

**BEFORE THE NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH,  
NEW DELHI**

**IN  
ORIGINAL APPLICATION NO.485/2023**

**IN THE MATTER OF:-**

DIWAN SINGH

....APPLICANT

**Versus**

STATE OF UTTARAKHAND

.....RESPONDENT

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THROUGH:



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Dated: 14/05/2024

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**REPLY/OBJECTION ON BEHALF OF RESPONDENT NO.5 (PROJECT PROPONENT) TO THE EXPERT JOINT COMMITTEE REPORT DATED 19.04.2024 SUBMITTED IN COMPLAINEE OF THE ORDER DATED 30.01.2024 PASSED BY HON'BLE NGT.**

**MOST RESPECTFULLY SHOWTH:-**

1. The detail project report (DPR) for Khutani Small Hydro Project (SHEP) having 21 MW Capacity was prepared by Uttarakhand Infrastructure Projects Company Ltd (UIPC). Through science and technology Entrepreneurship Park and department of water resources development, Indian institute of technology (IIT) Roorkee. The said DPR was approved by government of Uttarakhand vide letter No.782/1(2)/2013-04(8)/29/2010 dated 28.03.2013. Later the DPR was revised by IIT Roorkee with cost update during 2015. The updated DPR was also approved by government of Uttarakhand vide letter No. 1103/1/2015-04(08)/129/2010 dated 30.10.2015.

2. The Expert Joint Committee on field investigation has rightly come to the conclusion that the cracks observed in the house of the village Batgeri and Sirsauli are due to poor local construction practices, material use and local site conditions. These cracks are not developed due to works carried out by the project proponent /respondent no.5 at the project construction site.
3. The Expert Joint Committee carried out field investigation and many houses in these villages were inspected by the Expert Joint Committee. Not all houses show cracks and according to villagers, these cracks are old and not developed in recent times. Thus, the construction of the project does not have direct relationship with development of any cracks in the dwellings.
4. That the Expert Joint Committee report is in concurrence with the earlier report of a Joint Committee constituted by this Hon'ble Tribunal vide its order dated 04.08.2023 which has clearly indicated that the dumping site i.e. Site No.2 which is actually in use is 50 Mtr. away from the river, and it has a retaining wall. There is no threat to the aquatic life in the river because of the dumping of muck which is at a considerable distance from the river

with a retaining wall. The Expert Joint Committee constituted by this Hon'ble Tribunal vide its order dated 30.01.2024 had concluded that the boundary wall height need to be enhanced to about 6 ft towards river Sarju to avoid the spillage of debris from Muck dump site no.2. The Project Proponent / Respondent no.5 had duly complied with the observations of the Expert Joint Committee and had increased the height of the retaining wall to 6 Ft.

5. The detail Geological and Geotechnical investigation admittedly had put the Khutani SHEP is located in Seismic Zone-V. Tata Consultancy Engineers Ltd. has put Barrage in Zone-V as per Seismic Zoning Map of India. Kindly relevant extract of Tata Consultancy Engineers Pvt. Ltd. report of January, 2024 is annexed herewith as **Annexure-R/1**.
6. The small hydro power stations like the SHEP in question do not require constructions of any heavy structures. The Geology along the location of various project proponents has been found to be suitable for founding these structures. It is important to note that there are other 5 small hydro power stations being constructed on River Sarju. Considering the large number of active land slide zones along the alignment of water conductor system, it is considered

safe to provide a tunnel to carry water to the power house. Therefore, there is no adverse impact on the surface ecology and environment at all.

7. That a component of the consultancy services of Khutani small hydro electricity project undertaken by TATA Consultingengineers (TCE), the hydrological studies contain in the earlier DPR have been reviewed and updated. The revised detail project report dated 29.01.2024 of TCE clearly depicts that the barrage is in Zone-V as per the seismic Zoning map of India incorporated in IS; 189(Part 1)-2016. The horizontal earthquake force or the inertia forces has been determined the Indian code IS 1893;1984 reaffirmed 1998 criteria for earthquake resistant design of structures is used for calculating seismic coefficient. Therefore the formula given in the extract (Table) attached herewith lays that the basic horizontal seismic Co-efficiency for severe most Zone V from table 2 is 0.08. (Refer table 2 for Zone V). Copy of the review of Seismic co-efficiency and tabular format of measuring values of Basic Seismic Coefficients and Seismic Zone Factors in Different Zone prepared by Tata Consultancy Engineers Ltd. is annexed herewith as **Annexure-R/2.**

8. That Khutani small hydro electric project is a run of the River type of development of small hydro category on Sarju River which falls in the region of middle Himalayas. The entire catchment area is sparsely populated because of steeply sloping mountain ranges, remote location, inaccessibility and lack of ecologically exploitable resources. Since the water conductor system is conceived as a tunnel, its adverse impact on the surface ecology and involvement is absent. Because water conductor system mainly comprise of tunnel, migration of wildlife shall not be effected in any way by the project. Thus there is no adverse impact on forest, wildlife or fish life by this project.
9. In light of the above facts and circumstances, it is submitted that the present original application, being complete devoid of merits deserves to be dismissed.



