Minutes of the XVII meeting of National Committee on Seismic Design Parameters (NCSDP) for River Valley Projects held on 06.03.2007 in CWC, New Delhi

The XVII meeting of the National Committee on Seismic Design Parameters (NCSDP) for River Valley Projects was held on 6 March 2007 at 1100 hours in the Conference Hall, Central Water Commission, New Delhi. Shri B. S. Ahuja, 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.

17.1 Welcome by Chairman, NCSDP

Shri B.S.Ahuja, Member (D&R), CWC welcomed all the participants and invitees of the XVII 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.

17.2 Confirmation of the minutes of the last meeting

Minutes of the XVI meeting of NCSDP held on 27.10.2006 at NWA, CWC, Pune under the Chairmanship of Shri S. K. Das, Member (D&R), CWC were sent to all members vide letter No.CWC/FE&SA/2/2/2006/1128-39 dated 14.11.2006. Dr.I.D.Gupta, CWPRS raised an objection on Item No.16.4.1 of those minutes pertaining to Chutak HE Project stating that "the Committee had not accepted the recommended values of multiplying factors of MCE and DBE conditions." He observed that the site specific response spectral shape is required to depend in a systematic way in earthquake magnitude and distance, whereas the study for Chutak H.E. Project does not meet this fundamental requirement. The observation was deliberated upon.

Dr. Arya suggested that one has to take a balanced view and not worry too much about the numbers.

After deliberations, it was agreed that minutes as circulated may be approved.

Chairman, NCSDP then urged Dr. I.D. Gupta to make an independent study and derive the values for Chutak HE project, J&K and if there is any difference, it may be discussed in the next meeting. Meanwhile, the values finalized in the XVI meeting could be treated as valid.

17.3 Follow up actions of minutes of last meeting.

17.3.1 Guidelines for Site Specific Seismic Studies for River Valley Projects.

The Committee decided to discuss the guidelines subsequent to the discussion on seismic parameters of projects under the agenda. However, as the time was short, it could not be taken up during the XVII meeting.

17.3.2 Modifications of Site specific Seismic Studies for River Valley Projects.

IIT, Roorkee made a presentation on the recommendations of the following 5 projects, explaining the addendum giving details about the values of earthquake magnitude with relation to site conditions such as project geology including details like faults, MCT, detached planes, their location from project site, etc. This presentation was deliberated upon. IIT, Roorkee also circulated notes on all these 5 projects to all the members.

There was a difference of opinion on the assumption of the angle of fault as 90°. The members felt that assumption of 90° is high.

Dr. Arya observed that it was unnecessary to go into these refinements as it would hardly make any difference.

After the deliberations, the Committee accepted the values of multiplication factors of all the five projects as under :

		MCE	**DBE**
(a)	*Omkareshwar Project, Madhya Pradesh*	*0.20 g*	*0.10 g*
(b)	*Siang Middle (Siyom) Project, Arunachal Pradesh*	*0.45g*	*0.225g*
(c)	*Uri – II HE Project, Jammu & Kashmir*	*0.39 g*	*0.20 g*
(d)	*Nimboo Bazgoo HE Project, J&K*	*0.38 g*	*0.18 g*
(e)	*Kameng HE Project, Arunachal Pradesh*	*0.31g*	*0.155g*

17.3.3 **Site Specific Seismic Study for River Valley Projects**

Member-Secretary apprised the committee that reminders for the following projects were issued to project authorities for expediting the Site Specific Seismic Study Reports.

(a) Rampur H.E.Project, Himachal Pradesh

(b) Brutang Irrigation Project, Orissa

(c) Thotapalli Barrage Project, Andhra Pradesh

(d) Mankulam H.E.Project, Kerala

17.4 Old Projects

17.4.1 Chuzachen H.E.Project

Chuzachen H.E.Project is in the east of Sikkim State and consists of two gravity dams of height 48m and 41m respectively. The Rangpo dam project is located at latitude 27° 12' 14" N and longitude 88° 39' 59" E and Rangli dam project at latitude 27° 14' 30" N and longitude 88° 42' 46" E.

