

Minutes of the ninth National Committee on Dam Safety meeting held on 11.6.1992 at Central Water Commission, New Delhi.

The ninth meeting of the National Committee on Dam Safety (NCDS) was held on 11th June 1992 in Sewa Bhavan, R.K.Puram, New Delhi under the chairmanship of Dr.C.D.Thatte, Chairman, CWC and Chairman of NCDS.

The list of officers who attended the meeting is given in Annex.I.

Dr.Thatte, Chairman, NCDS welcomed the members of NCDS and other participants. The items on the agenda of ninth meeting were taken up for discussion and recorded as under:

9.1 Confirmation of the minutes of 8th meeting.

- 9.1.1 Comments received from Bhakra Beas Management Board (BBMB) on the minutes of the 8th meeting of NCDS were in the form of compliance to the minutes and provided further information of BBMB projects concerning a few items of the minutes of the meeting. These were considered in the 9th meeting of NCDS and appear elsewhere in these minutes. It was felt that these do not necessitate any change in the minutes as recorded.
- 9.1.2 The minutes of 8th meeting of NCDS held on 11.10.1991 at New Delhi were confirmed.

9.2 "Dam Safety Assurance and Rehabilitation Project."

- 9.2.1 Director, Dam Safety, CWC gave an account of the activities that took place under this project, on the key issues of staff deployment, provision of basic facilities to identified dams, Dam Safety Review Panel meeting for dams identified for rehabilitation, and the visit of World Bank Monitoring Mission in August 1991 and the World Bank Review Mission in April 1992.
- 9.2.2 It was intimated to the members of NCDS that CWC had assisted the four participating States by conducting model Phase I inspection for one dam in each State as below:

Madhya Pradesh	: Barna
Rajasthan	: Ranapratap Sagar
Tamil Nadu	: Sathanur

Similar action would be taken for Derjang dam in Orissa during June 1992.

- 9.2.3 The Hydrology Unit of CWC had prepared envelope curves for prioritizing hydrology review for dams under the PMF category and these guidelines were supplied to the States in February 1992. Essential literature and guidelines concerning the use of these envelope curves were also issued to the States simultaneously. Recently, during 4-5 June 1992, a two-day workshop was held in CWC on the subject (conducted by Hydrology Unit of CWC) in which about 20 engineers from 4 participating States under the DSARP scheme took part.
- 9.2.4 At the request of Chairman, CWC, the representatives of 4 participating States intimated the progress achieved in each State in respect of the DSARP scheme and the budget allocation for 1992-93 as intimated by them were:
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|----------------|----------------------|
| Madhya Pradesh | : Rs.4.2 crore |
| Orissa | : Rs.6.0 crore |
| Rajasthan | : Rs.7.58 crore; and |
| Tamil Nadu | : Rs.4.0 crore |
- 9.2.5 Chairman requested the above States to urgently compile the total rehabilitation package estimates for the 33 dams identified for rehabilitation by the end of the year 1992 so that these estimates could be got cleared by the respective Dam Safety Review Panel, enabling the States to submit the same to the Appraisal Committee of the MoWR for clearance. He also requested the State representatives to file their claim for reimbursement with World Bank promptly.

(Action : States of Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu)

9.3 Review of National Scenario

- 9.3.1 The National Scenario, particularly with reference to distress to dams, structural and operational deficiencies noted during the end of the monsoon of 1991 as obtained from the States and press reports were intimated to the members of NCDS for their information.
- 9.3.2 The Times of India in their New Delhi edition of 9.9.1991 reported "distress in Totladoh dam, threatening Nagpur's safety." CWC contacted the engineers of Irrigation Department of Maharashtra who intimated that there was no cause for anxiety concerning the safety of the dam.
- 9.3.3 Similarly, the Deccan Herald, Bangalore edition of 20.10.1991 reported a breach to the left guide wall of right bank canal of

Bhadra dam in Karnataka. Director, KERS, Krishnarajasagar intimated CWC of the constitution of two technical committees by the State Government for finalizing the proposals for repairs and for temporary regulation arrangements at the dam site.