**RESPONDENT NO.5**  
**(PROJECT PROPONENT)**

THROUGH:



(SSK Advocates & Solicitors)

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**AFFIDAVIT**

I, Santosh Thakur, s/o Sh. Ram Sagarthakur, aged about 46 years having registered office at 720 Mahabir Prasad Block, Asiad Village, New -Delhi 110049:

1. That I am the Authorized Representative of the project proponent/ Respondent No. 5 in the original Application and being well conversant with the facts of the case, am competent to swear this affidavit.
2. That the accompanying reply/objection has been drafted by my counsel under my instructions and I have read the same and have understood the contents thereof, which are true and my knowledge and based on record maintained by the respondent in its normal course of work, and nothing material has been concealed therefrom.
3. That the Annexure to the accompanying reply/objection are true/ certified copies of their respective originals.

*[Handwritten Signature]*

**DEPONENT**

**VERIFICATION:**

Verified at New Delhi on this 14 day of MAY 2024 that the contents of my above affidavit are true and correct to my knowledge, no part of its false and nothing material has been concealed therefrom.

*[Handwritten Signature]*

**DEPONENT**

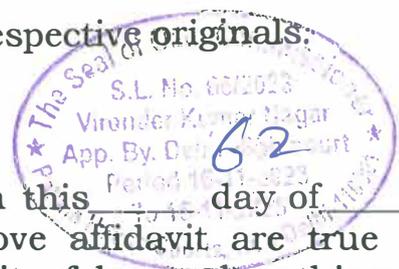
CERTIFIED THAT THE DEPONENT *Santosh Thakur*  
 S/o *Sh. Ram Sagarthakur*  
 Registered Office at *720 Mahabir Prasad Block, Asiad Village, New Delhi 110049*  
 has read and explained to him as true and correct to his knowledge.

*[Handwritten Signature]*  
 Civil Commissioner, Delhi

14 MAY 2024

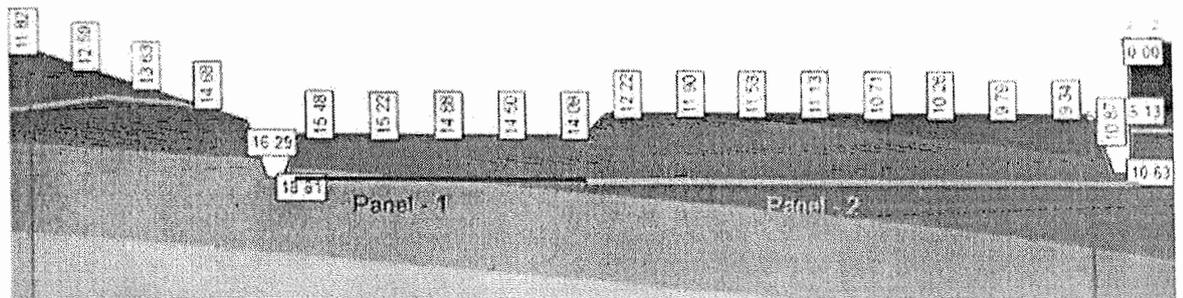
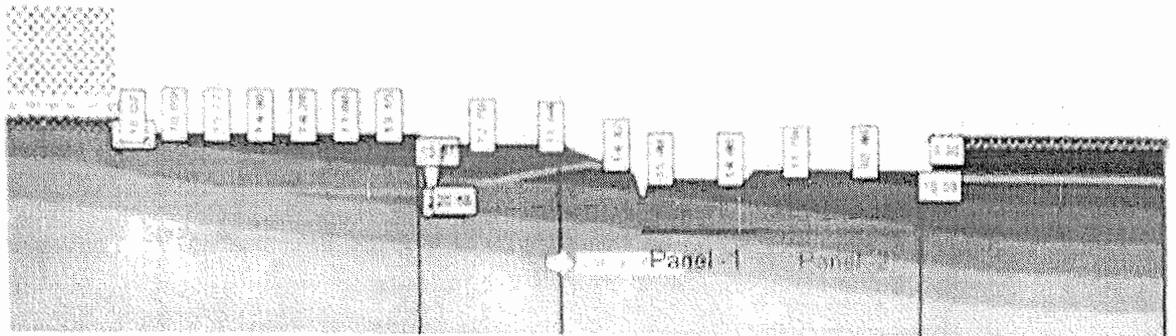
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14 MAY 2024



*[Handwritten Signature]*  
 Identified by Dependent who is present in my presence.

