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**Minutes of the XIX meeting of National Committee  
on Seismic Design Parameters (NCSDP) for River  
Valley Projects held on 11.04.2008 in CWC, New Delhi**

The XIX meeting of the National Committee on Seismic Design Parameters (NCSDP) for River Valley Projects was held on 11<sup>th</sup> April 2008 at 1100 hours in the Conference Hall, Central Water Commission, New Delhi. Dr. D. V. Thareja, Member (D&R), CWC and Chairman, NCSDP chaired the meeting. The list of members, project representatives and invitees who attended the meeting is given at Annexure I.

**19.1 Welcome by Chairman, NCSDP**

Dr. D.V. Thareja, Member (D&R), CWC welcomed all the participants and invitees of the XIX meeting of NCSDP. This was followed by a brief self-introduction by the participants. Thereafter, the Member-Secretary was requested to take up the agenda items for discussion.

**19.2 Confirmation of the minutes of the last meeting**

The Minutes of the XVIII meeting of NCSDP held on 05/07/07 in the Conference Hall, Central Water Commission, New Delhi under the Chairmanship of Shri. A.B.Pal, the then Member (D&R), CWC were sent to all members vide letter No. CWC/FE&SA/2/2/2007/872-883 dated 06/08/2007. As no comments were received the minutes as circulated were confirmed.

**Item No. 19.3 Follow up actions on Minutes of last meeting**

**Item No. 19.3.1 Vishnugad Pipalkoti H.E. Project, Uttarakhand**

The Vishnugad Pipalkoti HE Project, Uttarakhand, involves construction of a 45m high concrete gravity dam. The project is located at about 1.4 km d/s of Hailang village situated on the left bank of Alaknanda river at latitude 30°31'00"N and longitude 79°29'37"E. As per the seismic zoning map of India IS 1893-Part-1 (2002) the project site lies in seismic zone IV.

The site specific study [Report no.P-2005-01(Sept. - 2005)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. IIT, Roorkee has estimated a PGA value of 0.38g for MCE condition and 0.19g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal spectral accelerations are given in Fig. 3 & Table II of the site specific study report.

Member - Secretary apprised the Committee that the project was discussed in the XVIII meeting and the clarifications on the observations made by Dr. I.D. Gupta, CWPRS, Pune submitted by the Project Authorities was forwarded to Dr. I.D. Gupta and Dr. Gupta has conveyed his approval for adopting the coefficients and response spectra as given in the report.

**The Committee gave the approval for the study.**

**Item No. 19.3.2 Dibang H.E. Project, Arunachal Pradesh**

The Dibang H.E. Project involves construction of a 288m high concrete gravity dam across river Dibang near village Hunli. The project is located at latitude 28°20'07"N and longitude 95°46'38"E.

The proposed site lies in seismic zone V as per the seismic zoning map of India for earthquake resistant design of structures IS1893-Part-1 (2002).

The site specific study [Report no.P-2004-07 (October 2005)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee and copies of the report have already been made available to all the members of the committee. The IIT, Roorkee has estimated the PGA value as 0.38g. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal response spectra are given in Fig. 2 & 3 of site specific study report with multiplication factors 0.38g for MCE condition and 0.19g for DBE condition.

As decided in the last meeting, the reply from the Project Authorities on the comments of Mr. Sujit Das Gupta, of GSI was forwarded to him for his comments. During the meeting Mr. Sujit Das Gupta expressed his reservations in accepting the study carried out by IIT, Roorkee for the project. He reiterated that specific suggestion for undertaking ground geophysical surveys is to bring out the disposition of major regional structures around the project and to have some sub surface picture. He has again cited that in depth studies have been carried in Tibet and Nepal in equally and more rugged terrain and even 3-4 months local seismic network covering the NW oriented structures followed by analyses of data will give valuable inputs for seismic hazard assessment. He stated that an earthquake of magnitude 8.5 had occurred in that region and that should also be accounted for in this studies.

The NHPC stated that investigations are going on and they would be completed in 2009 and accordingly conditional clearance for the project may be given.

