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

MINUTES OF 26th MEETING (11th December, 2013)

Secretariat

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

MINUTES OF THE 26TH MEETING OF
NATIONAL COMMITTEE ON SEISMIC DESIGN PARAMETERS FOR RIVER VALLEY PROJECTS
HELD ON 11TH DECEMBER, 2013 IN CWC, NEW DELHI

GENERAL

The 26th meeting of the National Committee on Seismic Design Parameters (NCSDP) for River Valley Projects was held on 11th December, 2013, at Central Water Commission, New Delhi under the chairmanship of Sh. A.B. Pandya, Member (D&R), CWC. The list of Members, project representatives and invitees who attended the meeting is given *at* ***Annexure I***.

Meeting commenced with a round of Introductions, and Chairman (NCSDP) welcoming the participants and invitees of the meeting. Highlighting the importance of the NCSDP and appreciating that third meeting of NCSDP is being held in the current year, chairman requested the Members to address all issues that have emerged after the application of new guidelines.

Item 26.1 CONFIRMATION OF THE MINUTES OF THE 25TH MEETING

Member Secretary informed that the Minutes of the 25th Meeting of NCSDP held on 28th June 2013 and 8th July 2013 were circulated to the Members of the Committee, and relevant extracts from the Minutes of Meeting were also sent to the concerned project authority for information. Observing that no written observation/ comment on the circulated Minutes have been received by the Secretariat, he further informed the Committee that Dr. I. D. Gupta (Retd. Director CWPRS and former Member NCSDP) has verbally communicated that some of the values of horizontal seismic co-efficient (α_h) computed as per agreed formula and with the application of Design Basis Earthquake (DBE) response spectra are appearing to be on lower side.

Sh. S.K. Sibal, Director, CWC was of the view that with the application of IS-1893 (1984), the horizontal seismic coefficient values (α_h) for projects lying in seismic zone II, III, IV and V will get computed as 0.06, 0.12, 0.16 and 0.24 respectively and these values shall form the lower limit of the α_h as arrived by site specific seismic studies. Agreeing with the view, the representative of IIT Roorkee suggested that codal provisions shall be seen as minimum benchmark for finalization of any seismic parameter arrived through site specific studies. This suggestion was agreed by the Committee.

Bringing attention to the original issue raised by Dr. I.D. Gupta regarding low values of α_h arrived for DBE condition, the representative of CWPRS stated that the return period assumed in the guidelines for the DBE condition calls for a revision. The chairman noted that the economic life of dams in India is generally exceeding beyond 150 years, and hence the assumed return period of 145 years for Design Basis Earthquake definitely seems to be low. Representative of CWPRS suggested a return period value of 475 years for the DBE condition as also indicated by some of the ICOLD publications. the representative of IIT Roorkee stated that use of such DBE condition with the earlier agreed formula will lead to computation of α_h values matching with codal provisions. After a brief deliberation, the Committee agreed to adopt a return period of 475 years for development of response spectra under DBE condition.

At the end of discussion under the agenda item, the Committee agreed on the following decisions:

(a) The DBE level of ground motion is to be defined with a return period of 475 years.

(b) The horizontal seismic coefficient values (α_h) shall be computed as per the DBE level of response spectra (as per the formula agreed in the 25th meeting of NCSDP) and compared with α_h values arrived through the application of IS-1893 (1984) (i.e. 0.06 for Zone-II, 0.12 for Zone-III, 0.16 for Zone-IV and 0.24 for Zone-V) and the higher of the two values shall be adopted.

(c) The Consultants (IIT Roorkee and CWPRS, Pune) for the site specific seismic studies currently under consideration of the Committee will incorporate the above two decisions in the current studies and submit the revised response spectra and revised seismic design parameters at the earliest. [*CWPRS, Pune subsequently submitted its compliance vide their letter no. 324/12/2011-ES/70/388 dated 12.02.2014 (Annexure II) and IIT Roorkee has submitted its compliance vide their letter no. EQD/NCSDP/113 dated 11.03.2014 (Annexure III)].*

(d) In case, the horizontal seismic design coefficient (and corresponding vertical seismic design coefficients taken as 2/3rd of horizontal coefficient) approved in the 25th NCSDP meeting fall below the values arrived through the application of IS code i.e. IS-1893 (1984), then values arrived through IS code shall be adopted.

The Committee observed that the criteria laid out above may lead to same values of seismic co-efficient for earth and concrete dams in case composite dam is being planned. The Committee further noted that the seismic coefficients being proposed are for preliminary designs or firming up the dam dimensions only. The actual dam stability shall be worked out using response spectrum/Time history approved by NCSDP.

The Committee also confirmed the Minutes of the 25th Meeting as circulated, and agreeing that current decisions under the agenda item will be covered in the minutes of 26th Meeting.

Item 26.2 AGENDA ITEMS CARRIED OVER FROM PREVIOUS MEETING

The Member Secretary informed the Committee that in previous meeting the Committee had requested Dr. I.D. Gupta to provide the draft of amendments to the NCSDP guidelines (Oct, 2011) incorporating the decisions of that meeting. He further informed that owing to Dr. Gupta's retirement from the service, the compliance of above has not been achieved.

After brief discussion, the Committee decided that the NCSDP Secretariat shall carry out the required amendments to the guidelines incorporating decisions of the 25th and current NCSDP meetings, and put up the updated guidelines for consideration of the Committee.

Item 26.3 NEW PROJECTS CONSIDERED FOR APPROVAL OF THE COMMITTEE

Based on the decisions under Item 26.1 (c) above, CWPRS, Pune vide its letter no. 324/12/2011-ES/70/388 dated 12.02.2014 and IIT Roorkee vide its letter no. EQD/NCSDP/113 dated 11.03.2014 have furnished their compliances and the same are given as ***Annexure II*** and ***Annexure III*** respectively.