- 9.3.4 The dislocation of one crest gate at Kalyani dam in Andhra Pradesh was also reported in the press, vide the Deccan Chronicle edition of 29.11.1991. When the Irrigation Department of the State was contacted, they intimated CWC that an enquiry had been ordered and an interim report on the distress to gates had been submitted to the State Government. Reply from the State Government was awaited.
- 9.3.5 The "Nai Duniya" issue of 7.1.1992 reported distress (cracks) in Nandanwara dam in Madhya Pradesh on account of indiscriminate quarrying in areas adjacent to the dam site. The dam was inspected by Chief Engineer, Rajghat Dam Project, Jhansi on 10.1.1992 and by the Superintending Engineer (Dasan & Ken Circle), Sagar, Madhya Pradesh on 11.1.1992. They reported absence of cracks in either the masonry or the earthen portion of the dam as well as the absence of any abnormal increase in seepage.
- 9.3.6 In order to ensure prompt reporting of facts, Chairman suggested that for such incidents concerning dams, the Superintending Engineer of the State Dam Safety Cell should make a visit immediately and inspect the dam. The findings of his inspection should be reported directly to the Irrigation / Water Resources Secretary of the State with a copy to the DSO of CWC. This would enable CWC to report promptly to the MoWR and set the record straight based on the facts instead of depending on press reports that often suppressed facts and indulged in sensationalism.

Member (D&R) cited the Totladoh incident where the State Government acted promptly in investigating the newspaper report and issuing a press note the very next day, thus setting the records straight and leaving no room for speculation.

(Action : States)

9.4 Implementation of recommendations of the "Report on Dam Safety Procedures."

- 9.4.1 The States had been taking action from time to time in implementing the recommendations contained in the "Report on Dam Safety Procedures" circulated in 1987. In order to assess the

progress made by the States in implementing the recommendations, the States were required to send a copy of consolidated statement indicating their achievements on this issue and also to highlight those recommendations that the States found difficult to implement. The States of Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu supplied a copy of point-wise reply of recommendations indicating status of action taken on action points as on December 1991. The State of Karnataka replied that latest stage of action on the issue was incorporated in the latest status report of January 1992. Copy of the same may be sent to DSO of CWC. The State of Uttar Pradesh would send the reply later on. The States of Bihar, Orissa and Rajasthan were requested to send point-wise reply of recommendations at the earliest. The State of Kerala, Madhya Pradesh and West Bengal were requested to respond to the subject at the earliest.

(Action : States of Bihar, Karnataka, Kerala, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal)

- 9.4.2 On receipt of information from all members / States, CWC would prepare a note on the issue touching upon those action points where the States find difficulty in implementing the recommendations. NCDS would then be in a position to reconsider such issues.

9.5 Review of dam safety activities in India including status report on the health of dams.

- 9.5.1 States / members were requested to send status report on dam safety activities including health status of dams.

- 9.5.2 The following States / Organisations have responded with reports for the periods mentioned against each as below:

- (a) Andhra Pradesh (December 1985 to December 1987)
- (b) Bhakra Beas Management Board (April 1988, August 1989 & November 1989)
- (c) Gujarat (July 1981 to September 1984, October 1984 to December 1985, January to June 1986, July 1987 to December 1989 & January 1990 to March 1991)
- (d) Karnataka (July 1988, March 1989, May 1990 & May 1991)
- (e) Madhya Pradesh (January 1987 to March 1988 & April 1988 to December 1989)
- (f) Maharashtra (January 1989 to December 1990)
- (g) Orissa (January 1989)
- (h) Tamil Nadu (1991)

(i) West Bengal (1991)

- 9.5.3 The remaining States, viz. Bihar, Kerala, Rajasthan & Uttar Pradesh who were yet to send a report on the Dam Safety Activities of their Dam Safety Cells / Organisations were requested to expedite. State of Uttar Pradesh has sent separately the safety status of 109 large dams in the State but have yet to send a complete report of the activities of the State's Dam Safety Cell which may be expedited.

(Action : States)

9.6 Formation of sub-committees to monitor safety aspects of inter-State dams.

- 9.6.1 Three sub-committees were set up in March 1990 for monitoring safety aspects of inter-State dams in the Parambikulam Aliyar System (PAP), Mahanadi System and Subarnarekha System.
- 9.6.2 Recommendations of the sub-committee for monitoring the safety status of dams in the PAP System, based on inspection of Parambikulam and Sholayar Dams in October 1991, were communicated in February 1992 to the dam owners (Tamil Nadu) for follow-up action. The second meeting of sub-committee for PAP System would be convened some time in July 1992 and it intends to inspect three dams, viz. Lower Nirar (Tamil Nadu, PWD), Upper Nirar (Tamil Nadu, PWD) and Kerala Sholayar (Kerala State Electricity Board).
- 9.6.3 Chairman, NCDS desired that the State of Orissa, who is a Member Secretary and Convener of Mahanadi System and Subarnarekha System to hold the first meeting of these two sub-committees some time in July – August 1992 and intimate the progress achieved to NCDS at the earliest.

