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Annual Report 2007-08



Navin Chandra Sharma
Chief Engineer & Director



Irrigation Research Institute
Roorkee- 247 667 (Uttarakhand)

September 2008

सिंचाई बढ़ायें खुशहाली लायें

SAVE WATER TO SAVE EARTH

Consultancy Areas

IRI undertakes Research and Developmental activities related to Irrigation and Hydro-electric Projects in the following major areas :


- ☞ Providing efficient and economical hydraulic design for various engineering works viz.
 - Canal works, Spillways, Power Houses, Intakes.
 - Diversion Works, Surge Tanks, Sediment Excluding and Ejecting Devices.
 - Siting of Bridges and Barrages.
 - River Training, Flood Protection and Anti-erosion Measures.
- ☞ Carrying out Geotechnical Investigations and Experimentations.
- ☞ Economical design of Concrete Mixes using Flyash and Superplasticizers, Roller Compacted Concrete
- ☞ Ground Water Development
 - Conjunctive Use of Subsurface and Surface Water, Water Logging
 - Suitability for Canal Linings, Seepage from Canals, Tubewell
 - Stability due to Sub-surface flow, Water Suitability
 - Studies for Regeneration/Seepage from Water Bodies
 - Determination of Geohydrological Parameters by Radio Active Tracer Technique.
- ☞ Sedimentation Studies
 - Capacity and Life of Reservoirs
 - Sediment Transport in Reservoirs and Channels.
- ☞ Mathematical Modelling
 - Hydrological Events
 - Sub-surface flow, Surface flow
 - Hydraulic Structures etc. (Surge Tank, Water Hammer and Sedimentation Chamber)
- ☞ Basic & Fundamental Research in the field of Water Resources.

Editorial Committee

Er. Pramod Kumar Bhargava
Superintending Engineer, Basic Circle

Sri A. C. Pandey
Research Officer, Ground Water Division-1

Sri Sushil Kumar
Assistant Research Officer, M.T. Division-2



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From Chief Engineer & Director's Desk

It gives me great pleasure in presenting the 78th Annual Report of Irrigation Research Institute Roorkee for year 2007-08. For last five decades, IRI has made significant contribution in the development of water resources and Hydropower in the country. During the year, Hydraulic model

studies of Koteshwar H.E. Project (U.K.), Baglihar H.E. Project (J&K), Bridge over river Ganga at Munger(Bihar), Karcham Wangtoo H.E. Project (H.P.)Kemeng H.E. Project(Arunachal Pradesh), Polavaram Project(A.P.) were completed and model studies for many other projects were taken up during the year , to name a few of them are Shri Nagar H.E. Project (U.K.), Vishnu gad Pipal Koti H.E. Project (U.K.), Malana H.E. Project (H.P.), Teesta H.E. Project IV, Tandem operation of Jhakhri and Rampur Power House (H.P.). Model studies for siting Railway Bridge on different rivers for dedicated fright corridor project were also taken up during the year. 28 Research Reports, 87 Test Reports were issued during the year. Digitization of old Project drawings, Mathematical modeling for estimation of uplift pressures and exit gradient in hydraulic structures through "ANSYS" and use of stable isotopic composition of water in delineating leakage sources in hydraulic structures were the new openings of the year.

To conclude, I wish to record my sincere appreciation to various sponsoring authorities that have reposed faith in our research activities. Lastly but not the least I would like to congratulate engineers/scientists and staff of IRI who helped the institute to steer ahead achieving the goals. I am sure that IRI shall stand up to take time-bound, high profile projects so as to remain in the reckoning in national arena. I have utmost faith that our dedicated and professional scientific body will stand to take this challenge of future with equal ease.

Jai Hind

Navin Chandra Sharma
Chief Engineer & Director

September , 2008

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RESEARCH PERSONNEL

Chief Engineer & Director

Sri A. K. Jindal,	B. E.	(01.04.07 to 31.07.07)
Sri D.C. Sharma,	B. E.	(01.08.07 to 31.01.08)
Sri N.C. Sharma,	B. E.	(01.02.08 to 28.02.08)
Sri A. K. Gupta,	B. E.	(29.02.08 to 31.03.08)

HYDRAULICS CIRCLE

Superintending Engineer	Sri P. K. Bhargava, B.E., M.E.(Hons.)	(01.04.07 to 31.03.08)
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HYDRAULICS DIVISION - I

Research Officer	Sri Y. N. Goel, B.E.	(01.04.07 to 31.03.08)
Assistant Research Officer-I	Sri P.C. Jadli, M. Sc.	(01.04.07 to 31.03.08)
Assistant Research Officer-II	Sri P.K. Mall, B.E., M.Tech	(01.04.07 to 31.03.08)
Assistant Research Officer-III	Sri B.R. Panday, M. Sc., AMIE	(01.04.07 to 31.03.08)
Assistant Research Officer-IV	Sri P.C. Jadli, ** M. Sc.	(01.04.07 to 31.03.08)

HYDRAULICS DIVISION - II

Research Officer	Sri R.K. Gupta, ** B.E.	(01.04.07 to 31.03.08)
Assistant Research Officer-I	Sri K.P. Singh, M.Sc.	(01.04.07 to 31.03.08)
Assistant Research Officer-II	Sri Rajendra Kumar, M.Sc., AMIE	(01.04.07 to 31.03.08)
Assistant Research Officer-III	Sri A.C. Pandey, ** M.Sc.	(01.04.07 to 31.03.08)
Assistant Research Officer-IV	Sri R.K. Gupta, B.E.	(01.04.07 to 31.03.08)

HYDRAULICS DIVISION - III

Research Officer	Sri N. K. Sharma, ** B.E., M.E. (civil)	(01.04.07 to 31.03.08)
Assistant Research Officer-I	Sri N. K. Sharma, B.E., M.E. (civil)	(01.04.07 to 31.03.08)
Assistant Research Officer-II	Sri R. R. Singh	(01.04.07 to 31.03.08)
Assistant Research Officer-III	Sri R. C. Sharma, M.Sc.	(01.04.07 to 30.06.07)
	Sri R. R. Singh, **	(01.07.07 to 15.08.07)
	Sri Ajay Kumar, ** M.Tech (WRD)	(16.08.07 to 31.03.08)
Assistant Research Officer-IV	Sri Pritam Singh	(01.04.07 to 31.03.08)

HYDRAULICS DIVISION – IV

Executive Engineer	Sri Y. N. Goel, ** B.E.	(01.04.07 to 31.03.08)
Assistant Research Officer-I	Sri H. S. Sharma, AMIE Sri V.K. Khatri, ** B. Sc.	(01.04.07 to 29.08.07) (30.08.07 to 31.03.08)

BASIC CIRCLE

Superintending Engineer	Sri A. K. Jindal, B.E.	(01.04.07 to 31.07.07)
	Sri P. K. Bhargava, ** B.E., M.E.(Hons.)	(01.08.07 to 31.03.08)

GROUNDWATER DIVISION - I

Research Officer	Sri A. C. Pandey, ** M. Sc.	(01.04.07 to 31.03.08)
Assistant Research Officer-I	Sri Sushil Kumar, ** M.Sc.	(01.04.07 to 31.03.08)
Assistant Research Officer-III	Sri Anil Sharma, M. Sc.	(01.04.07 to 31.03.08)

GROUND WATER DIVISION - II

Executive Engineer	Sri A. C. Pandey, ** M. Sc.	(01.04.07 to 31.03.08)
Assistant Research Officer-I	Sri S. C. Verma, M. Sc., M.E.	(01.04.07 to 31.03.08)
Assistant Research Officer-II	Sri S. C. Verma, ** M. Sc., M.E.	(01.04.07 to 31.03.08)

BASIC DIVISION

Research Officer	Sri K. N. Gupta, ** B.E.	(01.04.07 to 31.03.08)
Assistant Research Officer-I	Sri A. C. Pandey, M. Sc.	(01.04.07 to 31.03.08)
Assistant Research Officer-III	Sri A. C. Pandey, ** M. Sc.	(01.04.07 to 31.03.08)
Assistant Research Officer-IV	Sri Jagdish Prasad	(01.04.07 to 31.03.08)
Assistant Research Officer	Sri K. N. Gupta, B.E.	(01.04.07 to 31.03.08)

MATERIAL TESTING DIVISION - II.

Executive Engineer	Sri A. C. Pandey, ** M. Sc.	(01.04.07 to 31.03.08)
Assistant Engineer-II	Sri Sushil Kumar, M.Sc.	(01.04.07 to 31.03.08)
Assistant Engineer-III	Sri Sushil Kumar, ** M.Sc.	(01.04.07 to 31.03.08)

MATERIAL TESTING CIRCLE

Superintending Engineer Sri S.C. Sharma, B.E. (01.04.07 to 31.03.08)

ADMINISTRATIVE DIVISION

Executive Engineer Sri J.M. Suyal, A.M.I.E. (01.04.07 to 31.03.08)

Assistant Engineer-I Sri G. K. Raturi, Dip.(Civil) (01.04.07 to 31.03.08)

Assistant Engineer-II Sri Rajendra Prasad, AMIE(Mech.) (01.04.07 to 16.05.07)
Sri Virendra Kumar, ** Dip.(Civil) (17.05.07 to 31.03.08)

Assistant Engineer-III Sri Subhash Chandra, B.E. (01.04.07 to 31.03.08)

Assistant Engineer-IV Sri A. B. L. Mittal, Dip.(Civil) (01.04.07 to 31.03.08)

Assistant Engineer-V Sri Virendra Kumar, Dip.(Civil) (01.04.07 to 31.03.08)

MATERIAL TESTING DIVISION - I

Executive Engineer Dr. M.S. Alam, M.Sc., Ph.D. (01.04.07 to 31.03.08)

Assistant Engineer-I Sri Karam Singh (01.04.07 to 31.03.08)

Assistant Research Officer-II Sri V.K. Khatri, B.Sc. (01.04.07 to 31.03.08)

Assistant Research Officer-IV Sri Karam Singh, ** (01.04.07 to 31.03.08)

SOILS DIVISION - I

Research Officer Dr. M.S. Alam, ** M.Sc., Ph.D. (01.04.07 to 31.03.08)

Assistant Research Officer-I Sri Sunder Singh M.Sc. (01.04.07 to 31.01.08)
Sri Sudhir Kumar, ** Msc. Eng (Civil) (01.02.08 to 31.03.08)

Assistant Research Officer-III Sri R.C. Gupta, M.Sc. (01.04.07 to 31.03.08)

Assistant Research Officer-IV Sri M.S. Sisodia, M.Sc. (01.04.07 to 29.02.08)
Sri Karam Singh, ** (01.03.08 to 31.03.08)

SOILS DIVISION - II

Executive Engineer Dr. M.S. Alam, ** M.Sc., Ph.D. (01.04.07 to 31.03.08)

Assistant Research Officer-I Sri Ved Pal Singh, M.Sc. (01.04.07 to 30.09.07)
Sri M.S. Sisodia, ** M.Sc. (01.10.07 to 29.02.08)
Sri Karam Singh, ** (01.03.08 to 31.03.08)

Assistant Research Officer-II Sri S.K. Agarwal, M.Sc., AMIE (01.04.07 to 31.10.07)
Sri Sunder Singh, ** M.Sc. (01.11.07 to 31.01.08)

Note : Where only B.E. is mentioned, it should be read as B.E. (Civil).

** Additional Charges



SECTION - A GENERAL REPORT

(A) GENERAL

1.0 Irrigation Research Institute (IRI) was established to carry out Research and Development works under the aegis of U.P. Irrigation Department in the year 1928 as a small research unit in Lucknow. Mr. Gerald Lacey, the propounder of famous regime theory was the first Research Officer. The success of this small unit was duly acknowledged and in 1945 activities were expanded when the unit was shifted to Bahadradabad. Later on it rose to a full fledged Institute in 1954 at Roorkee. The Institute gradually developed into a pioneer research station and is engaged in the research, development and testing works related to irrigation, flood and hydroelectric projects. In addition, it provides consultancy, modeling, in-situ and laboratory testing facilities to Government and Semi-Government

organisations in Uttarakhand, U.P. and other States of India, notable being U.P.P.W.D., U.P. State Bridge Corporation Limited, National Hydro-electric Power Corporation (NHPC), Rail India Technical and Engineering Services (RITES), Tehri Hydro Development Corporation (THDC), Hindustan Construction Company (HCC) Ltd. Satluj Jal vidut nigam Ltd. (SJVN Ltd.), GVK Ltd. Secundrabad, Lanco infrastructure Dans Energy Ltd., Teesta Jal Urja Ltd. and Engineering Departments of Arunachal Pradesh, Mizoram, Assam, Haryana, Bihar, Jammu & Kashmir, Himachal Pradesh, Gujarat, Manipur, Madhya Pradesh, Rajasthan and West Bengal etc. The Institute also undertakes problems of basic and fundamental research having immediate applicability in the field.