26.3.1 Triveni Mahadev HE Project, Himachal Pradesh

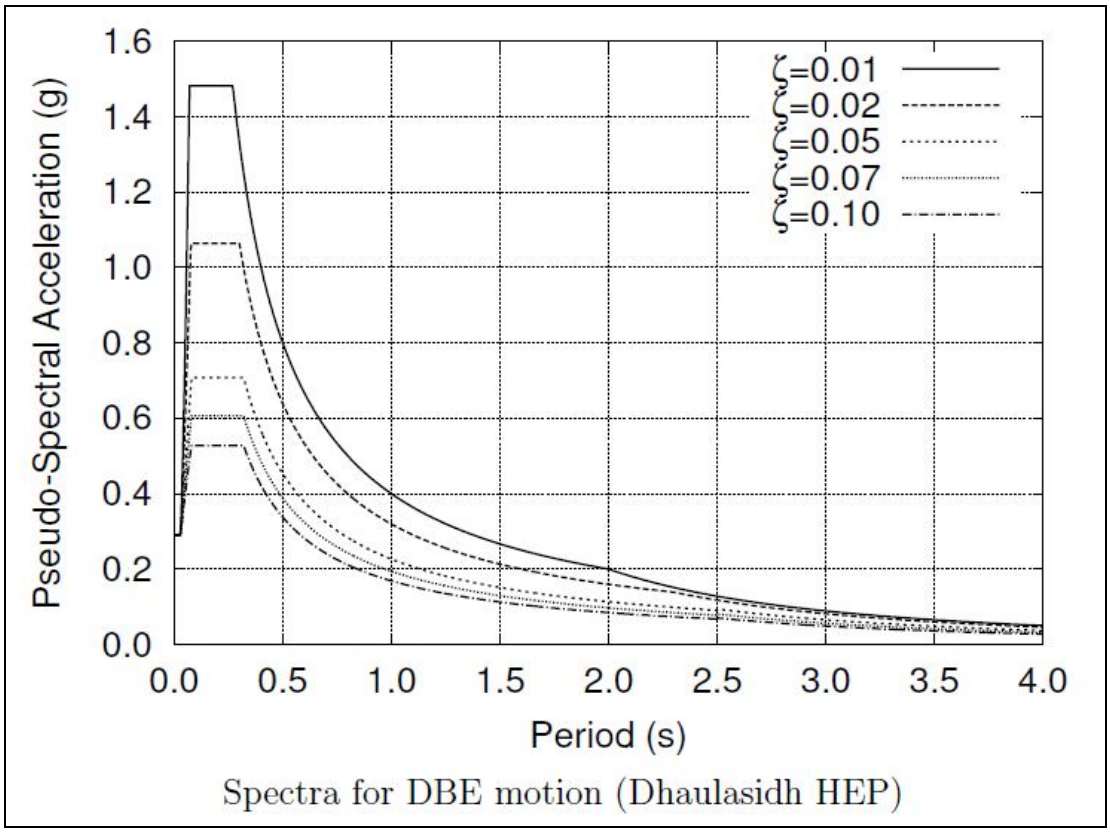
A presentation on the study report was made by the project authorities. During the presentation, the project authorities informed the Committee that in the process of optimization of power potential, utilizing regulated flows from u/s projects namely Thana Plaun HEP (191 MW) and Uhl HEP (100 MW) and evaluating the viability of the project on techno-economical considerations, Diversion Structure is being proposed to be changed from barrage to Dam (63 m high concrete dam) and under consideration for shifting the diversion site to 800 m d/s of barrage and 600 m d/s of the confluence of Binwa Khad with river Beas.

In the meeting, it was felt by the Committee that since the location and type of diversion structure is still under finalization, it will not be appropriate to consider the study report of aforesaid project for approval. ***The Committee Members were of the opinion that first of all the location and type of diversion structure shall be finalized by the project authorities and then the site specific seismic study needs to carried out and submitted to NCSDP for approval.***

26.3.2 Dhaulasidh HE Project, Himachal Pradesh

A presentation on the study report was made by the project authorities. **The Committee approved the study report of Dhaulasidh HE Project, Himachal Pradesh incorporating the revised seismic design parameters arrived as per Committee's decisions under item 26.1 and as summarized below:**

(a) Response Spectra



Spectra for DBE motion (Dhaulasidh HEP)

(b) Other seismic parameters

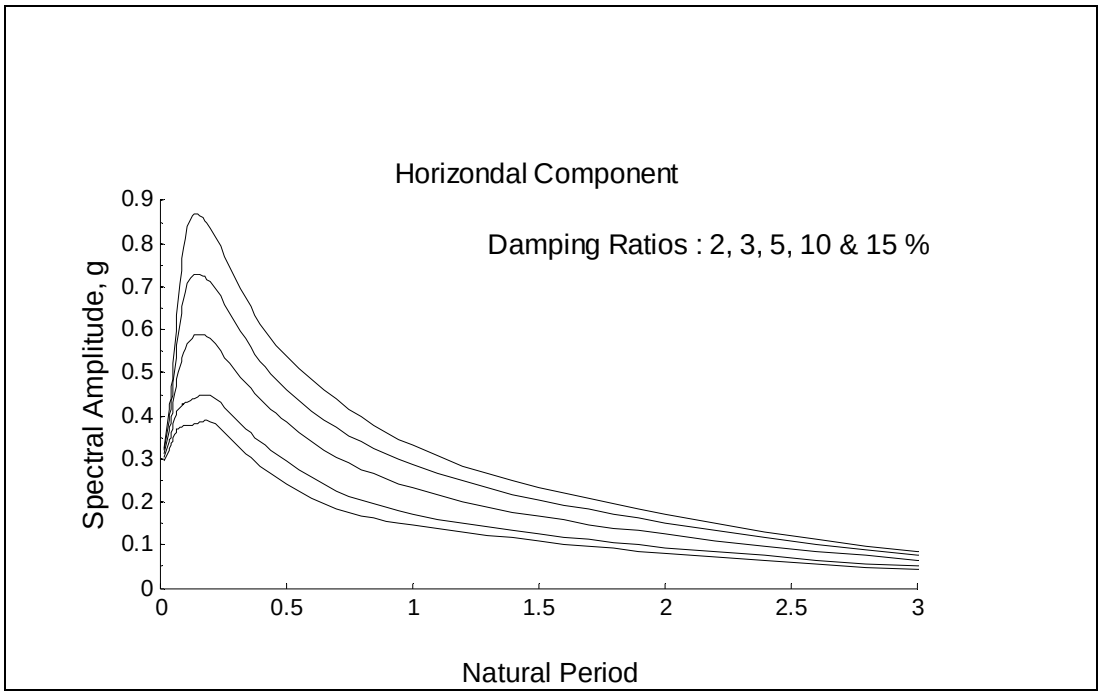
Max. Credible Earthquake Magnitude	7.0	Epicentral distance (km)	4	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.24		Vertical seismic co-efficient (α_v)		0.16
Strong motion duration (sec)	7		Total duration (sec)		36
Report reference	IIT Roorkee Report No. EQ: 2012-34 [(Project No. EQD-3022/2011-2012 (November-2012)] along with letter dated EQD/NCSDP/113 dated 11.03.2014 indicating revised parameters.				