For safety consideration, around 10% more uplift is considered in design to account for the 3-D subsurface flow. For the surety of uplift pressure values seepage analysis has been carried out in Phase2 software. The result shows that the value computed with the software is around 10% higher than the value computed by the Khosla's theory. Therefore, it is found reasonable to adopt 10% more uplift pressure for the design purpose. The result of Phase2 seepage analysis is given below



The hydraulic design and stability analysis of barrage are provided in Annexure 10.A-7.

#### 10.2.4.4 Earthquake Load

Barrage is in Zone V as per the Seismic Zoning Map of India incorporated in IS:1893 (Part-1)-2016. The horizontal earthquake force or the inertia forces has been determined the Indian code IS 1893:1984 reaffirmed 1998 criteria for earthquake resistant design of structures is used for calculating seismic coefficient.

As per seismic coefficient method given in clause 3.4.2.3 of IS 1893

$$a_h = \beta \cdot I \cdot a_0$$



Where

$\beta$  = coefficient depending upon the soil foundation system, from Table 3 = 1

$I$  = factor depending upon the importance of the structure from Table 4 = 3

$\alpha_0$  = basic horizontal seismic coefficient for severe most zone (Zone V) from Table 2 = 0.08

$a_h = 1 \times 3 \times 0.08 = 0.24$

Vertical seismic coefficient,  $a_v = 2/3 a_h = 0.16$

#### 10.2.4.5 Hydrodynamic Load

Due to horizontal acceleration of the foundation and barrage, there is an instantaneous hydrodynamic pressure exerted against the structure in addition to hydrostatic forces. The direction of hydrodynamic force is opposite to the direction of the earthquake acceleration. Based on the assumption that water is incompressible, hydrodynamic pressure at any depth 'y' below the reservoir surface shall be determined as follows:

$$P_e = 0.726 p_E WL$$

$$\text{and } p_E = C_m \cdot K_h \cdot Y_w \cdot WL$$

Where,

$C_m$  = maximum value of pressure coefficient for a given

constant slope and  $C_m = 0.735 \theta / 90^\circ$

where  $\theta$  is the angle in degree, which the u/s face of the dam

made with horizontal  $\theta = 90$

$P$  = hydrodynamic pressure in  $\text{kN/m}^2$  at depth  $y$ ,

$C_s$  = coefficient which varies with shape and depth,

Where,

$C_m$  = maximum value of  $C_s$  obtained,

**Review of seismic coefficient take for structural design for tunnel intake**

*A report on structural design calculation for tunnel intake prepared by M/S Tata Consulting Engineers Limited is also shared with the committee. The report was reviewed in detail. It was found that M/s Tata has wrongly taken the project in Zone IV as per seismic zoning map of India published by BIS. Actually, the project site is located in Zone V. Also, it seems that site-specific seismic studies were not carried out for the project. The Calculations are based on seismic Zone factor only. The recommended horizontal seismic coefficient as per Zone V is 0.24 as per National Committee on Seismic Design Parameters (NCSDP) while M/S Tata has considered 0.11 for calculations*

**TCE's Reply**

Khutani Small Hydro Electric Project is being developed as a low-head 'Run-of-the-River' type development involving a diversion barrage across the Saraju River in the Bageshwar district located in the Kumaon region of Uttarakhand.

The project lies in Zone V as per the Seismic Zoning Map of India incorporated in IS:1893 (Part-1)-2016.

The design horizontal seismic coefficient ( $\alpha_h$ ) for project components are calculated according to Indian Standard IS 1893-1984 reaffirmed 1998 criteria for earthquake resistant design of structures and as given below

As per seismic coefficient method given in clause 3.4.2.3 of IS 1893-1984

$$\alpha_h = \beta \cdot I \cdot \alpha_0$$

Where,

$\beta$  = coefficient depending upon the soil foundation system

$I$  = factor depending upon the importance of the structure

$\alpha_0$  = basic horizontal seismic coefficient

For Barrage

$\beta = 1$  (Refer Table 3)

$I = 3$  (Refer Table 4)

$\alpha_0 = 0.08$  (Refer Table 2 for Zone V)

Therefore, design horizontal seismic coefficient ( $\alpha_h$ ) =  $1 \times 3 \times 0.08 = 0.24$

This is in line with the recommended value as per zone V as per National Committee on Seismic Design Parameters (NCSDP) considering highest value of importance factor.

