National Committee on Seismic Design Parameters (NCSDP) for River Valley Projects

MINUTES OF 28th MEETING (9th January, 2015)

Secretariat

Foundation Engineering & Special Analysis (FE&SA) Directorate
Central Water Commission
New Delhi

MINUTES OF THE 28TH MEETING OF
NATIONAL COMMITTEE ON SEISMIC DESIGN PARAMETERS FOR RIVER VALLEY PROJECTS
HELD ON 9TH JANUARY, 2015 IN CWC, NEW DELHI

GENERAL

The 28th meeting of the National Committee on Seismic Design Parameters (NCSDP) for River Valley Projects was held on 9th January, 2015, at Central Water Commission, New Delhi under the chairmanship of Sh. C. K. Agrawal, Member (D&R), CWC. The list of Members, invitees and project representatives who attended the meeting is given at ***Annexure I***.

Meeting commenced with Sh. C. K. Agrawal, Chairman, NCSDP welcoming the participants of the meeting followed by a brief introduction of the participants.

Before taking up the Agenda items for discussion, Member Secretary informed the Committee that some observations of CWPRS on the site specific studies carried out by IIT Roorkee have been received in the Secretariat and the same was forwarded to IIT Roorkee for their response. The observations of CWPRS and response received from IIT Roorkee were circulated during the meeting and the same are placed as ***Annexure-II*** and ***Annexure-III*** respectively.

In the meeting, the observations of the CWPRS were discussed and the same were clarified by IIT Roorkee as indicated in their response. In one of the observation, CWPRS has mentioned that MCE assigned to Mishmi and Lohit thrusts are given as 8.5 in the report for Etalin HEP and 8.0 in the report for Naying HEP. In response, Dr. M. L. Sharma, IIT Roorkee has clarified that in the case of Naying HEP report, the magnitude assigned to Mishmi thrust, Lohit Thrust and Tidding Suture are recommended as 8.5 (which was inadvertently taken as 8.0 in DSHA). He also mentioned that the magnitude 8.5 assigned to this earthquake in catalogue has been considered in PSHA. Accordingly, the Table I of the report shall be modified. However, these changes do not have any bearing on the recommended parameters which are governed by MBT. ***After deliberation, the Committee decided to consider the study reports for discussion/ approval in light of clarifications given by the IIT Roorkee.***

Item 28.1 CONFIRMATION OF THE MINUTES OF THE 27TH MEETING

Member Secretary informed the Committee that the Minutes of the 27th Meeting of NCSDP held on 23rd June, 2014 were circulated to the Members of the Committee; and no observation/comment on the circulated Minutes has been received by the Secretariat. He also informed that relevant extracts from the Minutes of Meeting were sent to the concerned project authority for information.

The Committee noted above and confirmed the Minutes of the 27th Meeting as circulated.

Item 28.2 AGENDA ITEMS CARRIED OVER FROM PREVIOUS MEETING

28.2.1 Conditionally cleared Projects - Submission of Micro Earthquake (MEQ) study

1. Tato-II HE Project, Arunachal Pradesh

Member Secretary apprised the Committee that the site specific seismic study report of the Tato-II HEP, Arunachal Pradesh was approved by the Committee in its 23rd meeting held on 20th November, 2012 with the condition to submit the final report of MEQ studies by December, 2013. He further informed the Committee that the reminder was issued to the project authorities for submission of the final report of the MEQ study. In response, the project authorities vide their letter dated 13th November, 2014 has informed that the process has been initiated and it will take another 8 to 10 months to carry out the study. The project authorities have informed that the results of MEQ study will be submitted as soon as the activity is completed.

After brief deliberation, the Committee decided that the project authorities shall submit the final report of the MEQ study by December, 2015. The Committee was also of the opinion that the time line given to the project authorities for submission of the requisite study report shall be adhered to.

2 Dikhu HE Project, Nagaland

Member Secretary apprised the Committee that the site specific seismic study report of the aforesaid project was approved by the Committee in its 25th meeting held on 28th June and 8th July, 2013 with the condition to submit the final report of MEQ studies by July, 2014. As a follow up, the project authorities had submitted the report on Site

Specific Micro Earthquake (MEQ) Survey around Dikhu HE Project, Nagaland. Subsequently, the report was discussed in the previous (27th) meeting held on 23rd June, 2014 and some observations were made by the Committee. As decided by the Committee, the project authorities were requested to submit the compliance to the observations for consideration of the Committee. Member Secretary further informed the Committee that the project authorities have submitted the revised report incorporating the clarifications to the observations of the Committee vide their letter no. RM/2/DPR/CWC dated 15.10.2014 and the same was circulated amongst the Members of the Committee vide Secretariat's letter no. No. 2/2/2014 (Vol.-I)/FE&SA/665-673 dated 20.10.2014 for examination. No comments have been received so far.

During discussion, Dr. M L Sharma, IIT Roorkee informed the Committee he will forward observations on the compliance submitted by the project authorities. Accordingly vide letter dated 27.04.2014 ***(Annexure-IV)***, he has conveyed that the results of MEQ study of Dikhu HEP shows the seismicity around the dam site. Many of the points raised by the Department of Earthquake Engineering (i.e. IITR) have been complied with. However, in case of requirement of tomography, more data will be required to be acquired in future. Dr. Sharma has indicated that this may be discussed during next meeting. However, a conditional clearance may be given to the MEQ studies for Dikhu site.

After brief deliberation, the Committee considering the views of IITR accorded the conditional clearance to the MEQ studies. The aspect of requirement of tomography in future will be discussed in the next meeting and will be informed accordingly.

3 Thana Plaun HE Project, Himachal Pradesh

Member Secretary apprised the Committee that the site specific seismic study report of the aforesaid project was approved by the Committee in its 25th meeting with the condition to submit the final report of MEQ studies by July, 2014. He further informed the Committee that reminder was issued to the project authorities for submission of the final MEQ study report and in response, the project authorities vide their letter no. HPPCL/GM TM&TP HEP's/TP-civil/G-10/2014-1828-32 dated 17.09.2014 has informed

the necessary action has been initiated for carrying out the MEQ study and requested for extension till July 2015 for submission of the final report of MEQ.

After brief deliberation, the Committee accepted the request of the project authorities for extension till July 2015 for submission of the final report of MEQ. The Committee was also of the opinion that the time line given to the project authorities for submission of the requisite study report shall be adhered to.

4 Ratle HE Project, Jammu and Kashmir

Member Secretary apprised the Committee that the site specific seismic study report of the aforesaid project was approved by the Committee in its 25th meeting with the condition to submit the final report of MEQ studies by July, 2014. He further informed the Committee that reminder was issued to the project authorities for submission of the final MEQ study report and no response has been received.

After brief deliberation, the Committee decided that the project authorities shall submit the final report of the MEQ study by December, 2015. The Committee was also of the opinion that the time line given to the project authorities for submission of the requisite study report shall be adhered to.

5 Seli HE Project, Himachal Pradesh

Member Secretary apprised the Committee that the site specific seismic study report of the aforesaid project was approved by the Committee in its 26th meeting held on 11th December, 2013 with the condition to submit the final report of MEQ studies by December, 2014. It was also informed to Committee by the Member Secretary that project authorities vide their letter dated 18th December 2014 has requested for extension of time till March 2016 for submission of the MEQ study report.

After brief deliberation, the Committee decided that the project authorities shall submit the final report of the MEQ study by December, 2015. The Committee was also of the opinion that the time line given to the project authorities for submission of the requisite study report shall be adhered to.

6 Chamkarchu (stage-I) HE Project, Bhutan

Member Secretary apprised the Committee that the site specific seismic study report of the aforesaid project was approved by the Committee in its 26th meeting held on 11th December, 2013 with the condition to submit the final report of MEQ studies by December, 2014. He further informed the Committee that reminder has been issued to the project authorities for submission of the final MEQ study report and no response has been received.

After brief deliberation, the Committee decided that the project authorities shall submit the final report of the MEQ study by December, 2015. The Committee was also of the opinion that the time line given to the project authorities for submission of the requisite study report shall be adhered to.

28.2.2 Non-submission of site specific seismic study reports for NCSDP approval in respect of projects whose DPRs were conditionally cleared:

The Member Secretary apprised the Committee that in the previous meeting (27th), the Committee was informed that the DPR of 22 projects were conditionally cleared by FE&SA Directorate (Secretariat of NCSDP) subject to submission of the site specific seismic studies for NCSDP. However, the desired submission of site specific seismic study report as per new guidelines of NCSDP was not complied by the concerned project authorities. Accordingly, as per decision of the Committee reminder was issued to the concerned project authorities for compliance.

Member Secretary further informed the Committee that out of these 22 projects, the desired compliance from the 9 nos. of projects has been received so far. The list of remaining 13 projects along with their response in respect of submission of the desired study report is placed as ***Annexure-V*** wherein most of the project authorities have requested for extension of time. The project authorities of Tamanthi HEP, Myanmar (i.e. NHPC) vide their letter no. NH/PID/12.20.25/1818 dated 08.07.2014 informed that at present the project is under temporarily suspension. Similarly, Bunakha project authorities vide their letter no. 1592/ THDC/ RKSH/ CHM/ F1561-IX dated 27.06.2014 have informed that the study will be carried out after formation of JV Company between THDCIL and DGPC and report will be submitted during preconstruction stage which shall be taken up shortly.

After brief deliberation, the Committee decided that the concerned project authority shall submit the requisite compliance by June 2015.

28.2.3 Site specific seismic parameters for Dam Rehabilitation Improvement Project (DRIP) dams

The Member Secretary apprised the Committee that it was desired by the Committee in its last meeting (27th) to explore the possibility for a regional level study to cover all the DRIP dams in consultation with IIT Roorkee, and funding under DRIP.

Dr. B.R.K. Pillai, Director DSR, CWC and Project Director (DRIP) informed the Committee that as a follow up, the matter was discussed with IIT Roorkee for carrying out a region specific seismic study (South Indian region) so as to cover all DRIP dams. Subsequently, a proposal costing Rs. 80.90 lakh (Rupees eighty lakh ninety thousand only) for the said study has been received from IIT Roorkee, and the same was discussed in the 9th meeting of Technical Committee of DRIP held during 7th - 8th August, 2014. The Technical Committee of DRIP agreed with the proposal submitted by IIT Roorkee and also for booking the cost under central component of DRIP. The Proposal in this regard has been sent to MoWR for approval of the competent authority.

The representative of IIT Roorkee informed that awaiting the approval for the proposal, the work on the said study has already been started by IIT Roorkee. ***The initiative of the IIT Roorkee was noted with appreciation by the Committee.***

Item 28.3 NEW PROJECTS CONSIDERED FOR APPROVAL OF THE COMMITTEE

28.3.1 Bhakra Nangal Project, Himachal Pradesh

A presentation on the study report was made by the project authorities. The Bhakra dam is over 50 years old existing concrete dam of 225.55 m height.

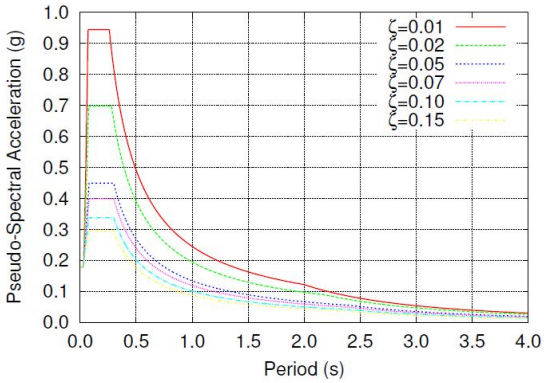
After brief deliberation, the Committee members were of the opinion that the reasons for taking up such studies needs to be appraised to the Committee alongwith details of the safety related performance of the dam.