26.3.3 Chamkarchu (stage-I) HE Project, Bhutan

A presentation on the study report was made by the project authorities. The project authorities informed that MEQ studies for 108m high concrete dam will be taken up shortly and final study report will be submitted by December, 2014 and the same has been conveyed by their letter dated 13.12.2013 ***(Annexure-IV)***

The Committee approved the study report of Chamkarchu (stage-I) HE Project, Bhutan incorporating the revised seismic design parameters arrived as per Committee's decisions under item 26.1 and as summarized below. The Committee also noted that its approval is conditional subject to the submission of MEQ studies by the project authorities by end of December, 2014:

(a) Response Spectra



(b) Other seismic parameters

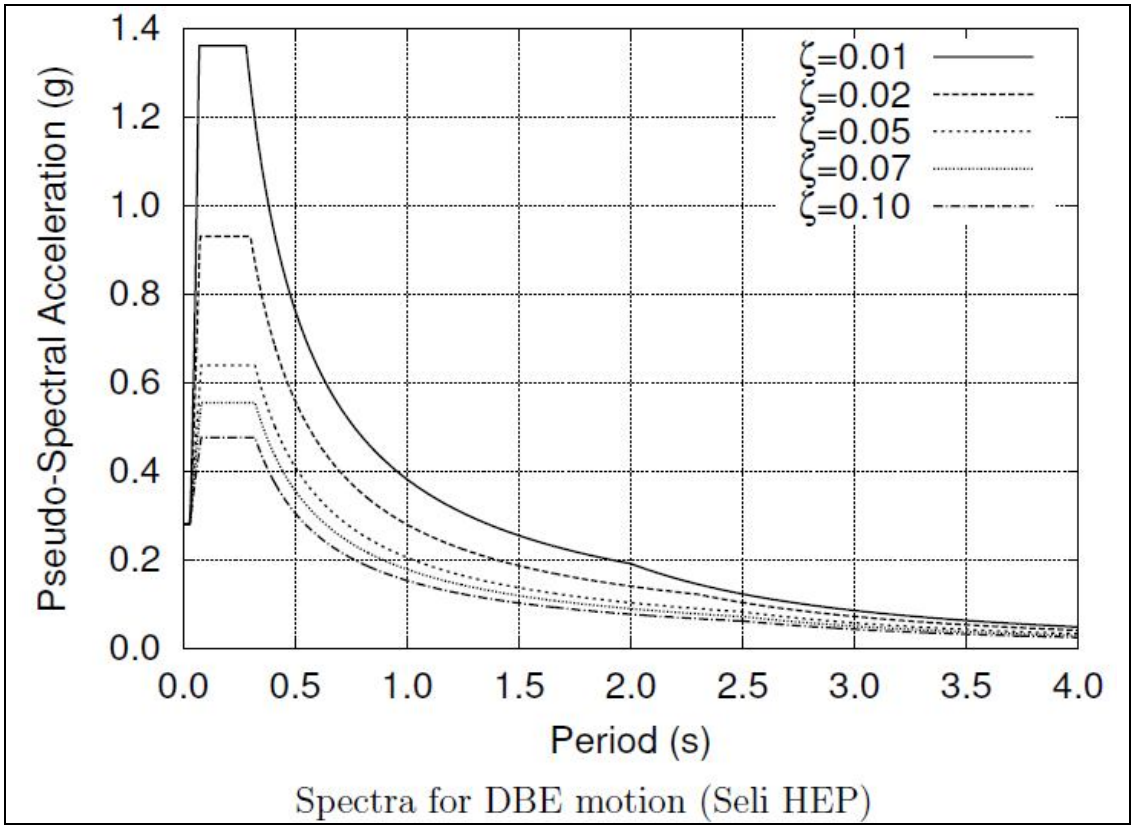
Max. Credible Earthquake Magnitude	8.0	Epicentral distance (km)	-	Focal depth (km)	36.6
Horizontal seismic co-efficient (α_h)		0.24	Vertical seismic co-efficient (α_v)		0.16
Strong motion duration (sec)		11.8	Total duration (sec)		46.1
Report reference	Revised Technical Report No. 4892 (October-2011) of CWPRS furnished vide their letter no. 324/12/2011-ES/70/388 dated 12.02.2014.				

26.3.4 Seli H.E. Project, Himachal Pradesh

A presentation on the study report was made by the project authorities. The project authorities have informed that MEQ studies for 123 m high concrete dam will be taken up shortly and final study report will be submitted by December, 2014.

The Committee approved the study report of Seli H.E. Project, Himachal Pradesh incorporating the revised seismic design parameters arrived as per Committee's decisions under item 26.1 and as summarized below. The Committee also noted that its approval is conditional subject to the submission of MEQ studies by the project authorities by end of December, 2014.