(Action : Bihar, Madhya Pradesh, Orissa & West Bengal)

9.7 Compilation of "Data Books".

- 9.7.1 During the 4th meeting of NCDS, it was decided that "Data Books" for dams of National Importance to be sent to CWC / DSO.
- 9.7.2 Such information had been received from the States of Andhra Pradesh, Bihar, Gujarat, BBMB, Karnataka, Madhya Pradesh, Tamil Nadu & Uttar Pradesh. The States of Kerala, Maharashtra, Orissa,

Rajasthan and West Bengal are yet to respond. Information was also pending in respect of Salal dam owned by NHPC.

- 9.7.3 It was requested that for States who had not responded, as mentioned above, the "Data Book" of one dam of National Importance be compiled and sent early to DSO of CWC for information.

(Action : States)

9.8 Safety inspection of barrages.

- 9.8.1 During the 7th meeting of NCDS, members were requested to take stock of total number of important barrages in order to verify the list of barrages State-wise supplied by DSO, CWC. States were also requested to fill up a proforma titled "Performance Data on Barrages" supplied by CWC.

- 9.8.2 Demi official letters were addressed by Director (Dam Safety) to the members of following States to expedite the reply:

(a) Bihar, (b) Kerala, (c) Orissa and (d) Rajasthan

States of Karnataka and Uttar Pradesh who had supplied partial information were requested to supply complete information for all barrages in their States.

- 9.8.3 No information had come from the States of Bihar, Kerala and Rajasthan. Representative from Orissa intimated that information was being collected for 7 barrages. Karnataka State had informed that information in respect of the pending barrage, i.e. Dhupdal Weir would be furnished later. Uttar Pradesh had supplied information for 6 barrages during the meeting. The States were requested to supply complete information by the end of August 1992 as the information was being compiled for publication.

(Action : States)

9.9 Safety status of dams of National Importance.

- 9.9.1 In all, there are 43 dams of National Importance and information on the safety status of 27 such dams had been received so far. Information on the following dams was still pending from the States:

Kerala : Kakki, Idukki, Cheruthoni, Kulamavu, Idamalayar

Madhya Pradesh : Gandhi Sagar

Jammu & Kashmir (NHPC) : Salal

Orissa : Hirakud, Salandi, Balimela, Rengali, Upper Kolab

Rajasthan : Ranapratap Sagar

Uttar Pradesh : Rihand, Ramganga, Meja

9.9.2 Recently, Dam Safety Cell of Uttar Pradesh submitted health status report of Rihand, Ramganga & Meja dams which were not in accordance with the proforma circulated to all members of NCDS. The State of Orissa submitted a publication on "Status Report on general health conditions of dams and activities of Dam Safety Organisation" January 1989. The information for National Importance dams was also not in accordance with the proforma circulated by NCDS.

9.9.3 Chairman, CWC requested the States to send the required information within one month. DSO of CWC intends to bring out a publication indicating health status of dams of National Importance, and the pending information needed to be expedited.

(Action : States)

9.10 Dam Safety Legislation.

9.10.1 During the 8th meeting of NCDS in October 1991, the members of those States who had not responded to the draft bill on Dam Safety Legislation were requested to pursue with their State Governments. D.O. letters were written by Secretary, MoWR to the Chief Secretaries of the States in March 1991 and subsequently reminders were sent to the States by MoWR and DSO, CWC to respond on the issue of Dam Safety Legislation expeditiously.

9.10.2 Reply / comments received from the States were as under:

Andhra Pradesh	: Draft bill was acceptable.
Bihar	: No reply
Gujarat	: Had shown willingness for legislation.
Karnataka	: No reply
Kerala	: No objection to the proposed legislation
Madhya Pradesh	: Did not consider legislation essential.
Maharashtra	: No reply
Orissa	: Expressed willingness for legislation.
Rajasthan	: No reply

Tamil Nadu	: Agreed to the draft bill
Uttar Pradesh	: Did not consider draft bill essential.
West Bengal	: No reply

- 9.10.3 States of Bihar, Karnataka, Maharashtra, Rajasthan and West Bengal who were yet to send a reply might pursue this matter with their Governments and arrange to send a reply to the NCDS at the earliest.