28.3.2 Lower Kopili Project, Assam

A presentation on the study report was made by the project authorities. During discussion, Sh. S.K. Sibal, Director, CWC pointed out that the recommendations on safety criterion such as permissible stresses are at variance with criteria given in guidelines. Accordingly, the Committee decided that recommendations on Safety criterion shall preferably be in accordance with the NCSDP guidelines, and any variation shall be recorded with justification. Further, Dr. L. R. Pattanur, CWPRS pointed out that the report should also incorporate the response spectra for 15% damping ratio. In response, the representative from IIT Roorkee (consultant) clarified that generally the response spectra for 5% and 10% damping are being used; however, they agreed to incorporate the 15% damping spectra and recommendations on safety criterion in the study report. The Committee agreed on the decision that the Consultant will incorporate the above observations in the report and submit its compliance at the earliest.

After brief deliberation, the Committee accorded approval to the study report of Lower Kopili Project, Assam incorporating the response spectra of 15% damping, period of total duration of shaking and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 given as Annexure IV. The summarized seismic design parameters of the approved report are as under:

(a) Response Spectra



Spectra for DBE motion (Lower Kopili HEP)

(b) Other seismic parameters

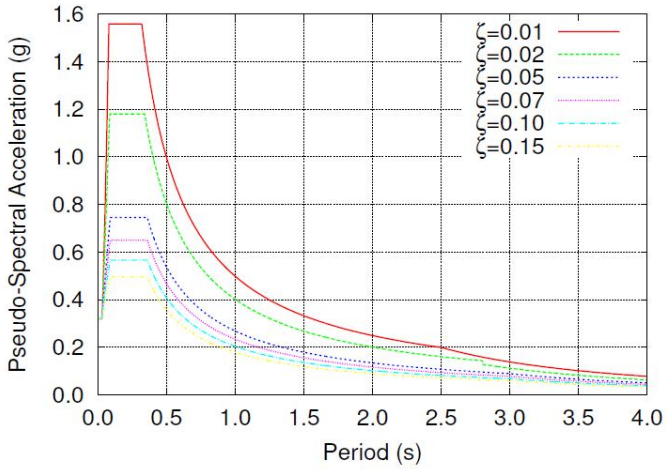
Max. Credible Earthquake Magnitude	7.0	Horizontal distance to surface projection of fault (R_{JB}) (km)	18	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)		0.24		Vertical seismic co-efficient (α_v)	0.16
Strong motion duration (second)		9	Total duration (second)		47
Report reference	IIT Roorkee Report (Project No. EQD-3012/11-12 (May-2014)] along with IIT Roorkee letter dated 27.04.2015.				

28.3.3 Etalin HE Project, Arunachal Pradesh

A presentation on the study report was made by the project authorities. Further, The project authorities have informed the Committee that MEQ studies for 101.5 m high Dri Dam (concrete dam) will be taken up shortly and final study report will be submitted by December, 2015. The observations of the Committee Members on the study report of this project were same as in the case of project under item 28.3.2 above. The representative of IIT Roorkee (consultant) agreed to incorporate the same in the study report.

After brief deliberation, the Committee accorded approval to the study report of Etalin HE Project, Arunachal Pradesh incorporating the response spectra of 15% damping, period of total duration of shaking and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 given as Annexure IV. The Committee also noted that its approval is conditional subject to the submission of MEQ studies by the project authorities by December, 2015. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



Spectra for DBE motion (Etalin HEP)

(b) Other seismic parameters

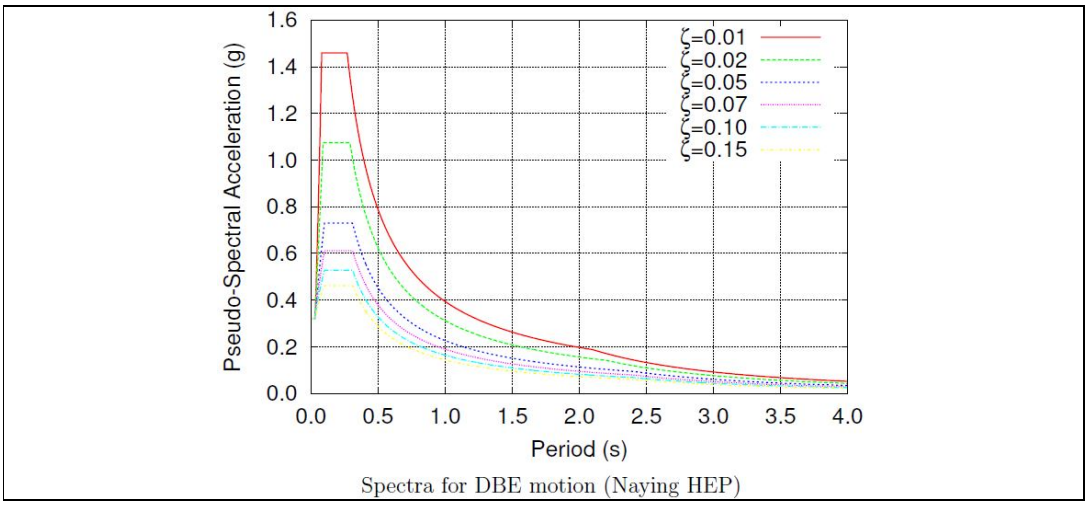
Max. Credible Earthquake Magnitude	8.5	Horizontal distance to surface projection of fault (R_{JB}) (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)		0.24	Vertical seismic co-efficient (α_v)		0.16
Strong motion duration (second)		10	Total duration (Second)		55
Report Reference	IIT Roorkee Report (Project No. EQD-6020/2012-2013 (February-2014)] along with IIT Roorkee letter dated 27.04.2015.				

28.3.4 Naying HE Project, Arunachal Pradesh

A presentation on the study report was made by the project authorities. The project authorities have informed that MEQ studies for 138.0 m concrete dam will be taken up shortly and final study report will be submitted by December, 2015. The observations of the Committee Members on the study report of this project were same as in the case of project under item 28.3.2 above. The representative of IIT Roorkee (consultant) agreed to incorporate the same in the study report.

After brief deliberation, the Committee accorded approval to the study report of Naying HE Project, Arunachal Pradesh incorporating the response spectra of 15% damping, period of total duration of shaking and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 given as Annexure IV. The Committee also noted that its approval is conditional subject to the submission of MEQ studies by the project authorities by December, 2015. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



Spectra for DBE motion (Naying HEP)

(b) Other seismic parameters

Max. Credible Earthquake Magnitude	7.5	Horizontal distance to surface projection of fault (R_{JB}) (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.24	Vertical seismic co-efficient (α_v)	0.16		
Strong motion duration (second)	8	Total duration (second)	43		
Report Reference	IIT Roorkee Report (EQ: 2014-34; Project No. EQD-6045/12-13 (July-2014)] along with IIT Roorkee letter dated 27.04.2015.				

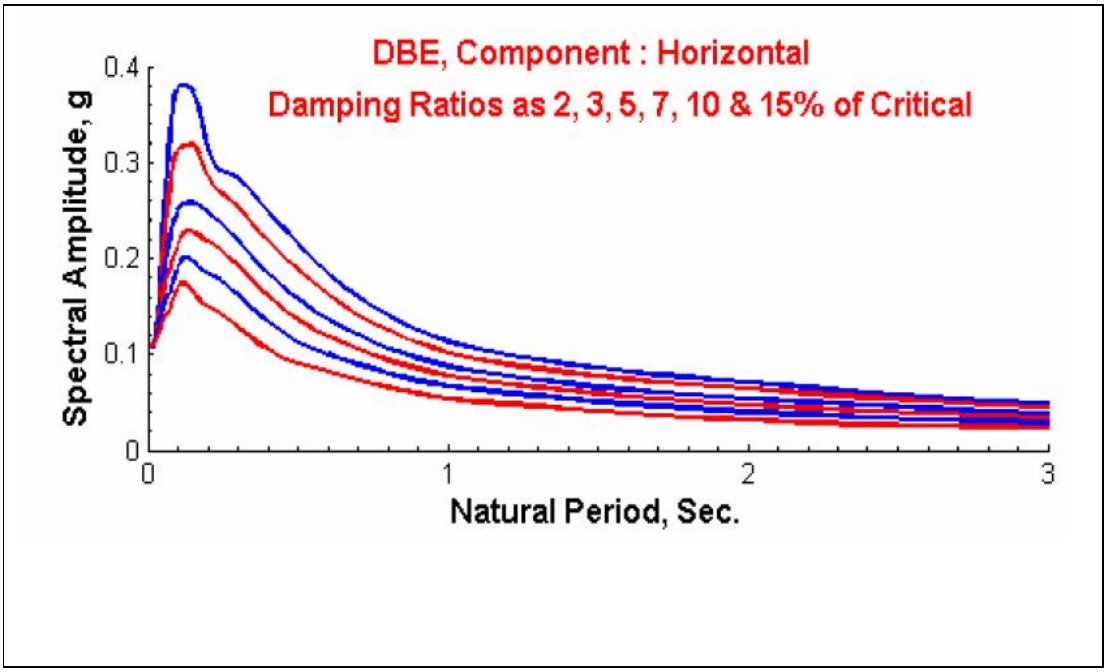
28.3.5 P V Narasimha Rao Kanthanapally Sujala Sravanthi Project, Telangana State

A presentation on the study report was made by the project authorities. The project authorities have informed that project envisages construction of a composite dam of height 28.2 m instead barrage as reported earlier. During discussion, Member Secretary pointed out that the periods of strong motion duration/total duration have not been indicated in the report. Further, the name of the state should be changed from "Andhra Pradesh" to "Telangana State". The project authorities have clarified that the study was carried out before formation of Telangana, however, the requisite corrections and periods of strong motion duration/total duration shall be incorporated in the report and submitted within a short time. The Committee agreed on the decision that the Consultant will incorporate the above observations in the report and submit its compliance at the earliest.

Member Secretary further informed the Committee that the study has been carried out by Dr. I D Gupta, Ex. Director CWPRS and former Member NCSDP as a consultant of the project. He has also informed that Committee that the study carried out by private agencies without mentioning the name of expert(s) is being submitted in the Secretariat. In view of this, the issue of acceptance of the studies carried out by an individual expert(s)/private agencies/organization was also discussed. After detailed deliberation, the Committee members were of the opinion to accept the aforesaid study carried out by Dr. Gupta as he is an expert of related field and had carried out a large number of such studies in the past at CWPRS before superannuation from the government service. Further, the Committee was also of the opinion that a format needs to be developed in respect of qualification of the consultant as individual expert/private agencies for carrying out such studies. Accordingly, Chairman NCSDP requested IIT Roorkee to provide inputs for formulation of the desired format in this regard. In response, IIT Roorkee vide their letter dated 27.04.2015 ***(Annexure-IV)*** has conveyed their opinion that the seismic hazard studies are necessarily multi-disciplinary studies where results are used at the site for engineering purposes. Starting from geology, tectonics, seismology, the inputs are required from geotechnical and structural engineering and recommendations made are very important strong ground motion parameters for sites. Since, no such tool is available to qualify the individual experts for private agencies, such things should be decided case to case basis.