(a) Response Spectra



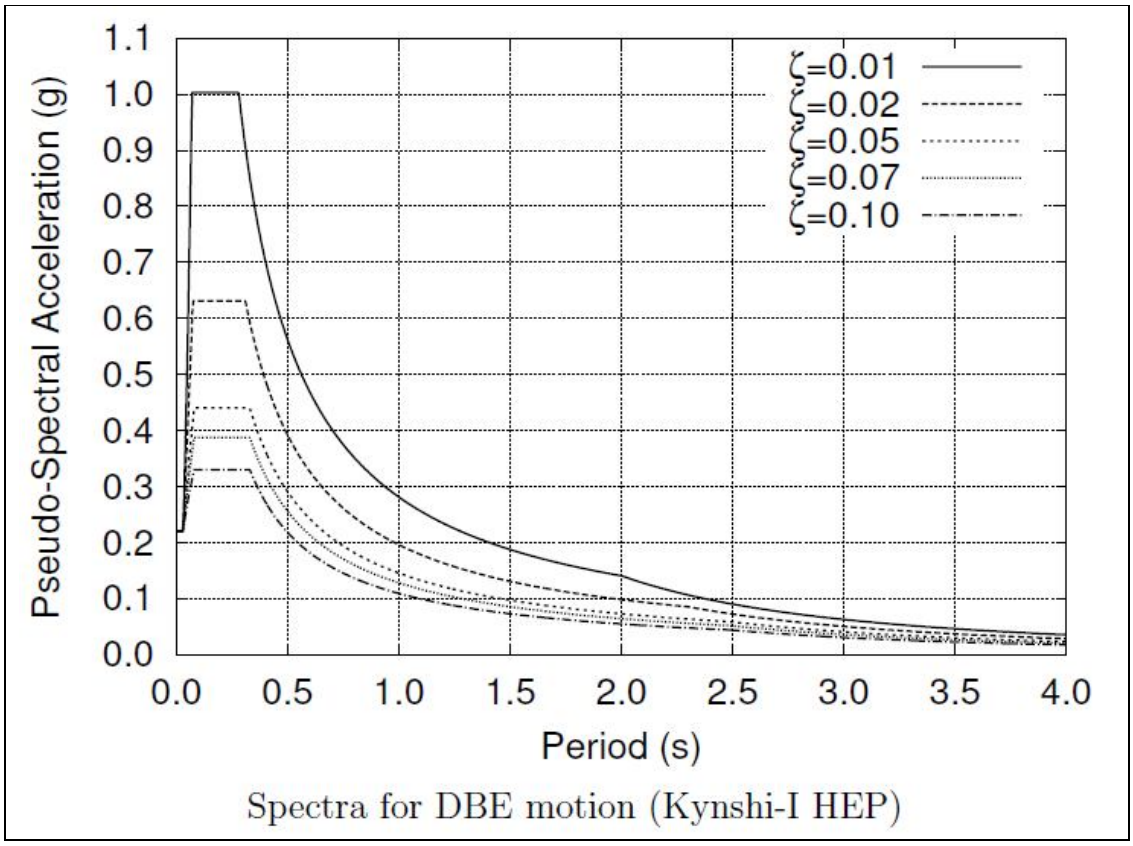
(b) Other seismic parameters

Max. Credible Earthquake Magnitude	7.5	Epicentral distance (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.17	Vertical seismic co-efficient (α_v)	0.11		
Strong motion duration (sec)	8	Total duration (sec)	36		
Report reference:	IIT Roorkee Report No. EQ: 2013-23 [(Project No. EQD-6019/12-13 (September-2013)] along with letter no. EQD/NCSDP/113 dated 11.03.2014 indicating revised parameters.				

26.3.5 Kynshi-I HE Project, Meghalaya

A presentation on the study report was made by the project authorities. **The Committee approved the study report of Kynshi-I HE Project, Meghalaya incorporating the revised seismic design parameters arrived as per Committee's decisions under item 26.1 and as summarized below:**

(a) Response Spectra



Spectra for DBE motion (Kynshi-I HEP)

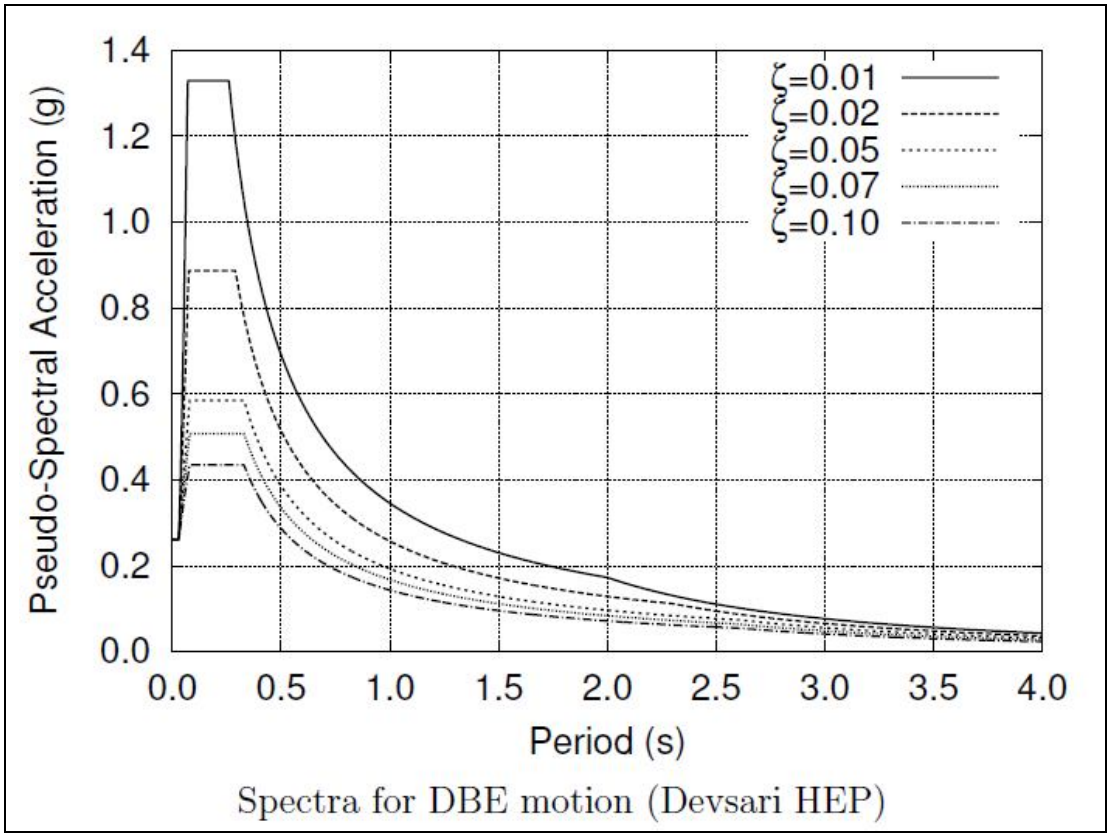
(b) Other seismic parameters

Max. Credible Earthquake Magnitude	7.5	Epicentral distance (km)	17	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)		0.24	Vertical seismic co-efficient (α_v)		0.16
Strong motion duration (sec)		10	Total duration (sec)		51
Report reference	IIT Roorkee Report No. EQ: 2011-32 [(Project No. EQD-3010/2011-2012, (March, 2012)] along with letter no. EQD/NCSDP/113 dated 11.03.2014 indicating revised parameters.				

26.3.6 Devsari HE Project, Uttarakhand

A presentation on the study report was made by the project authorities. **The Committee approved the study report of Devsari HE Project, Uttarakhand incorporating the revised seismic design parameters arrived as per Committee's decisions under item 26.1 and as summarized below:**

(a) Response Spectra



Spectra for DBE motion (Devsari HEP)

