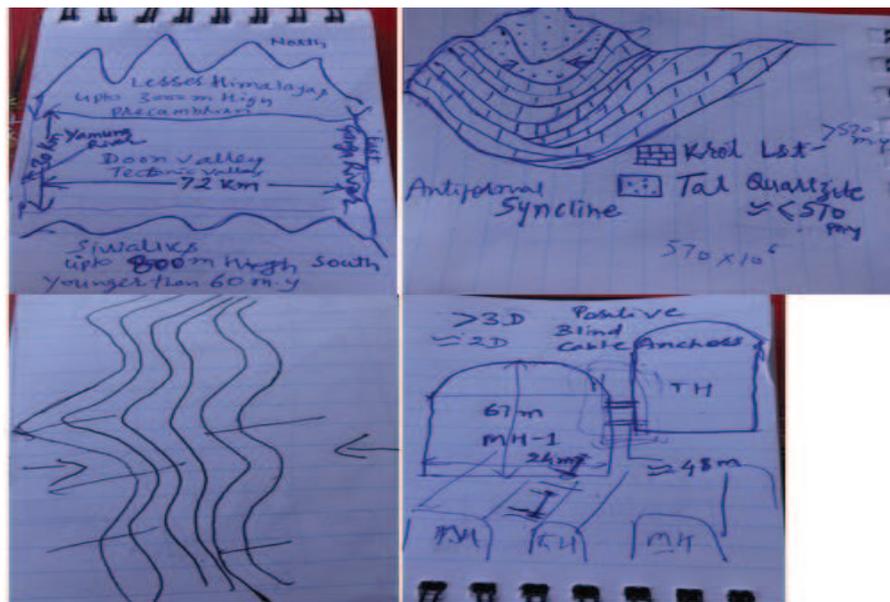


# REPORT ON EXCURSION OF EGNM DELEGATES TO TEHRI AND KOTESHWAR DAM PROJECTS, UTTARAKHAND, INDIA

BY  
HARISH BAHUGUNA  
Tour Director, Tehri Excursion, EGNM, India

The excursion to Tehri hydropower complex commenced on 30<sup>th</sup> October 2015 and the delegates started their journey from New Delhi. There were eight delegates from three different countries that included Dr. Alexander Strom (Engineering Geologist), M/s Tatiana Strom (Civil Engineer) from Russia, Jan Novotny, Radek Suchonel (both Geotechnical Engineers) from Czee Republic, Prof. Yonggong Jia (Director Ocean University of China and Chairman of Marine Engineering Geology Commission of IAEG), Mrs Hongxian Shan, Mr Shaotong Zhang and Xio Lei Liu (Marine Engineering Geologist) from Peoples Republic of China.

The team reached Dehradun the capital city of the state of Uttarakhand on 30<sup>th</sup> afternoon and en-route they were apprised about the geographical expanse of Doon Valley and the meaning of the word Doon in technical parlance. To make it convenient for them the sketches drawn by me on the pocket size spiral note pad came in very handy.



After satisfying the appetite and having some easy moments at the hotel the team embarked on a short trip to famous tourist destination i.e. Sahastrdhara a Sanskrit word which literally means thousand streamlets. This place is also well known for its karst topography that has been delicately carved by nature on the Krol lime stones of pre-cambrian age. The delegates were really thrilled to see the subterranean flow of the stream through the cave along with throes of karst features like stalactites, stalagmites and pillar etc. They also showed their curiosity about the medicinal effects of the sulfurous water at Sahastradhara.



The day ended with a stroll along the festive alleys of the famous **Paltan Bazar** (a market place for the British troops in the pre independent era). The intermittent spells of lovely, cool yet ever refreshing breeze flowing from the Mussoorie hills added to the charm of the Pinkish Evening at Dehradun. The delegates went for a short shopping spree and their gleaming faces were a live testimony to the fact that they had shed all the tiredness of the journey and instead were soaked with the local chores and enjoyment of the fabulous environs of Doon valley.

**The second day of the excursion (31-10-2015)** started with the road journey from Dehradun to the site of famous Tehri Dam, following the Dehradun – Mussoorie – Dhanaulti – Chamba – Tehri road. Delegates were shown the western extent of Doon Valley as the vehicle started gaining the elevation along the road. The topographical difference across main boundary thrust (MBT) separating the Tertiary Doon Gravels/Siwaliks from the overriding Jaunsars of Precambrian was explicit by its geomorphic expression and it was appreciated by the group members. En-route the first encounter was with the queen of hills Mussoorie and the delegates were ecstatic by even the glimpse of this beautiful hill town. The road section ahead exposed the rocks of limestones, dolomites and quartzites of Krol Group on the other limb of Mussoorie syncline.