The Chairman NCSDP suggested that NHPC should welcome the investigations. He stated that Dibang is a mega project (288m high

concrete gravity dam) involving huge investment and it will invite further global arguments. He said that in order to assure the people that we have thoroughly studied the project, it calls for an in depth study; and asked NHPC to give **an action plan for the investigations suggested alongwith the time required for meeting the target, so the project can then be considered for conditional clearance.**

#### **Item No. 19.3.3 Rangit H.E. Project Stage IV, Sikkim.**

The Rangit H.E. Project Stage IV involves construction of a 44m high concrete gravity dam across river Rangit near village Rishi. The project is located at latitude 27°13'10"N and longitude 88°18'10"E. The proposed site lies in seismic zone IV as per the seismic zoning map of India given in IS1893-(Part-1) 2002.

The site specific study related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by CWPRS, Pune. The CWPRS, Pune has estimated the zero period spectral acceleration values, which are equivalent to the peak ground acceleration (PGA) for horizontal and vertical component of motion as 0.457g and 0.283g respectively. The design response spectra for the horizontal and vertical components of motion are given in Fig. 13 & 14 of site specific study report. For preliminary studies and for initial dimensioning of the structure, seismic coefficients for horizontal ( $\alpha_h$ ) and vertical ( $\alpha_v$ ) component of motion for the maximum section of the dam have been recommended as 0.250g and 0.166g respectively.

The project was discussed in the XVIII meeting, in which Dr. D.K. Paul, IIT, Roorkee raised certain observations on the study. The Committee however accepted the study and accorded conditional approval for the parameters recommended in the study report.

Dr. I.D. Gupta, CWPRS who has conducted the seismic study has submitted clarifications and the same were deliberated upon during the meeting and **the committee approved the response spectra and multiplication factors as given in the above referred report.**

#### **Item No. 19.3.4 Tail Pond dam of Nagarjuna Sagar dam (Satrasala), Andhra Pradesh.**

The Tail Pond dam of Nagarjuna Sagar envisages construction of a 29.5m high concrete dam across the river Krishna 21km d/s of Nagarjuna Sagar Dam at Satrasala in the Guntur district of Andhra Pradesh.. The project is located at latitude 16°37.96'N and longitude 79°29.79'E.

The site specific study [Report no.NGRI-2006-SEISM-540 (March 2006)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by

National Geophysical Research Institute (NGRI), Hyderabad. The project was discussed in the XVII meeting and the Committee suggested that the project authorities should revise their study as the recommended values were too high.

In the last meeting the project authorities presented the revised study by NGRI (Technical report No. NGRI-2006-SEISM-540, June 2007). The revised study estimated the PGA as 0.185g for MCE condition and 0.092g for DBE condition. The Committee then suggested that since the study involved a lot of assumptions it needs to be cross checked with other methods and accorded conditional approval to the coefficients and the response spectrum as per the new report subject to their cross verification with other methods.

The project authorities in the present meeting explained that the study has since been cross checked with other methods and there is hardly any change in the estimated PGA of 0.185g. They have explained that the variation in the PGA when estimated by other methods is of the order of 0.02g and as such the PGA value already estimated as 0.185g may be approved.

The Committee after deliberation on the various approaches in the estimation of the PGA, accepted the study done by NGRI and **approved the maximum estimated PGA value of 0.185g for MCE condition and 0.092g for DBE condition.**

**Item No. 19.3.5 Pakal Dul (Drangdhuran) H.E. Project, Jammu & Kashmir**

The Pakal Dul H.E. Project envisages utilisation of 417m gross head by constructing a 305m long and 167m high concrete faced rockfill dam across the river Marsudar, a tributary of the Chenab in Distt. Doda of J&K state. The project is located at latitude 33°27'30"N and longitude 75°48'50"E.

The proposed site lies in seismic zone IV as per the seismic zoning map of India given in IS 1893-(part-1) 2002.

The site specific study [Report no.EQD-2001/2005-06 (March 2006)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. The IIT, Roorkee has estimated the PGA value as 0.31g. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal response spectra are given in Fig. 3 & Table II of the site specific study report with multiplication factors of 0.31g for MCE condition and 0.16g for DBE condition.

In the XVIII meeting the project authorities (NHPC) submitted the reply given by the department of Earth Quake Engineering, IIT Roorkee. The Committee decided that as the height of the dam is relatively high, the seismic parameters need to be worked out based on the geological set up of the site. The report shall clearly spell out the methodology adopted supported with figures. The Committee decided that a revised report shall be prepared using this approach and submitted.