2.0 MAJOR STUDIES CARRIED OUT

The major studies carried out during 2007-08 were :-

- | | |
|--|---|
| (i) Model Study For Rail-cum Road Bridge On River Ganga At Munger (Bihar). | (ii) Model Study For Flood Protection Works Along Right Bank of River Chandra Bhaga At Rishikesh (Uttarakhand). |
|--|---|

- (iii) Model Study For Siting Road Bridge Across River Ghagra In Distt. Ambedkarnagr (U. P.).
- (iv) Model Study For River Training Works For Bridge Over River Rapti In Distt. Balrampur (U. P.).
- (v) Model studies for Integral Surge Analysis & Water Hammer Pressure in HRT for UHL H.E. Project (H.P.)
- (vi) Model studies for the surge tank of UHL HE Project, Stage-III (HP)
- (vii) Mathematical model studies for integrated surge analysis & water Hammer Pressures in H.R.T. for UHL H.E.P. (HP)
- (viii) Tandom operation of Jhakri powerhouse and Rampur powerhouse (HP)
- (ix) Teesta-III HE Project (Sikkim)
- (x) Malana-II HE Project (HP)
- (xi) Matatila Dam Works (UP)
- (xii) M/s for Head Regulator of Arjun Sahayak Feeder of Ch.Charan Singh Lahchura Dam (UP)
- (xiii) M/s for developing combined rating curve of Baglihar Spillways (J&K)
- (xiv) Model studies for Head Regulator of Dhasan canal, Ch. Charan Singh Lahchura Dam project (U.P.).
- (xv) Sedimentation chamber of Kacham Wangtoo HE Project (H.P.).
- (xvi) Model studies for observing pressures along divide wall and spillway of Lahchura Dam Project (UP).
- (xvii) Model studies for Budhill HE Project (U.P.).
- (xviii) Model studies for Jorethang Loop HE Project (Sikkim).
- (xix) हर की पैड़ी, हरिद्वार के समक्ष बहती जल धारा में श्री गंगा जी के विशाल विग्रह की स्थापना के सम्बन्ध में प्रतिरूप अध्ययन।
- (xx) Model Studies for proposed aqueduct at km. 34.655 of Ban Sagar Feeder Canal, Mirzapur (U.P.)
- (xxi) Model Studies for Barrage of Singoli Bhatwari H.E. Project. (U.K.)
- (xxii) Model Studies for Desilting Basin of Singoli Bhatwari H.E. Project. (U.K.) An interim report on hydraulic tests for Tenga dam spillway of Kameng H.E. Project (Arunachal Pradesh).
- (xxiii) Model Studies for revised profile Bichom dam spillway of Kameng H.E. Project (Arunachal Pradesh).
- (xxiv) Model Studies for Protection work in U/S & D/S of Langda nala across B.S.F.C. Aqueduct at km. 38.650 (U.P.).
- (xxv) Model Studies for Silt Ejector of Madhya Ganga Canal at Bijnore (U.P.)
- (xxvi) Capacity Survey of Nanak Sagar Reservoir (U.P.)
- (xxvii) Change detection of Gola River in Haldwani and near by area by Remote Sensing Technique.
- (xxviii) Use of Environmental isotope for the Measurement of Erosion rate and Soil conservation in the catchments area of Reservoirs in U.P. and Uttarakhand.
- (xxix) Investigation of Seepage from Baspa H.E. Project (H.P) by Tracer Technique.

- (xxx) Study for Leakage in Gaj. H.E. Project (H.P) by Stable Isotope technique.
- (xxxi) Development of Multivariate Optimization Model for Cropping Pattern. (State of Arts)
- (xxxii) Optimization of drainage arrangement in a lined canal system by 3D—ansys (Mathematical Modelling)
- (xxxiii) Design of hydraulic structures using co-relation between 3D-EHDA and 2D ANSYS results of safety parameters.
- (xxxiv) 3-D EHDA model study for determination of uplift pressure below the lining of Saurashtra Branch canal (Gujarat)—Basic study
- (xxxv) 3-D EHDA model study for suitable under drainage arrangement for canal lining, Indira Sagar Project, Polavaraqm-III (A.P.)

ORGANISATIONAL SET-UP

During the year 2007-08, the Institute was headed by a Chief Engineer & Director with three circles and 12 divisions with following work programme:-

(1) Hydraulic Circle

- | | | |
|------------------------------|----------------|---|
| i) Hydraulics Division-I | H ₁ | Siting of Bridges, Barrages and Cross Drainage works including River Training & Flood Control works. |
| ii) Hydraulics Division-II | H ₂ | Spillways and Outlets, Canal Regulators, Energy Dissipation, Desilting Chambers, Surge Tanks and Sedimentation studies. |
| iii) Hydraulics Division-III | H ₃ | Spillways, Intake Works, Energy Dissipation and Rating of Current meters. |
| iv) Hydraulics Division-IV | H ₄ | Capacity Survey of Reservoirs and Sedimentation Studies.e |

(2) Basic Circle

- | | | |
|----------------------------|-----------------|---|
| i) Ground Water Division-I | GW ₁ | Application of Radioactive Isotope Technique for measurement of various parameters of Water management, Mathematical Modeling of ground water management below irrigation structures. Maintenance of Institute Library. |
|----------------------------|-----------------|---|

- | | | |
|-----------------------------------|-----|---|
| ii) Ground Water Division-II | GW, | Measurement of Seepage Pressure and Quantum of Seepage beneath Hydraulic Structures by EHDA technique and suitability of Canal Lining. |
| iii) Basic Division | B | Maintenance of Computer Centre of the institute, Imparting Computer training to the officers and staff of the institute, Computation of reservoir capacity by in house generated computer programme. Application of Remote Sensing and GIS in Water Resources Management, Discharge Measurement of channels. Vocational Training to Engineering students. |
| (iv) Material Testing Division-II | MT, | Field and Laboratory Testing of Rocks and Rock fill Materials and Publication Section. |

(3) Material Testing Circle

- | | | |
|--------------------------------|-----|--|
| i) Material Testing Division-I | MT, | Optimal Design of Concrete Mixes (including High Performance Concrete) and Testing of various materials such as Cement, Concrete, Bricks, Tiles, Steel Bars etc. |
| ii) Administrative Division | A | Maintenance of Colonies and Offices, Workshop and Stores at Roorkee and Bahadradab. The division also looks after the accounts/finances of the institute. |
| iii) Soil Division-I | S, | Field and Laboratory Testing of Soil related to the Foundation of Structures. |
| iv) Soil Division-II | S, | Testing of Soil Samples and Chemical Analysis of Water, Cement, Cement Mortar and Concrete etc. |

4.0 Publications

The following publications were issued during the year 2007-08:

- | | |
|--|--|
| <p>(i) Annual Report Annual Report for the year 2006-07 was published giving the brief account of the technical activities of the institute, including the important studies carried out, papers presented, research reports and test reports issued during the year. The expenditure</p> | <p>incurred under various sub-heads during the year has also been presented in the annual report.</p> <p>(ii) Research Reports During the year 2007-2008 a total number of 28 Research Reports were issued by the Institute on the basis of studies carried out by different divisions. A List of these Research Report titles is given in Section-B and the abstracts of the Reports are given in Section-C.</p> |
|--|--|

- (iii) **Technical Papers** During the year, 04 technical papers were published in various symposia and conferences. The details are given in Section-B.
- (iv) **Test Reports** Test reports are issued on the basis of field or laboratory tests carried out by the respective divisions. During the year 2007-08, 87 test reports pertaining to various projects/agencies were issued. The details are given in Section-D.
- (v) **Technical News** The Institute publish a quarterly technical news letter highlighting the activities of the institute regarding the studies carried out, studies in progress, training programmes, technical papers/reports published. The four issues of the technical news letter were published during the year highlighting various activities.

5.0 Library

The Institute library has rare and large collection of technical books, journals, reports and other publications. The IRI library possesses Indian and Foreign publications related to the field of water resources, hydropower, mathematical and earth sciences, engineering geology, etc. There are more than 20000 books in the IRI library at Roorkee and 3000 books at Bahadradab.

6.0 CO-ORDINATION WITH OTHER INSTITUTIONS

The institute is a member or represented on committees of the following organisations :

- Indian National Committee on Hydraulic Research (INCH), New Delhi.

- Central Ground Water Board (CGWB), Faridabad.
- Central Board of Irrigation and Power (CBI&P), New Delhi.
- Bhabha Atomic Research Centre (BARC), Mumbai.
- National Geophysical Research Institute (NGRI), Hyderabad.
- Indian National Committee on Irrigation
- Institution of Engineers (India).
- Bureau of Indian Standards, New Delhi.
- Indian Congress on large dams (ICOLD).
- Ganga Flood Control Commission (GFCC)

7.0 COORDINATION WITH THE ORGANIZATIONS LOCATED AT ROORKEE.

- (i) Indian Institute of Technology Roorkee.
 - Department of Civil Engineering.
 - Department of Water Resource Development and Management Training.
 - Department of Earthquake Engineering.
 - Department of Hydrology
- (ii) National Institute of Hydrology, Roorkee.
- (iii) Central Building Research Institute, Roorkee.

8.0 REPRESENTATION AT HIGH LEVEL COMMITTEES

The Chief Engineer & Director, I.R.I., Roorkee is a member of the following high level committees :

- Technical Advisory Committee (TAC) on State Flood Projects.
- Indian Road Congress.
- Chief Engineer's Committee of state.
- C.B.I.&P. Technical Committee on Management of Floods.
- Advisory Committee on Engineering Construction Technology of Council of Science & Technology, Lucknow, U.P.
- Science and Technology Advisory Committee of Ministry of Water Resources, New Delhi (STAC-MOWR).
- Governing Council of CWPRS, Pune.
- Academic Council, Indian Institute of Technology, Roorkee.
- Protective Works Committee of I.R.C., Ministry of Surface Transport, Govt. of India.
- Committee on Research and Future Development chaired by Advisor, Planning Commission, New Delhi.
- Sub-committee of the Indian National Committee on Hydraulic Research (INCH), New Delhi.
- Working Group of National Institute of Hydrology, Roorkee

(B) PARTICIPATION IN SEMINAR, SYMPOSIUM, WORKSHOP AND TRAINING

Sl. No.	Name of Seminar / Symposium / Workshop / Training attended	Place	Date	Name of Research Personnel who attended
1.	A training in AUTO CAD	IRI, Computer Centre Roorkee	24 April, 2007 to 01 May, 2007	Officers and staff of I.R.I
2.	“भारतवर्ष के अविरल विकास में जल संसाधनों की भूमिका” (26 एवं 27 सितम्बर, 2007) राष्ट्रीय जल विज्ञान संस्थान, रुड़की	एन0आई0एच0 रुड़की	26-27 Sep., 2007	Sri P. K. Bhargava, S.E. Sri R. K. Gupta., R. O. Sri A.C. Pandey, R.O. Sri K.P. Singh, A.R.O. Sri S. L. Verma, S/A
3.	Radiation Safety aspects of Nucleonic Gauges	BARC Mumbai	Nov. 26-Dec 4, 2007	Sri Arvind Kumar, S/A
4.	CBI&P Session on capacity building on Hydro Power Sector	Deharadun	25 Jan., 08	Sri A.C. Pandey, R.O.
5.	Meeting of Ganga Flood Control Committee.	Deharadun	05 Feb., 08	Sri N.C. Sharma, C.E. Sri P. K. Bhargava, S.E. Sri Y.N. Goel, R.O. Sri A.C. Pandey, R.O.
6.	R&D session of INCID	Hydrabad	18-19 Feb. 08	Sri A.C. Pandey, R.O.
7.	Illrd International Conference on Silting on Hydro Project organized by CBI&P	New Delhi	27-28 Feb. 08	Sri A.C. Pandey, R.O. Sri K.P. Singh, A.R.O.
8.	Meeting of BIS on Hydraulic Gate	New Delhi	12 March-08	Sri P. K. Bhargava, S.E. Sri A.C. Pandey, R.O.
9.	CBI&P Session on capacity building on Hydro Power Sector	Shimla	25 March, 08	Sri A.C. Pandey, R.O.
10.	Symposium on environmental Impact Assessment of Hydro Project CBI&P.	New Delhi	28 March, 08	Sri A.C. Pandey, R.O. Sri N.K. Sharma, R.O.