(Action : States)

9.11 Safety review of large dams.

- 9.11.1 According to the recommendations of the "Report on Dam Safety Procedures," safety review of dams of more than 15 m in height or which store 60 million cubic metre or more of water, was to be carried out by an independent panel of experts once in ten years. The proposal was accepted by Government of India in 1987. Hence such review of all large dams was to be completed by 1997.
- 9.11.2 Till date only two States, viz. Gujarat and Madhya Pradesh had responded with Gujarat preparing a ten year programme for inspection of 197 large dams and Madhya Pradesh submitting a tentative programme of taking up 120 large dams in 1992-93. BBMB intimated conducting safety review of all three dams under their charge by the Dam Safety Committee of BBMB. Karnataka State intimated that they had submitted proposals to their State Government. Maharashtra State intended to undertake safety review of 12 dams for the year 1992-93.
- 9.11.3 Chairman suggested that the States might prepare proposals for safety review of dams by an independent panel of experts as a research scheme to be funded by MoWR. NCDS would recommend to the Ministry for funding such schemes. The States must, however, prepare a programme for this job year-wise for all their large dams and intimate to NCDS expeditiously.

(Action : States)

9.12 Undertaking emergency action downstream of dams and demarcation of flood zones.

- 9.12.1 During the 8th meeting of NCDS, Chairman had suggested the four States who were participants in the "Dam Safety Assurance and Rehabilitation Project," viz. Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu to undertake Emergency Action Planning of the 33

dams posed for rehabilitation. The State representatives intimated that for such a job, a huge volume of data was required and same was under compilation. It also required conducting Dam Break Analysis for which few officers were trained.

- 9.12.2 To work out priorities for undertaking this job, Chairman suggested that those dams which were in distress and had undergone extensive cracking should get priority. Such dams as suggested by Member (D&R), CWC happened to be Tigma (Maddhya Pradesh) and Parbati (Rajasthan). These dams should be taken up first for Dam Break Analysis.
- 9.12.3 CWC would be sponsoring a course of Dam Break Analysis at Hyderabad to be held in the second week of October 1992. All States were requested to send one nomination for this course. It was essential that the four States participating in DSARP sent nominations of two officers from each State for this course.
- 9.12.4 In connection with the preparation of Disaster Management Plan (DMP) for major projects, questions were raised as to whether it should be based on DBA. Representatives of States indicated that it was not a set practice to prepare DMP for new projects and none of the States had so far undertaken such an exercise. It was the common consensus of all representatives of NCDS that DMP might be prepared in selective cases for dams which were in distress and, where a possibility of its failure, endangering life and property in the downstream can be contemplated.
- 9.12.5 Since preparation of DMP for large dams was important issue on which a decision nationwide was required, members were requested to take up this issue with their respective Governments expeditiously and intimate the opinion of their Governments to NCDS.

(Action : States)

9.13 National Register of Large Dams.

- 9.13.1 A publication titled National Register of Large Dams was brought out by DSO of CWC in April 1990 and was circulated to all States / members of NCDS to examine the register and communicate corrections, if any, for updating the same.
- 9.13.2 For the States from whom information was received, necessary in the computerized data had been undertaken. The State of Bihar intimated that data in the National Register of Large Dams had

been compared and there was no need for any corrections in the computerized data. However, it might be seen that there were a number of blanks. The State was requested corrections to fill up these blanks and send modified data to the DSO of CWC as early as possible. The State of West Bengal responded and sent copy of corrected entries belonging to their States. The State was requested to fill up Not Available entries also. Recently, the State of Uttar Pradesh had sent required information.

- 9.13.3 The States of Orissa & Rajasthan were yet to respond. Demi-official letters were written to the Secretaries of these States by Member (D&R) in March 1992, requesting them to update the register at the earliest. These States were again requested by Chairman, CWC to do the needful expeditiously.