After brief deliberation, the Committee accorded approval to the study report of P V Narasimha Rao Kanthanapally Sujala Sravanthi Project, Telangana State incorporating requisite information supplied by the project authorities vide their letter dated 14.03.2015 given as Annexure VI. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



(b) Other seismic parameters

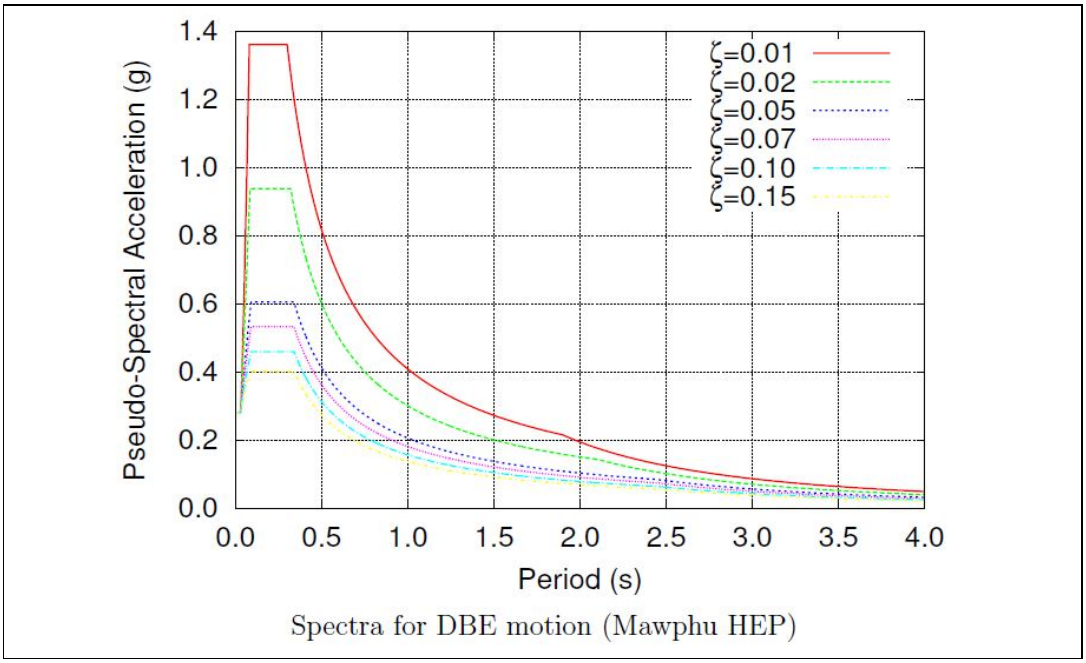
Max. Credible Earthquake Magnitude	6.3	Closest distance from the fault (km)	4.8	Focal depth (km)	25
Horizontal seismic co-efficient (α_h)	0.12 (for both concrete and earthen portion)	Vertical seismic co-efficient (α_v)	0.08 (for both concrete and earthen portion)		
Strong motion duration (second)	7.96	Total duration (second)	35.84		
Report Reference	Technical Report December (-2013) by Dr. I. D. Gupta, Ex. Director CWPRS submitted vide letter no. SRJV/TW/F. Kanthanapally/2015/024-B dated 14.03.2015.				

28.3.6 Mawphu HE Project (Stage-II), Meghalaya

A presentation on the study report was made by the project authorities. The observations of the Committee Members on the study report of this project were same as in the case of project under item 28.3.2 above. The representative of IIT Roorkee (consultant) agreed to incorporate the same in the study report.

After brief deliberation, the Committee accorded approval to the study report of Mawphu HE Project (Stage-II), Meghalaya incorporating the response spectra of 15% damping, period of total duration of shaking and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 given as Annexure IV. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



Spectra for DBE motion (Mawphu HEP)

(b) Other seismic parameters

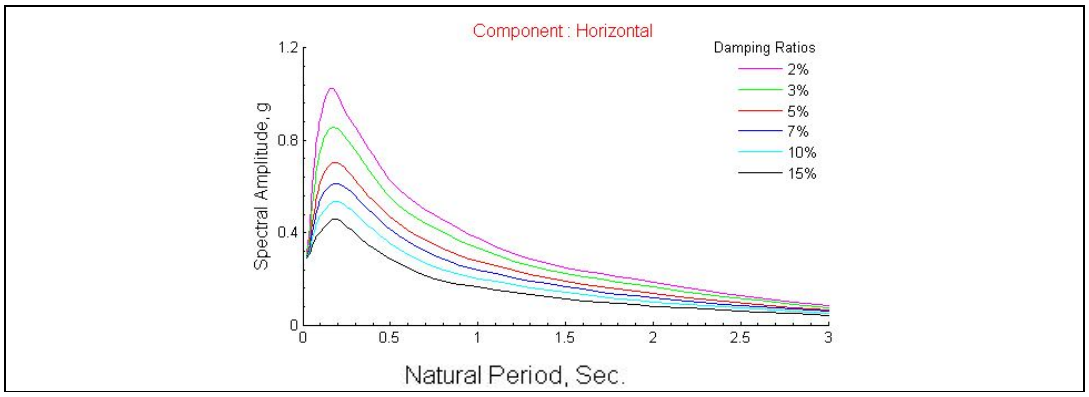
Max. Credible Earthquake Magnitude	8.0	Horizontal distance to surface projection of fault (R_{JB}) (km)	12	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.24	Vertical seismic co-efficient (α_v)			0.16
Strong motion duration (second)	10	Total duration (second)			55
Report Reference	IIT Roorkee Report (Project No. EQD-6047/12-13 (March-2014)] along with IIT Roorkee letter dated 27.04.2015.				

28.3.7 Arun-3 HE Project, Nepal

A presentation on the study report was made by the project authorities. During discussion, it was pointed out that the site is located in the vicinity of Seismic Zone V. Therefore, in the study Seismic Zone V (in place of Seismic Zone IV as considered in the study) should be considered for finalization of the seismic design parameters. The representative from CWPRS, Pune has agreed to submit the revised study suitably with in short time. In response, CWPRS has complied with the observations of the Committee vide their letter dated 14.01.2015 and e-mail dated 03.02.2015.

After brief deliberation, the Committee accorded approval to the study report of Arun-3 HE Project, Nepal subject to incorporation of above comments. As per revised study conveyed by the Consultant (CWPRS, Pune) vide their letter dated 14.01.2015 and e-mail dated 03.02.2015 given as Annexure VII, the summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



(b) Other seismic parameters

Max. Credible Earthquake Magnitude	7.5	Closest distance to fault rupture plane (km)	13.7	Focal depth (km)	25
Horizontal seismic co-efficient (α_h)	0.24		Vertical seismic co-efficient (α_v)		0.16
Strong motion duration (second)	11		Total duration (second)		50
Report Reference	Revised CWPRS, Pune Technical Report No.-4908 December-2011 (revised in August, 2014) as submitted vide email dated 03.02.2015 in compliance to NCSDP observations.				

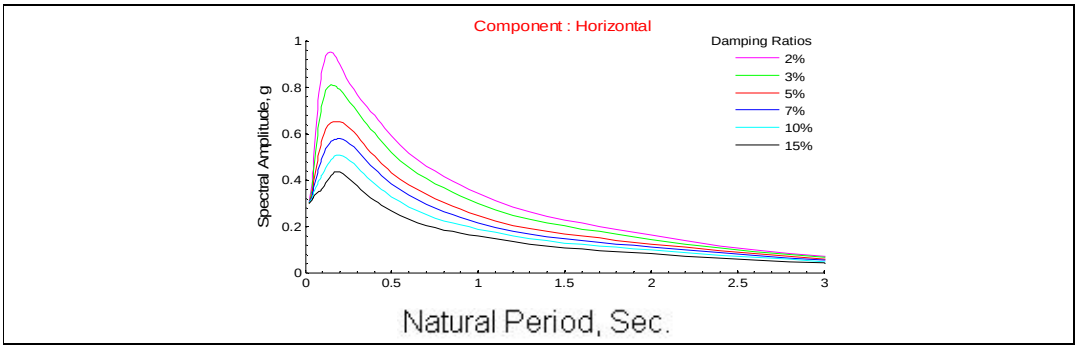
28.3.8 Wangchu HE Project, Bhutan

A presentation on the study report was made by the project authorities. The project authorities have informed that MEQ studies for 134.0 m concrete dam will be taken up shortly and final study report will be submitted by December, 2015. During discussion, Dr. M L Sharma, IIT Roorkee pointed out that distance of rupture plane from MCT taken

as 29 km should be reduced suitably and the study needs to be reviewed accordingly. The representative from CWPRS, Pune has mentioned that practically there will be no change in the final results. However, they agreed to review the study and submit within a short time. Accordingly, CWPRS has confirmed vide their letter dated 14.01.2015 that there is practically no change in the final results due to decrease in the closest distance to fault rupture and the results of the report holds. Subsequently, CWPRS vide their e-mail dated 03.02.2015 ***(Annexure VII)*** has submitted the modified report and the same was forwarded to IIT Roorkee for their observations. The IIT Roorkee vide their letter dated 27.04.2015 ***(Annexure-IV)*** has conveyed that the observations made by the IIT Roorkee have been considered by CWPRS in the modified report. The report may be given approval from the Committee. IIT Roorkee has also indicated that in future report a schematic diagram showing the geometry alongwith the distances may be given in the report.

After brief deliberation, the Committee accorded approval to the study report of Wangchu HE Project, Bhutan subject to incorporation of above comments. As per modified report conveyed by the Consultant (CWPRS, Pune) vide their letter dated 14.01.2015 and e-mail dated 03.02.2015 given as Annexure VII, the summarized seismic design parameters of the approved report are given below. The Committee also noted that its approval is conditional subject to the submission of MEQ studies by the project authorities by December, 2015.

(a) Response Spectra



(b) Other seismic parameters

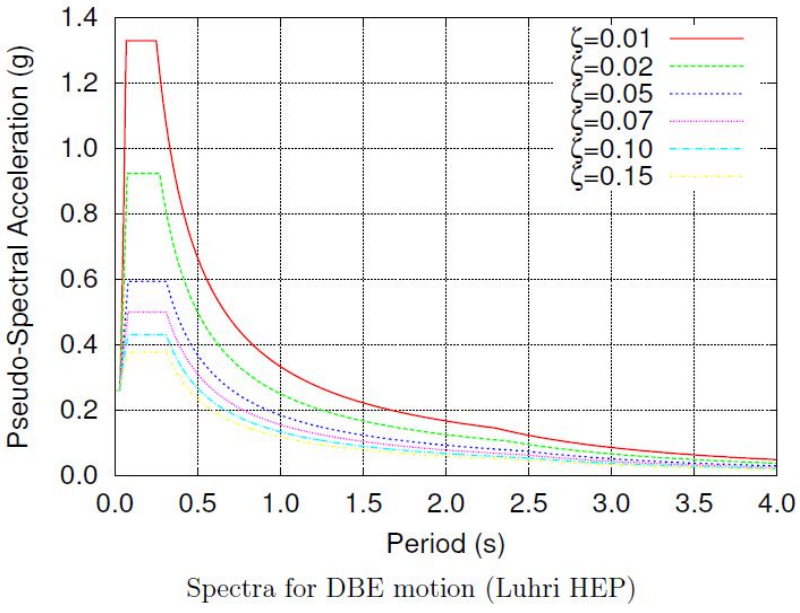
Max. Credible Earthquake Magnitude	8.0	Closest distance to fault rupture plane (km)	29	Focal depth (km)	35
Horizontal seismic co-efficient (α_h)	0.24	Vertical seismic co-efficient (α_v)	0.16		
Strong motion duration (second)	11	Total duration (second)	50		
Report Reference	Revised CWPRS, Pune Technical Report No.-4915 January-2012 (revised in August, 2014) as submitted vide email dated 03.02.2015 in compliance to NCSDP observations.				

28.3.9 Luhri HE Project, Himachal Pradesh

A presentation on the study report was made by the project authorities. The observations of the Committee Members on the study report of this project were same as in the case of project under item 28.3.2 above. The representatives from IIT Roorkee (consultant) have agreed to incorporate the same in the study report.