(C) DISTINGUISHED VISITORS

- **Sri Matber Singh Kandari**, Hon'ble Minister of Irrigation, Flood Protection & Drinking Water, visited Irrigation Research Institute, Roorkee.
- **Sri Sagar Chandra**, Chief Engineer & Head of the Department, visited Irrigation Research Institute, Roorkee.
- **Sri Ajay Singh Nambiyal**, Additional Secretary (Irrigation), visited Irrigation Research Institute, Roorkee.
- **Sri Kimwium Olesen**, Head of the Project, Water Resource Deptt. Denmark.
- **Mr. A. K. Gaur**, Chief Engineer, **Mr. Amarpal Singh** Dy. Chief Engineer, **Mr. K. M. Singh**, Engineer, **Mr. Sati**, Geologist, WAPCOS.
- **Mr. V. Rama Rao**, Director-Technical, **Mr. Sivaji**, Director-Project Development, **Mr. G. S. Rayudu**, **Mr. S. S. Khot**, **Mr. Pankaj Sharma**, Director & **Mr. Krishan Mohan**, Alaknanda Hydropower Corporation Ltd. (AHPCL), GVK Ltd. Secandrabad.
- **Dr. P. C. Jose**, **Mr. Arthar Yapa**, **Mr. V. Ratna Kumar**, **Mr. Honey Mehra**, Joint Technical Engineer (Hydro.), **Mr. Robert Goldsmith**, Manager, **Miss E. Diretia**, **Mr. Amit Gupta** & **Mr. Vishal Goel**, Director operation, SMEC, Gurgaon.
- **Mr. S. K. Gupta**, Chief Engineer, **Mr. S. P. Gupta**, Director-Design (C), **Mr. B. K. Chopra**, Dy. Manager, **Mr. A. K. Dutta**, Dy. General Manager, **Mr. Ramesh Sharma**, Sr. Manager, HPSEB, New Shimla.
- **Mr. J. V. Huraut**, Consultant-Tecsuit, **Mr. V. V. Badareenarayana**, Expert Civil Design, **Mr. T. V. Raman**, Sr. Vice President, EIPL, Gurgaon for Teesta -III Hydro Electric Project (Sikkim).
- **Dr. S. B. Werakoon**, Prof./Head, Civil Engineering, University of Peradeniya, Sri Lanka.
- **Mr. Phil Helwing**, St. John's, New Zealand.
- **MR. Bharat B. Gharat**, Dy. C.E. (civil), TCE, Bombay.
- **Mr. P. K. Yadav** DGM, Hydro Design L&T Faridabad.
- **Mr. R. P. Singh**, Executive Director (D&E), **Mr. Ashok Kumar** NEEPCO New Delhi
- **Mr. P. K. Goel**, Chief Engineer, **Mr. Sadruddin Ahmad**, S.E., **Mr. Koshal Kumar** S.E., **Mr. Ravindra Prasad Goel**, Executive Engineer, **Mr. S. P. Saini** Assistant Engineer. M.G.C. Construction division, Bijnor.
- **Mr. G. M. Prasad**, G.M., **Mr. Rajiv Vishnoi**, Dy.G.M., THDC Ltd., Rishikesh.
- **Mr. S. Agarwal**, Group manager & Delegates of National Council for Cement and Building Materials, Ballabgarh (Hariyana) visited the Irrigation Research Institute, Roorkee.

(D) Budget and Financial Accounting

Administrative Division is the only drawing and disbursing division of the Institute which caters for the financial functioning of the Institute. This division maintains the account of expenses incurred by different divisions in accordance with financial rules. The division is also engaged in procurement of materials, construction and maintenance work of residential and non-residential buildings of Irrigation Research Institute at Roorkee and Bahadrabad. The division is also responsible for the construction of all models at Bahadrabad Research Station. A 256 line C.DOT PBX System with a 200 line telephone exchange for communications is also maintained by this division. The division also maintains the main workshop of the Institute at Roorkee. The details of subhead-wise expenditure incurred during the year 2007-08 are as:

Sl. No.	Sub-Head	Expenditure (Rs.)
(A).	8443 Civil Deposit	4,24,63,547.18
(B.)	(1) 4701 Expenditure of Research Programme	54,93,458.00
	(2) 2701 M&R	40,93,791.00
	(3) 2701 S&R	20,99,109.00
	(4) 2701- 02 Labour wages	65,75,000.00
	(5) 2701 Contingency	34,02,361.00
	(6) Travelling Expenses	75,000.00
(C.)	Pay and Allowances	5,46,85,020.00
	TOTAL A+B+C	11,88,87,286.18

CIRCLEWISE FINANCIAL STATUS FOR THE YEAR 2007-08

Sl. No.	Name of Circle	Opening Balance (Rs.)	Funds received during 2007-08 (Rs.)	Expenditure during 2007-08 (Rs.)
1.	Hydraulics Circle	1,80,59,420.99	3,64,92,242.00	3,10,79,522.83
2.	Basic Circle	52,81,649.90	1,16,1427.00	23,37,443.09
3.	Material Testing	1,15,76,307.50	86,53,959.45	74,67,281.32



SECTION B LIST OF PUBLICATIONS AND TRAINING PROGRAMMES

(A) RESEARCH REPORTS

Sl. No.	R.R. No.78.	TITLE OF REPORT
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(1) HYDRAULICS DIVISION-I

Hydraulics Division – I, the oldest division of the IRI, mainly deals with the model studies for river training and flood protection works, siting bridges, barrages and pump canals. Its work station is at Bahadrapur. Various studies carried out by this division during the year were :-

- | | | |
|-----|----------------------|---|
| (1) | (H ₁ -01) | Further Model Study For Rail-cum Road Bridge On River Ganga At Munger (Bihar) |
| (2) | (H ₁ -02) | Model Study For Siting Road Bridge Across River Ghagra In Distt. Ambedkarnagr (U. P.). |
| (3) | (H ₁ -03) | Model Study For Flood Protection Works Along Right Bank Of River Chandrabhaga At Rishikesh (Uttarakhand). |
| (4) | (H ₁ -04) | Model Study For River Training Works For Bridge Over River Rapti In Distt. Balrampur (U. P.) . |

(2) HYDRAULICS DIVISION-II

Hydraulic Division-II, one of the four Divisions of hydraulic circles of IRI Roorkee, generally caters to the physical hydraulic modeling of dams, spillways, energy dissipations devices, canal structures, intake and outlet works, flushing of reservoirs, desilting chamber of power channels and siting of weirs and barrages etc. in addition to physical hydraulic modeling, the division provides mathematical modeling also in the field of desilting chambers, surge shafts, and water hammer. The division maintains a class "B" meteorological observatory and an Automatic weather Station (AWS) for observing various climatic elements at Hydraulic Research Station Bahadrabad

- (5) (H₂-01) Model studies for Developing combined rating curve of Baglihar spillways (Baglihar HE Project (J&K))
- (6) (H₂-02) Annual Report 2006-07
- (7) (H₂-03) Model studies for Integral Surge Analysis & Water Hammer Pressure in HRT for UHL H.E. Project (H.P.)
- (8) (H₂-04) Hydraulic Behaviour of Power Intake of Koteshwar H.E. Project on Comprehensive Model
- (9) (H₂-05) Mathematical model studies for integrated surge analysis & water hammer pressures in H.R.T. for Uhl H.E.P. (HP)
- (10) (H₂-06) Hydraulic behaviour of stilling basin with reduced height of side wall in Koteshwar H.E. project (UK)
- (11) (H₂-07) Model studies for head regulator of Arjun Sahayak Feeder of Ch. Charan Singh Lahchura dam (U.P.).
- (12) (H₂-08) Compilation & analysis of observation recorded at meteorological observatory, Bahadrabad during year 2007
- (13) (H₂-09) Further model studies for the surge tank of Uhl HE Project, Stage-III (HP)

(3) HYDRAULICS DIVISION-III

Hydraulics Division III is involved in hydraulic model studies for river various types of high and medium head structures evolving stage discharge curve, siting of Dams, barrages, intakes, spillways, energy dissipation, desilting arrangements, bye pass arrangements and rating of current meters etc. Studies carried out during the year were :-

- (14) (H₃-01) Model Studies for Revised Proposal of Spillway and Intake Structure of Karcham Wangtoo H.E. Project (H.P.)
- (15) (H₃-02) Annual Report
- (16) (H₃-03) Model Studies for Proposed Aqueduct at Km. 38.650 of Ban Sagar Feeder Canal (U.P.)
- (17) (H₃-04) An Interim Report on Model Studies for Revised Profile of Bichom Dam Spillway of Kemang H.E. Project (Arunachal Pradesh)

- (18) (H₁-05) Model Studies for availability of water at Dhori Ghat Pump House in district Mau (Uttar Pradesh)

(4) HYDRAULICS DIVISION-IV

Hydraulics Division-IV deals with the capacity survey and sedimentation studies of different reservoirs.

- (19) (H₄-01) Capacity survey of Dhora Reservoir.

(5) GROUND WATER DIVISION-I

Ground Water Division I, one of the four divisions of Basic Circle of I.R.I. Roorkee generally caters to the Groundwater modeling of dams, barrages, canal structures, reservoirs and power houses. In addition to the physical hydraulic modeling, the division provides mathematical modeling also in the field of aquifers and in estimation of seepage losses and uplift pressures in canals and Rivers. The Division maintains an isotope laboratory which deals with usage of tracers in estimation of discharge in mountainous streams and also in estimation of seepage from hydraulic structures. The division also maintain the institute library at Roorkee. Various studies completed during the year were:-

- (20) (GW₁-01) Annual Research Report Ground Water Division-I during year 2007-08.
- (21) (GW₁-02) Simulation of Sand holes below a barrage foundation containing clayey strata by 3D-FEM using ANSYS.
- (22) (GW₁-03) Optimal length of Canal lining of Rapti Link Channel at Km. 14.600 at Bhakhla Siphons by FEM Approach.

(6) GROUND WATER DIVISION-II

Ground Water Division II, generally caters to the Groundwater EHDA modeling of hydraulic structures founded on alluvium soil. The studies based on 2-D & 3-D simulation modeling for the determination of (1) uplift pressures beneath the hydraulic structures, (2) exit gradient at the releasing end of structures, (3) quantum of seepage and seepage pressure on underground power houses are carried out in the division. The Division has a canal lining laboratory for carrying out 2-D and 3-D mathematical simulation studies related to regional ground water regime, surface and subsurface water interaction, regeneration of rivers, artificial recharge, estimation of seepage from canal lining etc. Various studies carried out by the division during the year were :-

- (23) (GW₂-01) Annual Research Report Ground Water Division during 2007-08.
- (24) (GW₂-02) Model Studies for Quantum of Seepage Carried by Longitudinal Drains for Indira Sagar Right Main Canal, Polavaram Project (Package-III) (A.P.), by developing Flow-net, using 2-D EHDA and Mathematical Techniques.

- (25) (GW,-03) 3-D EHDA Model Study for Under Drainage Arrangement Below the Lining of Indira Sagar Right Main Canal, Polavaram Project (A.P.) (Supplement to T.M. No. 77 RR (GW₂-05)

(7) BASIC DIVISION

Basic Division is generally responsible for the maintenance of Computer Center of the institute, organizing computer courses for officers and staff of Irrigation department. In addition, the division caters discharge measurement in canals. Presently Pentium computers and peripherals are available in the computer centre to meet the present day challenges. The Division maintains a Remote Sensing and GIS Laboratory also, since 1997. The laboratory is engaged in studies using remote sensing techniques with computer aided technology. Data related to water management projects are presented in GIS data base and other studies pertaining to water resources development are being carried out. Various studies carried out by the division during the year were :-

- (26) (B-01) Annual General Report of Basic Division (2006-07)
(27) (B-02) Change detection of Gola River near by Haldwani (Uttarakhand)

(8) MATERIAL TESTING DIVISION - I

The Material Testing Division- I carried out the studies related to Design of concrete mix including roller compacted concrete, high performance concrete and fiber reinforced concrete for construction of dams and other structures. The various studies carried out by the division during the year were :-

- (28) (MT,-02) Design of Concrete Mixes for Ch. Charan Singh Flood Management Research and Training Centre, Bhola Jhal Meerut

(B) TECHNICAL PAPERS

Papers published during year 2007-08

- (1) Bhargava, P.K., Gupta, R.K. and Singh, K.P. "Increasing power generation by trapping of sediment from the flow". Third International Conference on Silting Problems in Hydro Power Projects, CBI&P, New Delhi, Feb., 2008.
- (2) भार्गव, पी० के०, गुप्ता, आर० के०, सिंह के० पी० "जल प्रवाह में सिल्ट मात्रा कम करके विद्युत उत्पादन में वृद्धि" राष्ट्रीय संगोष्ठी, राष्ट्रीय जल विज्ञान संस्थान, रुड़की (उत्तराखण्ड), सितम्बर, 2007।
(The paper was awarded 2nd prize)
- (3) जिन्दल, ए० के०, पाण्डेय, ए० सी० एवं वर्मा, श्याम लाल "भारतवर्ष के अविरल विकास में जल संसाधनों की भूमिका – उत्तराखण्ड में हिम संसाधन एवं प्रबन्धन का महत्व" (26 एवं 27 सितम्बर, 2007) राष्ट्रीय जल विज्ञान संस्थान, रुड़की।
- (4) जिन्दल, ए० के०, पाण्डेय, ए० सी० एवं वर्मा, श्याम लाल "भारतवर्ष के अविरल विकास में जल संसाधनों की भूमिका – भारत में जल संसाधन की उपलब्धता एवं आवश्यकता के परिपेक्ष्य में नदियों की अन्तरश्रंखला बद्धीकरण की सामयिकता" (26 एवं 27 सितम्बर, 2007) राष्ट्रीय जल विज्ञान संस्थान, रुड़की।



Sri J. P. Yadav, Hon'ble Minister of State, **MOWR**, Govt. of India, New Delhi awarding prize to **Sri P. K. Bhargava**, Superintending Engineer, Irrigation Research Institute, Roorkee for the Paper entitled "जल प्रवाह में सिल्ट मात्रा कम करके विद्युत उत्पादन में वृद्धि".