In the present meeting project authorities submitted a reply received from IIT Roorkee on the comments raised by the Committee during the 18<sup>th</sup> meeting. After deliberations the Committee suggested that the same has to be **circulated among all the Members of the Committee and the project would be considered in the next meeting.**

#### **Item No. 19.3.6 Dhankari Dam (Andaman and Nicobar)**

The existing Dhankari Water supply scheme comprises of a 32.25m high, 132m long concrete dam constructed across Dhankari Nallah. The present scheme envisages increase in the height of the existing dam by 5m in order to augment its live storage capacity by creating an additional storage of 3.2 M.cu.m. The project area lies in the Andaman Nicobar Island bounded by latitudes 11°32'30"N to 11°35'00"N and longitudes 92°40'00"E to 92°42'30" E.

As per the seismic zoning map of India IS 1893-Part-1 (2002) the project site lies in seismic zone V.

The site specific study [Report No.EQ 2003-01] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. IIT Roorkee has estimated the PGA value as 0.51g for MCE condition and 0.255g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The horizontal response spectrum has been given in Fig 3 & Table II of site specific study report.

In the 18<sup>th</sup> meeting the project authorities suggested that they would review the study since there has been a major earthquake that had caused the Tsunami after the present study was conducted.

In the present meeting the project authorities stated that the seismo tectonic modeling was again carried out by IIT Roorkee using the updated earthquake catalogue and the MCE value which is the potential of the seismogenic source has not changed and the same is recommended to be used for the site. Project authorities requested that the values recommended earlier vide report No. EQ-2003-01 may be approved. The Committee felt that the **estimated PGA value of 0.51g by IIT Roorkee is very conservative and accepted the same alongwith the response spectra in the referred report.**

#### **Item No. 19.4 New Projects.**

##### **Item No. 19.4.1 Mankulam HE Project, Kerala**

Mankulam HE Project, Kerala, involves construction of a 50m high concrete gravity dam. The project is located in the Idukki district of Kerala on Melacherry river at latitude 10°07'19"N and longitude 76°55'21"E.

As per the seismic zoning map of India IS 1893-Part-1 the project site lies in seismic zone III.

The site specific study [Report no.4485 (Sept. - 2007)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by CWPRS, Pune. The CWPRS, Pune has estimated the peak ground acceleration for the horizontal and vertical motion as 0.326g and 0.256g respectively. The design basis earthquake (DBE) level of ground motion is recommended to be one half of the MCE level of ground motion.

The project authorities presented the seismic studies and geology of the project area alongwith the salient features of the project. Mr. Sujit Das Gupta of GSI has stated that in Peninsular India the earthquake data availability is less and therefore the Probabilistic approach would not give the correct results.

Dr. Arya expressed that seismologists are working on the higher side of the seismological values and our design values are going higher. Dr. Srikhanda from IIT Roorkee stated that the estimated value of PGA is based only on a single peak of very small time base. The Committee observed that that the effective peak acceleration for this project should be on the lower side of what has been estimated in the present study.

The Committee therefore decided to give conditional clearance to the project for planning purpose with the condition that **the study needs to be revised as the estimated value of PGA is on a higher side.**

##### **Item No. 19.4.2 Singoli Bhatwari H.E. Project, Uttarakhand**

The Singoli Bhatwari HE Project, Uttarakhand, involves construction of a 22m high barrage. The project is located at Rudraprayag district near Okhimath Tehsil on Mandakini river at latitude 30°30'17"N and longitude 79°05'22"E.

As per the seismic zoning map of India IS 1893-Part-1 (2002) the project site lies in seismic zone IV.

The site specific study [Report No.EQD-3012/2007-08(Dec. - 2007)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee which has estimated the PGA value as 0.38g for MCE condition and 0.19g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The horizontal response spectra are given in Fig. 6 & Table-II of site specific study report.

The study has been presented by the project authorities viz: L&T Uttarakhand Hydropower Limited.