After brief deliberation, the Committee accorded approval to the study report of Luhri HE Project, Himachal Pradesh incorporating the response spectra of 15% damping, period of total duration of shaking and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 given as Annexure IV. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



Spectra for DBE motion (Luhri HEP)

(b) Other seismic parameters

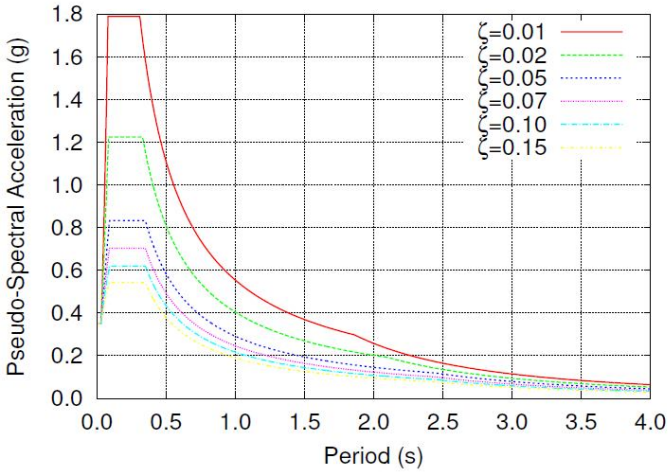
Max. Credible Earthquake Magnitude	7.5	Horizontal distance to surface projection of fault (R_{JB}) (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.24	Vertical seismic co-efficient (α_v)			0.16
Strong motion duration (second)	8	Total duration (second)			43
Report Reference	IIT Roorkee Report (EQ: 2014-30; Project No. EQD-6005/13-14 (June-2014)] along with IIT Roorkee letter dated 27.04.2015.				

28.3.10 Kalai-II HE Project, Arunachal Pradesh

A presentation on the study report was made by the project authorities. Further, the project authorities have informed the Committee that MEQ studies for 198.0 m concrete dam will be taken up shortly and final study report will be submitted by December, 2015. The observations of the Committee Members on the study report of this project were same as in the case of project under item 28.3.2 above. The representatives from IIT Roorkee (consultant) have agreed to incorporate the same in the study report.

After brief deliberation, the Committee accorded approval to the study report of Kalai-II HE Project, Arunachal Pradesh incorporating the response spectra of 15% damping, period of total duration of shaking and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 given as Annexure IV. The Committee also noted that its approval is conditional subject to the submission of MEQ studies by the project authorities by December, 2015. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



Spectra for DBE motion (Kalai-II HEP)

(b) Other seismic parameters

Max. Credible Earthquake Magnitude	8.5	Horizontal distance to surface projection of fault (R_{JB}) (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.24		Vertical seismic co-efficient (α_v)		0.16
Strong motion duration (second)	11		Total duration (second)		60
Report Reference	IIT Roorkee Report (EQ: 2014-02; Project No. EQD-3011/10-11 (January-2014)] along with IIT Roorkee letter 27.04.2015.				

28.3.11 (New) Ganderbal HE Project, Jammu and Kashmir

A presentation on the study report was made by the project authorities. Member Secretary mentioned that the title of the project name has been indicated as "Ganderbal" which needs to be corrected as "New Ganderbal". Sh. S.K. Sibal, Director, CWC pointed out that the recommendations on safety criterion such as permissible stresses are at variance with criteria given in guidelines. Accordingly, the Committee decided that recommendations on Safety criterion shall preferably be in accordance with the NCSDP guidelines, and any variation shall be recorded with justification. During discussion, it has also been pointed out that the values of horizontal peak ground acceleration (PGA) reported are on higher side. Further, Dr. L. R. Pattanur, CWPRS mentioned that the report should also incorporate the response spectra for 15% damping ratio along with time histories and response spectra both at river bed level (considering overburden) as well as at the rock outcrop/bed rock level.

After brief deliberation, the Committee decided that the study needs to be revised in view of above observations made by the Committee and resubmitted for consideration of the Committee.

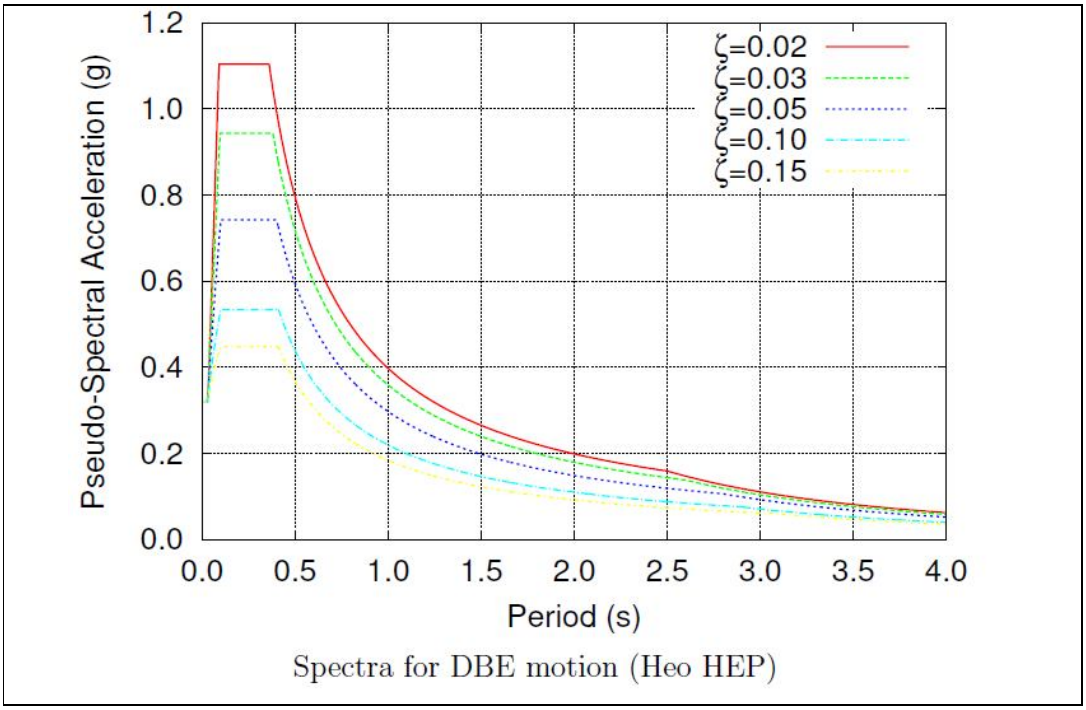
28.3.12 Heo HE Project, Arunachal Pradesh

A presentation on the study report was made by the project authorities. Sh. S.K. Sibal, Director, CWC pointed out that the recommendations on safety criterion such as permissible stresses are at variance with criteria given in guidelines. Accordingly, the Committee decided that recommendations on Safety criterion shall preferably be in accordance with the NCSDP guidelines, and any variation shall be recorded with justification. Further, Dr. L. R. Pattanur, CWPRS pointed out that the report should also incorporate the response spectra for 15% damping ratio along with time histories and response spectra both at foundation (river bed) level as well as at the rock outcrop/bed rock level. In response, the representative from IIT Roorkee has mentioned that there will be no change in the recommended seismic design parameters on account of these observations. However, they agreed to incorporate the requisite information in the study report. Accordingly, IITR has provided the response spectra for 15% damping ration along with safety criteria vide their letter dated 27.04.2015 and e-mail dated 29.04.2015. It has also been mentioned that the spectra and time histories for motion at bedrock level have been included in the report and will be submitted for records; the

design parameters are based on the motion at the river bed level which is already included in the report and hence there is no change in the estimation of seismic design parameters.

After brief deliberation, the Committee accorded approval to the study report of Heo HE Project, Arunachal Pradesh incorporating the response spectra of 15% damping, period of total duration of shaking and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 and email dated 29.04.2015 given as Annexure IV. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



Spectra for DBE motion (Heo HEP)

(b) Other seismic parameters

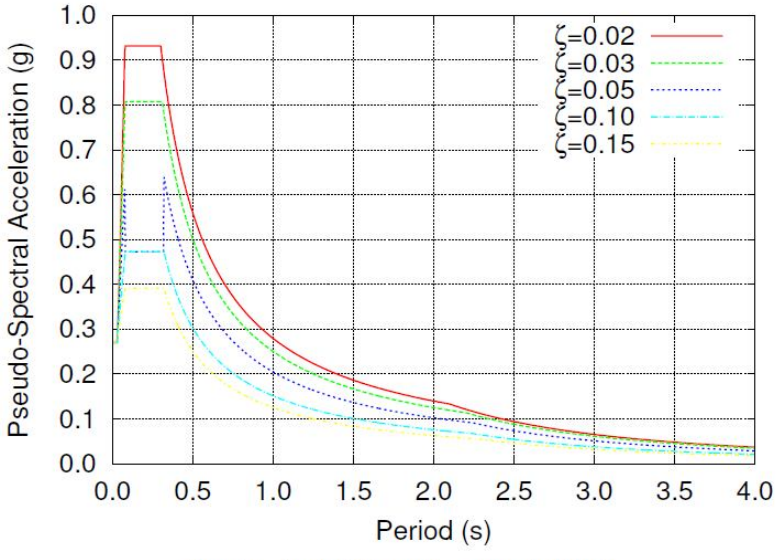
Max. Credible Earthquake Magnitude	7.5	Horizontal distance to surface projection of fault (R_{JB}) (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.24	Vertical seismic co-efficient (α_v)			0.16
Strong motion duration (second)	13	Total duration (second)			67
Report Reference	IIT Roorkee Report (Project No. EQD-6044/13-14 (October- 2014)] along with IIT Roorkee letter dated 27.04.2015.				

28.3.13 Pauk HE Project, Arunachal Pradesh

A presentation on the study report was made by the project authorities. The project authorities have informed the Committee that MEQ studies for 105.0 m concrete dam will be taken up shortly and final study report will be submitted by December, 2015. The observations of the Committee Members on the study report of this project were same as in the case of project under item 28.3.2 above. The representatives from IIT Roorkee (consultant) have agreed to incorporate the same in the study report.

After brief deliberation, the Committee accorded approval to the study report of Pauk HE Project, Arunachal Pradesh incorporating the response spectra of 15% damping and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 given as Annexure IV. The Committee also noted that its approval is conditional subject to the submission of MEQ studies by the project authorities by December, 2015. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



Spectra for DBE motion (Pauk HEP)

(b) Other seismic parameters

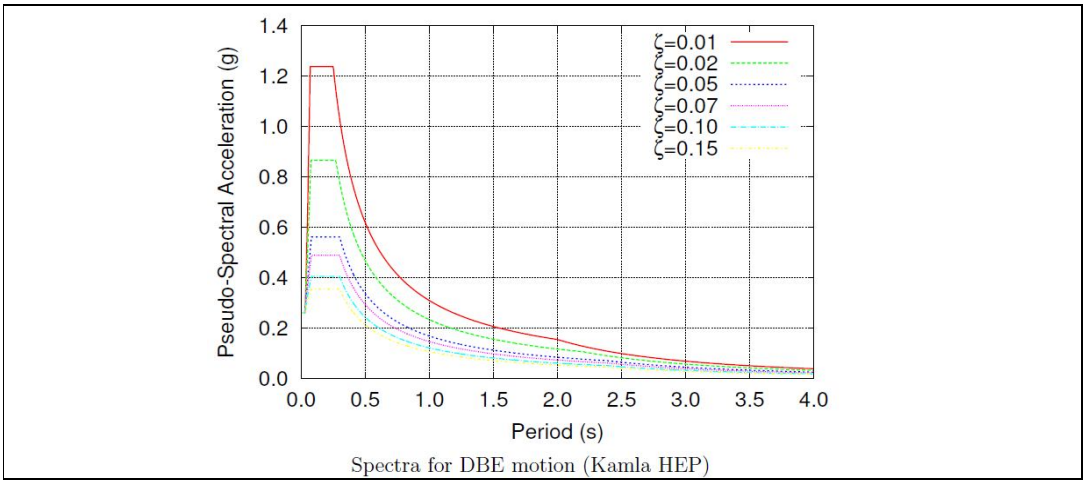
Max. Credible Earthquake Magnitude	7.5	Horizontal distance to surface projection of fault (R_{JB}) (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.24	Vertical seismic co-efficient (α_v)	0.16		
Strong motion duration (second)	8	Total duration (second)	43		
Report Reference	IIT Roorkee Report (Project No. EQD-6044/13-14 (October-2014)] along with IIT Roorkee letter dated 27.04.2015.				