SECTION- C INFORMATORY ABSTRACTS

(A) HYDRAULICS DIVISION - I

(1) FURTHER MODEL STUDY FOR RAIL CUM ROAD BRIDGE ON RIVER GANGAAT MUNGER (BIHAR)

RR(H₁-01)

The model studies for Rail cum Road Bridge on River Ganga at Munger were earlier conducted using 1998 river survey, 1977 (worst considered river configuration) and 2004 river survey and report T.M. No. 72 RR(H₁-03) June 2001, 72 RR(H₁-05) August and 76 RR(H₁-03) June 2005 respectively in which a bridge with 25 spans and guide bunds were recommended. As the river, in the subsequently years,



continued to shift towards north, it was desired from I.R.I to conducted three more studies with all 29 nos. of spans of the bridge. The result of this study were reported vide T.M. No. 77 RR(H₁-04) March 2007.

Further, during running of 3rd proposal the sponsor desired that the observation with study -3 for a discharge of 99,000 cumec be also recorded. It was also proposed by the sponsor to conduct one more study with maximum discharge of 99,000 cumec and with left guide bund at pier No. 26. The result of these studies have been included in the present report. A marginal change in velocities and maximum water levels on both the banks along with other parameters have been observed and reported in T.M.

(2) MODEL STUDY FOR ROAD BRIDGE ACROSS RIVER GHAGHARA IN DISTT. AMBEDKARNAGAR (U.P)

RR(H₁-02)

The model studies for determination of waterway and river training work for Tanda Kalwari Road Bridge in Distt. Ambedkarnagar,

U.P. was previously conducted on 1984 river course and later on 1987 river course. The recommendation of above mentioned studies could not be implemented at site. The study was again referred to I.R.I. in 2006, when the left spill of the river became the main channel. This study has been conducted on post floods 2006 river survey. The study shows that a bridge of 2229.65 m length comprising 72 spans with its right abutment on Tanda side would be appropriate, which has been recommended for construction at the site an elliptical guide bund of 1183.37 m length with a



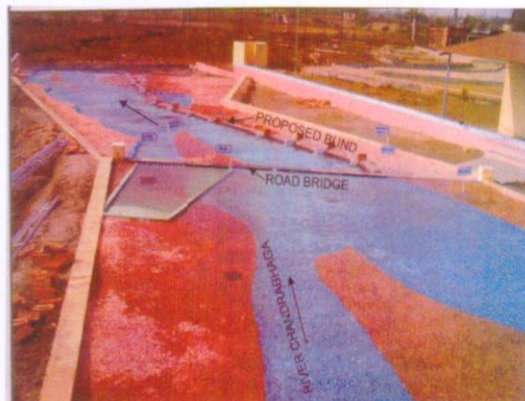
circular head of radius 200 m on the left bank of river was found satisfactory for the bridge.

(3) MODEL STUDY FOR FLOOD PROTECTION WORKS ALONG RIGHT BANK OF RIVER CHANDRABHAGA AT RISHIKESH (UTTARAKHAND)

RR(H,-03)

Model studies were conducted on a distorted physical model of river Chandrabhaga to a horizontal scale of 1:40 and vertical scale of 1:25, along right bank of the river at Adarsh Nagar, Rishikesh (Uttarakhand). The hydraulic tests revealed that the design discharge of 820cumec for bund as given by the sponsors appears to be too high. Since at a discharge more than 460 cumec, the water overflow at the top of the deck slab of the existing road bridge located just u/s of proposed bund. The proposed bund alignment and section of bund requires some changes in the upper reach of

about 65m i.e. the alignment of the bund will be curved in plan with its front face having 1:3 batter instead of normal bund section in the rest



portion of the bund. A spurs arrangement have been found satisfactory for the adopted discharge of 460 cumecs. However, while designing the pitching and spurs of the proposed bund . the values of maximum velocities at these place have to be taken care of properly.

(4) MODEL STUDY FOR RIVER TRAINING WORKS FOR BRIDGE OVER RIVER RAPTİ IN DISTT. BALRAMPUR (U.P.)

RR(H,-04)

The model study for suggesting suitable river training measures at the outflanked 269.45 m long bridge across river Rapti in district Balrampur (U.P.) was referred to this institute by the Executive Engineer, Provincial Division, P.W.D. Balrampur. The model study was conducted on a physical model built to 1:200 horizontal and 1:25 vertical scales. On the basis of the model study, elliptical guide bunds on upstream and straight circular guide bunds on downstream have been recommended for construction at the site. To guide the river flow in to the existing bridge, an artificial pilot channel of 1000 m length having 50 m bed width and 3(H):1(V) side slopes has also been recommended. To save the possible out-flanking of the bridge, protection work on

upstream face of the right approach road in about 350 m length and upto 800 m length on left approach road may be provided.

(B) HYDRAULICS DIVISION - II

(5) MODEL STUDY FOR DEVELOPING COMBINED RATING CURVE OF BAGLIHAR SPILLWAYS (J&K)

RR(H₂-01)

A combined rating curve for all the three different types of spillways fully open (except centre bay of chute spillway closed) was developed on the existing 1:60 scale comprehensive model. It was found that the



design discharge of 16500 cumec passed at reservoir El. 845.32m. A discharge of 13595 cumec could be passed at FRL El. 840.0m. The combined rating curve is provided in T.M..

(6) ANNUAL REPORT OF HYDRAULICS DIVISION-II, IRRIGATION RESEARCH INSTITUTE, ROORKEE (2006-07)

RR (H₂-2)

Hydraulics Division 2 having a professional experience of about 5 decades caters research needs of Irrigation & Hydroelectric projects of the country. The division deals with hydraulic modeling of dams, spillways, energy dissipations devices, canal structures, intake and outlet works, flushing of reservoirs, desilting of power channels and

siting of weirs and barrages etc. in addition to physical hydraulic modeling, the division provides mathematical modeling also in the field of desilting chambers, surge shafts, and water hammer. The division maintains a class "B" meteorological observatory for observing various climatic elements at Hydraulic Research Station Bahadrabad. During the year 2006-07, 16 Technical memorandum /Research Reports were issued and one technical paper was published in international R&D session of CBI&P held at Lucknow on 13-16 Feb. 2007

(7) MODEL STUDIES FOR INTEGRATED SURGE ANALYSIS, WATER HAMMER PRESSURES IN HRT & PENSTOCKS FOR UHL HE PROJECT (HP)

RR (H₂-3)

Model studies to determine the upsurge & down surge levels in surge tank and water hammer pressures in HRT & penstocks were conducted on a physical model constructed for Uhl HE Project (HP). The minimum down surge levels with worst transient of down surge (100%-0-66.6%) were observed at El. 853m and El. 852.5m with and without spilling provision in expansion chamber respectively.



The maximum upsurge level with worst transient of upsurge (66.7%-100%-0) was observed at El. 892.2m and El. 893.7m with and without spilling provision in expansion chamber respectively. The minimum positive pressure in HRT with worst transient (100%-0-66.6%) of down surge was 25.2m at piezo point No.9. The

flow conditions in the surge tank under upsurge & down surge conditions were found satisfactory.

(8) HYDRAULIC BEHAVIOUR OF POWER INTAKE OF KOTESHWAR HE PROJECT ON COMPREHENSIVE MODEL

RR(H₂-4)

Model studies were conducted for the power intake of Koteswar HE Project (UK) on a geometrical similar part model built to scale 1:25. The findings of model studies were issued vide T.M. No. 77-RR-(H2-3), May 2006 and 77-RR-(H2-11), September 2006. It was desired by the Director CWC that the power intake be constructed in the existing comprehensive model of the project built to scale 1:60 and flow conditions in front of power intake be observed at rated discharge of the power house. The hydraulic behaviour of the power intake tested on the comprehensive model (1:60) revealed that the flow conditions were more or less same as were observed on the part width model (1:25) and reported in 77-RR-(H2-11), September 2006. The comparison of flow conditions at intake observed on both model at different reservoir levels was given in the report.

(9) MATHEMATICAL MODEL STUDIES FOR INTEGRATED SURGE ANALYSIS & WATER HAMMER PRESSURES IN H.R.T. FOR UHL H.E. PROJECT (H.P.)

RR(H₂-5)

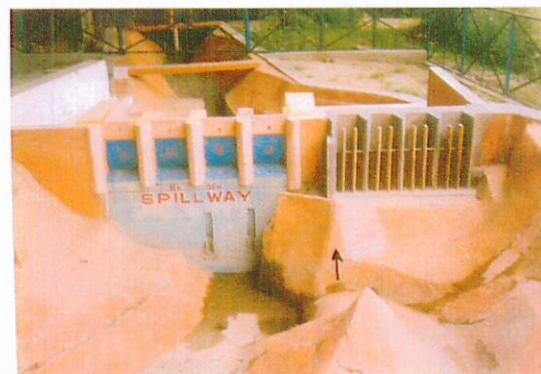
The mathematical model studies were conducted for surge analysis and water hammer pressures in HRT and penstocks with the help of computer software. The efficiency of turbine and generator, guide vane closing/opening time, maximum & minimum friction in HRT were taken in account in the computer software. The studies indicated that the computed and observed surge levels are in good agreement. The maximum & minimum pressures in HRT were computed and

compared with observed one. The computed pressures are in higher side in comparison to observed pressures in HRT and penstocks within 1% to 7% variation near surge tank. This may be due to some model limitations. Therefore, computed maximum pressures may be taken in account for design purpose. The minimum pressures in HRT were positive even under worst transient of down surge.

(10) HYDRAULIC BEHAVIOUR OF STILLING BASIN WITH REDUCED HEIGHT OF SIDE WALL IN KOTESHWAR HE PROJECT (UK)

RR(H₂-6)

Model studies were conducted earlier for evolving suitable energy dissipation device below the spillway. The findings were reported vide 76-RR-(H2-10), January 2006. The hydraulic tests conducted on 1:60 scale geometrical similar model had indicated that a proposal comprising of a bucket at El. 544.0m in the centre portion of 48m width of overflow section and a 107m long stilling basin at



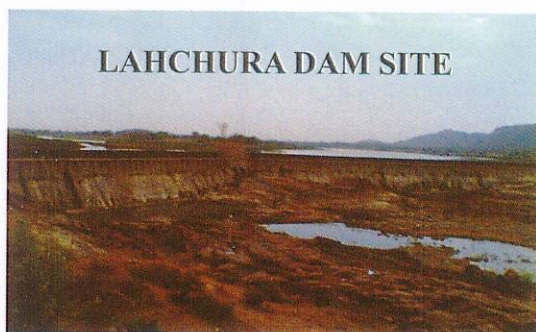
El. 528m was found to be hydraulically efficient for energy dissipation. Dy.General Manager (D), THDC Ltd. Rishikesh vide his letter No. THDC/D&E/ KOT - 3/ 8452 dt.7-7-07 informed that right wall of the stilling basin which isolates the basin from the powerhouse can not be constructed upto El. 570m in its full length of 107m due to some design and site constraints. The height of the wall is proposed to be reduced upto El. 556m in a length of 43.37m from d/s end of the wall. It was desired to test this change on

the model at different discharges in respect of flow conditions in the basin, residual velocities and scour d/s of the end sill. Model tests conducted for discharges varying from 25% to 100% of the maximum discharge indicate that reducing the height of the right side wall of the stilling basin in the length of 43.37m from its d/s end may cause only slight change in the flow conditions in respect of residual velocities and observed scour depth.