(Action : States)

9.14 Setting up of hydrological units in the States for review of hydrology of existing dams.

- 9.14.1 The necessity of setting up a hydrology unit in the State for review of hydrology of existing dams, was discussed during the 7th and 8th meeting of NCDS. Some States / Organisations had already started this job. As per information available with NCDS, Madhya Pradesh had carried out such review for 22 dams, Maharashtra for 14 dams and Gujarat for 74 dams.
- 9.14.2 Under the "Dam Safety Assurance and Rehabilitation Project" aided by World Bank, the States of Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu would be undertaking hydrology review of all large dams under their charge in the next five years.
- 9.14.3 During the 8th meeting of NCDS, it was agreed that the first target should be dams of National Importance and States should endeavour to complete the hydrology review of such dams within a year.
- 9.14.4 The Indian National Committee on Hydrology (INCOH), constituted by the Ministry of Water Resources had informed that State level committees on hydrology had been constituted in the States of Andhra Pradesh, Goa, Gujarat, Karnataka, Madhya Pradesh, and Nagaland for proper coordination of hydrological activities at the State level. The State level committees could be utilized to assist in the hydrology review of existing dams.

- 9.14.5 Members of NCDS felt that it would be worthwhile to examine the possibility of seeking assistance from the National Institute of Hydrology (NIH) at Roorkee for conducting the hydrology review of existing dams. Appropriate consultants might also be appointed by the States for this job.
- 9.14.6 Those States who were yet to undertake this job might indicate their method of operation for getting the hydrology review of existing dams in their States carried out within a reasonable time frame.

(Action : States)

9.15 Data on gated storages.

- 9.15.1 States were requested to supply the data on gates storages. So far, information had been received from the States of Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh & BBMB.
- 9.15.2 The information was pending in respect of the following States:
1. Bihar : No response
 2. Orissa : 48 dams (storage against gates for 16 dams given)
 3. Rajasthan : 23 dams (storage against gates not given)
 4. West Bengal : 19 dams (storage against gates for 17 dams pending)
- 9.15.3 As the information on gated storages would be included in the publication on dam safety proposed to be brought out soon, the States mentioned above were requested to supply the pending information latest by the end of September 1992.

(Action : States)

9.16 Preparation of completion report of large dams.

- 9.16.1 During the 7th meeting of NCDS it was opined that priority should be given to National Importance dams followed by other large dams while preparing the completion report of dams.
- 9.16.2 The position regarding preparation of completion report by the States / Organisations was as under:

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| (a) BBMB | As part of the completion report for projects under BBMB, it had supplied a copy of the following: |
| | (i) Construction features, Beas Sutlej Link and Dehar Power Plant – Vol.I |
| | (ii) Construction features, Beas Dam and Pong Power Plant – Vol.I |
| (b) Gujarat | Completion report for 8 dams aided by World Bank was nearing completion. |
| (c) Karnataka | Completion report for 3 dams of National Importance and 5 large dams had been completed. |
| (d) Maharashtra | Completion report for 6 dams had been completed. |
| (e) Orissa | Completed for Salandi, Rengali & Upper Kolab. Those for Hirakud & Balimela were under preparation. |
| (f) Tamil Nadu | History of Cauvery Mettur Project supplied as completion report for Mettur Dam. |

9.16.3 Chairman opined that the States should lay stress in compiling the completion report of National Importance dams on priority and they may hire consultants, if found necessary, for the job. A sample copy of the completion report for any one dam from those States who have compiled be sent to DSO of CWC.

(Action : States)

9.17 Preparation of Operation & Maintenance Manual.

9.17.1 Some States had already taken action to prepare the O&M Manual in respect of large dams under their charge. The latest position of available reports with NCDS was as under:

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| (A)BBMB | O&M Manual for Pandoh dam & Reservoir, its Water Conductor System, Dehar & Pong Power Plant, Beas dam and Pong reservoir. |
|---------|---|

(B) Gujarat	Reservoir Operation Manual for Karjan and Damanganga Projects.
(C) Maharashtra	O&M Manual of Paithan dam (Jayakwadi Project)
(D) Uttar Pradesh	O&M Manual for Yamuna H.E. Project.
(E) West Bengal	Regulation Manual for Kangsabati Reservoir.

- 9.17.2 The States of Andhra Pradesh, Bihar, Karnataka, Kerala, Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu might commence this work and send one copy of the O&M Manual for any one dam to the DSO, CWC for perusal.

(Action : States)

9.18 Instrumentation for dams.

- 9.18.1 During the 6th meeting of NCDS, members were requested to verify and update information on the subject of instrumentation contained in Chapter III of the "Report on Dam Safety Activities" brought out by CWC. Members were also requested to intimate mortality, performance and analysis of instrumentation data and conclusions drawn from thereof.