28.3.14 Kamala (Subansiri Middle) HE Project, Arunachal Pradesh

A presentation on the study report was made by the project authorities. The project authorities have informed that the Committee that MEQ studies for 216 m concrete dam will be taken up shortly and final study report will be submitted by December, 2015. The observations of the Committee Members on the study report of this project were same as in the case of project under item 28.3.2 above. The representatives from IIT Roorkee (consultant) have agreed to incorporate the same in the study report.

After brief deliberation, the Committee accorded approval to the study report of Kamala (Subansiri Middle) HE Project, Arunachal incorporating the response spectra of 15% damping, period of total duration of shaking and Safety criterion supplied by IIT Roorkee (consultant) vide their letter dated 27.04.2015 given as Annexure IV. The Committee also noted that its approval is conditional subject to the submission of MEQ studies by the project authorities by December, 2015. The summarized seismic design parameters of the approved report are given below:

(a) Response Spectra



Spectra for DBE motion (Kamla HEP)

(b) Other seismic parameters

Max. Credible Earthquake Magnitude	7.5	Horizontal distance to surface projection of fault (R_{JB}) (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.24		Vertical seismic co-efficient (α_v)		0.16
Strong motion duration (second)	8		Total duration (second)		43
Report Reference	IIT Roorkee Report (EQ: 2014-26; Project No. EQD-3008/11-12 (June-2014)] along with IIT Roorkee letter dated 27.04.2015.				

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The meeting ended with vote of thanks to the chair.

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Central Dam Safety Organisation

National Committee on Seismic Design Parameters (NCSDP)

28th Meeting

Summary of the Decisions Taken at the Meeting

Date of Meeting:	09.01.2015	Time:	11:00 h to 18:00 h	Venue:	Conference Room, 525(N), Sewa Bhawan, R K Puram, New Delhi-66
Present Chairperson:	Sh. C K Agrawal, Member (D&R), CWC		Member Secretary:	Sh O P Gupta Director (FE&SA), CWC	
Other Members, Invitees, Project Representatives (Name, Designation, Organization): A List of participants is placed at ***Annexure-I***					

S.N.	Agenda Point / Decision	Responsibility	Achievement/ Progress	Remarks
28.1	Confirmation of minutes of the 27th meeting	To be confirmed by the Committee	confirmed	-
28.2	Agenda items carried over from previous meetings			
28.2.1	Conditionally cleared projects-submission of MEQ Studies	Concerned Project Authorities	Dikhu HEP, Nagaland submitted the compliance. Others requested for extension of time.	Compliance to be submitted by December, 2015
28.2.2	Non-submission of site specific seismic study reports for conditionally cleared DPRs	Concerned Project Authorities	Complied by 9 projects. Others requested for time extension	Compliance to be submitted by June, 2015
28.2.3	Site specific seismic parameters for DRIP dams	-	Proposal received from IIT Roorkee	For kind information of the Committee
28.3	New Projects to be considered for approval of the Committee			
28.3.1	Bhakra Nangal Project, Himachal Pradesh	Concerned Project Authorities	Some observations made by the Committee.	Compliance to be submitted by concerned project authorities
28.3.2	Lower Kopili, HEP, Assam	-	Cleared	-
28.3.3	Etalin HE Project, Arunachal Pradesh	Concerned Project Authorities	Conditional clearance	MEQ studies to be submitted by December, 2015

S.N.	Agenda Point / Decision	Responsibility	Achievement/ Progress	Remarks
28.3.4	Naying HE Project, Arunachal Pradesh	Concerned Project Authorities	Conditional clearance	MEQ studies to be submitted by December, 2015
28.3.5	P V Narasimha Rao Kanthanapally Sujala Sravanthi Project, Telangana State	-	Cleared	-
28.3.6	Mawphu HE Project (Stage-II), Meghalaya	-	Cleared	-
28.3.7	Arun-3 HE Project, Nepal	-	Cleared	-
28.3.8	Wangchu HE Project, Bhutan	Concerned Project Authorities	Conditional clearance	MEQ studies to be submitted by December, 2015
28.3.9	Luhri HE Project, Himachal Pradesh	-	Cleared	-
28.3.10	Kalai-II HE Project, Arunachal Pradesh	Concerned Project Authorities	Conditional clearance	MEQ studies to be submitted by December, 2015
28.3.11	(New) Ganderbal HE Project, Jammu and Kashmir	Concerned Project Authorities	Observations made by the Committee.	To be resubmitted
28.3.12	Heo HE Project, Arunachal Pradesh	-	Cleared	-
28.3.13	Pauk HE Project, Arunachal Pradesh	Concerned Project Authorities	Conditional clearance	MEQ studies to be submitted by December, 2015
28.3.14	Kamala (Subansiri Middle) HE Project, Arunachal Pradesh	Concerned Project Authorities	Conditional clearance	MEQ studies to be submitted by December, 2015

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Annexure –I

28th Meeting of National Committee on Seismic Design Parameters (NCSDP) on River Valley Projects

List of Participants on 09.01.2015

Sl. No.	Name & Address	Designation	Deptt./ Org.	Status/ Representative
I. Committee Members				
1.	Sh. C.K. Agrawal	Member (D&R)	CWC, New Delhi	Chairman, NCSDP
2.	Sh. L.A.V. Nathan	Chief Engineer (DSO)	CWC, New Delhi	Member
3.	Dr. M.L. Sharma	Professor & Head Deptt. of Earthquake Engg.	DEQ, IIT Roorkee,	Member
4.	Dr. L.R. Pattanur	Senior Research Officer	CWPRS	Representative of CWPRS
5.	Sh. Niroj Kumar Sarkar	Superintending Geologist	GSI, Shillong	Representative of GSI
6.	Sh. G. Suresh	Scientist 'E'	IMD Delhi	Representative of IMD
7	Sh. Rajiv Kumar Srivastava		Geodetic Research Branch	Representative of Survey of India
8.	Sh. O.P. Gupta	Director, FE&SA	CWC, New Delhi	Member-Secy. NCSDP
II. Special Invitees and other officials				
9.	Sh. S.K. Sibal	Director	CWC	CWC
10.	Dr. B. R. K. Pillai	Director (DSR)	CWC	CWC
11.	Sh. Vevek Tripathi	Director, CMDD(E&NE)	CWC	CWC
12.	Sh. V. Rambabu	Sr. Research Officer	CWPRS	CWPRS
13.	Dr. Manish Shrikhande	Professor	DEQ, IIT Roorkee	IIT Roorkee
14.	Sh. Saurabh	Asst. Director	CWC	NCSDP Secretariat
15.	Sh. G. Sanjeeva Reddy	Asst. Director II	CWC	"
16.	Sh. C.L. Premi	Head Draftsman	CWC	"
17.	Ms. Vinod Sharma	Sr. Draftsman	CWC	"
III. Project Representatives and Consultants				
18.	Sh. Vikas Giridhar	ADE,	Bhakra & Beas Design Directorate, Himachal Pradesh	Bhakra Nangal Project, Himachal Pradesh
19.	Sh. Utpal Imta	AGM, Nodal Officer	Assam Power Generation Corp. Limited, Assam	Lower Kopili HE Project, Assam
20.	Dr. A. K. Jha	Lahmeyer Intnl.	-do-	-do-
21.	Sh. B.C Jha	-do-	-do-	-do-
22.	Sh. A.K. Relen	-do-	-do-	-do-

23.	Sh. P.K. Khound	DGM	-do-	-do-
24.	Sh. M.M Madan	President & CEO	Etalin Hydro Electric Power Company Limited	Etalin HEP, Arunachal Pradesh
24.	Sh. Arun Gaur	Ex. Vice President	-Do-	-Do-
25.	Sh. D.K. Joshi	Vice President	-Do-	-Do-
26.	Sh. Dheeraj Marwaha	DGM	-Do-	-Do-
27.	Sh. Pramod Singh	DGM	-Do-	-Do-
28.	Sh. P.S.Khurana	COO(Hydro)	Naying DSC Power Limited	Naying HEP, Arunachal Pradesh
29.	Sh. Trilochan Singh	Consultant(Geology)	-Do-	-Do-
30.	Sh. Inderdeep	Sr. Engineer	-Do-	-Do-
31.	Sh. Sunil Dutta	ICCS, Noida	SEW-Rithwik Joint Venture	P V N Rao Kanthanapally Sujala Sravanthi Project, Telangana
32.	Sh. Sunil Dutta	ICCS, Noida	-Do-	-Do-
33.	Sh. Deva	ICCS, Noida	-Do-	-Do-
34.	Sh. Naga Raju	SEW-Rithwik Joint Venture, Hyderabad	-Do-	-Do-
35.	Sh. Daya Shanker Rai	GM	NEEPCO Limited	Mawphu HE Project(Stage-II), Meghalaya
36.	Sh. C.R. Jhon Zeliang	Sr. Manager (C)	-Do-	-Do-
37.	Sh. Sanjib Baruah	Dy. Manager (C)	-Do-	-Do-
38.	Sh. Rajeev Ranjan	Dy. Manager (C)	-Do-	-Do-
39.	Price Borgohain	Trainee Officer (Geology)	-Do-	-Do-
40.	Sh. L.M. Verma	AGM	SJVN Limited	Arun-3 HEP, Nepal
41.	Sh. R.K. Abral	DGM	-Do-	-Do-
42.	Sh. M.S. Thakur	Senior Manager	-Do-	-Do-
43.	Sh. Mahesh Dutta	Sr. Geologist	-Do-	-Do-
44.	Sh. Anjana Sharma	Senior Engineer	-Do-	-Do-
45.	Sh. Kuldeep Garg	Senior Engineer	-Do-	-Do-
46.	Sh. L.M. Verma	AGM	SJVN Limited	Wangchu HEP, Bhutan
47.	Sh. R.K. Abral	DGM	-Do-	-Do-
48.	Sh. M.S. Thakur	Senior Manager	-Do-	-Do-
49.	Sh. Mahesh Dutta	Senior Geologist	-Do-	-Do-
50.	Sh. Anjana Sharma	Senior Engineer	-Do-	-Do-
51.	Sh. Kuldeep Garg	Senior Engineer	-Do-	-Do-
52.	Sh. K.L. Amuta	AGM	SJVN Limited	Luhri HEP, Himachal Pradesh
53.	Sh. Ankit Prabhaker	Engineer	-Do-	-Do-
54.	Sh. Mahesh Dutta	Geologist	-Do-	-Do-
55.	Sh. Naveen Alagh		Kalai Power Private Limited	Kalai-II HEP, Arunachal Pradesh
56.	Sh. Deepak Gopalani		-Do-	-Do-
57.	Sh. Manoj Pradhan		-Do-	-Do-
58.	Sh. Binaya Mishra		-Do-	-Do-
59.	Sh. Amarpal Singh		-Do-	-Do-
60.	Dr. G.A. Mukhtar	Chief Geologist	J&K State Power Development Co. Limited	(NEW) Ganderbal HEP, Jammu & Kashmir