The project site lies in seismic zone IV as per seismic zoning map of India IS:1893 (2002).

The Site Specific Seismic Study Report No.IITK March 2006 relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Kanpur. The IIT, Kanpur has estimated the PGA value of 0.40g.

The project was discussed in the XVI meeting under item No.16.4.2. The committee, after deliberating on the report, then suggested that the response spectra shall be worked out using mean + sigma (84 percentile) basis and not on mean basis as has been done now. Also, the peak of the spectra should be made flatter to reduce its sensitivity to dam frequencies. The committee opined that it is not per se against using a number of attenuation relationships to arrive at different values of multiplying factors for MCE condition, but after undertaking such an exercise, the concerned agency shall opt for one relationship suitable for that site, rather than taking the highest values arising out of such an exercise.

The revised Site Specific Seismic Study Report was presented by Shri P. N. Narula, Dy. D.G.(GSI), Rtd. and consultant, taking into

account all the modifications suggested in item 16.4.2 of the minutes of XVI meeting. A copy of the revised report was also circulated among the members. Chairman suggested that members may take two weeks time to react and give their observations. He further stated that if still after two weeks no comments / observations are received, the factors for the project may be treated as accepted.

17.4.2 Indira Sagar H.E.Project, Polavaram

Indira Sagar H. E. Project envisages construction of 33 m high earth cum rockfill dam across river Godavari. The coordinates of dam site are at latitude 81° 46' N and longitude 17° 13' E.

The project site lies in seismic zone IV as per seismic zoning map of India IS:1893 – Part I (2002).

The Site Specific Seismic Study Report No.P-04-10 (1986) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee.

The project authorities presented the project's salient features and the approach and methodology for arriving at the PGA value of 0.16g for MCE condition.

The Committee, after deliberating on the report, accepted the multiplication factors of 0.16g for MCE condition and 0.08 g for DBE condition.

17.4.3 Karcham Wangtoo H.E.Project, Himachal Pradesh

Karcham Wangtoo H.E.Project involves construction of 98 m high concrete gravity dam across river Sutlej. The project is located in Kinnaur district of Himachal Pradesh at latitude 31° 50' N and longitude 78° 17' E.

The project site lies in seismic zone IV as per seismic zoning map of India IS:1893 – Part I (2002).

The Site Specific Seismic Study Report No.P-2004-05 (August 2005) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee.

The project authorities (Jaypee Group) presented the project's salient features and study report.

Dr. I.D. Gupta opined that the MCE magnitude of 8.0 at a distance of 14 km produces much more acceleration and the mean peak ground acceleration of 0.38g appears to be less. He also felt that the attenuation relation used is not comprehensive.

Dr. Arya stated that the attenuation relation is highly debatable. He stressed that the energy in the peak is the peak multiplied by the time base, and in Himalayas, the attenuation is much faster.

After some more deliberations, the committee accepted the recommended value of 0.38g for MCE condition and 0.19g for DBE condition.

17.4.4 Loharinag Pala H.E.Project, Uttaranchal

Loharinag Pala H. E. Project is a run of the river scheme. The project envisages utilization of a 433 m drop available by constructing a 73.4 m wide barrage across river Bhagirathi near village Loharinag. The project is located at latitude 30° 58' N and longitude 78° 42' E.

The project has been considered to be in seismic zone V as it is on the boundary of seismic zone IV and V.

The Site Specific Seismic Study Report No.2003-10 (July 2005) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee.

The project authorities presented the project's salient features and the study report. The committee felt that the factor 0.38g for MCE condition is highly conservative.

Mr. Sujit Das Gupta suggested that for all future projects to be cleared by NCSDP, the design seismic parameters of existing projects and those already previously approved within a radius of 100 km of the present site, be mentioned in the report along with a location map of all those structures.