The IIT Roorkee have given the design seismic coefficient for dam (Primary Structure) as

$$A_h = \frac{Z}{2} \frac{S_a}{g}$$

To a query from the NCSDP Sectt, that the horizontal seismic coefficient is 1/4 of 5% damped response spectral amplitude of the horizontal ground motion at the natural period, IIT Roorkee clarified that  $A_h$  computed from the above formula is not the horizontal seismic coefficient and that it is horizontal spectral acceleration.

Dr. Arya at this stage stressed the need for preparing the IS 1893-2002 Part-V pertaining to dams to avoid confusion in the use of the site specific studies conducted by the various agencies.

#### **Item No. 19.4.2.1**

The Chairman suggested that the project authorities should prepare a document stating how they are utilizing the recommended seismic parameters approved by the Committee for the dam design. He desired that they should prepare a document listing out the procedures in steps that are followed in the analysis of the dam and also what the designers look for in a BIS code. They should state the methodology and come up with their own recommendations. The document prepared by the Project authorities may also draw from the procedures suggested by ICOLD, US Army Corps of Engineers, the Japanese Code etc. He stated that the document should be as good as a code for earthquake resistant design of a dam. He said that pending submission of that document by the project authorities, only a conditional approval would be accorded to the earthquake studies. Such a condition would be lifted once that document is submitted to FE&SA Dte., CWC.

**The site specific study of the project was accordingly, conditionally cleared by the Committee in accordance with decisions listed in Para 19.4.2.1.**

#### **Item No. 19.4.3 Teesta H.E. Project (Stage-III), Sikkim**

The Teesta H.E. Project (Stage-III), Sikkim, involves construction of a 60m high concrete faced rockfill dam. The project is located at Chungthang village of North Sikkim District situated on Teesta river at latitude 27°35'50"N and longitude 88°39'30"E.

As per the seismic zoning map of India IS 1893-Part-1 (2002) the project site lies in seismic zone IV.

The site specific study [Report No.EQD-3006/2006-07(Aug. - 2007)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. IIT, Roorkee has estimated the PGA value as 0.36g for MCE condition and 0.18g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The horizontal response spectra are given in Fig. 6 & Table-II of site specific study report.

The project authorities presented the seismic studies and geology of the project area alongwith the salient features of the project. After deliberations the **Committee accorded conditional approval to the study, its response spectra and the multiplication factors.**

The Chairman observed that the project authorities should come up with a document as mentioned under Item 19.4.2.1 giving design of the project utilizing the recommended seismic parameters. They should also carry out a design for a fictitious case of 50 m high concrete dam (instead of CFRD as of now) taking the recommended values of seismic parameters of Teesta Stage-III Project. The document should list out the procedures adopted in the analysis of the dam and what the designers are looking for in a BIS code. They should give the methodology and come up with their own recommendations. The document should be as good as the format of a code for earthquake resistant design of a dam.

The site specific study of the project was accordingly accorded conditional approval by the Committee. After the document as suggested by the Committee is received, the project would be put up to the Chairman of NCSDP for formal clearance.

#### **Item No. 19.4.4 Vyasi H.E. Project, Uttarakhand**

The Vyasi H.E. Project, Uttarakhand involves construction of a 86m high concrete gravity dam across river Yamuna near village Hathiari in Dehradun District. The project is located at latitude 30°31'00"N and longitude 77°53'00"E.



The proposed site lies in seismic zone IV as per seismic zoning map of India for earthquake resistant design of structures IS1893-Part-1 (2002).

The site specific study [Report no.P-2004-03 (October 2004)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. IIT, Roorkee has estimated the PGA value as 0.36g for MCE condition and 0.18g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal response spectra are given in Fig. 3 and Table IV.

The project authorities presented the seismic studies and geology of the project area alongwith the salient features of the project. After deliberations the **Committee accorded conditional approval to the response spectra and multiplication factors as given in the above referred report** with the condition that the project authorities should come up with a document as outlined in Para No. 19.4.2.1 of the Minutes.

#### **Item No. 19.4.5 Alaknanda H.E. Project, Uttarakhand**

The Alaknanda HE Project, Uttarakhand, involves construction of 20m high barrage. The project is located at Chamoli district on Alaknanda river at latitude 30° 43.4'N and longitude 79° 29.7'E.

As per the seismic zoning map of India IS 1893-Part-1 (2002) the project site lies in seismic zone IV.