61.	Dr. Shakeel Ahmad		-Do-	-Do-
62.	Dr. Hamid Sana		-Do-	-Do-
63.	Sh. Mohammad Kharim	GM, Velcan Energy	Heo Hydro Power Private Limited	Heo HEP, Arunachal Pradesh
64	Sh. M.M. Rawal	Sr. Advisor, Velcan Energy	-Do-	-Do-
65.	Sh. Kashif	Senior Engineer	-Do-	-Do-
64.	Sh. Mohammad Kharim	GM, Velcan Energy	Pauk Hydro Power Private Limited	Pauk HEP, Arunachal Pradesh
65.	Sh. M.M. Rawal	Sr. Advisor, Velcan Energy	-Do-	-Do-
66.	Sh. Kashif	Senior Engineer	-Do-	-Do-
67.	Sh. M.M Madan	President & CEO	Kamala Hydro Electric Power Company Limited	Kamala (Subansiri Middle) HEP, Arunachal Pradesh
68.	Sh. Arun Gaur	Ex. Vice President	-Do-	-Do-
69.	Sh. D.K. Joshi	Vice President	-Do-	-Do-
70.	Sh. Dheeraj Marwaha	DGM	-Do-	-Do-
71.	Sh. Pramod Singh	DGM	-Do-	-Do-

Annexure-II

Phone : 2438 0552 Fax : 2438 1004

Government of India
Central Water and Power Research Station
Khadakwasla, Pune 411 024

No. PA-1/2014 Dated: 23.12.2014

Dr.B.R.K.Pillai
Director (FE&SA)
Member-Secy. NCSDP
F.E.S.A. Directorate
716(S), Sewa Bhawan
R.K.Puram, New Delhi-110066

Sub: Observations on the reports for consideration of the NCSDP - reg
Ref: i) Letter no. 2/2/2014(Vol-I)/FE&SA/650-658 dated 13.10.2014
ii) Letter no. 2/2/2014(Vol-I)/FE&SA/665-673 dated 20.10.2014
iii) Letter no. 2/2/2014(Vol-I)/FE&SA/724-732 dated 18.11.2014

Sir,

Having perused the reports received vide above referred letters, the observations are as follows:

1. The ground motion prediction equations (GMPE) by Boore and Atkinson (2008) computes the spectral acceleration at a range of periods. It is observed that in the reports from IIT Roorkee the above GMPE is used for obtaining the PGA and spectral amplitudes at 0.2s and 1.0 s for generating the deterministic spectrum as given in section 4.3 (ii) of the NCSDP Guidelines. It is recommended that they follow section 4.3 (iii) of the NCSDP Guidelines as done in the case of the probabilistic spectrum.

2. The probabilistic response spectrum is obtained using two GMPEs, Boore and Atkinson (2008) and Abrahamson and Silva (1997), the deterministic response spectrum is obtained using only one GMPE, Boore and Atkinson (2008), how can the two be compared when they are not obtained using the same GMPEs.

3. There is no mention of a prescribed spectrum in the NCSDP Guidelines. How is the prescribed spectrum arrived at? The studies are conducted to obtain the site specific spectrum.

4. The moment magnitude is approximately equal to the surface wave magnitude in the range 5.0-7.5 as given by Kanamori (1983), what of the magnitudes larger than 7.5? For the earthquake of 12th June1897 the magnitude of 8.7 is surface wave magnitude computed by Richter (Ambraseys and Bilham, 2003), however the same has been used in place of moment magnitude. The moment magnitudes computed for the said event by some authors are 8.03 (Ambraseys and Douglas, 2004), 8.01 (Ambraseys, 2000) and 8.1± 0.1 (Bilham and England, 2001).

5. The MCE assigned to the Mishmi and Lohit thrusts are given as 8.5 in the report for Etalin HEP and 8.0 in the report for Naying HEP.

Thanking you,

Yours faithfully,
(S. Govindan) 23/12/14
Director

Annexure-III

Reply received from IIT Roorkee vide their email dated 07.01.2015

Pointwise reply to the observations made by CWPRS

1. The practice to develop the design spectrum on the basis of zero period acceleration (ZPA), constant acceleration (at T_n=0.2 s), and constant velocity (at T_n = 1.0 s) is a standard procedure and is adopted in all seismic design codes including ISO:3010 Basis for Design of Structures - Seismic actions on structures, ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures, and IS-1893:2002 (implicitly). The design spectra thus generated provides a protection against sensitivity of the estimated natural period to modelling assumptions.
2. The probabilistic estimates from two GMPEs are combined through the use of logic trees to account for alternate models (epistemic uncertainty). There is no possibility of combining two different models in a deterministic estimate. The Boore-Atkinson (2008) model has been adopted for deterministic estimation because of minimum number of input parameters. For other models a variety of model parameters are not available in Indian context and some assumptions are required which can introduce unnecessary bias in the estimation.
3. The phrase "prescribed spectrum" wherever it appears in the report refers to the recommended design spectrum on the basis of functional form and the estimated coefficients as tabulated in the report.
4. For historical earthquakes, the assigned magnitudes are presumed to be equivalent to moment magnitudes.
5. The magnitudes of great earthquakes have been discussed from time to time in the NCSDP and has been considered based on the discussions for specific sources. However, in the case of Naying HEP report the magnitude assigned to Mishmi thrust, Lohit thrust and Tidding Suture are recommended to be considered as 8.5 (which was inadvertently taken as 8.0 in DSHA). Accordingly, Table I in the report shall be modified. However, these changes do not have any bearing on the recommended parameters which are governed by MBT. It may be noted that the magnitude 8.5 assigned to this earthquake in the catalogue has been considered in PSHA.

भूकम्प अभियांत्रिकी विभाग
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Web : www.iitr.ac.in

No. EQD/NCSDP/
Date: APRIL 27, 2015

Shri O.P. Gupta
Director, FE&SA Dte,
Central Water Commission,
NCSDP Secretariat,
712(A), Sewa Bhawan, R.K. Puram,
NEW DELHI- 110 066

Sub: 28th meeting of the NCSDP held on 9th Jan, 2015

Dear Sir,

This is in reference to the various points to be clarified for the minutes of the 28th meeting of the NCSDP held on 9th Jan, 2015. Following is the point wise reply:

1. Observations/clearance on MEQ study of Dikhu (compliance submitted by the proj auth.):

The MEQ study of Dikhu has been conducted and the results show the seismicity around the dam sites. Many of the points raised by the Department of the Earthquake Engineering have been complied with. However, in case of requirement of tomography, more data will be required to be acquired in future. This may be discussed during the next meeting. However, a conditional clearance may be given to the MEQ studies for Dikhu site.

2. Format for qualification of individual expert/pvt. agencies to carry out such studies:

The Seismic hazard assessment studies are necessarily multi-disciplinary studies where results are used at the site for engineering purposes. Starting from geology, tectonics, seismology, the inputs are required from geotechnical and structural engineering and recommendation made are very important strong ground motion parameters for the sites. Since no such tool is available to qualify the individual experts for pvt. Agencies, such things should be decided on case to case basis in the meeting itself.

3. Observations on Wangchu HEP (revised report supplied by CWPRS was forwarded vide email dated 03.02.2015):

The observations made by the Department of Earthquake Engineering have been considered by the CWPRS in the modified report submitted. The report may be given approval from the committee. However, in future report a schematic diagram showing the geometry alongwith the distances may be given in the report.

4. Spectra for 15% damping for all the projects.

As per the requirements, the Spectra for 15% damping for all the projects are attached with this letter.

5. Safety criteria as per NCSDP guidelines for all the projects.

Safety Criteria for DBE, the dam/barrage is required to be within elastic range with little or no damage. The demand-capacity ratio (DCR), defined as the ratio of induced tensile stress to the tensile strength of the concrete, should be less than or equal to 1.0. The permissible tensile strength (f_t) of plain concrete may be obtained from the static compressive strength f_c as $f_t = 0.324\ f_c^{2/3}$ (in MPa).

Under MCE conditions, the dam/barrage should not experience a catastrophic loss of the reservoir. The safety assessment using a linear dynamic analysis may be based on DCR not exceeding 2.0 and the region of nonlinear response being less than 15% of the dam cross-section surface area. When these performance conditions are exceeded, a nonlinear dynamic analysis is required to estimate the stability of dam after MCE level event.

6. Heo HEP, Arunachal Pradesh – time histories and response spectra both at foundation (river bed) level as well as at the rock outcrop level.

The time histories and response spectra both at foundation (river bed) level as well as at the rock outcrop level are included in the report.

Thanking you,

Yours sincerely,

(M.L. Sharma)

Encl: As above

From Manish Shrikhande <m.shrikhande@gmail.com>
Sent Wednesday, April 29, 2015 10:01 am
To fesadte-cwc <fesadte-cwc@nic.in> , opgupta01@rediffmail.com
Subject Fwd: response spectra in color
Attachments report.pdf 295K

---------- Forwarded message ----------
From: **Manish Shrikhande** <mshrifeq@iitr.ac.in>
Date: 28 April 2015 at 12:50
Subject: response spectra in color
To: fesadte-cwc <fesadte-cwc@nic.in>, opgupta01@rediffmail.com

Dear Shri Gupta:

Please see the attached document for DBE response spectra in color. The spectra and time histories for motion at bedrock level for Heo HEP are included in the revised report which is being sent for your records. However, the design parameters are based on the motion at the riverbed level which is already included in the report and hence there is no change in the estimation of seismic design parameters.

Thanking you and with best regards,

Manish

--
Manish Shrikhande <m.shrikhande@gmail.com, mshrifeq@iitr.ac.in>
Department of Earthquake Engineering, Indian Institute of Technology Roorkee
Roorkee-247667. INDIA. Phone: +91 1332 285437 (O), 285605 (R); Fax: +91 1332 276899

http://sites.google.com/site/mshrikhande

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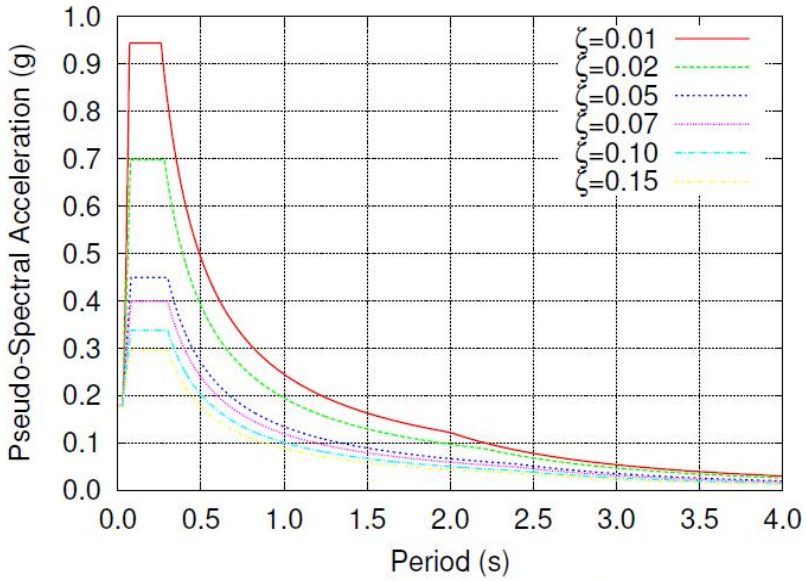
Manish Shrikhande <m.shrikhande@gmail.com, mshrifeq@iitr.ac.in>
Department of Earthquake Engineering, Indian Institute of Technology Roorkee
Roorkee-247667. INDIA. Phone: +91 1332 285437 (O), 285605 (R); Fax: +91 1332 276899