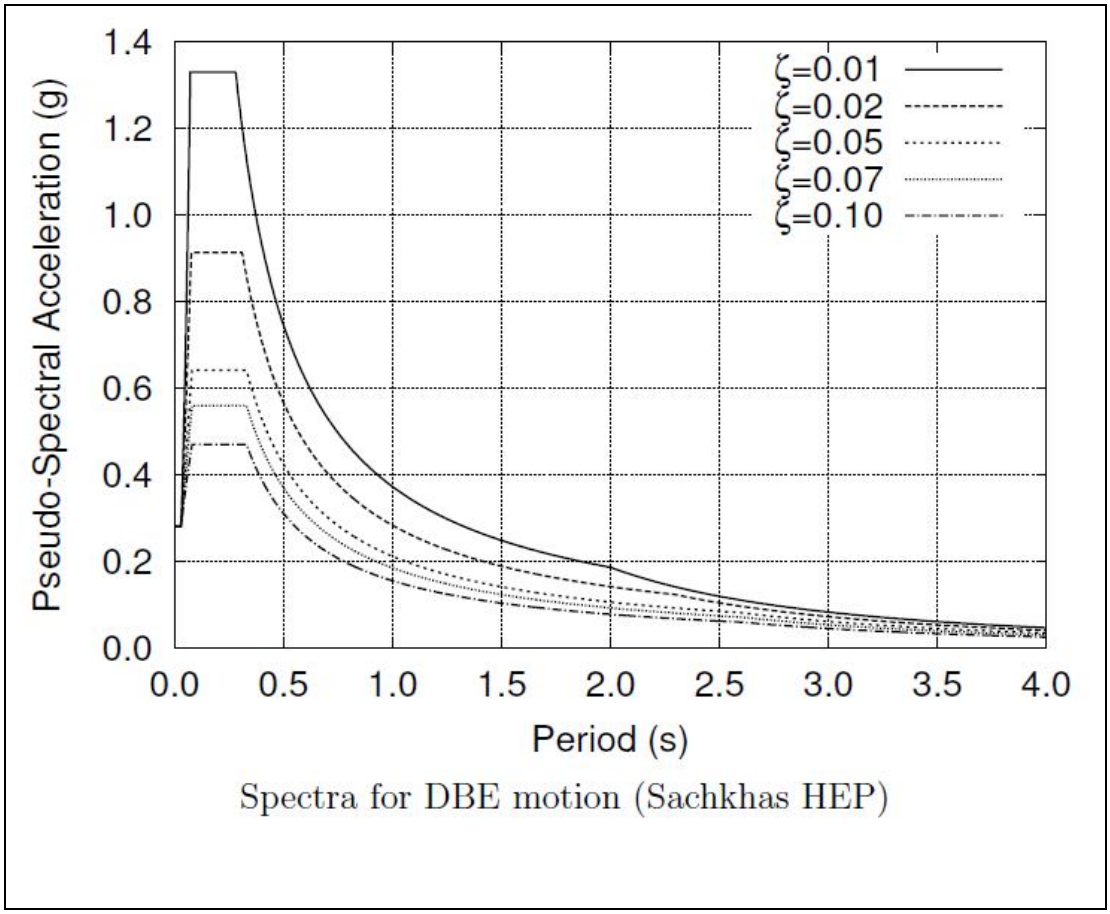
(b) Other seismic parameters

Max. Credible Earthquake Magnitude	8.0	Epicentral distance (km)	22	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)		0.24	Vertical seismic co-efficient (α_v)		0.16
Strong motion duration (sec)		10	Total duration (sec)		51
Report reference	IIT Roorkee Report No. EQ: 2013-16 [(Project No. EQD-6014/2012-2013 (May-2013)] along with letter no. EQD/NCSDP/113 dated 11.03.2014 indicating revised parameters.				

26.3.7 Sach Khas HE Project, Himachal Pradesh

A presentation on the study report was made by the project authorities. **The Committee approved the study report of Sach Khas HE Project, Himachal Pradesh incorporating the revised seismic design parameters arrived as per Committee's decisions under item 26.1 and as summarized below:**

(a) Response Spectra



(b) Other seismic parameters

Max. Credible Earthquake Magnitude	7.5	Epicentral distance (km)	5	Focal depth (km)	15
Horizontal seismic co-efficient (α_h)	0.17	Vertical seismic co-efficient (α_v)	0.11		
Strong motion duration (sec)	8	Total duration (sec)	43		
Report reference	IIT Roorkee Report [(Project No. EQD-3021/2011-2012 (December -2012)] along with letter no. EQD/NCSDP/113 dated 11.03.2014 indicating the revised parameters.				

Item 26.4 PROPOSAL FOR MODIFICATION IN THE COMPOSITION AND TERMS OF REFERENCE (ToR) OF NCSDP

The Member Secretary informed the Committee about limited responses received in respect of composition and terms of reference of the Committee. He also informed the Committee about suggestions received concerning modified composition and terms of reference.

During deliberations, the names of Dr. C.S. Manohar, Indian Institute of Science, Bangalore; Dr. (Prof.) Durgesh C. Rai, Department of Civil Engineering, IIT Kanpur; Sh. Sujit Dasgupta, (Retd.) Deputy Director General, GSI and Prof. J. R. Kayal, (Retd.) Deputy Director General, GSI were also proposed by the Members for inclusion in the Committee.

After detailed discussion on the proposed modification in the composition and terms of reference of the NCSDP, the Committee approved the document (as brought out in ***Annexure-V***) for its submission as NCSDP's recommendation for further consideration by Ministry of Water Resources (MoWR).

The meeting ended with vote of thanks to the chair.

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Summary of Policy related decisions of 26th NCSDP meeting:

(a) The DBE level of ground motion is to be defined with a return period of 475 years.

(b) The horizontal seismic coefficient values (α_h) shall be computed as per the DBE level of response spectra (as per the formula agreed in the 25th meeting of NCSDP) and compared with α_h values arrived at through the application of IS-1893 (1984) (i.e. 0.06 for Zone-II, 0.12 for Zone-III, 0.16 for Zone-IV and 0.24 for Zone-V) and the higher of the two values shall be adopted.

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Annexure –I

26th Meeting of National Committee on Seismic Design Parameters (NCSDP) on River Valley Projects

List of Participants on 11.12.2013

Sl.No.	Name & Address	Designation	Deptt./ Org.	Status/ Representative
I. Committee Members				
1.	Sh. A.B.Pandya	Member (D&R)	CWC, New Delhi	Chairman, NCSDP
2.	Sh. L.A.V. Nathan	Chief Engineer (DSO)	CWC, New Delhi	Member
3.	Dr. Rajesh Prakash	Scientist 'E'	IMD Delhi	Representative of IMD
4.	Dr. Manish Shrikhande	Assoc. Professor, Deptt. of Earthquake Engg.	DEQ, IIT Roorkee,	Representative of IIT Roorkee
5.	Dr. L.R. Pattanur	Senior Research Officer	CWPRS	Representative of CWPRS
6.	Sh. Rajiv Kr. Srivastava	Superintending Surveyor, Geodetic & Research branch	Survey of India Dehradun,	Representative of Survey of India
7.	Dr. B. R. K. Pillai	Director, FE&SA	CWC, New Delhi	Member-Secy. NCSDP
II. Special Invitees and other officials				
8.	Sh. Y.K. Handa	Chief Engineer	CWC	CWC
9.	Sh. S.K. Sibal	Director	CWC	CWC
10.	Dr. Jasodhir Das	Scientist	DEQ, IIT Roorkee	IIT Roorkee
11.	Sh. V. Rambabu	Engineering Seismology	CWPRS	CWPRS
12.	Sh. O.P. Gupta	Deputy Director	CWC	NCSDP Secretariat
13.	Sh. Saurabh	Asst. Director	CWC	''
14.	Sh. G. Sanjeeva Reddy	Asst. Director II	CWC	"
15.	Sh. C.L. Premi	Head Draftsman	CWC	"
16.	Ms. Vinod Sharama	Sr. Draftsman	CWC	"
III. Project Representatives and Consultants				
17.	Sh. P.K.Kathuria	General Manager	HPPCL	Triveni Mahadev HE Project, Himachal Pradesh
18.	Sh. Dinesh kumar Chaudhary	DGM	-Do-	-Do-
19.	Sh. Bhuvnesh Sharma	Sr. Manager	-Do-	-Do
20.	Ms.Laxmi	Geologist	-Do-	-Do-
21.	Er. Deepak Nakhasi	General Manager	SJVNL	Dhaulasidh HE Project, Himachal Pradesh
22.	Er. K L Aumta	AGM	-Do-	-Do-
23.	Er. Harsh Bmetha	Sr. Engineer	-Do-	-Do-
24.	Sh. Brijesh Badoni	Geologist	-Do-	-Do-