(11) MODEL STUDIES FOR HEAD REGULATOR OF ARJUN SAHAYAK FEEDER OF CH.CHARAN SINGH LAHCHURADAM (UP)

RR (H₂-7)

Model Studies were carried out for head regulator of Ch. Charan Singh Lahchura Dam (U.P.) on a 1:15 scale geometrically similar



LAHCHURA DAM SITE

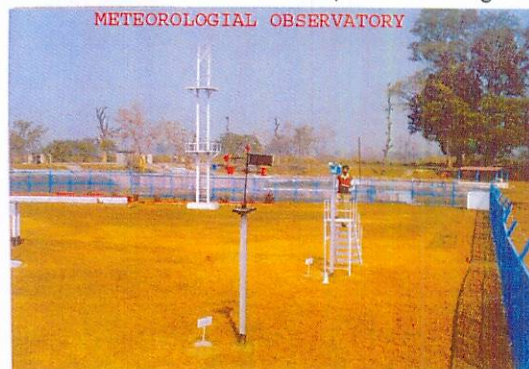
model. Studies indicated that a water way of 40m provided in head regulator was found adequate. For Pond level of 182.30m, a gate opening v/s discharge curve was developed. For energy dissipation arrangement, a 8.1m long stilling basin as suggested by sponsor and supplemented with 0.8m high baffle blocks at 3.4m from glacis along with cube blocks of size 0.3m were found adequate.

(12) COMPILATION & ANALYSIS OF OBSERVATION RECORDED AT METEOROLOGICAL OBSERVATORY BAHADRABAD DURING YEAR 2007

RR(H₂-8)

Meteorological data such as temperature, relative humidity, rainfall, wind

velocity, silt concentration and evaporation rate were observed at Meteorological Observatory, Bahadrabad in the year 2007. Max. & min. temperatures of the year were 42.0°C and (-)0.1°C. Out of total 1124.0mm rainfall during the year, 81% was received in four rainy months from June to September. Highest



METEOROLOGICAL OBSERVATORY

rainfall of 78.2mm in a day was received on 14-6-07. Max. instant wind velocity of 14.0 Km/Hr at 3.05m height was observed on 5, 15, 25 March, 24 April, 5, 7 June at 14:18 Hrs. Total evaporation losses during the year were 1044.0mm while max. Sediment concentration of 3660ppm in IRI feeder channel was recorded during monsoon in August.

(13) FURTHER MODEL STUDIES FOR SURGE TANK OF UHL HYDRO ELECTRIC PROJECT STAGE-III (HP)

RR (H₂-9)

Further model studies were conducted for surge tank of Uhl Hydro Electric Project Stage-III (HP) after incorporating the revised data in the existing model to determine the size of the surge tank so that residual pressures in the HRT may be as per conditions mentioned in IS Code 4880-1976. The computed & observed test results indicated that the surge tank dia. will have to increase from 10m to 11m to achieve minimum residual pressures more than the permissible limit (i.e. 3m) under worst load transient of down surge (100%-0-66.7%). The observed minimum & maximum surge levels were El. 857.0m and El. 893.8m respectively and minimum residual pressure of 4.8m in HRT was observed with 11m dia. surge tank.

(C) HYDRAULICS DIVISION III

(14) MODEL STUDIES FOR REVISED PROPOSAL OF SPILLWAY AND INTAKE STRUCTURE OF KARCHAM WANGTOO H.E. PROJECT (H.P.)

RR (H₃-01)

Model studies for revised proposal of spillways and Intake structure of Karcham Wangtoo H.E. Project were conducted on a comprehensive model built to a geometrically similar scale of 1:30. The rating curve under ungated condition for sluice spillway was developed on the model. The hydraulic behaviour of sluice spillway profile with respect to pressures was found satisfactory. Test results indicated that with stilling basin of length 95.0 m at El. 1765.0 m supplemented with 11.5 m high solid end sill, an oscillatory hydraulic jump formed at the glacis toe. Due to this phenomenon some residual energy in the form of surface waves travelled up to 20.0 m downstream of the end sill. As such suitable protective measures are required to be provided in the river bed in a length of 20.0 m in the downstream of the end sill. The rating curve for auxiliary spillway was also developed. The hydraulic behaviour of the auxiliary spillway with respect to pressures and throw of the trajectory was found satisfactory. At the design discharge of 500 cumec as well as at 20% higher discharge, the flow entered the intake smoothly without formation of vortices/dimples at reservoir level varying from El. 1799.0 m (MDDL) to El. 1810.0 m (FRL).

(15) ANNUAL REPORT FOR THE YEAR 2007-2008

RR (H₃-02)

Hydraulic Division-III was established in May 1965, since then model studies pertaining to various hydraulic structures such as dams, diversion structures, spillways, outlets, intake of hydro-electric projects, desilting arrangements, canal and bypass for power houses, are being conducted in this

division during the year 2007-08. Five Technical memorandum / Research Reports were issued which, have been briefly summarized.

(16) MODEL STUDIES FOR PROPOSED AQUEDUCT AT KM. 38.650 OF BAN SAGAR FEEDER CANAL(U.P.)

RR(H₃-03)

The hydraulic tests for the proposed aqueduct located at km. 38.650 of Ban Sagar Feeder Canal were conducted on geometrically similar physical model built to a scale 1:20. The tests indicated that upstream and downstream transitions and trough portion as proposed by sponsor gave satisfactory flow conditions, therefore it was recommended for adoption.

(17) AN INTERIM REPORT ON MODEL STUDIES FOR REVISED PROFILE OF BICHOM DAM SPILLWAY OF KAMENG H.E. PROJECT (ARUNACHAL PRADESH)

RR (H₃-04)

Further model studies were conducted for revised profile of Bichom dam spillway of Kameng H.E. Project (Arunachal Pradesh) on existing geometrically similar comprehensive model built to the scale 1:60. The observed hydraulic tests indicated that the proposed



water way of 54.0 m for spillway having its crest at El. 735.0 m along with breast wall was found adequate to pass the maximum design discharge of 10476 cumec (PMF) at reservoir El. 757.8 m with six bays operative and at reservoir El. 763.0 m with five bays operative conditions. The approach flow conditions to the

spillway structure were found more or less uniform at different discharges. The trajectory was not formed by the proposed ski jump bucket below spillway at discharge up to (PMF) 10476 cumec. As proposed bucket was neither working as ski jump bucket nor as roller bucket, hence suitable modifications in flip bucket will be required.

(18) MODEL STUDY FOR AVAILABILITY OF WATER AT DOHRI GHAT PUMP HOUSE IN DISTRICT MAU (UTTAR PRADESH)

RR (H₃-05)

Dohri Ghat Pump House which was designed for a discharge of 22.1 cumec is situated on right bank of river Ghagra at about 2.5 km downstream of Dohri Ghat P.W.D. Bridge in Distt. Mau (U.P.). It feeds Dohri Ghat Pump Canal having running capacity of 18.7 cumec discharge. At the time of construction of pump house, river Ghagra used to flow hugging it, but now the river has been shifted and is flowing at about 150 m distance from Pump House. Superintending Engineer, Drainage Circle, Balia (U.P.) referred the problem to I.R.I. Roorkee to suggest measures to feed the pump Canal for the whole year. This report deals with the model studies for aforesaid purpose.

On the basis of model studies, it was inferred that a 900 m long supply channel having 25 m bed width & 2(H): 1(V) side slopes off taking from 0.9 km. along river from Dohri Ghat Pump House should be dredged to feed the Dohri Ghat Pump Canal in combination of modification in existing drain.

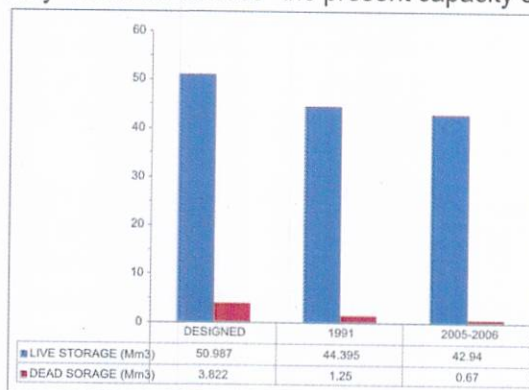
(D) HYDRAULICS DIVISION - IV

(19) CAPACITY SURVEY OF DHORA RESERVOIR

RR(H₄-01)

The Dhora earthen dam of 9.05 km. length was constructed in the year 1961-62 on two streams named Dhora and Katna. The

created reservoir was named as Dhora. The present report discusses the results of the survey conducted during February 2005 to May 2005 to assess the present capacity of



Dhora reservoir. The study indicates that the present capacity of the reservoir is 43.610 million cubic metre (year 2006) against 54.809 MCM at the time of creation (year 1962) and 45.645 MCM in first hydrographic survey (year 1991). The rate of sedimentation for the period from first hydrographic survey (year 1991) to second hydrographic survey (year 2005) works out to be 10.79 Hectare-metre /100 sq.km/Year.

(E) GROUND WATER DIVISION-I

(20) ANNUAL RESEARCH REPORT

RR (GW₁-01)

The studies and activities undertaken by the ground water division-1 during the year 2007-08 are documented in the report.

(21) SIMULATION OF SAND HOLES BELOW A BARRAGE FOUNDATION CONTAINING CLAYEY STRATA BY 3-D FEM TECHNIQUE USING 'ANSYS'

RR(GW₁-02)

Well defined criteria and techniques are on hand to design a Barrage. Experience has revealed that for sprouting well-organized and cost effective design of Barrages physical model studies are inevitable. To relieve excessive seepage pressures, sand holes are some times provided around the downstream

sheet pile. Generally the seepage arrangements are studied on 3-D EHDA model, but when barrage foundation contains clay intercepting the downstream sheet pile, the problem becomes difficult and can not be solved through conventional EHDA modeling. Hence, an attempt has been made successfully to tackle such typical problem by 3-D FEM technique using a versatile software code 'ANSYS'.

In EHDA models it is customary to simulate the clay strata by air (assuming that clay is almost as impermeable to groundwater flow as air is to electric flow) and sand holes by copper wires of appropriate diameter (assuming that copper is as permeable to electric flow as sand is to groundwater flow). At the same time, the sand layer in an EHDA model is generally simulated by tap water. As such sand holes must also be represented by tap water or some other substance having almost same electrical conductivity as that of tap water. However, it is a difficult proposition. Therefore, the sand holes are represented by copper wires assuming that it can simulate the tap water up to some extent. But a deep analysis of results obtained from such EHDA model of sand hole showed that the uplift pressures lowered abruptly at the sand hole. This was due to the fact that electrical conductivity of copper is about 10^9 times the electrical conductivity of tap water. This means that if the sand holes are represented by copper wire, they will behave just like open channels, through which water can flow with least resistance and high velocities.

Thus the 3-D EHDA model representing air for clay layer and copper for sand holes may leads to simulation errors. This situation pushes designers towards digital models which are more adaptable in accommodating real world complex boundary conditions.

The study brings out the fact that the FEM using the software code 'ANSYS' is of immense utility for mathematical analysis of seepage modeling particularly when soil below a hydraulic

structure is heterogeneous and boundary conditions are complex and the model construction becomes almost impossible using any physical modeling technique.

(22) OPTIMAL LENGTH OF CANAL LINING OF RAPTI LINK CHANNEL AT KM.14.600 AT BHAKHLA SIPHON FEM APPROACH.

RR (GW,-03)

Uncontrolled ground water movement and seepage may cause serious structural, economic losses and endanger human lives. Major adverse impacts of ground water on hydraulic structures relate to the seepage of ground water. Study of ground water seepage is important both for optimal ground water development management and evolving efficient design of hydraulic structures.

The flow of water through the sub soil with its attendant hydraulic gradients and uplift pressure plays a major role in the design of hydraulic structure resting on the porous media. Seepage endangers structural stability in two ways, namely by piping or under mining and by exerting uplift pressures.

Generally in the vicinity of a hydraulic structure the groundwater regime is governed by 3-dimensional Laplacian law.

The objective of this study is to assess the influence of length of lining of the canal on the hydrostatic uplift pressure and exit gradient near the cut off below the drainage barrel floor of Rapti Link Channel at Km. 14.600 at Bhakhla Siphon using ANSYS-FEM package.

Keeping in view the hydraulic symmetry and data storage requirement the model domain has been decomposed into four symmetrical components.

Analysis reveals that the uplift pressures on the Barrel floor and the length of the canal lining are inversely related. On the edge of the Barrel the maximum uplift pressure is 58.05% for the 50 m of canal lining. The uplift pressure

reduces to 45.45% and 37.54% for lining lengths 75m and 100m respectively. The minimum value of uplift pressure 26.51% was found at the central line of the barrel with 100m canal lining. Corresponding values of uplift pressure for lining length 75m and 50m are increased to 33.29% and 41.17% respectively. The uplift pressure decreases from its maximum value at the barrel edge below the central line of canal towards central line of barrel as well as towards cutoff of the barrel floor. The analysis indicates that the uplift pressure is maximum at the junction of lined and unlined channel below the central line of canal and decreases towards central line of barrel as well as towards the earthen embankment. The exit gradient values are not in safe range on either side for lining length of 50m. on the other hand for 100m lining length on each side of the aqueduct the exit gradient values become over safe. The exit gradient values for 75 m lining length on either side are lying in safe limit (ie, < 1/6). Thus it may be concluded that the optimal lining length on each side should be between 50m and 75m only. The negative value of exit gradient for 50m lining at location D may be attributed to the excess vertically downward flow of seepage water through the embankment of canal into the river bed.