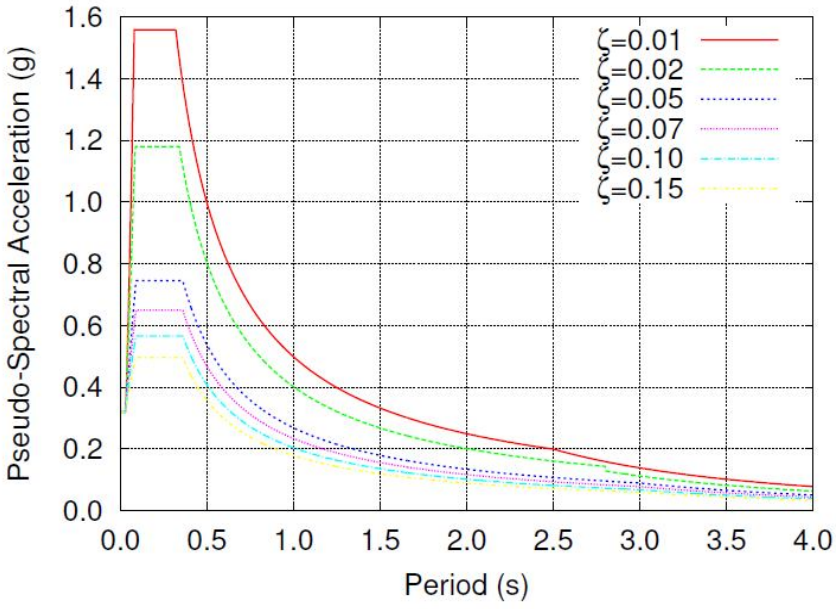
http://sites.google.com/site/mshrikhande

Kopili Lower HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 9 s and Total duration: 47 s.



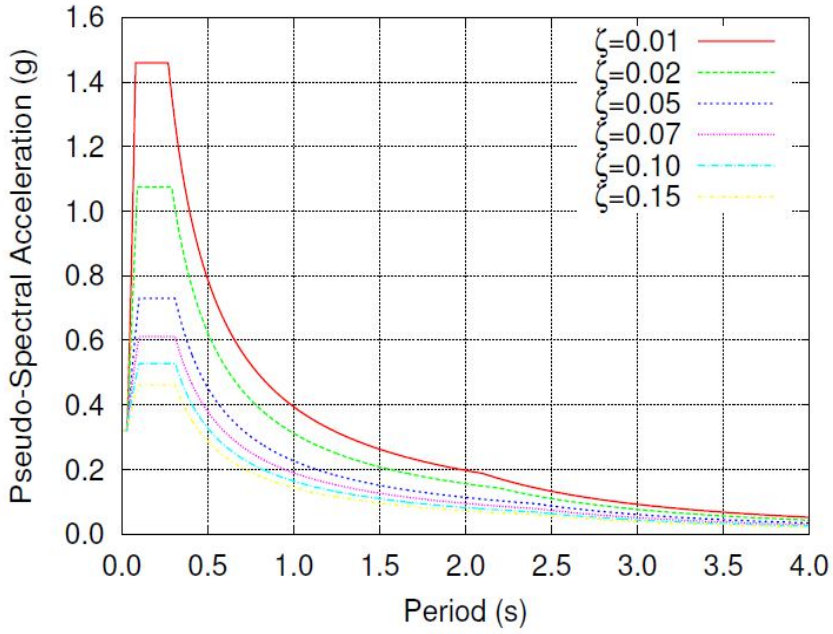
Spectra for DBE motion (Lower Kopili HEP)

Etalin HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 10 s and Total duration: 55 s.



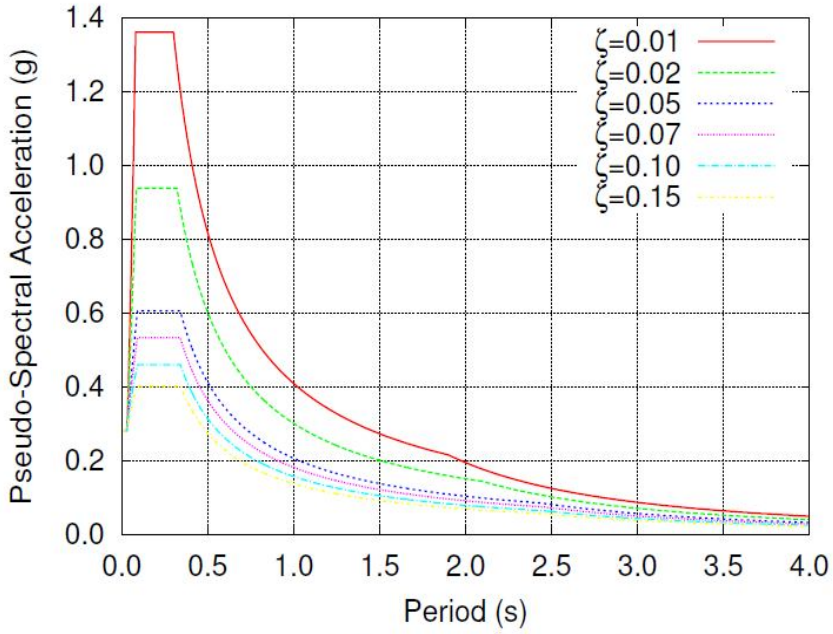
Spectra for DBE motion (Etalin HEP)

Naying HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 8 s and Total duration: 43 s.



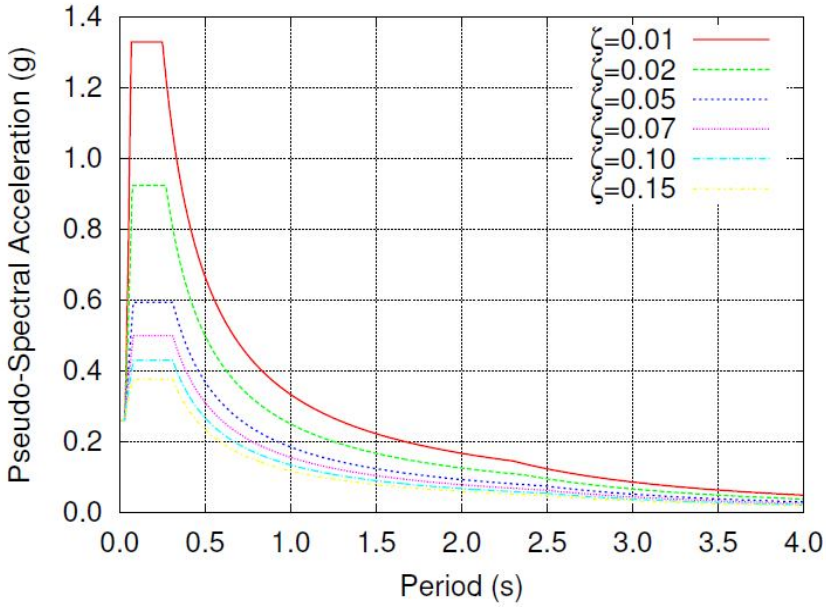
Spectra for DBE motion (Naying HEP)

Mawphu HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 10 s and Total duration: 55 s.



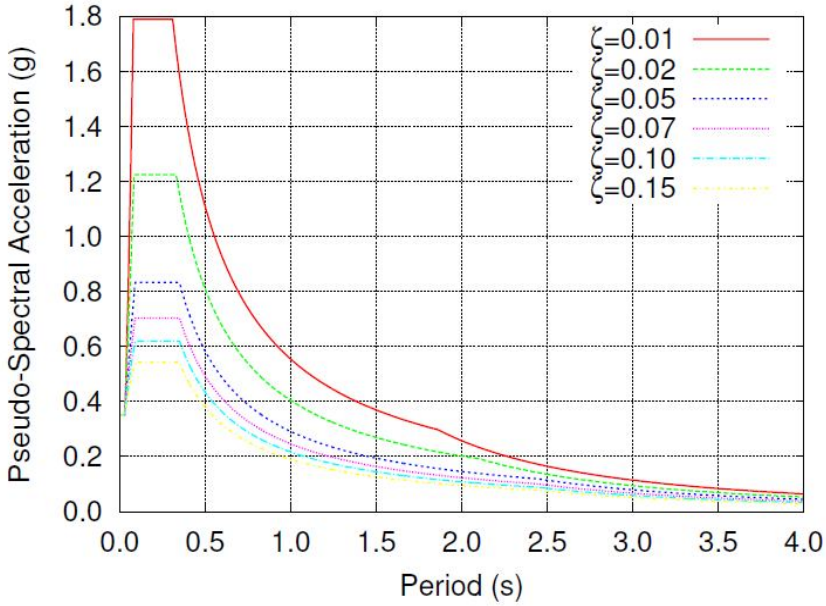
Spectra for DBE motion (Mawphu HEP)

Luhri HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 8 s and Total duration: 43 s.



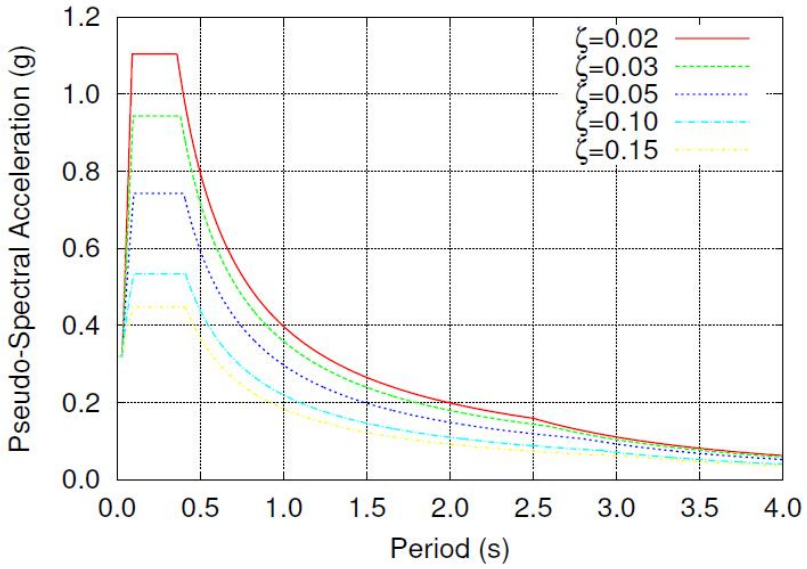
Spectra for DBE motion (Luhri HEP)

Kalai-II HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 11 s and Total duration: 60 s.



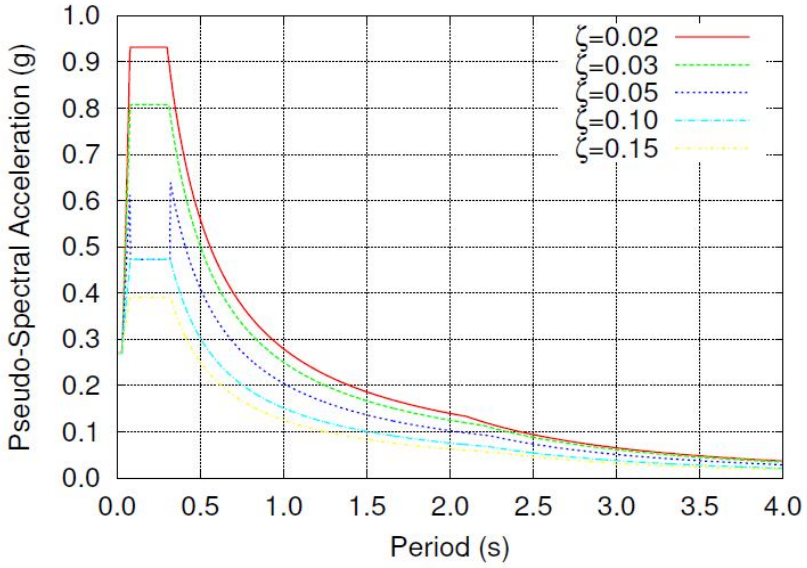
Spectra for DBE motion (Kalai-II HEP)

Heo HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 13 s and Total duration: 67 s.