The site specific study [Report No.EQD-3013/2007-08(Oct.- 2007)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. IIT, Roorkee has estimated the PGA value as 0.36g for MCE condition and 0.18g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal spectral accelerations are given in Fig. 5 & Table-II of site specific study report.

The study has been presented by the project authorities viz; the GMR Energy Ltd. Mr. Sujit Das Gupta, GSI wanted to know how the seismic study conducted by IIT Roorkee has taken into account the overburden alluvium on which the barrage is being founded. IIT Roorkee have replied that the effect of overburden has been taken into consideration in the study and that its effect is reflected in the shape of the spectrum – in the amplification and in the depth of the spectrum. Mr. Sujit Das Gupta also desired that this should be brought out in the report including the studies done based on shear wave velocity. The IIT Roorkee stated that they would have to look into their report for the details on the shear wave velocity.

The Chairman NCSDP has stated that as the project DPR is still being examined in CWC/CEA for TEC and additional geotechnical investigations

are on, IIT Roorkee may therefore, look into the issues raised by Mr. Sujit Das Gupta and send a reply to the NCSDP Secretariat. The Committee however, suggested that **the Project authorities may go ahead with their tender stage drawings with the parameters given in the Site Specific Seismic study report.**

The Committee also requested the project authorities to submit a document as outlined in the Para No. 19.4.2.1 of the Minutes.

**Item No. 19.4.6 Sapta Kosi high dam multipurpose project and Sun Kosi storage-cum-diversion scheme, Nepal.**

The Sapta Kosi high dam multipurpose project and Sun Kosi storage-cum-diversion scheme, Nepal, involves construction of a 269m high concrete gravity/rockfill dam across river Sapta Kosi at latitude 26° 53'29" N and longitude 87° 10'14"E and an underground power house in left abutment of the dam. At about 8.0 Km down stream of the Sapta Kosi dam, a 969.9 m long Chhatra barrage at latitude 26° 50'07" N and longitude 87° 08'41"E near Chhatra village. The Sun Kosi storage-cum-diversion scheme involves construction of a 50m high concrete gravity dam at latitude 27° 06'15" N and longitude 86° 28'25"E across river Sun Kosi, a power house at latitude 26° 58'35" N and longitude 86° 25'00"E at the end of a 16.2 Km long diversion tunnel for diverting water of river Sun Kosi to river Kamala, a 51m high rock fill Kamala dam across river Kamala, at latitude 26° 53'52" N and longitude 86° 12'54"E and a 300m long 3.0 m high Chisapani barrage at latitude 26° 55'45" N and longitude 86° 08'57"E at Chisapani.

The site specific study [Report No.4394 (Nov. - 2006)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by CWPRS, Pune. CWPRS, Pune has estimated the PGA value for MCE condition for various components of the project as given below.

Project component	PGA value for MCE condition	
	Horizontal	Vertical
Sapta Kosi dam	0.7202g	0.4975g
Sun Kosi dam	0.6902g	0.4457g
Chhatra barrage	0.6144g	0.4025g
Sun Kosi power house	0.6596g	0.4036g
Chisapani barrage& Kamala dam	0.5009g	0.3370g

The design basis earthquake (DBE) level of ground motion to be used for actual design is recommended to be one half of the MCE level of ground motion.

The project was not presented in the meeting and the Committee therefore decided to consider it in the next meeting when the project authorities should make their presentation.

#### **Item No. 19.4.7 Kelo dam Project, Chhattisgarh**

Kelo dam Project, Chhattisgarh, involves construction of a 24.22m high and 2462 m long earthen section and a 16.0 m high and 192 m long concrete/masonry spillway portion across river Kelo near Danote village in distt. Raigarh. The project is located at latitude 21°57'00"N and longitude 83°23'20"E. As per the seismic zoning map of India IS 1893-Part-1 the project site lies in seismic zone II.

The site specific study [Report No.4444 (April. - 2007)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by CWPRS, Pune. The PGA under MCE condition for horizontal and vertical motion have been recommended by CWPRS as 0.199 g and 0.162g respectively. The value of DBE is recommended to be one-half of the MCE level of motion. The vertical seismic coefficient for both concrete/masonry and earthen dams can be taken as 2/3 of the corresponding horizontal value. The site specific design seismic coefficients of horizontal ( $\alpha_h$ ) and vertical ( $\alpha_v$ ) component of motion for the purpose of conventional stability analysis for the masonry/concrete dam have been recommended as 0.119g and 0.079g and for earthen dam 0.093g and 0.062g respectively.