The graph between exit gradient and lining length reveals that minimum length of lining comes out to be 67m (on either side of barrel) so that the value of exit gradient remains within safe limit of 1/6.0 at any point of the exit of cutoff.

(F) GROUND WATER DIVISION-II

(23) ANNUAL RESEARCH REPORT DURING 2007-08

RR (GW₂-01)

The studies and activities undertaken by the ground water division-2 during the year 2007-08 are documented in the report.

(24) MODEL STUDIES FOR QUANTUM OF SEEPAGE CARRIED BY LONGITUDINAL DRAINS FOR INDIRA SAGAR RIGHT MAIN CANAL, POLAVARAM PROJECT (PACKAGE-III) (A.P.), BY DEVELOPING FLOW-NET, USING 2-D EHDA AND MATHEMATICAL TECHNIQUES

RR (GW₂-02)

Model studies were earlier conducted for optimizing under drainage arrangement below the bed of Indira Sagar Right Main Canal, Polavaram Project (Package-III), (A.P.) and test results were issued vide T.M. No. 77 RR (GW₂-05). Further studies were conducted for finding out phreatic lines and estimation of quantum of seepage through three longitudinal drains, proposed below the bed of the canal. The flow-net of the seepage was also developed on a 2-D model.

(25) 3-D EHDA MODEL STUDY FOR UNDER DRAINAGE ARRANGEMENT BELOW THE LINING OF INDIRA SAGAR RIGHT MAIN CANAL, POLAVARAM PROJECT (A.P.)

(Supplement to TM 77RR (GW₂-05))

RR (GW₂-03)

3-D EHDA model studies were conducted on existing model of Indira Sagar Right Main Canal by providing (i) filter drains on side slope at 10 m c/c, 20 m c/c and (ii) filter layer on side slope alongwith proposal 3(b) of T.M. No. 77 RR (GW₂-05). The reduction in uplift pressure on canal bed from 1.34 m to 1.32 m, 1.28 m and 0.92 m was observed by providing sloping drains 10 m c/c, 20 m c/c and filter layer on side slope respectively.

(G) BASIC DIVISION

(26) ANNUAL GENERAL REPORT OF BASIC DIVISION (2006-07)

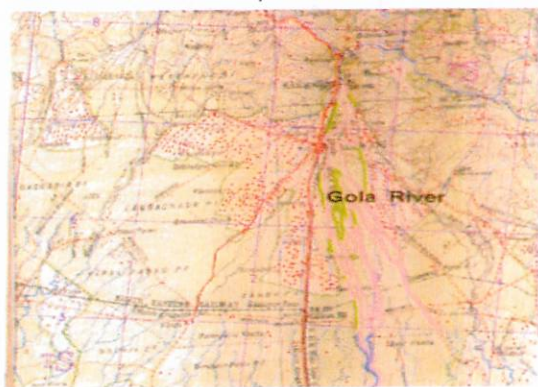
RR(B-01)

The studies and activities undertaken by the ground water division-2 during the year 2007-08 are documented in the report.

(27) CHANGE DETECTION OF GOLA RIVER NEAR BY HALDWANI (UTTARAKHAND)

RR(B-02)

The report deals with the study of change detection of river Gola near Haldwani city. This type of study with conventional ground based survey instruments are time consuming and expensive. Remote Sensing techniques (ERDAS IMAGINE & ARC-VIEW) have been adopted for this study. In the present study, Survey of India toposheets of the year 1946 and 1961 were used. Comparison of the above two



toposheets in the context of Gola river indicates the shifting of river course. The maximum shift of middle portion in study are observed 90.0 Meters towards East and 465.0 Meters towards West in a span of 15 years.

(H) MATERIAL TESTING DIVISION-I

(28) DESIGN OF CONCRETE MIXES FOR CH. CHARAN SINGH FLOOD MANAGEMENT, RESEARCH & TRAINING CENTRE, BHOLA JHAL MEERUT

RR (MT,-02)

The Project Manager, U.P. Projects Corporation Ltd., Unit-18, Agra sponsored the problem of concrete mix design for construction of Ch. Charan Singh Flood management, Research and Training Centre at Bhola Jhal, Meerut. The sponsor desired to design the concrete mix of grade $A_{20}M_{20}$ at workability 50 ± 5 mm (in terms of slump) on the basis of 28-days

compressive strength under moderate exposure conditions of the structure for durability.

Portland Pozzolana cement (J. K. Super) having 28 days compressive strength 43.1 MPa was used in the mix design. In the design of concrete mix crushed coarse aggregate and natural river sand conforming to IS grading Zone-II was used.

The mix design was carried out by casting and testing of cube specimens of size 150 mm. The laboratory target compressive strength of 28.3 N/mm^2 was achieved at free water cement ratios 0.553 for plain concrete and 0.50 for Reinforced concrete. The quantities were worked out taking into account the requirement of minimum cement content and maximum free water cement ratio for plain and reinforced concrete as per para 8.2.4.1 and Table-5 of I.S. 456 2000. The mix proportions by weight per cubic metre of concrete for the mix were recommended for adoption at site.



SECTION - D TEST REPORTS

Sl. No.	TR No. 78	Title of Test
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MATERIAL TESTING DIVISION - I

Material Testing Division-I carryout the laboratory testing for determination of suitability of physical properties of different types of construction materials such as bricks, brick tiles, cement, aggregates, steel bars etc. Some of the tests carried out during the year include :

- | | | |
|-----|---------------------------------|--|
| (1) | MT ₁ -01,03,04 | Compressive Strength of c. c cubes Provided by Executive Engineer, Maneri Bhali Unnivesh Khand, Maneri |
| (2) | MT ₁ -02,33 | Physical Properties of cement Provided by Project Manager, U.P.P.C. Ltd. Roorkee |
| (3) | MT ₁ -07,08,32,36,39 | Physical Properties of cement Provided by Executive Engineer, Yamuna Construction Division-2, Dehradun |
| (4) | MT ₁ -05 | Testing of bricks, c.c. cubes and coarse & fine aggregate Provided by Executive Engineer, Yamuna Construction Division-2, Dehradun |
| (5) | MT ₁ -06,09,31,38 | Testing of bricks, for steel bars and coarse & fine aggregate provided by Executive Engineer, Yamuna Construction Division-2, Dehradun |
| (6) | MT ₁ -10 | Testing of fine aggregate Executive Engineer, Yamuna Construction Division-2, Dehradun |

- (7) MT₁-37 Testing of bricks, for steel bars and coarse & fine aggregate Provided by Executive engineer, Yamuna Construction Division-2, Dehradun
- (8) MT₁-11 Physical properties of Cement provided Executive Engineer Uttarakhand pay jal Sansandhan Vikas Nirman Nigam, Dehradun
- (9) MT₁-12 Testing of coarse aggregate provided by M/S Bhangna Hydropower Company Ltd., Noida (U.P)
- (10) MT₁-15,28 Tensile strength of for steel bars, provided by M/S Bhangna Hydropower Company Ltd., Noida (U.P)
- (11) MT₁-30 Physical properties of cement provided by M/S Bhangna Company Ltd., Noida (U.P)
- (12) MT₁-13 Testing of c.c. cubes for steel bars coarse & fine aggregate provided by Executive Engineer, Nirman Khand PWD New Tehri
- (13) MT₁-14 Physical properties of cement provided by Executive Engineer, Nirman Khand PWD New Tehri
- (14) MT₁-16 Testing of bricks, for steel bars and fine aggregate provided by Executive Engineering Services Division, Hardwar
- (15) MT₁-17 Physical properties of cement provided by Executive Engineering Services Division, Hardwar
- (16) MT₁-40 Testing of c.c. cubes provided by Executive Engineering Services Division, Hardwar
- (17) MT₁-18 Physical properties of cement provided by Sri Surendra Singh Manakpur Adampur Distt. Hardwar
- (18) MT₁-19 Testing of coarse aggregate provided by AGM, THDC Uttarkashi
- (19) MT₁-20 Physical properties of cement provided by P.M. U. P. P. C. Ltd. Unit -18, Agra
- (20) MT₁-22 Testing of c.c. cubes provided by P.M. U. P. P. C. Ltd Unit -18, Agra
- (21) MT₁-23 Testing of bricks provided by P.M. U. P. P. C. Ltd Unit -18, Agra
- (22) MT₁-21 Physical properties of cement (2nos) provided by Irrigation Division, Dehradun

- | | | |
|------|------------------------|---|
| (23) | MT ₁ -24 | Testing of c.c. Cubes provided by Secretary, Hardwar Development authority Hardwar |
| (24) | MT ₁ -25,26 | Testing of c.c. Cubes provided by Secretary, Hardwar Development authority Hardwar |
| (25) | MT ₁ -27 | Testing of bricks provided by Executive Engineer, I & P Division, Rishikesh |
| (26) | MT ₁ -29 | Physical properties of cement provided by Executive Engineer, Irrigation Division Hardwar |
| (27) | MT ₁ -34 | Testing of bricks provided by M/S Maharashtra power Transmission Structures Pvt. Ltd. Bhagwanpur |
| (28) | MT ₁ -35 | Physical properties cement provided by Director, Alaknanda Hydropower Company Ltd. Secundrabad (AP) |

MATERIAL TESTING DIVISION II

Material Testing Division - II deals with the insitu tests on rockmass and laboratory tests on intact rock samples. The insitu tests like uniaxial jacking, flat Jack, block shear, pull out and bearing capacity tests, load tests on bridges for IRC class 'A' & class 'AA' loading and aqueducts are carried out by this division. The laboratory tests on rock specimen are also carried to find out unconfined compressive strength, modulus of elasticity and poisson's ratio, dynamic modulus of elasticity etc.

The division also maintains and upkeep the various Technical Memorandums, reports issued by the institute and also provides Xerox facility. Studies carried out during the year include:

- | | | |
|------|---------------------|--|
| (29) | MT ₂ -01 | Annual Report of the Division |
| (30) | MT ₂ -02 | Pull out tests at Ch. Charann Singh Lahchura Dam site, Lahchura, Mahoba provided by Executive Engineer Modha Band Nirman Khand, Mahoba (U.P) |
| (31) | MT ₂ -03 | Pull out tests at Ch. Charann Singh Lahchura Dam site, Lahchura, Mahoba provided by Executive Engineer Modha Band Nirman Khand, Mahoba (U.P) |
| (32) | MT ₂ -04 | Rock to Concrete Block shear Test at Karcham -Wangtoo H.E. provided by R.L. Gupta, Director, Jai Prakash Associates Sahibabda (Gzb) |
| (33) | MT ₂ -05 | Rock to Concrete Block shear Test at Karcham -Wangtoo H.E. provided by R.L. Gupta, Director, Jai Prakash Associates Sahibabda (Gzb) |

(34) MT₂-06

Determining the unconfined compressive strength of Rock core samples of Naitwar- Mori & Jakhol- Sankri Electric projects Mori, Distt: Uttarkashi provided by Dy. G.M. NM & JS, HEP, SJVN Ltd, Mori, Uttarakhand

SOIL DIVISION - I

The Soil Division-I has three well equipped Soil laboratories. The division is mainly responsible for carrying out the laboratory testing for the determination of engineering properties of soils, field investigations for determination of Bearing Capacity of foundations, Insitu Shear Parameters, modulus of subgrade reaction, Insitu permeability and sub-soil strata to study the seepage behaviour etc. study carried out during the year include

(35) S₁-01

Annual Report of the Division

(36) S₁-02

Determination of Laboratory and Field Densities for construction of Road on Left Bank of Upper ganga Canal at Kms. 79.200, 80.000, 80.700 and 81.150 under Ch. Charan Singh Kanwar Sadak Pariyojna provided by Executive Engineer, Irrigation Construction Division Meerut.

(37) S₁-03

Determination of Bearing capacity and in-situ sheam parameters of foundation soil at Km. 33.670 of Ban Sagar Feeder Channel provided by Executive Engineer, Ban Sagar Canal Construction Division -4 Mirzapur (U.P)

(38) S₁-04

In-Place density tests at premises of Alps Industries Ltd. Sidcul Haridwar provided by Sri S.K. Tiwari, Dy. Manager, Civil Alps Industries Ltd. Sidcul Haridwar.