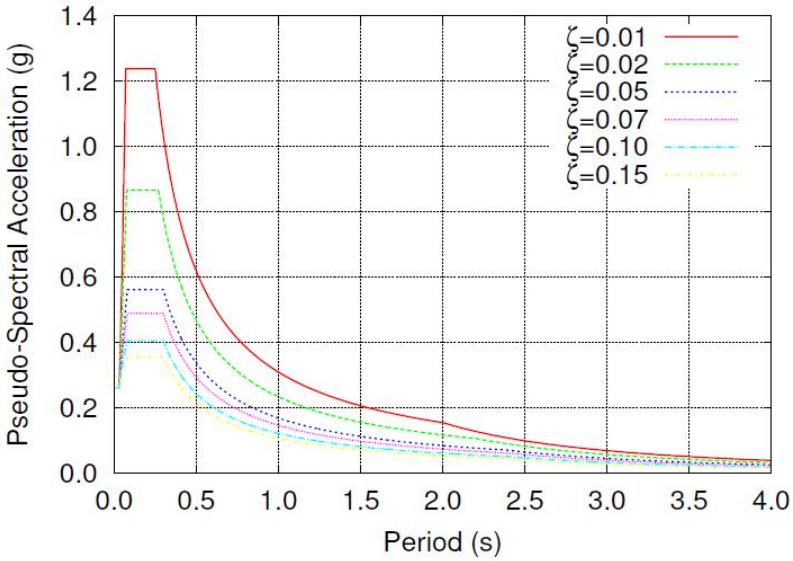
Spectra for DBE motion (Heo HEP)

Pauk HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 8 s and Total duration: 43 s.



Spectra for DBE motion (Pauk HEP)

Kamla HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 8 s and Total duration: 43 s.



Spectra for DBE motion (Kamla HEP)

Safety Critera For DBE, the dam/barrage is required to be within elastic range with little or no damage. The demand-capacity ratio (DCR), defined as the ratio of induced tensile stress to the tensile strength of the concrete, should be less than or equal to 1.0. The permissible tensile strength (f_t) of plain concrete may be obtained from the static compressive strength f_c as $f_t = 0.324 f_c^{2/3}$ (in MPa).

Under MCE conditions, the dam/barrange should not experience a catastrophic loss of the reservoir. The safety assessment using a linear dynamic analysis may be based on DCR not exceeding 2.0 and the region of nonlinear response being less than 15% of the dam cross-section surface area. When these performance conditions are exceeded, a nonlinear dynamic analysis is required to estimate the stability of dam after MCE level event.

Annexure-V

List of the projects showing responses received from the project authorities in respect of submission of site specific seismic study (as per new guidelines)

Sl.No.	Name of Project	Response received from Project Authorities
1	Dibbin HEP (120 MW), Arunachal Pradesh	Project authorities vide their letter no. CWC/ND/SKDT/1360101/47 dated 18th October, 2014 informed that the study have taken up through IIT Roorkee. And it will take about 3 to 4 months time.
2	Talong Londa HEP (225MW), Arunachal Pradesh	Project auth. vide their letter SEL/NHEP/T/2014/294 dated 12.06.2014 have requested more time to submit the study.
3	Nafra HEP (2x60 MW), Arunachal Pradesh	Project auth. vide their letter GMR/HYDRO/302/3230/14 dated 16.10.2014 have informed that the study as per new guidelines is under process and will be submitted after its completion.
4	Bunakha HEP (180MW), Bhutan	Project authorities vide their letter no. 1592/ THDC/ RKSH/ CHM/ F1561-IX dated 27.06.2014 have informed that the study will be carried out after formation of JV Company between THDCIL and DGPC and report will be submitted during preconstruction stage which shall be taken up shortly.
5	Kholongchu HEP (4x150 MW), Bhutan	Project authorities vide their letter no. SJVN/DPF/Arun-3/corresp/Vol-XXII-205-06 dated 20.06.2014 have informed that the study is under process and report shall be submitted in due course of time.
6	Chatru HEP (126MW), Himachal Pradesh	Project authorities vide letter no. DS infra/CHH/DPR-1282 dated 02.07.2014 have informed that the process to procure the fresh data from IMD has already been taken and study would take significant time for completion. They have committed that the study will be submitted to NCSDP and approved parameters will be used in design.
7	Tamanthi HEP (1200MW), Myanmar	NHPC Vide their letter no. NH/PID/12.20.25/1818 dated 08.07.2014 informed that the project is under temporally suspension due to economic unviability as well as highly effective on social and environmental impacts.
8	Punatsangchhu -II HEP, Bhutan	Project authorities vide their letter no/ WAP/Hydro/PHEP-II/CWC/2015 dated 7th Jan 2015 have informed that the study is under progress and will require further four months. Accordingly, requested for extension of time for submission of the study.
9	Amochhu HEP (4x135MW), Bhutan	NTPC vide their letter no. CC: PEH:999:5515:02 dated 06.01.2015 has informed that the preparation of DPR was assigned to NTPC as a consultancy assignment and DPR has already been submitted to RGoB after clearance by CEA. Further, they have indicated that the project has been identified to be executed in Inter Governmental Authority mode, which is yet to be formed by the GoI and RGoB. Accordingly, NTPC has requested for one for one year time extension.
10	Chago Yangthang HEP(3x60 MW), Himachal Pradesh	As a compliance, the project authorities vide their letter dated 23.12.2004 have submitted the reports (May, 2013) which needs to be revised as per NCSDP guidelines. Accordingly, vide secretariat letter of even no. dated 06.01.2015, project authorities have requested to submit the same.
11	Kolodyne-II HEP (460MW), Mizoram	Project authorities vide their letter no. CC:PEH dated 07.01.2015 have requested for extension of one year time for submission of desired study.
12	Nand Prayag Langasu HEP(100MW), Uttarakhand	Project authorities vide their letter no. 26/UJVNL/03/GM (New Proj)/NPL dated 07.01.2015 informed that the study is under progress at CWPRS and expected to be completed in next 2 to 3 months and the same may be submitted by June, 2015.
13	Demwe Upper HEP (1080MW), Arunachal Pradesh	Project authorities vide their letter no. LUPL/NCSDP/Seismic/141211 dated 11th December, 2014 have informed that the work of revised study has already given to IIT Roorkee. However, due to non-finalization of project parameters and dam type, the studies are yet to be completed. After finalization of the same by CEA/CWC the study will be submitted for approval.

SEW - RITHWIK JOINT VENTURE

C/o.SEW INFRASTRUCTURE LIMITED,
Office : 6-3-871, 'Snehalata, Greenlands Road, Begumpet, Hyderabad - 500 016, TS
Tel.No.040 – 663 00 000, Fax No. 040 – 2340 5016
e-mail : technical@sewinfra.com Website : www.sewinfra.com

Ref : SRJV/TW/F.Kanthanapally/2015/024-B
Date: 14-March-2015

The Director (FE & SA) &
Member Secretary (NCSDP)
Central Water Commission,
F.E. & S.A. Directorate,
8th Floor (N), Sewa Bhawan, R.K. Puram,
New Delhi - 110 066
Telefax: 011-26101017
e-mail: fesadte-cwc@nic.in

Dear Sir,

Sub: **P.V. Narasimha Rao, Kanthanapally, Sujala Sravanthi Project, Phase-I, Package-I** at Kanthanapally (V), Eturunagaram (M), Warangal (District), Telangana - **Submission of revised report of Estimation of site-specific design seismic parameters - Reg.**

Ref: 28th Meeting of NCSDP for river valleys project on 09.01.2015.

We invite your kind attention to the 28th Meeting of NCSDP for river valley projects on 09.01.2015.

Accordingly, we herewith submit the revised report of site-specific design seismic parameters for P.V.Narasimha Rao Kanthanapally Sujala Sravanthi Project in Telangana State. Incorporating the following information as desired by you in three (3) sets for your kind consideration and approval.

1) Strong motion duration and period of total duration of checking are mentioned in Clause 8: Generation of Design Accelerograms and Clause 9: Results & Recommendations
2) Andhra Pradesh changed to Telangana State
3) Barrage changed to dam everywhere.

Kindly arrange for approval of the seismic study report from NCSDP Committee for adopting the seismic values in the designs of the above subject project.

Thanking you & with regards,

For & on behalf of:
SEW - RITHWIK JOINT VENTURE

(M. THIRPATH REDDY)
AUTHORIZED SIGNATORY

Encls.: As above.

Annexure-VII

अनुसंधान के माध्यम से सेवा
Service Through Research

भारत सरकार
Government of India
जल संसाधन, नदी विकास तथा गंगा संरक्षण मंत्रालय
Ministry of Water Resources, River Development and Ganga Rejuvenation
केन्द्रीय जल और विद्युत अनुसंधान शाला
CENTRAL WATER AND POWER RESEARCH STATION
खडकवासला पुणे–411024, भारत
Khadakwasla, Pune - 411 024, India

Tel: 020-24103300
Fax: 020-24381004
E-mail: director@cwprs.gov.in
Website: www.cwprs.gov.in
www.mowr.gov.in

No. Dated: 14.01.2015

Shri O.P.Gupta
Director
F.E.S.A. Directorate
716(S), Sewa Bhawan
R.K.Puram
New Delhi-110066

Sub: Review of the site specific seismic hazard for Arun-III HEP, Nepal and Wangchhu HEP, Bhutan

Sir,

As recommended by the NCSDP the observations made have been complied with as follows

i) In the case of Arun-III, Nepal, the site specific horizontal and vertical seismic coefficients were found to be 0.19 and 0.13 respectively. Assuming that seismic zone V of the IS code:1893 is applicable to the region of the site the horizontal design seismic coefficient (α_h) works out to be 0.24 and the vertical seismic coefficient (α_v), taken as 2/3rds of α_h, is found to be 0.16 and being higher are recommended for design.

ii) In the case of Wangchhu, Bhutan, the closest distance to rupture plane has been suitably decreased as suggested and the MCE level deterministic spectrum was obtained. The difference between the deterministic and probabilistic spectra was found to be more than 25%, hence average of the two spectra were taken (in the earlier study the difference between the spectra was less than 25%, hence envelop was taken of the two spectra). The MCE level of the horizontal acceleration time history has a PGA of 0.438g as against the earlier PGA of 0.441g. Thus there is practically no change in the final results due to the decrease in the closest distance to fault rupture plane. Thus the results of the report hold.

Thanking you,

Yours faithfully,

(L.R.Pattanur)

From	lalitha pattanur <lrpattanur@yahoo.co.in>
Sent	Tuesday, **February 3, 2015** 4:35 pm
To	fesadte-cwc@nic.in
Subject	Wangchhu HEP & Arun III HEP reports
Attachments	ARUN-REPORT-475.DOC 1.8MB; DOCSHE~1.DOC 51K; REPORT475.DOC 1.8MB; DOCSHEET475.DOC 75K

Shri O.P. Gupta

Sir,

Please find attched the reports for the subject studies duly modified as suggested in the 28th meeting

with Regards

L.R.Pattanur