Therefore, Vertical seismic coefficient for barrage,  $\alpha_v = 2/3 \alpha_h = 0.16$

Similarly, for Tunnel Intake

Importance factor  $I = 1$  being categorised as 'other structure' as per Table 4

Therefore,  
Design horizontal seismic coefficient for tunnel intake ( $\alpha_h$ ) =  $1 \times 1 \times 0.08 = 0.08$

However, In the structural design report for tunnel intake vide Doc. No.: TCE.7784A-CV-CALC-3028-01 (R2), the Seismic Coefficient ( $\alpha_h$ ) was calculated as 0.11 following the formula  $\alpha_h = Z/2 * I/R * S_a/g$  provided in IS:1893 (Part-1)–2016.

It is pertinent to mention that IS:1893 (Part-1)–2016 deals primarily of building structure and the provision indicated in the above code for calculating design seismic coefficient is meant for buildings.

For hydropower structure, mainly dam/barrage/intake, horizontal seismic coefficients are generally calculated as per provision given in clause 3.4.2.3 of IS 1893-1984.

Therefore, the method for calculating design horizontal seismic coefficient following IS:1893 (Part-1)–2016 and seismic zone were wrongly adopted in the structural design report for tunnel intake.

However, the value calculated in the report (0.11) is more than the actual value (0.08) calculated following IS 1893-1984 and thus, will not have any impact in the design aspect.

References:

**TABLE 2 VALUES OF BASIC SEISMIC COEFFICIENTS AND SEISMIC ZONE FACTORS IN DIFFERENT ZONES**

( Clauses 3.4.2.1, 3.4.2.3 and 3.4.5 )

Sl. No.	ZONE No.	METHOD	
		Seismic Coefficient Method	Response Spectrum Method ( see Appendix F )
		Basic horizontal seismic coefficient, $\alpha_0$	Seismic zone factor for average acceleration spectra to be used with Fig. 2, $P_0$
(1)	(2)	(3)	(4)
i)	V	0.08	0.40
ii)	IV	0.05	0.25
iii)	III	0.04	0.20
iv)	II	0.02	0.10
v)	I	0.01	0.05

NOTE — For under ground structures and foundations at 30 m depth or below, the basic seismic coefficient may be taken as 0.5  $\alpha_0$ ; for structures placed between ground level and 30 m depth, the basic seismic coefficient may be linearly interpolated between  $\alpha_0$  and 0.5  $\alpha_0$ .

The seismic coefficients according to 3.4.2.1 for some important towns and cities are given in Appendix E.

IS : 1693 - 1984

**TABLE 3 VALUES OF  $\beta$  FOR DIFFERENT SOIL-FOUNDATION SYSTEMS**

( Clause 3.4.3 )

Sl. No.	TYPE OF SOIL MAINLY CONSTITUTING THE FOUNDATION	VALUES OF $\beta$ FOR					
		Piles Passing Through Any Soil, but Resting on Soil Type I	Piles Not Covered Under Col 3	Raft Foundations	Combined or Isolated RCC Footings with Tie Beams	Isolated RCC Footings Without Tie Beams or Unreinforced Strip Foundations	Well Foundations
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Type I Rock or hard soils	1.0	—	1.0	1.0	1.0	1.0
ii)	Type II Medium soils	1.0	1.0	1.0	1.0	1.2	1.2
iii)	Type III Soft soils	1.0	1.2	1.0	1.2	1.5	1.5

NOTE — The value of  $\beta$  for dams shall be taken as 1.0.

**TABLE 4 VALUES OF IMPORTANCE FACTOR,  $I$**

( Clauses 3.4.2.3 and 3.4.4 )

Sl. No.	STRUCTURE	VALUE OF IMPORTANCE FACTOR, $I$ ( see Note )
(1)	(2)	(3)
i)	Dams ( all types )	3.0
ii)	Containers of inflammable or poisonous gases or liquids	2.0
iii)	Important service and community structures, such as hospitals; water towers and tanks; schools; important bridges; important power houses; monumental structures; emergency buildings like telephone exchange and fire bridge; large assembly structures like cinemas, assembly halls and subway stations	1.5
iv)	All others	1.0

NOTE — The values of importance factor,  $I$  given in this table are for guidance. A designer may choose suitable values depending on the importance based on economy, strategy and other considerations.