(39) S₁-05

Bearing capacity of foundation for the proposed commercial Complex at Transport Nagar, Dehradun provided by vice Chairman, Mussorie-Dehradun Development Authorities Dehradun

(40) S₁-06

Results of gradation analysis and direct shear tests on rock fill samples pertaining to Bursar Dam, Kishtwar (J&K) provided by Shri A.N. Lakhnupal Senior Manager (R) Quality control Complex N.H.P.C Kishtwar (J&K)

(41) S₁-07

Results of gradation analysis and direct shear tests on rock fill samples pertaining to Bursar Dam, Kishtwar (J&K) provided by Shri A.N. Lakhnupal Senior Manager (R) Quality control Complex N.H.P.C Kishtwar (J&K)

(42) S₁-08

Determination of Bearing capacity of foundation soil for the proposed New MDDA office building Dehradun provided by vice Chairman, Mussorie-Dehradun Authorities Dehradun

- (43) S₁-09 Results of triaxial shear tests conducted on rock-fill samples pertaining to Bursar Dam dishtwar (J&K) provided by Shri A.N. Lakhanpal Senior Manager (R) Quality control Complex N.H.P.C Sector -2 Kishtwar (J&K)
- (44) S₁-10 Determination of N-values and Bearing capacity for foundation soil abutment of the proposed steel girder bridge (Double lane) on Dakpathar Dhalipur power channel provided by Executive Engineer Civil construction Div-2 Dhalipur (Dehradun)
- (45) S₁-11 Permeability test results of rock-fill samples pertaining to Pakal Dal Hydroelectric Project Kishtwar provided by Shri A.N. Lakhanpal Senior Manager (R) Quality control Complex N.H.P.C Sector -2 Kishtwar (J&K)
- (46) S₁-12 Permeability test results of rock-fill samples pertaining to Bursar Dam Hydroelectric Project Kishtwar provided by Shri A.N. Lakhanpal Senior Manager (R) Quality control Complex N.H.P.C Sector -2 Kishtwar (J&K)
- (47) S₁-13 Compressibility characteristic of rock-fill samples pertaining to Pakal Dal Hydroelectric project Kishtwar provided by Shri A.N. Lakhanpal Senior Manager (R) Quality control Complex N.H.P.C Sector -2 Kishtwar (J&K)
- (48) S₁-14 Compressibility characteristic of rock-fill samples pertaining to Bursar Dam Hydroelectric project Kishtwar provided by Shri A.N. Lakhanpal Senior Manager (R) Quality control Complex N.H.P.C Sector -2 Kishtwar (J&K)
- (49) S₁-15 Shear parameters of soil samples of A T Nala and Parsari Nala Chamoli Provided by Executive Engineer, Irrigation Construction Division Chamoli (Uttarakhand)
- (50) S₁-16 Pile load test at the site of Sanskrit University Haridwar provided by Project Manager, U.P. Rajkiya Nirman Nigam Ltd. Unit-1 Haridwar
- (51) S₁-17 Bearing capacity for foundation of proposed VRB at Km. 94.600 of Hardoi Branch Shahjahanpur provided by Executive Engineer, Rastriya Jal Parvand Yojna sharda Naher Khand Sahjahanpur (U.P)
- (52) S₁-18 Laboratory tests on soil samples received from Afzalgarh Sinchai Khand Dhampur provided by Executive Engineer, Afzalgarh Sinchai Khand Dhampur (U.P)
- (53) S₁-19 Determination of silt factor for the sample of river bed material from barrage site Baijnath, Bageshwar provided by Assistant engineer-1 Irrigation Division Bageshwar (Uttarakhand)

- (54) S₁-20 Bearing capacity of foundation of proposed Sanyukat Janch Chowki, Asrodi Dehradun provided by Project Manager, Unit-3, Construction Wing Uttarakhand Payjal Nigam Rohini
- (55) S₁-21 Determination of silt factor for soil sample of Hechary Construction site, Satpuli provided by Executive Engineer, Yamuna Construction Division-2 Dehradun
- (56) S₁-22 Laboratory tests on soil samples received from S.S.J.V.-ZVS joint Venture, Badagaon, Joshimath provided by Project Manager, S.S.J.V.-ZVS joint Venture, Joshimath
- (57) S₁-23 Determination of bearing capacity of foundation of proposed aqueduct at Km. 22.850 of Right Kalda Rajwaha in Distt. Ghaziabad provided by Executive Engineer, Bulendshahar Division Ganga Canal Bulendshahar
- (58) S₁-24 Determination of bearing capacity of foundation for proposed VRB at Km. 165.720 of UGC provided by Executive Engineer, Bulendshahar Division Ganga canal, Bulendshahar

SOIL DIVISION II

इस खण्ड के अधीन रासायनिक प्रयोगशाला तथा मृत्तिका प्रयोगशाला-2 स्थापित हैं। रासायनिक प्रयोगशाला में सीमेन्ट, सीमेन्ट मोर्टार, सीमेन्ट कंक्रीट, पानी का रासायनिक विश्लेषण तथा सेडिमेन्ट ग्रेन साइज निर्धारण किया जाता है। मृत्तिका प्रयोगशाला द्वारा मृदा के अभियान्त्रिकी गुण ज्ञात करने के लिये विभिन्न स्थल एवं प्रयोगशाला परीक्षण किये जाते हैं। परीक्षण कार्यों के अतिरिक्त, इस खण्ड द्वारा त्रैमासिक तकनीकी समाचार पत्र का प्रकाशनकार्य भी किया जाता है। इस वर्ष खण्ड द्वारा निम्नलिखित कार्य सम्पन्न कराये गये-

- (59) S₂-01 Grain size distribution of silt samples provided by Assistant Research Officer-2 Hydraulics Division-2, Bhadrabad (Hardwar)
- (60) S₂-02 Density of Soil Samples provided by Executive Engineer, Irrigation Division Haridwar (Uttarakhand)
- (61) S₂-03 Chemical Analysis of cement Mortar samples provided by Shri K.S. Suhel, Consultant Project Maharashtra power Transmission Structure Pvt. Ltd
- (62) S₂-04 Chemical Analysis of cement Concrete samples provided by Shri A.S. Kaneri, Investigation Officer (Technical) Public Commissioner Officer, 1-Hari puram, G.M.S. Road, P.O.- Kanwali, Dehradun (Uttarakhand)
- (63) S₂-05 Chemical Analysis of cement Mortar and Cement Concrete samples provided by Shri A.S. Gaur, Executive Engineer, Madhya Ganga Canal Division, Aligarh (U.P)

- (64) S₂-06 Chemical Analysis of Cement Concrete samples provided by Shri A.S. Kaneri, Investigation Officer (Technical) Public Commissioner Officer, 1-Hari puram, G.M.S. Road, P.O.- Kanwali, Dehradun (Uttarakhand)
- (65) S₂-07 Chemical Analysis of cement Concrete samples provided by Executive Engineer, Lower Division Agra Canal (U.P)
- (66) S₂-08 Chemical Analysis of cement Concrete samples provided by Shri Sunder Singh, S/o Shri Manpal Singh, Village & Post- Manakpur Adampur, Haridwar (Uttarakhand)
- (67) S₂-09 Proctor Compaction and Permeability Test of Soil Samples provide3d by S.S.J.V.Z.V.S. Join Venture Bargaon, Joshimath (Uttarakhand)
- (68) S₂-10, 13 Chemical Analysis of cement Mortar samples provided by Secretary, Haridwar Development authority, Haridwar (Uttarakhand)
- (69) S₂-11 Chemical Analysis of cement Mortar samples provided by A. E. 2, Madhya Ganga Canal Construction Division -10, Bulandshahar (U.P)
- (70) S₂-12 Chemical Analysis of cement Mortar samples provided by Executive Engineer, I & P Div.-1 Dehradun (Uttarakhand)
- (71) S₂-14 Grain size distribution of silt samples provided by Assistant Research Officer-2 Hydraulics Division-2; Bhadrabad (Hardwar)
- (72) S₂-15 Laboratory Tests of Soil samples provided by Research Officer Ground Water Div.-1 I.R.I. Roorkee (Uttarakhand)
- (73) S₂-16, 18 Chemical Analysis of cement Mortar samples provided by Superintending Engineer, Tons Civil construction Circle-1, Dehradun (Uttarakhand)
- (74) S₂-17 Chemical Analysis of Water samples provided by Advisor, Alaknanda Hydropower Company Limited, Koteshwar Colony shri Nagar Garwhal (Uttarakhand)
- (75) S₂-19 Grain size distribution of silt samples provided by Assistant Research Officer -2 Ground Water Division-1 Irrigation Research Institute Roorkee.

IMPORTANT ACTIVITIES

It is also to mention that :-

- (1.) The task of digitization of old but important design drawings conceived by IDO Roorkee for different hydro projects like Maneri Bhali Stage I & Stage II, Chilla Risikesh H. E. Scheme and Chibro-Khodri H. E. Scheme (Yamua Stage II) was under taken by the computer centre of the institute. The soft copies of the design drawings, some of which were 40 years old, were prepared through A₀ Scanner and were saved in JPEG format. The Directory of the scanned drawing has been prepared in MS-excel Sheet to help in retrieving the desired drawing.
- (2.) Estimation of uplift pressure and exit gradient in hydraulic structures is generally conducted through 3D-EHDA modeling. The technique, although very useful, has limitation of correct simulation of strata. To overcome this limitation, the "ANSYS" software was used for determination of uplift pressures and exit gradient in hydraulic structures. As a pilot study the under drainage arrangement behind canal lining of Indra Sagar Pariyojna (AP) was under taken. The results obtained by "ANSYS" were found in very close vicinity with results obtained by 3D-EHDA modeling. The uses of "ANSYS" in estimating uplift pressure and exit gradient in hydraulic structures may be very helpful in saving time and money as compared to 3D-EHDA modeling.
- (3.) The use of radio-active tracer in the assessment of leakage through reservoirs & conveyance system of hydraulic projects, although very useful but has been in question due to environmental and health standards. Since most of the reservoirs are also being used for drinking water and other humane utilities, the injection of radio-active material may become hazardous.

To overcome this non radio-active isotopes are taken into consideration. The possible stable isotopic compositions of water are: H₂¹⁶O, HD¹⁶O, D₂¹⁶O, H₂¹⁷O, HD¹⁷O, D₂¹⁷O, H₂¹⁸O, HD¹⁸O and D₂¹⁸O. All of these occur in natural waters but, considering the natural abundances of the isotopes, it is only the molecules of H₂¹⁶O, H₂¹⁸O, HD¹⁶O and H₂¹⁷O which are of analytical relevance (Gat and Gonfiantini, 1981). Differences among the stable isotopic content in snow, rainfall, surface waters and groundwater are therefore used for estimating e.g. flow paths and became an important subset of the larger hydrological use of isotopic tracers. This methodology was opted for the first time by the institute for detecting the source of leakage in the conveyance system of Gaj H. E. Project (H.P.).

PICTORIAL ACTIVITIES AT I. R. I., ROORKEE



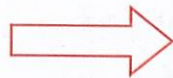
Sh. Sagar Chandra, HOD, Irrigation Department, Uttarakhand & Sh. Ajay Singh Nambiyal, Addl. Secy., Government of Uttarakhand addressing officers at I. R. I., Roorkee



Digitization of Project Drawings in the Computer Centre of the institute

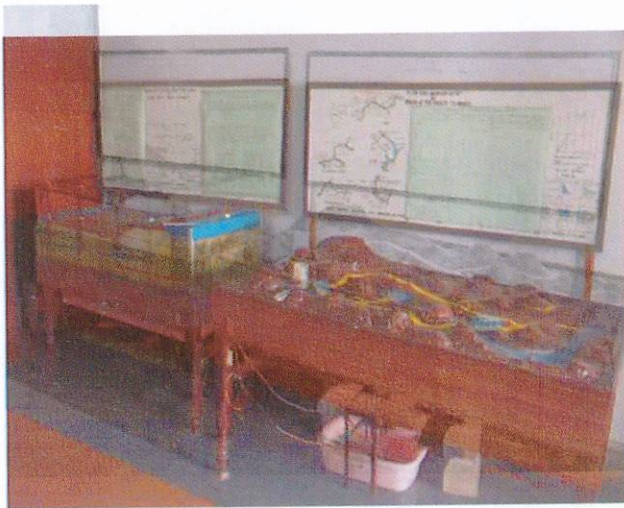


Abrasion Testing Equipments in Material Testing Laboratory of the institute

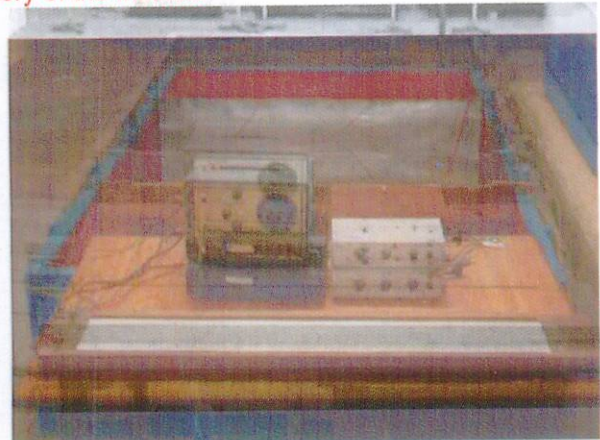
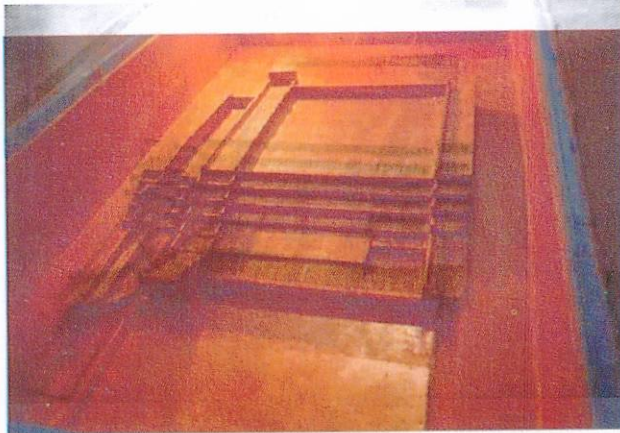