After deliberations; the committee accepted the recommended values of multiplication factors 0.38g for MCE condition and 0.19g for DBE condition.

17.4.5 Tapovan Vishnugad H.E.Project, Uttaranchal

Tapovan Vishnugad H. E. Project is a run of the river scheme. The project envisages utilizing a 518 m drop available by constructing a barrage of 75.7 m width, 120 m long with crest elevation at EL 1783 m across river Dhauliganga near village Tapovan. The project is located at latitude 30° 29' 30" N and longitude 79° 37' 30" E.

The project site lies in seismic zone IV as per seismic zoning map of structures IS:1893 – Part I (2002).

The Site Specific Seismic Study Report No.P-2003-11 (July 2005) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. The project authorities presented the project's salient features and study report.

After deliberations, the committee accepted the recommended values of multiplication factors 0.38 g for MCE condition and 0.19 g for DBE condition.

17.4.6 Tail Pond dam of Nagarjuna Sagar dam (Satrasala), Andhra Pradesh.

Tail Pond dam of Nagarjuna Sagar envisages construction of 29.5 m high concrete dam across river Krishna, 21 km downstream of Nagarjuna dam at Satrasala of Andhra Pradesh. The project is located at latitude 16° 37' 96" N and longitude 79° 29' 79" E.

The Site Specific Seismic Study Report No.NGRI-2006-SEISM-540 (March 2006) relating 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 NGRI, Hyderabad presented the project's salient features and the study report. It was informed by them that they have modified their earlier report. In the earlier report, they recommended the value of multiplication factor for MCE condition as 0.311g and no value was given for DBE condition. In the revised report, they have recommended the multiplication factor values as 0.28g for MCE condition and 0.14g for DBE condition.

The committee observed that the basis for the MCE magnitude as 6.5 on Gundlakamma fault at a distance of 24 km and depth of 15 km needs to be provided using past earthquake data and the

tectonic set up in the region around the project site rather than stating that it is from the GSHAP map. The committee also felt that the accelerations of 0.28g and 0.14g are very high as the Nagarjunasagar Dam which stands on the u/s side has not been designed for that factor. The committee therefore, suggested the project authorities to review their study and NGRI agreed to review.

17.4.7 Dibang H.E.Project, Arunachal Pradesh

Dibang H. E. Project involves construction of 288 m 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 project site lies in seismic zone V as per seismic zoning map of India for earthquake resistant design of structures IS:1893 – Part I (2002).

The Site Specific Seismic Study Report No.P-2004-07 (October 2005) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee.

The project authorities presented the project's salient features and site geology. The committee, after deliberating the report, suggested that geophysical investigations are required to be done before arriving at any PGA value as the height of the dam is quite high at 288 m.

Mr. Sujit Das Gupta insisted upon geophysical investigations. After the investigations, the project authorities will have to review the report and resubmit to NCSDP for consideration in the next meeting.

17.4.8 Pakal Dul (Drangdhuran) H.E.Project, Jammu & Kashmir

Pakal Dul H. E. Project envisages utilization of 417m gross head by constructing a 305m long and 167m high concrete faced rockfill dam across the river Marusudar, a tributary of Chenab in District Doda of Jammu & Kashmir state. The project is located at latitude 32° 27' 30" N and longitude 75° 48' 50" E.

The project site lies in seismic zone IV as per seismic zoning map for earthquake resistant design of structures IS:1893 – Part I (2002).

The Site Specific Seismic Study Report No.EQD-2001/2005-06 (March 2006) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee. They have estimated the PGA value of 0.31 g. The project was discussed in the XVI meeting under item No.16.4.3.

Mr Sujit Das Gupta, Director, GSI has observed that almost a thumb rule is being applied to derive MCE, which is 7.5 for MBT and 8.0 for MCT for almost all Himalayan Sites and that the dip of the plane 15° and focal depth of scenario earthquake is 15 km.