25.	Sh Imran Sayeed	Chief (Geology)	NHPC	Chamkarchu (Stage-I), HE Project, Bhutan
26.	Sh. S.L. Kapil	Chief (Geophysics)	-Do-	-Do-
27.	Sh. Anil K. jain	Chief Engineer (Design)	-Do-	-Do-
28.	Sh. Vivek Singh	AGM	Moserbaer	Seli HE Project, Himachal Pradesh
29.	Sh. Rajesh Srivastava	Representative	-Do-	-Do-
30.	Sh. Rakesh Kumar	Representative	-Do-	-Do-
31.	Sh. Rajesh Dixit	Representative	-Do-	-Do-
32.	Sh. Jaideep Lakhtakia	General Manager	Athena Kynshi Power Pvt. Ltd.	Kynshi-I HE Project, Meghalaya
33.	Sh. Sasi Nair	Representative	-Do-	-Do-
34.	Ms. Pooja Garg	Representative	-Do-	-Do-
35.	Mr. Winfred	Representative	-Do-	-Do-
36.	Sh. S.S. Goshia	Sr. Vice President	Aquagreen	-Do-
37.	Sh. Keshurilal	Representative	-Do-	-Do-
38.	Er. Deepak Nakhasi	General Manager	SJVNL	Devsari HE Project, Uttarakhand
39.	Er. K L Aumta	AGM	-Do-	-Do-
40.	Er. Harsh Bmetha	Sr. Engineer	-Do-	-Do-
41.	Sh. Brijesh Badoni	Geologist	-Do-	-Do-
42.	Sh. B. Bhattacharjee	Representative	L&T HHL	Sach Khas HE Project, Himachal Pradesh
43.	Sh. A.K. Chaudhary	Representative	-Do-	-Do-
44.	Sh. R.K. Thakur	Representative	-Do-	-Do-
45.	Sh. Chanda	Representative	-Do-	-Do-

Annexure-II

सेवा अनुसंधान के माध्यम से सेवा
Service Through Research

भारत सरकार
Government of India
जल संसाधन मंत्रालय
Ministry of Water Resources
केन्द्रीय जल और विद्युत अनुसंधान शाला
CENTRAL WATER AND POWER RESEARCH STATION
खडकवासला पुणे-411024, भारत
Khadakwasla, Pune - 411 024, India

Tel: 020-24103325, 24103356
Fax: 020-24381004
E-mail: mathew_ft@cwprs.gov.in
Website: www.cwprs.gov.in

No. 324/12/2011-ES/ 70 (388

Dated: 11.02.2014

To
Shri O.P. Gupta
Dy. Director, CWC
NCSDP Secretariat
712(S), Sewa Bhavan
R.K. Puram, New Delhi - 110016

Sub: Revised technical report of Chamkharchu stage-I hydro electric project, Bhutan.

Sir,

Please find enclosed one copy of the revised technical report entitled 'Estimation of site-specific seismic design parameters for Chamkharchu stage-I Hydro Electric Project, Bhutan' bearing Technical Report No. 4892 for October 2011, after complying with the requirements as discussed in the 26th meeting of National Committee on Seismic Design Parameters (NCSDP) held on 11.12.2013.

Receipt of the report may please be acknowledged.

Yours faithfully

11/2/14

(M.N. Singh)
Joint Director

Encl: As above

Annexure-III

भारतीय प्रौद्योगिकी संस्थान रुड़की
भूकम्प अभियांत्रिकी विभाग
रुड़की – 247 667, उत्तराखण्ड, भारत
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
DEPARTMENT OF EARTHQUAKE ENGINEERING
ROORKEE - 247 667, UTTARAKHAND, INDIA
Fax : 0-1332-276899/273560 Tel. : 285228/284328 E-mail : quake@iitr.ernet.in

No. EQD/NCSDP/ 113
Date: March 11, 2014

Dr. B.R.K. Pillai
Director (FE&SA) & Member Secy (NCSDP)
Govt. of India
Central Water Commission
FE&SA Directorate
712(A), Sewa Bhawan, R.K. Puram,
NEW DELHI- 110 066 email: fesa_cwc@nic.in

Dear Sir:

Please find enclosed herewith the design spectra for horizontal component of DBE motions for the projects discussed in the last meeting of the NCSDP wherein it was decided that the probabilistic estimate of the design basis ground motion should be pegged at a return period of 475 years. The computations for the site specific ground motions were accordingly repeated with the 475 year return period probabilistic estimate.

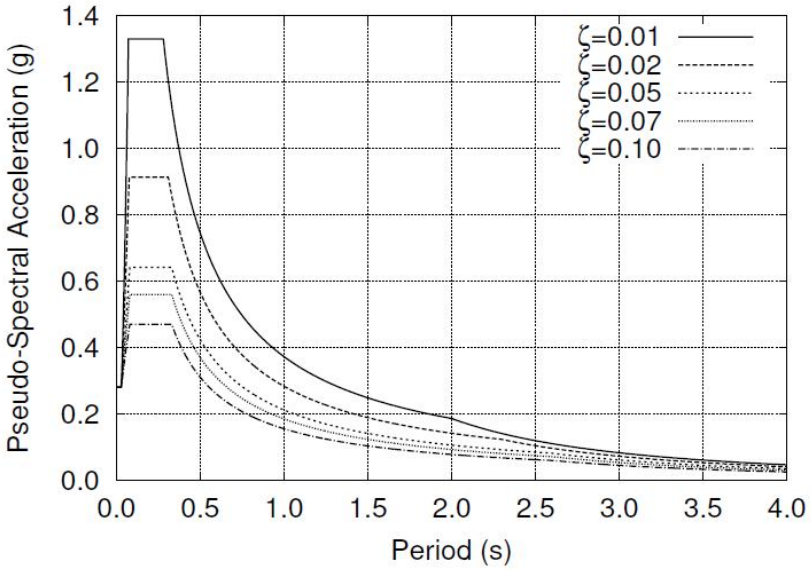
We apologize for the delay.