A view of Tri-axial Shear Test in Soil Laboratory of the institute



Liquid Scintillation System and Models of Discharge measurement & Seepage Losses using Tracer Technique in Isotope Laboratory of the Institute

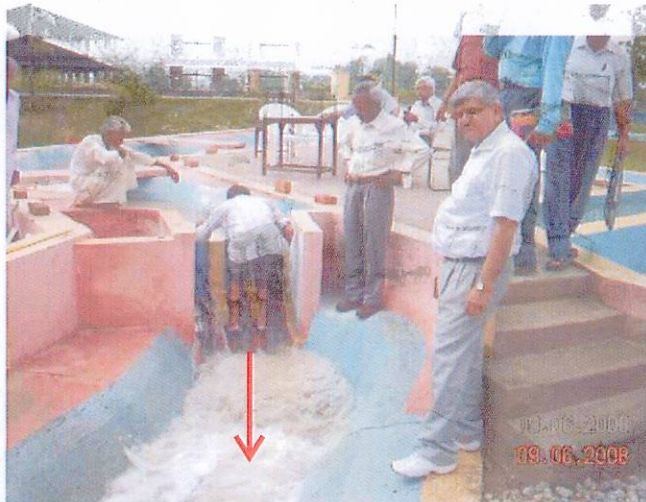


Model of the foundation of Jorthang Barrage (Sikkim) for estimation of Uplift pressures through 3-D EHDA modeling in Ground Water Laboratory of the institute

PICTORIAL ACTIVITIES AT H. R. S., BAHADRABAD



A Panoramic View Of BAHADRABAD From Google Earth

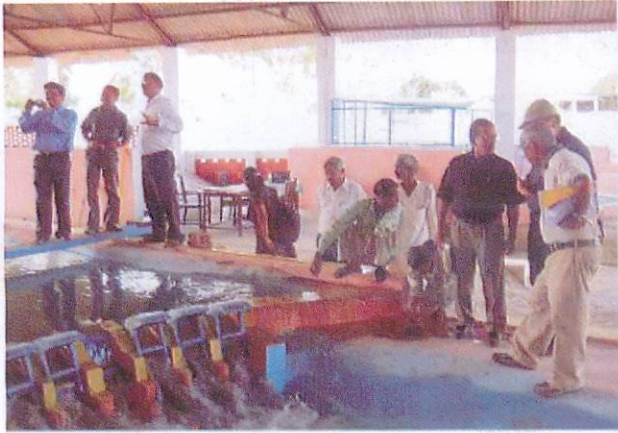


Sh. Bijendra Sharma & Sh. V. K. Kapoor
Inspecting the Model of
"Budhil H. E. Project (H. P.)".

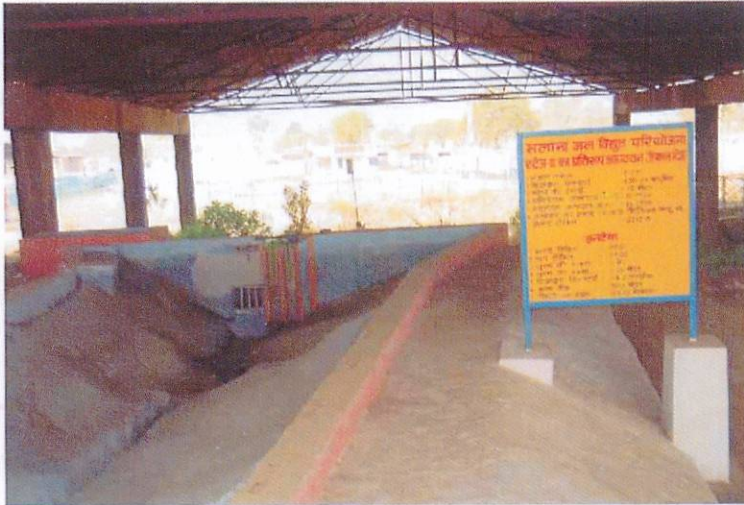


Model of
"Shivkuti Salori"
protection work near
Allahabad (U.P.)





Inspection of Models of 330 MW Shri Nagar H. E. Project (Uttarakhand) by GVK And SMEC Officers



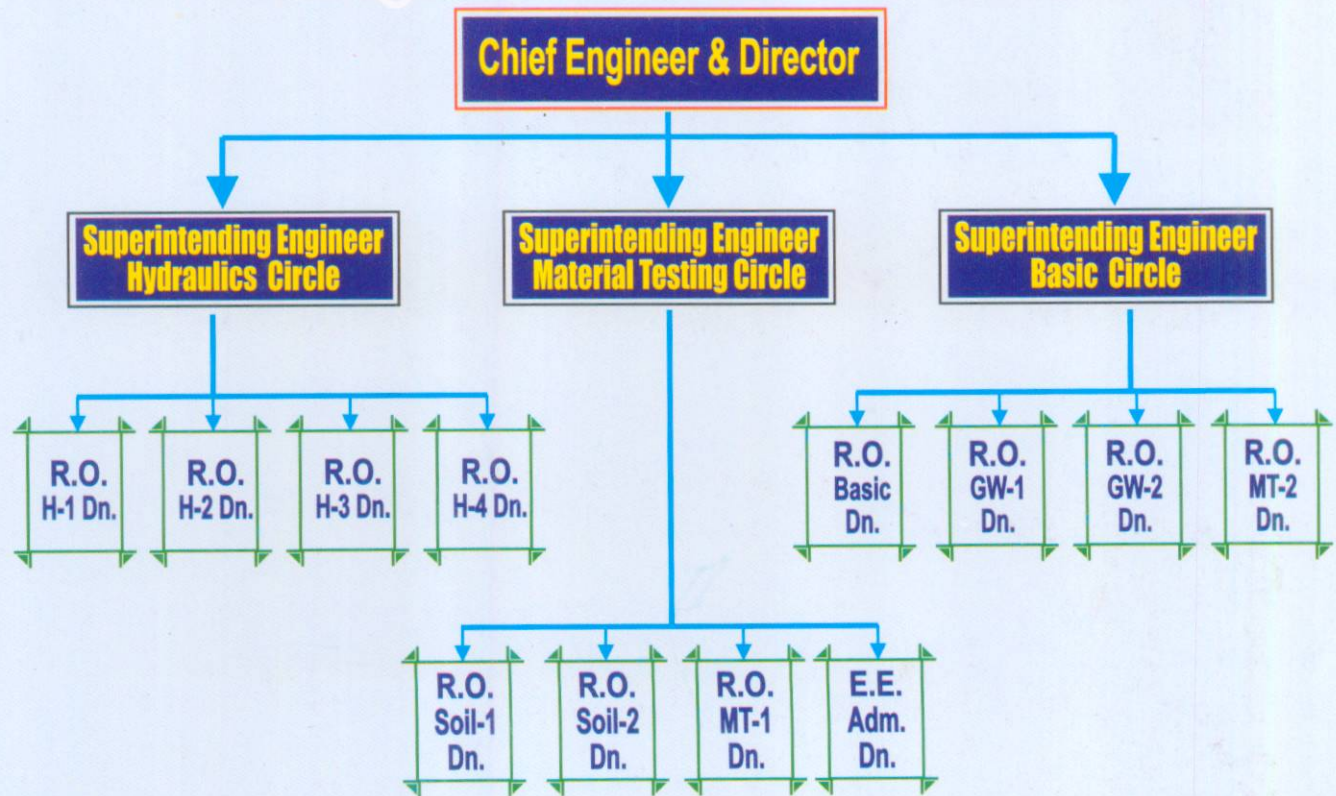
Model of Malana
H. E. Project (H.P.)



Model of Tista
H. E. Project (W.B.)



Organisational Setup of Irrigation Research Institute

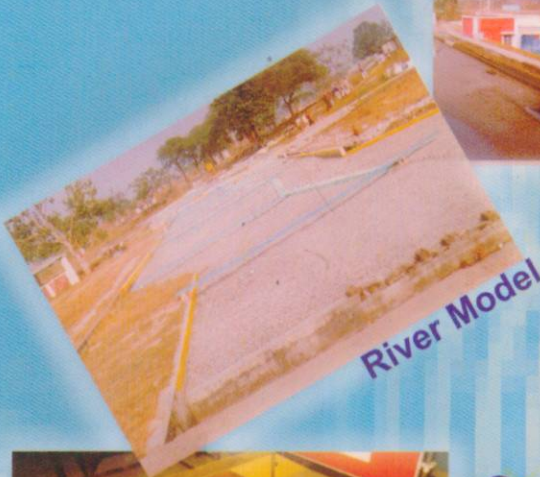
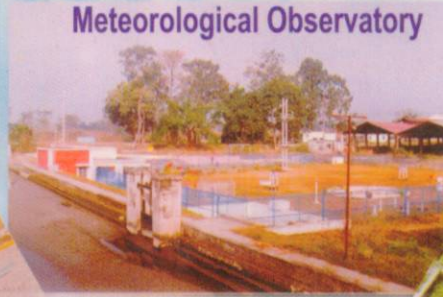


Assistant Engineer/Assistant Research Officer -32

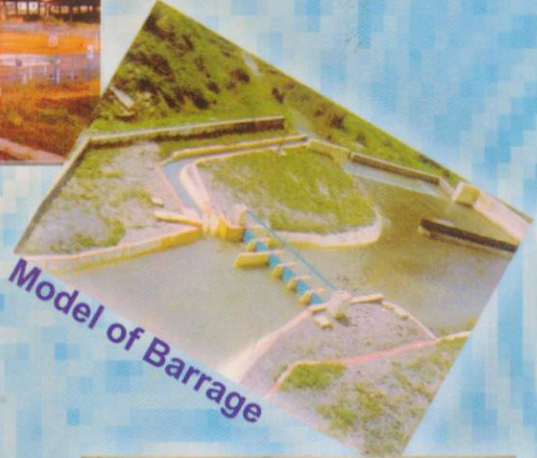


Glimpses of Activities

Meteorological Observatory

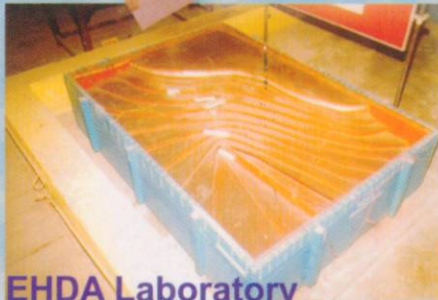


River Model



Model of Barrage

Consultancy Areas



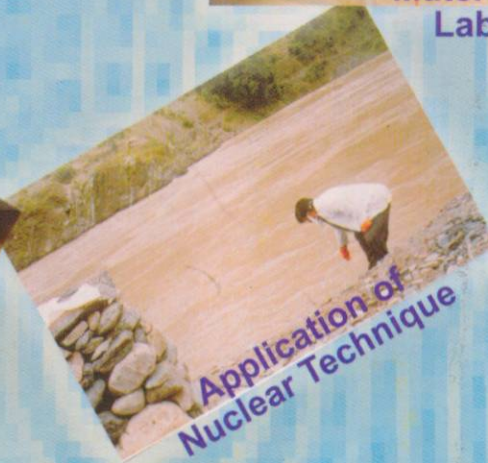
EHDA Laboratory



Material Testing Laboratory



Water Quality & Chemical Laboratory



Application of Nuclear Technique

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सिंचाई बढ़ायें खुशहाली लायें

SAVE WATER TO SAVE EARTH