- 9.18.2 The response from the States on the status of instrumentation of individual dams was under:

BBMB	: 3 dams
Gujarat	: 25 dams
Madhya Pradesh	: 11 dams
Maharashtra	: 46 dams
Tamil Nadu	: 6 dams

- 9.18.3 Members were unanimous in their opinion that very little had been done so far by the States in respect of dam instrumentation and much effort was required in this respect, particularly in analyzing instrumentation data for preparing structural behaviour report which was the ultimate objective for placement of instruments in the dam. Keeping this in view, it was decided during the 6th meeting of NCDS to collect statistical data on the type of instruments engaged in each dam, their performance, mortality, periodicity for analysis of data, referring the analysis to designers for their suggestions, status of structural behaviour report,

preparation and the adequacy or otherwise of the staff engaged for this job.

- 9.18.4 Most of the member States of NCDS are yet to respond to the above queries and unless they respond, NCDS would not be in a position to take a decision on this issue. Since something specific need to be done in the matter of "Dam Instrumentation," the States who have not yet responded were requested to send the information mentioned above at the earliest.

(Action : States)

9.19 Equipment for underwater surveillance.

- 9.19.1 The Remote Operated Underwater Vehicle (ROV) since its commissioning in November 1990, had been utilized for underwater scanning of the upstream face of five important dams in the country, viz. Koyna, Hirakud, Tigra, Bhakra and Gandhisagar.
- 9.19.2 Requests had been received for underwater surveillance of the following dams:

Gujarat	: Ukai, Kadana, Dharoi, Karjan, Panam & Damanganga
Karnataka	: Talakalale
Orissa	: Hirakud
Tamil Nadu	: Periyar, Sholayar, Pechiparai & Manimuthar

- 9.19.3 Chairman desired that the ROV should be fully utilized and priority would be given to the States of Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu who were the participants of "Dam Safety Assurance and Rehabilitation Project."
- 9.19.4 As regards deployment of the Diving Gear Equipment (DGE), this equipment was presently under the custody of BBMB and divers from BBMB were trained by the suppliers of DGE, namely DIVEX of United Kingdom. Regarding its deployment it was envisaged that BBMB would cater to the need for projects in North India and WAPCOS would be utilizing the DGE for projects in the rest of the country. The equipment would be provided free of charge to these two organizations by CWC and the projects would be charged on cost basis, with priorities of deployment to be fixed by CWC.
- 9.19.5 In order to set in motion the process, Chairman desired that Member (D&R) hold a meeting with WAPCOS and Tamil Nadu to finalise on the deployment of DGE for dams in Tamil Nadu, based on the request of the State already available with CWC and for DSO to prepare an agenda note for the Board meeting of BBMB seeking

approval of the Board for BBMB to utilize the DGE for the northern States (Rajasthan, Madhya Pradesh, Uttar Pradesh, Himachal Pradesh, etc.).

(Action : States)

9.20 Seismic status of dams of National Importance.

- 9.20.1 In view of the likely damage to the dams that might have occurred on account of significant earthquake, it is important to inspect the dams. To undertake such inspection, DSO of CWC had circulated to all members of NCDS the document titled "Guidelines for inspection of dams following earthquakes." This document was a comprehensive one covering both embankment and gravity dams and, apart from detailed guidelines for assessing damages to the dams following earthquakes, it had specific checklist for inspection.
- 9.20.2 So far, BBMB has filled up the checklist in respect of Bhakra (concrete gravity dam), Pong (embankment dam) & Pandoh (embankment dam). Inspection of these dams was carried out after 20th October 1991 earthquake that struck north India. No damages had been noticed.
- 9.20.3 The States in north India including NHPC were requested to take similar action. Other States were requested to examine the guidelines thoroughly and make use of the same for inspection of dams under their charge after the occurrence of an earthquake.

(Action : States)

9.21 Standardized meteorological and other observations.

- 9.21.1 During the 5th meeting of NCDS, the States / Organisations were requested to send list of dams where meteorological observations were conducted and the list of instruments installed.
- 9.21.2 The States had been sending information from time to time. So far, information has been received from the States / Organisations as under:

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|-------------------|---------------|
| 1. BBMB | : for 3 dams |
| 2. Andhra Pradesh | : for 3 dams |
| 3. Gujarat | : for 53 dams |
| 4. Karnataka | : for 19 dams |

- 5. Madhya Pradesh : Informed selecting of 15 dams for provision of gadgets for hydro meteorological observations.
- 6. Maharashtra : for 76 dams
- 7. Orissa : for 35 dams (incomplete information)
- 8. Tamil Nadu : Informed that they would install a weather station at each dam site.