The project authorities presented the seismic studies and geology of the project area along with the salient features of the project. After deliberations **the Committee accorded approval to the response spectra and multiplication factors as given in the above referred report.** The Committee however pointed out that the study report submitted has some significant typographical errors, which should be corrected and a corrected copy should be submitted to NCSDP Sectt. for record.

#### **Item No. 19.4.8 Upper Narmada Project, Madhya Pradesh**

The Upper Narmada Project, Madhya Pradesh, involves construction of a 30.64m high earthen dam. The project is located near Rinatola Village in Dindori Distt. on Narmada river at latitude 22°51'50"N and longitude 81°23'20"E.

As per the seismic zoning map of India IS 1893-Part-1(2002) the project site lies in seismic zone III.

The site specific study [Technical Report No. 4451 (May 2007)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by CWPRS, Pune. CWPRS, Pune has estimated the PGA value for the horizontal and vertical

motions to be 0.144g and 0.128g respectively for MCE condition. The design basis earthquake (DBE) level of ground motion is recommended as one half of the MCE level of ground motion. The MCE level of smoothed design response spectra for both the horizontal and vertical components of motion are given in Fig 12 of the site specific study report.

After deliberations **the Committee accorded approval to the response spectra and multiplication factors as given in the above referred report.**

#### **Item No. 19.4.9 Pench Diversion Project, Madhya Pradesh**

The Pench diversion Project, Madhya Pradesh, involves construction of a 41.0 m high earthen dam. The project is located near Machagora Village in Chhindwara Distt. on Pench river at latitude 22°7'10" N and longitude 79°10'25"E.

As per the seismic zoning map of India IS 1893-Part-1(2002) the project site lies in seismic zone III.

The site specific study [Technical Report No. 4440 (April 2007)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by CWPRS, Pune. CWPRS, Pune has estimated the PGA value for the horizontal and vertical motions to be 0.199g and 0.178g respectively for MCE condition. The vertical seismic coefficient has been recommended as 2/3 of the corresponding horizontal value. The design basis earthquake (DBE) level of ground motion is recommended as one half of the MCE level of ground motion. The horizontal response spectra are given in Fig. 11 of site specific study report.

The project authorities presented the seismic studies and geology of the project area alongwith the salient features of the project. After deliberations **the Committee accorded approval to the response spectra and multiplication factors as given in the above referred report.**

#### **Item No. 19.4.10 K. L. Rao Sagar Pulichintala Project, Andhra Pradesh**

The K. L. Rao Sagar Pulichintala Project, Andhra Pradesh, involves construction of a 42.24 m high concrete gravity dam. The project is located near Pulichintala Village in Guntur Distt. on Krishna river at latitude 16°46'14" N and longitude 80°03'33" E.

As per the seismic zoning map of India IS 1893-Part-1(2002) the project site lies in seismic zone III.

The site specific study [Technical Report No. 4087 (March 2004)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by CWPRS, Pune. CWPRS, Pune has estimated the PGA value for the horizontal and vertical motions to be 0.1804g and 0.1533 g respectively for MCE condition. The design basis earthquake (DBE) level of ground motion is recommended as one half of the MCE level of ground motion. The horizontal response spectra are given in Fig. 15 of site specific study report.

The project authorities presented the seismic studies and geology of the project area alongwith the salient features of the project. After deliberations **the Committee accorded approval to the response spectra and multiplication factors as given in the above referred report.**

#### **Item No. 19.4.11 Budhil H.E. Project, Himachal Pradesh**

The Budhil HE Project, Himachal Pradesh , involves construction of a 61.5m high concrete gravity dam. The project is located at Chamba district near Village Thalla, Barmour Tehsil on Budhil river at latitude 32°26'48"N and longitude 76°33'26"E.

As per the seismic zoning map of India IS 1893-Part-1 (2002) the project site lies in seismic zone IV.

