point out that an amount of Rs. 301.20 crore has been provided in the revised cost estimate towards the cost of the diversion dam. It is apprehended that the other alternative of providing a diversion barrage may work out to be cheaper.

In view of the above you are requested to reply to the above comments and submit the reply to the comments already conveyed to you.

It is further requested to contact C.E.(P) for comments on civil aspects of the DPR and C.E.(SP) with respect to the comments on Electro-mechanical aspects of the DPR and sort out all the contentions issues with them.

Yours faithfully,

Chief Engineer (PSP&R),
HPSEB, Shimla-4.

APPENDIX 9(b)

Reply by JIL to HPSEB's Letter No. HPSEB(SECTT.) 101 (H)/KW/2000-722-24
dated 25.10.2000

KARCHAM- WANGTOO H.E. PROJECT (1000 MW)

Reply by JIL to HPSEB's letter no. HPSEB(SECTT.) 101 (H)/KW/2000-722-24 dated 25.10.2000

1. The replies to Board's comments on the hydrological and electro-mechanical aspects are contained in Volume VI of DPR (Dec.2000)

2. As suggested, an alternative of having a barrage with suitable storage to create appropriate peaking capacity has been studied. The results of this study are contained in the enclosed Annexure I.

3. Comments from CE(P) on Civil aspects and comments from CE(SP) on Electro-Mechanical aspects have been taken care of in this revised DPR.

Annexure I

KARCHAM- WANGTOO H.E. PROJECT (1000 MW)

Proposal of having a barrage instead of a dam at Karcham

1.0 INTRODUCTION

A preliminary study of having a barrage at Karcham instead of a dam has been made. Since the barrage has to have the same peaking capacity as the dam, the FRL of the reservoir has to be at El. 1810 m with the minimum drawdown level at El.1799 m as proposed for the dam. The hydrological studies taking discharge data upto July 31, 2000 have been presented in Chapter A3, Vol.III of the DPR (Dec.2000). The design flood for the dam has been worked out as 8260 cumec against a design discharge of 5540 cumec adopted earlier.

In the barrage proposal, for passing the design discharge of 8260 cumec to reduce the gate height, 8 no. sluices of 9 m x 9m size with a breast wall above El. 1785 m have been provided with their invert level at El.1776 m instead of at El. 1782 m as provided in the proposal of dam contained in Vol. III of DPR. The invert level for the sluice has been kept at El.1776 m and not at the river bed level so that the hoisting mechanism of the gate remains above the TWL which has been assumed at El.1783.8 m. Energy dissipation of flood water passing over the barrage has been proposed in a hydraulic jump type stilling basin downstream of barrage axis.

2.0 SALIENT DATA

1.	Design Discharge(As per DPR)	8260 cumec
2.	Pond level (As per DPR)	1810 m
3.	Minimum draw down level(As per DPR)	1799 m
4.	Top of Barrage (Same as top of dam in DPR)	1813 m
5.	River Bed Level (As per DPR)	1770 m

6.	Max. width of river Section at El.1810 (As per DPR)	165 m
7.	Max. tail water level (As per DPR)	1783.8 m
8.	Minimum tail water level (During non-monsoons)	1770 m
9.	Intake sill level (As per DPR)	1786 m
10.	Size & no. of spillway sluice at entrance (As per DPR)	9 no. of 9 m(H) x 9 m(W)
11.	Sill level of sluice at entrance (Changed from El.1782 m to El 1776 .0 for barrage)	1776 m
12.	Gate height (As per DPR)	9 m (Breast wall from El.1785.0 to 1813 m to reduce gate height)
13.	Adopting one bay of 9m width as auxiliary bay for escaping debris,no. of 9 m wide effective bays for passing flood discharge of 8260 cumec	8 No.
14.	Pier width (As per DPR)	7 m
15.	Total width of barrage between abutments	(Bays) + (Piers) 9 x 9 + 8 x 7 = 137 m

3.0 DESIGN OF A BARRAGE

3.1 Assume HFL for 8260 cumec design discharge at El.1807 m.

Discharge passing through 8 no. sluice openings during floods with HFL at El.1807.00

Q = (Area of one sluice opening) x (No. of Sluices) x Cd x $\sqrt{2gh}$

$= (9m \times 9m) \times (8) \times (0.6) \times \sqrt{2 \times 9.81 \times (1807 - 1783.8)}$ [Assume Cd= 0.6]

= 81 x 8 x 0.6 x 21.33 m/sec

= 8295 cumec

Thus, a flood of 8260 cumec shall pass through 8 no. sluices with HFL at El.1807.00. This provides enough free board above HFL upto top of barrage which shall be at El.1813.00. (Same as top of dam)

3.2 q(discharge intensity/m) = $\frac{8260}{9 \times 8}$ *cumec/m*

= 114.72 cumec/m

Say 115 cumec/m

(So far barrages have been designed for 'q' being equal to 50 cumec/m. Compared to that, a discharge intensity of 115 cumec m is very high for design of a barrage.)