At Buranskhanda the group could witness a very good view of the snow clad peaks of the majestic Central Himalayas. Any experienced Himalayan Geologist could very well visualize the boundary between the Lesser Himalayas and Central Himalayas i.e. the Main Central Thrust (MCT).

After this stint with the geological traversing the group decided to have a sojourn with the treasure of nature that is presented by the lush green meadows and dense Deodar (cedars-deodara) forest at the Eco Park Dhanaulti. Delegates enjoyed the sky walk and flying fox and the swings available in the park. The serene environs at this park was so soothing and solacing that it refreshed the group members and filled them with the vigor and zest that was required to see the Indian Engineering Marvel the Tehri dam.

The team received a grand welcome at the guest house of the project owners at Bhagirathipuram. The General Manager of THDC India Ltd. along with his team of Additional General Managers and Deputy General Managers presented the bouquet of flowers to all the delegates and exchanged pleasantries with them. The entire team of delegates was declared as the Corporate Guest by THDC, which is a rare honor that the company bestows on some selected and elite guests.

Before embarking for the site visit it was high time to satisfy the appetite and a sumptuous lunch was waiting at the dining table, courtesy THDC. The group headed for the visit to dam, chute spillway, glory hole spillways, stilling basin, transformer hall and machine hall sites of the highest rock fill structure on Indian soil i.e. Tehri dam. This dam is also highest rock fill dam in the south-east Asia and is fourth highest in the world. The specter of this dumb behemoth and its appurtenances was a treat to watch for all the delegates. It was more so special for Dr. Alexander Strom from Russia as he was involved with the design and construction of this project way back in 1989.

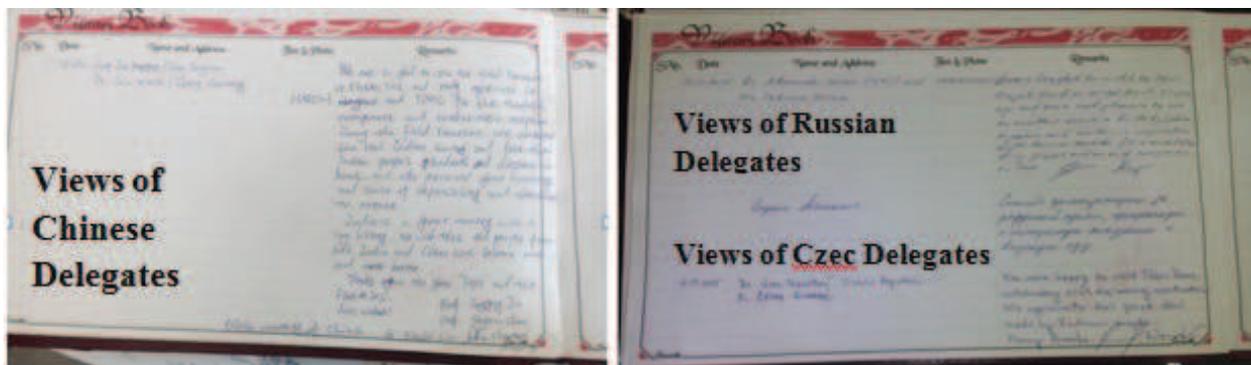


The delegates were given a brief idea about the geological set up at the project site and the geotechnical problems encountered at different sites and the solutions provided thereof.

They were really impressed by the pile shaft treatment given at the slopes of maintenance gate shaft area, multiple drifting for advancing excavation of gate shafts through the deformed and sheared mass, combination of cladding, bundled anchors, cable anchors and CC blocks at right bank shaft spillway site, the glory hole spillways, shear trench given at the junction of chute spillway and stilling basin, positive and blind cable anchors given at the common wall of machine hall and transformer hall. The day ended with a visit to the under construction machine hall of the second stage i.e. pumped storage plant (PSP).

**The third day (01-11-2015)** began with a power point presentation on the Geotechnical Aspects of Tehri and Koteshwar Dam Projects that was given by Harish Bahuguna the Tour Director for this excursion. The presentation covered all aspects of the two projects so comprehensively that the delegates were spell bound by the quality of the content, to say the least. After this the delegates were taken to a voyage in the giant reservoir of Tehri in a newly purchased state of the art cruise boat of THDC the vast expanse of the reservoir along Bhagirathi and Bhilangana rivers left the delegates aghast and mesmerized. The group then proceeded to an entourage to the other component of the Tehri hydropower complex i.e. the 97.50m high concrete gravity dam at Koteshwar which is located in the same river valley (Bhagirathi) approximately 22 km downstream of Tehri dam. The THDC authorities at Koteshwar welcomed the delegates and organized a complimentary lunch for them. The team visited the dam, spillway and powerhouse site of Koteshwar and were apprised, by Tour Director, about the geological setup, geotechnical problems faced and treatments provided at different sites. From Koteshwar, the group headed straightway to New Tehri Town to see the rehabilitation part of the Tehri dam and they appreciated the systematic development of habitation and other ancillary facilities, particularly the stadium, the underground inter sate bus terminal and covered shopping complex here.