The site specific study [Report No.EQD-3011/2007-08(Dec. - 2007)] related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. IIT, Roorkee has estimated the PGA value as 0.31g for MCE condition and 0.16g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The horizontal response spectra are given in Fig. 6 & Table II of site specific study report.

The project authorities presented the seismic studies and geology of the project area alongwith the salient features of the project. After deliberations the **Committee accorded conditional approval to the response spectra and multiplication factors as given in the above referred report.** The Committee requested the project authorities to submit a document as outlined in Para No. 19.4.2.1 of the Minutes for the final clearance of the project.

#### **Item No. 19.4.12 Lata Tapovan H.E. Project, Uttarakhand**

The Lata Tapovan HE Project, Uttarakhand , involves construction of a 16m high barrage. The project is located at Chamoli district near Vill. Lata on Dhauliganga river at latitude 30°31'30"N and longitude 79°43'30"E.

As per the seismic zoning map of India IS 1893-Part-1 (2002) the project site lies in seismic zone V.

The site specific study (Report No.EQD-2023/2005-06- March, 2007) related to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. IIT, Roorkee has estimated the PGA value as 0.38g for MCE condition and 0.19g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The horizontal response spectra are given in Fig. 6 and Table II of site specific study report.

The project authorities presented the seismic studies and geology of the project area alongwith the salient features of the project. After deliberations the **Committee accorded conditional approval to the response spectra and multiplication factors as given in the above referred report.** The Committee requested the project authorities to submit the document as outlined in Para No. 19.4.2.1 of the Minutes for the final clearance of the project.

**Item No. 19.4.13 Kundah Pumped Storage H.E. Project (4x125MW), Tamil Nadu.**

The Kundah Pumped Storage H.E. Project, Tamil Nadu is located at latitude 11°20' N to 11°25' N and longitude 76°30'E to 76°40'E. In this project the existing Porthimund reservoir at Porthimund stream as upper reservoir and Avalanche- Emerald reservoir at Porthimund / Avalanche stream as lower reservoir, constructed in 1960 will be utilized as storages.

The project authorities have not carried out site specific seismic study as the reservoirs are in existence over 40 years and all the major structures are under ground.

The proposed site lies in seismic zone III as per seismic zoning map of India for earthquake resistant design of structures IS1893-Part-1 (2002).

The salient features of the project have been presented by the project authority. As the project does not involve construction of any new dam and only a power house and that too 300m underground, it has been stated by the project authorities that no site specific seismic study has been conducted.

The Deptt. Of Earth quake Engg. IIT Roorkee felt that the bed rock motion on the site is to be estimated. Mr. Sujit Das Gupta from GSI opined that rather than the earthquake it is to be evaluated, if any fault is passing through that power house area.

After deliberating on the issue of the necessity of the study, the **Committee decided that site specific seismic study for the project is to be got done by the project authorities.**

**Item No. 19.5.0 Guidelines for Site Specific Seismic Studies for River Valley Projects.**

The item was included in the last two meetings but due to paucity of time it could not be discussed. In the meeting Chairman desired that the detailed analysis listing all assumptions/basis considered in arriving at the response spectra may be brought out by Institutes like IIT Roorkee, IIT Kanpur and leading consulting Agencies like NHPC, NEEPCL, L&T, Jay Pee, NTPC Hydro, LANCO, GMR energy etc. and other corporations like THDC and Teesta Urja so that the approach for arriving the seismic parameters can be finalized and uniformity can be introduced in the studies.

**Item No. 19.6 Other items**

The Committee desired that the Project authorities should submit the site specific seismic study reports in soft as well hard copy to the Sectt. for their record. The Committee desired that the Sectt. should obtain a soft copy of all the reports discussed above.

The Committee has also desired that the site specific seismic study report should also contain a chapter on the seismic parameters already approved for different projects in the vicinity. All the agencies carrying out such studies will make sure to incorporate the same in their reports hence forth.

In the light of discussions the Committee requested Mr Sujit Das Gupta to list out the essential details required to be included in the site specific seismic study report.

The meeting ended with vote of thanks to the Chair.