The committee felt that this is too much of a simplification to accept as the site specific input parameters. The committee members also deliberated upon the earthquake catalogue appended in the reports and felt that it is not being utilized to its full potential.

The committee, therefore, did not accept the study and it was decided that the site specific study may have to be reviewed.

The committee, after deliberating on the report, suggested that, as has been stated earlier for other projects, for this project too, the logic of arriving at the earthquake magnitude along with the relation of the fault plane distance from the dam has to be made clear and the report should be supported by a diagram explaining all this.

17.4.9(A) Kotlibhel H.E.Project Stage 1A, Uttaranchal

Kotlibhel H. E. Project Stage 1A involves construction of 82.5 m high concrete gravity dam across river Bhagirathi. The project is located near Muneth village at latitude 30° 09' 26" N and longitude 31° 29' 57" E.

The project site lies in seismic zone IV as per seismic zoning map of India IS:1893 – Part I (2002).

The Site Specific Seismic Study Report No.EQD-2013/2005-06 (December 2005) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee.

17.4.9(B) Kotlibhel H.E.Project 1B, Uttaranchal

Kotlibhel 1B H.E.Project involves construction of 70.5 m high concrete gravity dam across river Alaknanda. The project is located at latitude 30° 09' 01" N and longitude 78° 30' 02" E.

The project site lies in seismic zone IV as per seismic zoning map of India IS:1893 – Part I (2002).

The Site Specific Seismic Study Report No.P-EQD-2014/2005-06 (December 2005) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee.

17.4.9(C) Kotlibhel H.E.Project Stage II, Uttaranchal

Kotlibhel H.E.Project Stage II involves construction of 58.6 m high concrete gravity dam across river Ganga. The project is located near Kandiyala village at latitude 30° 04' 05" N and longitude 78° 30' 02" E.

The project site lies in seismic zone IV as per seismic zoning map of India IS:1893 – Part I (2002).

The Site Specific Seismic Study Report No.P-EQD-2015/2005-06 (February 2006) relating to the local and regional geological conditions, earthquake occurrence and seismo-tectonic set up of the region was carried out by IIT, Roorkee.

The committee observed that as in the case of Pakal Dul H.E. Project, in the case of the above three H.E. projects of Kotlibhel (Stage 1A, 1B and II) also a thumb rule is used to derive MCE and this is too much of a simplification and the studies need to be reviewed.

Due to paucity of time, the new projects listed in the agenda viz. Vishnugad Pipalkoti H.E. Project, Uttranchal and Dhankari Dam, Andaman and Nicobar could not be discussed and it was decided to consider them in the next meeting.

The meeting ended with a vote of thanks to the Chair.