3.3 Scour depth (R) = $1.35 \times \left[\frac{q^2}{f}\right]^{\frac{1}{3}}$

Taking f = 4 (Same as taken for design of Dakpathar barrage)

R = $1.35 \times \left[\frac{(115)^2}{4}\right]^{\frac{1}{3}}$

= 20.0 m

3.4 Depth of upstream cutoff = 1.25 x R

= 1.25 x 20 = 25 m

3.5 Depth of downstream cutoff(d) = 1.50 x R

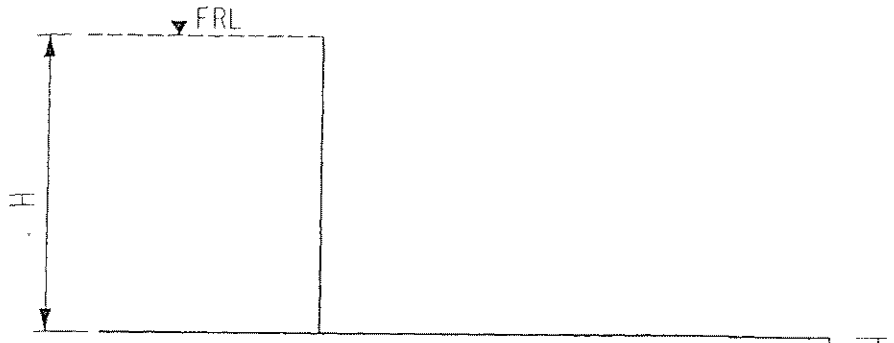
= 1.50 x 20 = 30 m

Bottom level of d/s cut off = 1783.80 - 30
= 1753.80
Say El. 1754 m

3.6 Total floor length

(i) Assume exit gradient (G_E) as 1/5 for river strata consisting of shingles and coarse sand over which the barrage foundation shall rest. Length of floor shall be determined for the condition when the reservoir is at FRL(El. 1810 m) and there is no water in the river d/s of barrage i.e. the TWL (El.1770 m.)

(ii) From Khosla's theory:



H = Head of Water
b = Length of floor
d = Depth of Cut off

Let b = Length of barrage floor
d = Depth of cutoff on d/s end below stilling basin floor at El. 1762 m
= 1762 - 1754 = 8 m
H = Head of water
= FRL - TWL
= 1810-1770 = 40 m

(iii) Exit gradient G_E is defined as

$$G_E = \frac{H}{d} \times \frac{1}{\pi\sqrt{\lambda}} \quad \text{where} \quad (1)$$

$$\lambda = 1 + \frac{\sqrt{1 + \alpha^2}}{2} \qquad (2)$$

$$\& \qquad \alpha = \frac{b}{d} \qquad (3)$$

From equation (1)

$$\frac{1}{5} = \frac{40}{8} \times \frac{1}{\pi\sqrt{\lambda}}$$

$$\frac{1}{\pi\sqrt{\lambda}} = \frac{1}{5} \times \frac{8}{40} = 0.04$$

(Iv) From Fig. 6.11 of Publication No. 179 m 'Manual in Barrage and Weirs on Permeable Foundations' brought out by CBIP in October 1985,

for $\frac{1}{\pi\sqrt{\lambda}} = 0.04$

$$\alpha = 50$$

i.e. $\frac{b}{d} = 50$

$$b = 50 \times 8 = 400 \text{ m}$$

Thus for a barrage to cater for a design discharge of 8260 cumec and to provide for peaking between El.1810 m and El.1799 m, a barrage of about 400 m length would be required to satisfy the exit gradient criteria and to guard against scouring action of the river.

3.7 Energy dissipation

For energy dissipation during floods, it is proposed to provide a hydraulic jump type stilling basin.

(i) H = 1810 - 1770 = 40 m

(ii) V_1 (U/S of sluice gate) = $\frac{8260}{(1807-1770) \times (9\times9+7\times8)}$

= $\frac{8260}{37\times137}$

= 1.63 m/sec

(iii) Velocity head = $\frac{V_1^2}{2g} = \frac{(1.63)^2}{2\times9.81} = 0.135m$

(iv) Level of Total energy line = 1807 + 0.135
on u/s ($E_{1)}$ = 1807.135 m

(v) V_2 (in the basin) = $\frac{8260}{(1783.8-1762.0) \times 137}$

= $\frac{8260}{21.8\times137}$

V_2 = 2.77 m/sec

(vi) Velocity head = $\frac{V_2^2}{2g}$ $\frac{(2.77)^2}{2\times9.81} = 0.390$

(vii) Level of total energy line in the d/s (E_2) = 1783.80 + 0.39

= 1784.19 m

(viii) H_L = $E_1 - E_2$

= 1807.135 - 1784.19

= 22.945 m

Say 23.00m

(ix) q at basin = $\frac{8260}{81+56} = \frac{8260}{137}$

= 60.29

Say 60 cumec/m

(x) Average q (average discharge intensity in the sluices and in the stilling basin)

