



# केन्द्रीय सिंचाई व शक्ति मंडल CENTRAL BOARD OF IRRIGATION AND POWER

An ISO 9001 : 2000 Organisation

No. 31(700)/CBIP/Scour of Rock/2011/New Delhi

Dated: 21<sup>st</sup> September 2011

Shri A.K. Ganju  
Member - D&R  
Central Water Commission  
Sewa Bhawan, R.K. Puram  
New Delhi 110066



Try Dr. Sec/Dir/Die  
अ.सं./Dy.No. 1293  
दिनांक/Dt. 13/10/11

**Sub: Short Course on Scour of Rock (downstream of overtopping dams and plunge pools)  
19 October 2011 (Wednesday) at New Delhi**

Dear Sir,

As you are aware the hydraulic structures spilling excess water from dam reservoirs, have been a major engineering concern for a long time. The transfer of water to the downstream river may scour the dam foundation and the downstream river bed. On the long term, this scour process may create structural safety problems. Hence, accurate prediction of time evolution and ultimate scour depth is required which is traditionally estimated by use of empirical or semi-empirical formulae that partially neglect basic physical processes involved. Especially the role of fluctuating dynamic pressures in plunge pools and their transfer inside underlying rock joints is unknown. Also, empirical expressions are often only applicable to the specific conditions for which they were developed. They neglect the influence of aeration on dynamic pressures and cannot correctly simulate the resistance of the rock against progressive break-up.

There appears a need to create awareness among engineers of the concerned agencies in India about the state-of-the-art insight and offers techniques that can be used to analyze scour of rock downstream of overtopping dams and in plunge pools.

Keeping in view the above, the Central Board of Irrigation and Power (CBIP) and Indian Committee on Large Dams (INCOLD), propose to organize a Short Course on **Scour of Rock (downstream of overtopping dams and plunge pools)** on **19 October 2011 (Wednesday)** in the Conference Hall of CBIP, Malcha Marg, Chanakyapuri, New Delhi.

**Dr. George Annandale**, P.E., D.WRE, F.ASCE, Program Leader at Golder Associates, Inc., who has 35 years of experience as a civil engineer specializing in water resources engineering and is known for the development of the Erodibility Index Method that can be used to determine the erodibility of any earth material, including rock, will be instructor for the course. He has published approximately 100 peer-reviewed papers and is author, co-author and contributing author to seven books on sedimentation and scour, including the book **Scour Technology**, published by McGraw-Hill in 2006.

In view the importance of the course and your organization's involvement in the development of dam/hydropower, we request you to kindly nominate 4-5 officers from your organization/department for participation in the programme. The registration fee for participation in the deliberations of the Short Course is Rs. 5,000/- per person. 10% discount will be extended to members of INCOLD and CBIP. The payment is to be made by bank draft/cheque drawn in favour of "Central Board of Irrigation and Power, New Delhi".

We look forward to receiving the nominations of officers at an early date.

Thanking you  
Yours faithfully,

*(V.K. Kanjlia)*  
Secretary  
2/10

Forwarded to Dir (Trg) for further necessary action  
4.10.11  
Pl. Circulate.

Matcha Marg, Chanakyapuri, New Delhi 110 021  
Tel : 91-11- 2687 6229, 2611 6567, 2687 5017, 2410 2437  
Fax : 91-11-2611 6347; E-mail : cbip@cbip.org; cbip@vsnl.com; Website : www.cbip.org

# SHORT COURSE ON SCOUR OF ROCK (downstream of overtopping dams and plunge pools)

19<sup>th</sup> October 2011  
Conference Hall of CBIP, New Delhi

## REGISTRATION FORM

1. Name \_\_\_\_\_  
First Name \_\_\_\_\_ Middle Name \_\_\_\_\_ Surname \_\_\_\_\_
2. Position \_\_\_\_\_
3. Organization \_\_\_\_\_
4. Address \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
City \_\_\_\_\_ Pin \_\_\_\_\_
5. State \_\_\_\_\_ Country \_\_\_\_\_
6. Tel. No. \_\_\_\_\_ Fax No. \_\_\_\_\_
7. E-Mail \_\_\_\_\_ Internet \_\_\_\_\_

I intend to participate in the deliberations of the short course.