Annexure -1

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

Date : 06.03.2007
Attendance

Sl.No.	Name & Address	Designation	Deptt./ Org.	Status/ Representative
I. Committee Members				
1.	Sh. B.S. Ahuja	Member (D&R)	CWC, New Delhi	Chairman, NCSDP
2.	Sh. T.P. Singh	Chief Engineer (DSO)	CWC, New Delhi	Member
3.	Dr. A.S. Arya	National Seismic Advisor, Prof. Emeritus, IIT Roorkee	Ministry of Home Affaira, UNDP, New Delhi	Member
4.	Sh. I.D. Gupta	Joint Director	CWPRS, Pune	Member
5.	Sh. Sujit Das Gupta	Director	GSI, Kolkata	Member
6.	Dr. D.K. Paul	Professor	DEQ, IIT Roorkee, Roorkee	Member
7.	Mr. M. Ravi Kumar	Scientist & Project Leader,	NGRI, Hyderabad	Member
8.	Sh. G. Varun Kumar	S.S.O.C.	Survey of India Dehradun	Representative of Member
9.	Sh. J. Jai Raju	Director, FE&SA	CWC, New Delhi	Member-Secy. NCSDP
II. Special Invitee				
10.	Dr. M.L. Sharma	Assoc. Professor	DEQ, IIT Roorkee, Roorkee	
11.	Sh. Manish Shrikhande	Assoc. Professor	DEQ, IIT Roorkee, Roorkee	
III. Project Representatives and Consultants				
12.	Sh. K. Ramakrishna	S.E., Irrigation	Govt. of Andhra Pradesh	Indira Sagar (Polavaram) Project
13.	Sh. M. Ramachandraiah	S.E.I&CAD	Govt. of Andhra Pradesh	Indira Sagar (Polavaram) Project
14.	Dr. A.R. Chandrasekaran	Retd. Professor IIT Roorkee	Consultant, Govt. of Andhra Pradesh	Indira Sagar (Polavaram) Project
15.	Sh. M. Venkateswara Rao	C.E., Indira Sagar, (Polavaram)	Govt. of Andhra Pradesh	Indira Sagar (Polavaram) Project
16.	Sh. D.P. Goel	M.D.	M/s Jaypee	Karcham Wangtoo H.E.P.
17.	Mr. K.V. Sharma	Consultant	M/s Jaypee	Karcham Wangtoo H.E.P.
18.	Mr. Vipin Kumar	G.M.	M/s Jaypee	Karcham Wangtoo H.E.P.
19.	Mr. A. Rajagopalan		M/s GATI Infrastructures Ltd.	Chuzachen H.E. Project

20.	Sh. P.L. Narula	Consultant	Ex Dy. Director General, GSI	Chuzachen HE Project
21.	Sh. S. Chaudhary	Asstt. Manager	NHPC	Kotlibhel H.E. Project
22.	Sh. Imran Sayeed	Chief Geologist	NHPC	Chutak HE Project, Kotlibhel HE Project 1-A, 1B and Stage-2 Debang and Pakal Dul HE Project
23.	Sh. S.C. Gupta	A.G.M.	NTPC Ltd., Noida	Tapovan Vishungad HE Project, Loharinagpala HaE Project
24.	Sh. P.R. Rawat	Dy. CDE	NTPC Ltd., Noida	Tapovan Vishungad HE Project, Loharinagpala HaE Project
25.	Sh. S.K. Dutt	Dy. CDE	NTPC Ltd., Noida	Tapovan Vishungad HE Project, Loharinagpala HaE Project
26.	Sh. P.K. Jain	Sr. Manager (Civil)	NHPC Faridabad	Chutak HE Project, Kotlibhel HE Project 1-A, 1B and Stage-2 Debang and Pakal Dul HE Project
27.	Sh. D.K. Joshi	Sr. Manager (Geo)	NHPC Faridabad	Chutak HE Project, Kotlibhel HE Project 1-A, 1B and Stage-2 Debang and Pakal Dul HE Project
28.	Sh. S.P. Jalote	Consultant Geologists	Jaiprakash Industry	Vishnugad Pipalkoti HE Project
29.	Sh. J.K. Varshney	Manager	THDC Ltd.	Vishnugad Pipalkoti HE Project
30.	Sh. T.S. Routela	Sr. Manager	THDC Ltd.	Vishnugad Pipalkoti HE Project
31.	Sh. P. Solomon Raju		NGRI Hyderabad	Nagarjuna Sagar Tail Pond
32.	Sh. Sudarshan	SE	A.P. Govt.	Nagarjuna Sagar Tail Pond
33.	Sh. Raghotham UR	Consultant	STUP Consultants Pvt. Ltd.	Nagarjuna Sagar Tail Pond
34.	Sh. Nagi Reddy	Officer technical	Govt. of A.P.	Indira Sagar (Polavaram) Project
35.	Sh. B.S.N. Murty	Dy. Ex. Engineer	Govt. of A.P.	Indira Sagar (Polavaram) Project