9.21.3 The States who had supplied partial information were requested to send in complete information and States of Bihar, Kerala, Rajasthan, West Bengal & Uttar Pradesh who had not yet responded were requested to send in the information expeditiously, as the information is scheduled for inclusion in the CWC publication to be brought out soon.

(Action : States)

9.22 Problem bank on research & development.

9.22.1 New moves were expected on a large number of problems in water related technologies in the 8th Five Year Plan. These efforts could give best results if they could be organized on a systematic basis. The reliance was on the National Committee and the apex Central institutions working in different subject areas.

9.22.2 It was seen in the past that, in the absence of a problem bank well developed, the choice of Research & Development (R&D) programmes tended to be many a times arbitrary. It would be desirable to avoid that situation and ensure that there were certain criteria and objectives clearly kept in view before selecting and sponsoring the R&D efforts. In that direction, it was expected that the Technical Advisory Committees of the research institutions of the MoWR, the Technical Advisory Committees of other organizations and the National Committees on the different specialized subjects would develop systematically problem banks of their own by trying to answer the following three basic questions:

- (a) What was the additional information we needed for being more effective?
- (b) What were the new materials that we had to develop or bring into use for better results?

- (c) What were the new processes and equipment that we ought to develop and adopt for greater economy and speed?

9.22.3 In the past, much of the thrust in the R&D sector remained confined to "Information" and "Materials." Development of new technological processes, including mechanization and equipment development was not included in a substantive manner in the R&D programmes. But in the 8th Five Year Plan, keeping in view the objectives approved by the National Development Council and laid down in the Planning Commission's approach paper, the development of equipments and processes would have to be given much greater attention than hereto before.

9.22.4 This issue was discussed in detail in the 9th meeting of NCDS, wherein members suggested development of equipment and processes in the area of Dam Safety Surveillance & Rehabilitation.

- (a) Remote control operation of spillway gates.
- (b) Indigenous development of equipment for roller compacted concrete in dam construction.
- (c) Equipment for uphole cleaning of formed drains (Body Drains) in gravity dams and also development of suitable materials for the same purpose.
- (d) Equipment for monitoring of cracks on a continuous basis.

9.22.5 On the issue of crack monitoring in dams, BBMB had sent a brief broucher on "Movement Monitoring System" marketed by Cole Brand Instrumentation of U.K. It was a very handy gadget for crack monitoring though not much different from either Demec Gauges or Whittemore Gauges which were very much in use in India.

9.22.6 Chairman suggested that members of NCDS could examine the proceedings of the two workshops held by CBIP in February 1989 and on December 1991 on research needs in dam safety to determine areas requiring research & development of processes and gadgets in the field of dam safety and send their suggestions to DSO of CWC.

(Action : States)

9.23 Compilation on River Valley Projects.

9.23.1 The Water Resources Department, Government of Gujarat had brought out an excellent publication in 1989 titled "Major, Medium

& Minor River Valley Projects.” The compilation gave the salient features of each project, sketches of structures and clear coloured perspective photographs of each project. The publication was shown to the members of NCDS during the meeting. Members were also shown a publication titled “Dams in Japan” 1991 brought out by the Japanese National Committee on Large Dams. This publication gave the salient features of many large dams in Japan accompanied by sketches in plan and cross-sections of the dams, supplemented by aerial colour photographs of these dams.

9.23.2 Chairman desired that members of NCDS should examine the above two compilations and arrange to publish compilations of similar nature and quality for the dams in their States / Organisations, particularly incorporating aerial photographs of the dams.

9.23.3 For members who wished, procure the above two publications, they might write to Secretary, Department of Water Resources, Government of Gujarat, Block No.9, 7th floor, Sardar Bhavan, Sachivalaya, Gandhinagar 382010 for the publication from Gujarat and to Chairman, Japanese National Committee on Large Dams, Uchisaiwai Buildings, 4-2 Uchisaiwai-Cho, 1-Chome, Chiyodaku, Tokya -100, Japan for the Japanese publication.

(Action : States)