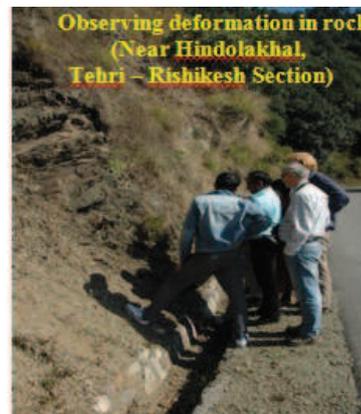
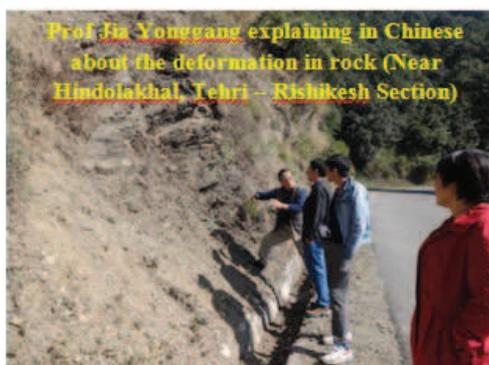
The delegates were overwhelmed by the warmth, comfort and courtesy extended by the hosts THDC during their stay at Tehri and their intellectual hunger was also duly taken care during the site visit. They entered their feed back in the prestigious Red Book (a privilege given to special guests).



The entire visit of EGNM delegates to Tehri and Koteshwar projects was given wide coverage in the daily vernaculars.

**The fourth and the last day (02-11-2015)** of the excursion started on a positive note and THDC management came to bid adieu to the EGNM delegation and a sense of gratitude was emanating from either side. The team took off from Bhagirathipuram (Tehri) by road to Haridwar following the Tehri – Rishikesh - Haridwar road. The scenic landscape of the Garhwal Himalayas kept the delegates engrossed in exploring nature, however the discussions on the regional geological and tectonic set up of Lesser Himalayas continued pari-passu.

Trainees took deep interest in observing the different phases of disharmonic deformation on an exposure of Nagthat Formation wherein the pellicitic phyllitic band yielded actively and the arenaceous quartzite band responded passively to the stresses. Prof Yonggang, subsequently translated the whole description in Chinese to explain it to his scholars.



At Narendranagar (the town established by King Narendra Vikram Shah of Shah Dynasty of erstwhile Kingdom of Garhwal) the group had a close interface with the insignia of the monarchy, the Royal Palace. Moving slightly ahead the delegates were shown the eastern most extremity of Doon Valley with the Gangese marking the easternmost boundary, lesser Himalayas the northern limit and Siwaliks marking the southern limit. Delegates were ecstatic to see the panoramic view of meandering loops of Ganga and the Oxbow lake in the making at Rishikesh. Descending down the Lesser Himalayas the group could see the exposure of Main Boundary Thrust (MBT) near Rishikesh.

The ethno-geological traverse that was in progress, since morning, converted into a pure touristic delight at Rishikesh. The group was more than happy to see the surroundings at temple town Laxmanjhula and to walk over the suspension bridge built in 1921. Everyone purchased some souvenir bearing the imprints of traditional Indian or something very rustic and iconic with Garhwal or Laxmanjhula, for their near and dear ones.



To make this trip more memorable for them a lunch was organized at the famous Chotiwalla restaurant at Swargashram, known for its pure Indian delicacies and the delegates enjoyed the taste traditional but pure Indian cuisine. Czeck friends offered flowers and tiny lamps in the reverence to holy Ganga while we were crossing it by a ferry.

The group headed to Haridwar from where they started their return journey to New Delhi and to their respective native places. It is beyond expression the warmth the members were having and the camaraderie we developed during these four days time. All of us were so emotionally choked that I find it difficult to bring down the feelings in words albeit writing this long report. Hugs, pats, shake hands and gleaming faces were omniscient when we parted our ways at Haridwar. All of us honored our promise to the group for sharing our thoughts and photographs after returning back home. The emails, received by the author have already been shared with EGNM officials, and the mails speak out for themselves.

I personally thank the organizers of EGNM that they chose me as the tour Director for this trip which has left me soaked and deeply drenched in the warmth and bonhomie of having met such a magnificent group of people. Sincere thanks to THDC authorities for making the stay and visit so comfortable at Tehri. Thanks to ISEG fraternity for the honors and I promise to rise to the occasion every single time you ask me. I am Proud to be an Indian.