\_\_\_\_\_  
Signature

Place:

Date:

# SHORT COURSE ON SCOUR OF ROCK (downstream of overtopping dams and plunge pools)

19<sup>th</sup> October 2011  
Conference Hall of CBIP, New Delhi

Organized by:



Central Board of Irrigation  
& Power



Indian Committee on  
Large Dams



TAI  
Tunnelling Association of India



## BACKGROUND

The short course provides state-of-the-art insight and offers techniques that can be used to analyze scour of rock downstream of overtopping dams and in plunge pools. Topics that will be covered include assessment of the potential for rock scour, and the maximum depth and rate of scour of rock. Economical solutions to scour problems are often dependent on knowledge of the rate of scour, i.e., whether the maximum extent of scour occurs almost immediately, or whether it is time-dependent. Scour that occurs almost instantaneously may require extensive protection, while scour that is time-dependent and only reaches its full extent after, say, decades, may require only limited protection if at all. The topics covered are based on technological developments in rock scour assessment developed over the past 20 years.

The short course offers instruction on processes leading to scour, and on pragmatic methods to quantify the erosive capacity of water and the erosion resistance of rock, and practical methods for calculating the potential for, extent and rate of scour. The methodologies presented in the short course have been successfully applied in practice and have been validated by making use of scour case studies.

## LEARNING OBJECTIVES

The learning objectives are to provide participants with the opportunity to develop,

- Insight into scour processes and how flowing water interacts with rock and leads to scour,
- The capability to quantify the ability of rock to resist the erosive capacity of water,
- The capability to quantify the erosive capacity of water that can lead to scour of rock,
- The capability to calculate the potential for, extent and rate of scour of rock.

The methods presented in the short course will be illustrated with case study results.

## COURSE OUTLINE

- **Introduction and examples of rock scour**
- **Boundary characteristics of flowing water** and how it leads to scour of rock
- **Rock characteristics and failure mechanisms** leading to scour of rock when interacting with flowing water
- **Rock scour potential:**
  - Quantification of the erosive capacity of water
  - Quantification of the ability of rock to resist scour by water
- **Extent and rate of rock scour:**
  - Quantification of maximum scour depth
  - Quantification of the rate of scour of rock
- **Case Studies**

## COURSE NOTES

Course participants will receive a hard copy of the PowerPoint slides.

Participants interested in receiving a copy of the book **Scour Technology**, published by McGraw-Hill and authored by Dr. Annandale, at a discount price of \$90.00 (normal price \$95.00) should inform the presenter before the course commences.

either by cheque or in cash, at the time of delivery of the book to participants at the short course.

## INSTRUCTOR

**Dr. George Annandale, P.E., D.WRE, F.ASCE**, Program Leader at Golder Associates, Inc., has 25 years of experience as a civil engineer specializing in water resources engineering. He is known for the development of the Erodibility Index Method that can be used to determine the erodibility of any earth material, including rock. The method has been accepted by the engineering profession, is used internationally for design and safety assessment of infrastructure and is included in federal and state guidelines. He has published approximately 100 peer-reviewed papers and is author, co-author and contributing author to seven books on sedimentation and scour, including the book **Scour Technology**, published by McGraw-Hill in 2006. He consults nationally and internationally and has worked on projects in the United States of America, Canada, Australia, Turkey, Iceland, Switzerland, Indonesia, Kalimantan, Papua, Sumbawa, the Philippines, Pakistan, Morocco, Kenya, Sri Lanka, South Africa, Malawi, Israel, Colombia, Venezuela, Mexico, Laos and Zaire.

## VENUE

The short course will be held in the Conference Hall of Central Board of Irrigation & Power, Malcha Marg, Chanakyapuri, New Delhi - 110 021 (Phone: +91 11 26116567/26115984; Fax: +91 11 26116347; E Mail: sunil@cbip.org Web: www.cbip.org)

## OFFICIAL LANGUAGE

The official language of the short course will be English only. No simultaneous translation facility will be provided.

## REGISTRATION

The registration fee payable per participants for participation in the deliberations of the short course is Rs. 5000/- by cash/cheque to be drawn in favour of "Central Board of Irrigation and Power" payable at New Delhi

## SECRETARIAT

### Central Board of Irrigation & Power

Malcha Marg, Chanakyapuri

New Delhi-110 021, India

Tel : 91-11-26115984/26116567 Extn: 113

Fax : 91-11-26116347

E-Mail : sunil@cbip.org; cbip@cbip.org;

Web : http://www.cbip.org

**Contact persons:** **Shri A.C. Gupta**, Director – Water Resources (9871995996)  
**Shri Sunil Sharma**, Senior Manager - Technical (9811299136)

## Notes:

1. All correspondence should be addressed to the "Secretary, Central Board of Irrigation & Power, Malcha Marg, Chanakyapuri, New Delhi 110 021.
2. All payments should be made by cheque at par/Demand Draft drawn in favour of "Central Board of Irrigation and Power", payable at New Delhi.
3. Participants will have to make their own arrangement for travel, boarding and lodging, etc.
4. Last date for receipt of Registration Form is 30<sup>th</sup> September 2011. Spot registration facility will also be available, provided prior information is received.