= $\frac{115 + 60}{2}$

= 175 /2

q = 87.5 cumec/m

(xi) d_1 = $-\frac{d_2}{2} + \sqrt{\frac{2q^2}{gd_2} + \frac{(d_2)^2}{4}}$

Taking d_2 = 21.16

d_1 = $-\frac{21.16}{2} + \sqrt{\frac{2(87.5)^2}{9.81 \times 21.16} + \frac{(21.16)^2}{4}}$

d_1 = $-10.58 + \sqrt{73.77 + 111.94}$

= - 10.58 + 13.62

= 3.04 m

(xii) H_L = $\frac{(d_2 - d_1)^3}{4\ d_1\ d_2}$

= $\frac{(21.16 - 3.04)^3}{4 \times 21.16 \times 3.04}$

= 23.1 m (which is nearly the same as worked out earlier)

(xiii) Length of stilling basin

= $5\ (d_2 - d_1)$

= 5 (21.16 - 3.04)

= 5 x 18.12

= 90.6 m

Thus for energy dissipation, a stilling basin of about 90 m length shall be required. A typical longitudinal section of the barrage is given in figure on at the end of Appendix 9 (b).

3.0 RESULTS OF STUDY

3.1 The total length of the barrage comes to 400 m out of which 118 m length of the barrage is on the downstream and 282 m on the upstream of barrage axis.

3.2 The discharge intensity 'q' for the barrage in the sluice portion is 60 cumec and in the stilling basin portion 115 cumec. In the hilly reaches where sediment movement is tremendous during monsoons, no barrage has been constructed so far for such high intensity of discharge.

3.3 The barrage extends by 282 m upstream of the barrage axis. Near about this location , river Baspa meets the river Satluj. Thus, the upstream

portion of the barrage may be susceptible to damage due to floods in the river Baspa.

3.4 Barrages are normally designed for head of water varying between 10 to 20 m with its crest at the river bed level. This gives a length of the barrage between 100 m to 180 m. In the present case, the FRL being high, the head above river bed at the barrage site becomes 40 m resulting into a 400 m long barrage.

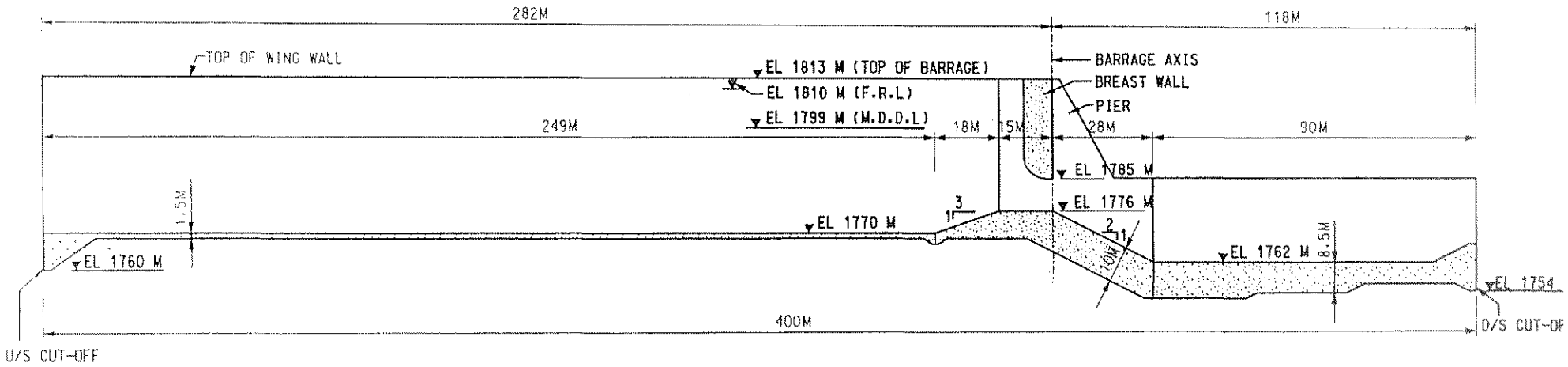
3.5 Full reservoir level (FRL) being at El.1810 m, the height of wing walls and abutments would be of the order of 45 m requiring a minimum base width of about 35 m in the upstream portion of the barrage. This would mean an excavation in the river width of about 137 m(between abutments) plus 2 x 35 m (for abutments) i,e, 207 m for the barrage. The length of dam at top at El.1813 m i.e. the distance between hill faces at El.1813 m is 177.8 m as per Drg. No. 1200-04-02 (Rev.2) of the DPR. To accommodate a excavated width of 207 m in a length of 400 m along the river would involve lot of excavation, destabilise the hill slopes and disrupt road communication for a long time.

3.6 The concrete in the wingwalls , abutments, u/s and d/s floor, piers etc. in case of the barrage is of the order of 8,00,000 m^3 as against 4,44,000 m^3 in case of the dam. Assuming cost of other items to be equal, excess quantity of concrete alone would involve an extra cost of about Rs. 125 Crores in case of a barrage.

4.0 CONCLUSION

In view of the reasons given hereinabove, the proposal of constructing a barrage over permeable foundations does not appear techno-economically feasible. Therefore, the proposal of a dam over rock foundations as envisaged presently is proposed to be adopted.

KARCHAM-WANGTOO H.E. PROJECT (1000 MW)



L-SECTION OF BARRAGE AT KARCHAM

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METRES.