Thanking you.

Yours sincerely,

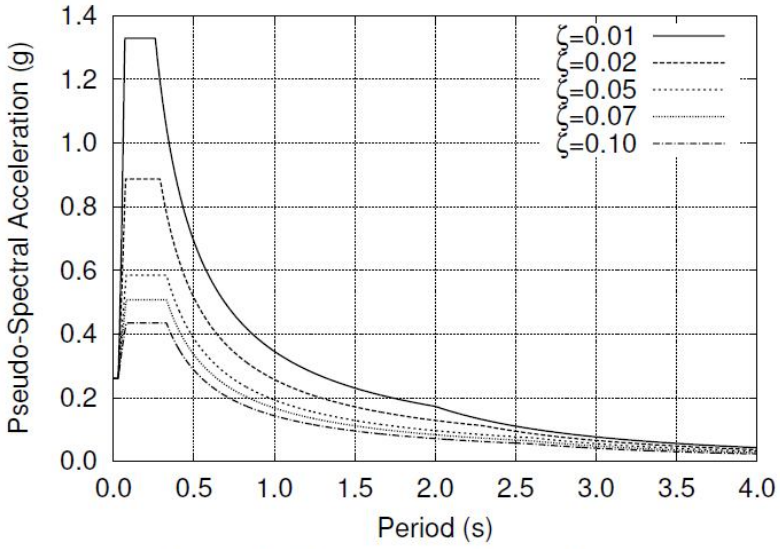
11/3/2014
(Ashok Kumar)
Prof. and Ofctg. Head

Sachkhas HEP The estimated seismic coefficients are: $\alpha_h = 0.17$ and $\alpha_v = 0.11$. Strong motion duration: 8 s and Total duration: 43 s.



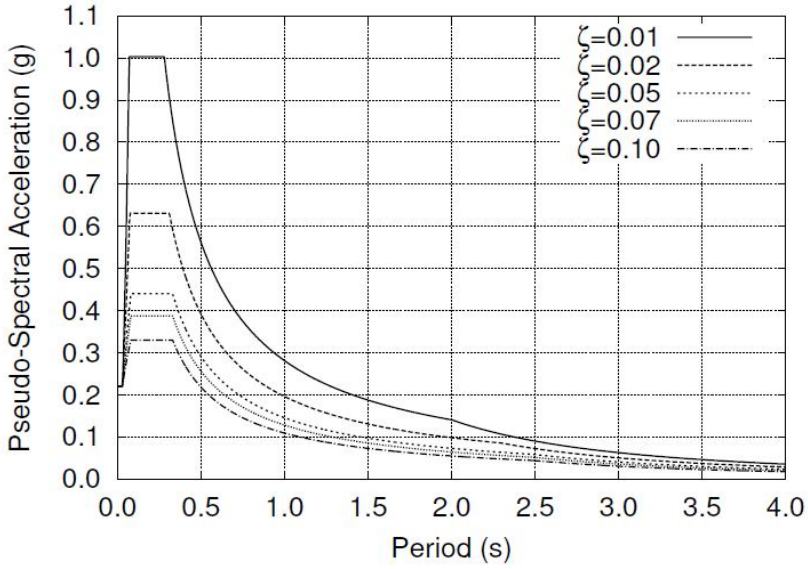
Spectra for DBE motion (Sachkhas HEP)

Devsari HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 10 s and Total duration: 51 s.



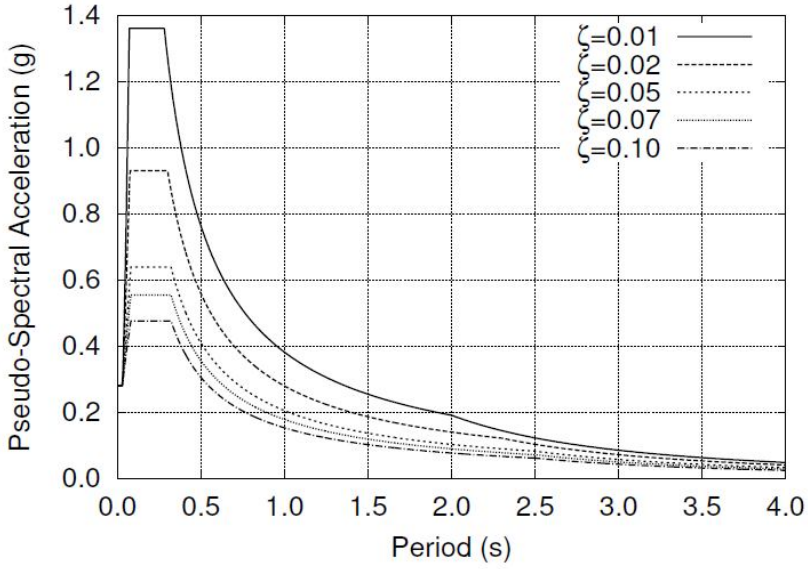
Spectra for DBE motion (Devsari HEP)

Kynshi-I HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 10 s and Total duration: 51 s.



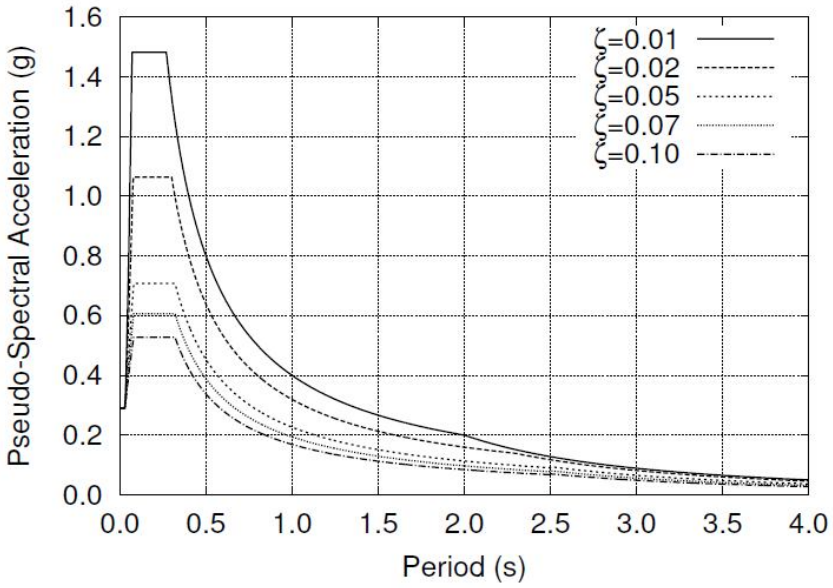
Spectra for DBE motion (Kynshi-I HEP)

Seli HEP The estimated seismic coefficients are: $\alpha_h = 0.17$ and $\alpha_v = 0.11$. Strong motion duration: 8 s and Total duration: 36 s.