Annexure -1

**XIX Meeting of National Committee on Seismic Design Parameters**  
**(NCSDP) on River Valley Projects**

**Date : 11.04.2008**

**Attendance**

Sl.No.	Name & Address	Designation	Deptt./ Org.	Status/ Representative
<b><i>I. Committee Members</i></b>				
1.	Dr. D.V. Thareja	Member (D&R)	CWC, New Delhi	Chairman, NCSDP
2.	Sh. S.K. Sen Gupta	Chief Engineer (DSO)	CWC, New Delhi	Member
3.	Sh. Sujit Das Gupta	Director	GSI, Kolkata	Member
4.	Dr. A.S. Arya	Prof. Emeritus	IIT Roorkee	Member
5.	Dr. Ashwani Kumar	Professor	DEQ, IIT Roorkee, Roorkee	Member
6.	Sh. H.S. Mandal	Meteorologist, IMD	IMD Delhi	Member
7.	Sh. J. Jai Raju	Director, FE&SA	CWC, New Delhi	Member-Secy. NCSDP
<b><i>II. Special Invitees</i></b>				
8.	Sh. S.K. Sibbal	Director	CWC	
9.	Dr. M.L. Sharma	Assoc. Professor	DEQ, IIT Roorkee, Roorkee	
10.	Dr. Josodhin Das	Assoc. Professor	DEQ, IIT Roorkee, Roorkee	
11.	Sh. N.N. Rai	Dy. Director	CWC	
12.	Sh. V.C. Gupta	Dy. Director	CWC	
13.	Sh. Shibram Majhi	A.D.	CWC	
14.	Mrs. J.M. Peter	E.A.D.	CWC	
<b><i>III. Project Representatives and Consultants</i></b>				
15.	Sh. Sudarshan	Chief Engineer	A.P. Govt.	Nagarjuna Sagar Tail Pond
16.	Sh. Sinachalpadhy		NGRI, Hyderabad	Nagarjuna Sagar Tail Pond
17.	Sh. P.K. Singh	Superintending Engineer	Andaman PWD	Dhankari Project H.E.
18.	Sh. Imran Sayeed	Chief Geologist	NHPC	Dibang H.E. Project
19.	Sh. M.K. Sharma	C.E.O.	JPCL	Rangit Project
20.	Sh. Rakesh Mahajan	Vice President	Indo Canadian Consultancy	Rangit Project
21.	Sh. R.S. Chadha	Vice President	JPCL	Rangit Project
22.	Sh. K.K. Bhandari	G.M.	JPCL	Rangit Project
23.	Sh. V. Viswanathan Nayar	Dy. C.E.	Kerala Electricity Board	Mankulam H.E. Project
24.	Sh. R.K. Gupta	Sr. Manager	Vyasi H.E. Project	Vyasi H.E. Project
25.	Sh. Rajeev Sethi	V.P. Designs	Teesta Urja	Teesta H.E. Project
26.	Sh. Keshav Deshmukh	C.E. Designs	NHPC	Pakal H.E. Project
27.	Sh. P.K. Gupta	C.E.	NHPC	Pakal H.E. Project



28	Sh. R.G. Shilpkar	Ex. Engineer	Pench Diversion Project	Pench Diversion Project
29	Sh. Rajeev Phirke		Pench Diversion Project	Pench Diversion Project
30	Sh. R.C. Divedi		Kelo Project	Kelo Project
31	Sh. G.S. Sharma		Alaknanda Project	Alaknanda Project
32	Sh. S. Kannan		Alaknanda Project	Alaknanda Project
33	Sh. P.K. Yadav		Singoli Bhatwari	Singoli Bhatwari
34	Sh. H.M. Dayal	Consultant	Singoli Bhatwari	Singoli Bhatwari
35	Sh. Karpana Ganesh	Asst. Manager	Lanco Group	Budhil H.E. Project
36	Mr. A.K. Scod	Consultant	Lanco Group	Budhil H.E. Project
37	Sh. S.N. Das	Consultant	Lanco Group	Budhil H.E. Project
38	Sh. Manoj	Consultant	Lanco Group	Budhil H.E. Project
39	Sh. B. Lakshamana Rao	S.E., Hyderabad	Central Designs Org.	K.L. Rao Sagar Pulichintala Project
	Sh. S. Satyanarayana	S.E., Hyderabad	Central Designs Org.	K.L. Rao Sagar Pulichintala Project