Spectra for DBE motion (Seli HEP)

Dhaulasidh HEP The estimated seismic coefficients are: $\alpha_h = 0.24$ and $\alpha_v = 0.16$. Strong motion duration: 7 s and Total duration: 36 s.



Spectra for DBE motion (Dhaulasidh HEP)

Annexure-IV

(भारत सरकार का उद्यम)

NHPC Limited
(A Government of India Enterprise)

फोन/Phone : 13.12.13
दिनांक/Date :

संदर्भ सं./Ref. No.
संदर्भ सं/NH/PID/ 765

To,
Shri.O.P.Gupta,
Dy.Director,
NCSDP secretariat,
Foundation Engineering & Special Analysis (FE & SA) Directorate,
Central Water Commission,
712 (S), Sewa Bhawan,
R.K.Puram,
New Delhi
110605

विषय: Regarding clarification on MEQ studies been taken up for Chamkarchu-I project, Bhutan

Sir,

Kindly refer to the NCSDP meeting discussion regarding MEQ studies for Chamkarchuu stage-I Hydroelectric Project, Bhutan. In this connection, it is submitted that an agreement between the Department of Energy, Royal Government of Bhutan (RGoB) and NHPC ltd was signed in Dec. 2009 for the preparation of Detailed Project Report (DPR) for Chamkarchuu stage-I Hydroelectric Project (670MW) in Bhutan. Presently the DPR is under scrutiny by CWC & CEA.Techno Economic clearance of this project is expected very shortly. Further, construction of this project is proposed to be taken up on joint venture basis between NHPC and RGoB. A joint venture company will be formed for construction of the project after the decision by Govt. of India.

In view of the above details it is submitted that the MEQ study of the project will be taken up by the joint venture company and the MEQ report will be prepared by Dec. 2014. Accordingly, it is requested that approval for seismic design parameters of the project may kindly be accorded.

Thanking You,

Yours Sincerely,

13/12/13

(S.L.Kapil)
Chief (Geophysics)
Project Investigation Division
NHPC Office Complex
Sector 33, Faridabad
Haryana-121003

Annexure-V

NATIONAL COMMITTEE ON SEISMIC DESIGN PARAMETERS FOR RIVER VALLEY PROJECTS
DRAFT OF MODIFIED CONSTITUTION

I COMPOSITION THE NATIONAL COMMITTEE ON SEISMIC DESIGN PARAMETERS

The composition of the Committee shall be as under:

1.	Member (D&R), Central Water Commission, New Delhi	: *Ex officio* Chairman
2.	Head, Deptt. of Earthquake Engg. Indian Institute of Technology, Roorkee	: *Ex officio* Member
3.	Director, Central Water and Power Research Station, Pune	: *Ex officio* Member
4.	Head, Centre for Seismology, Indian Meteorological Department, New Delhi	: *Ex officio* Member
5.	Head, Geosciences Division, Indian Institute of Remote Sensing, Dehradun	: *Ex officio* Member
6.	Additional Surveyor General, Geodetic & Research Branch, Survey of India, Dehradun	: *Ex officio* Member
7.	Dy. Director General, Mission IVA, Geological Survey of India, CHQ, Kolkata	: *Ex officio* Member
8.	Director, Engineering Project Evaluation, DGCO, Geological Survey of India, New Delhi	: *Ex officio* Member
9.	Commissioner (SPR), Ministry of Water Resources, New Delhi	: *Ex officio* Member
10.	Chief Engineer (DSO), Central Water Commission, New Delhi	: *Ex officio* Member
11	Dr. M. Ravi Kumar, Senior Principal Scientist, National Geophysical Research Institute, Hyderabad	: Member (*in personal Capacity*)
12.	Dr. (Prof.) C. S. Manohar Department of Civil Engineering Indian Institute of Science Bangalore	: Member (*in personal Capacity*)
13.	Dr. (Prof.) Durgesh C. Rai, Department of Civil Engineering, Indian Institute of Technology, Kanpur	: Member (*in personal Capacity*)
14.	Sh. Sujit Dasgupta, (Retd.) Deputy Director General, GSI	: Non-official Member
15.	Prof. J. R. Kayal (Retd.) Deputy Director General, GSI	: Non-official Member
16.	Director, FE&SA, Central Water Commission, New Delhi	: *Ex officio* Member-Secretary

The Members of the Committee shall not be directly associated with formulation of site specific seismic study reports that are submitted for Committee's approval.

II TERMS OF REFERENCE OF THE NATIONAL COMMITTEE ON SEISMIC DESIGN PARAMETERS

The functions of the Committee shall be as follows:

1. Examination of site specific seismic study report of upcoming river valley projects in terms of compliance to Committee's guidelines.

2. Evaluation and approval of study results of site specific seismic studies of upcoming river valley projects considering all aspects of the site and the terrain, and if required, give recommendations for further studies.

3. Periodic review of the Committee's guidelines in view of the emerging scenario world wide in respect to the techniques and methodologies for seismic hazard assessment.

4. To consider on case to case basis special references in respect of review of seismic design parameters of existing dams owing to changed scenario of seismic activities in the region concerned.

5. To give recommendations as and when felt necessary on the best practices for seismic safety of the dams.

6. To consider varied aspects of seismic risks associated with dams including Reservoir Triggered Seismicity, and make appropriate recommendations.

7. To evaluate and recommend on establishment and standardization of seismic networks at dam sites and consolidation of data from such networks; and to monitor the implementation.

8. To give recommendations on research activities needed in the field of seismic safety of dams.

The expenditures entailed in the functions of the Committee shall be met in the following manner:

1. Expenditure incurred (including cost of travelling, dearness allowance, and other incidental expenses) to attend the meeting by the *ex officio* Members of the Committee shall be borne by their concerned controlling authorities.

2. In case of Members in personal Capacity, the expenditure incurred towards travelling cost, dearness allowance, and other incidental expenses to attend the meeting shall be borne by the Central Water Commission (CWC) as per entitlements applicable to an official of the rank of Chief Engineer in CWC.

3. In case of non-official Members, the expenditure towards cost of travelling and accommodation to attend the meeting shall be borne by CWC as per entitlements applicable to an official of the rank of Chief Engineer in CWC. In addition to above, the non-official Members shall also be paid a sitting fee of Rs. 3000/- (Rupees three thousands only) for each day of meeting attended by him.

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