

# **ISRMTT NEWS LETTER**

**Indian Society of Rock Mechanics  
and Tunnelling Technology**

---

**Quarterly Issue: July - 2020**

## President's Message



**Sh. R. K. Gupta**  
CMD, WAPCOS & NPCC

Dear Members,

Conceptualised and formed in 1992, ISRMTT completed its Silver Jubilee in 2017. ISRMTT recognises the initiative, support and contribution of its founder members in building this society from a handful of members to present status of about 2200. The list is too long, but I would like to mention the untiring efforts of members of Dr. V.M. Sharma, Dr. A.K. Dhawan and Dr. Rajbal Singh who initiated the formation of ISRMTT. The society also started a Bi-annual Journal of Rock Mechanics and Tunnelling Technology (JRMTT) in 1993 and it has also travelled its journey of 25 years. The credit of success of the journal without any interruption goes to the Chief Editor, Dr. Bhawani Singh, supported by Dr. Subhash Mitra and Dr. R. K. Goel. All the volumes of the journal are available online at [www.isrmtt.com](http://www.isrmtt.com) without any fee. ISRMTT organises its Mega event named INDOROCK once in two years and 8 conferences have been organised so far.

ISRMTT also honours with Lifetime Achievement Award, Outstanding Contribution to Rock Mechanics and Excellence Performance Awards for contribution of eminent personalities for meritorious work in the field of rock mechanics and tunnelling technology and efforts in bringing the society visible. Awards Committee selects the best papers published in ISRMTT events and journal for cash awards also.

ISRMTT News Letter was started long back but unfortunately, its continuity could not be maintained. Now, ISRMTT News Letter is being initiated with new energy and hope, we will continue the same. We seek support from one and all in this endeavour. Members can contribute short articles, news of breakthroughs in the field of tunnelling, information about the forthcoming technical events etc.

INDOROCK-2020 was planned at IIT Roorkee to commemorate 25 years of JRMTT for which the initial preparations were already started. However, due to outbreak of COVID-19 pandemic and restrictions, the event has been postponed to 2021.

Online WEBINARS by eminent experts have been planned during this period for sharing of experiences and knowledge.

Because of the COVID-19, printing of ISRMTT publication Journal of Rock Mechanics and Tunnelling Technology, January Issue of 2020 was printed in June, 2020. Dispatch of the same to Institutional Members is in process. We hope to publish the July issue on time and circulated.

Executive Committee of ISRMTT President:

**Sh. R.K. Gupta, CMD, WAPCOS Ltd**

Immediate Past President:

**Sh. A.B. Pandya, CWC**

Vice President (1):

**Dr. R.K. Gupta, CWC**

Vice President (2):

**Mr. A. K. Mishra, MHPA**

Honorary Secretary:

**Mr. Amit Gupta, WAPCOS**

Treasurer:

**Dr. D.V. Sarwade, CSMRS**

Members:

1. **Dr. V. M. Sharma, AIMIL Ltd.**
2. **Dr. A.K. Dhawan, DRIP**
3. **Mr. S.B. Suri, AECS**
4. **Mr. Anupam Mishra, WAPCOS**
5. **Mr. C.S. Khokhar, AECOM**
6. **Prof. Mahendra Singh, IIT, Roorkee**
7. **Dr. Rajbal Singh, WAPCOS**
8. **Mr. Rajeev Kumar, CSMRS**
9. **Mr. Hari Dev, CSMRS**
10. **Mr. Chandan Kumar,  
Geoconsult India Pvt. Ltd.**
11. **Dr. R.K. Goel, CIMFR (Retd.)**
12. **Mr. Sanjeev Garg, IGS**



**Hari Dev, CSMRS**

## **SHORT ARTICLE**

### **Steel Lining for Hydro Tunnels – Design and QC Requirements**

Hydro power tunnels are normally pressure tunnels except tail race tunnels in case of impulse turbines. Therefore, these water conveyance tunnels do need lining to cater to the internal and external loads. Depending upon the loads due to static and dynamic heads, the lining is designed and implemented. Water conveyance system in hydropower projects comprise head race tunnel, surge shaft, pressure penstocks and tail race tunnel. Pressure shafts and penstocks have to bear the high internal water pressure. Apart from the internal water pressure, choice of liners depends on the magnitude of in-situ stresses and geological formation. Weak rocks may require steel lining whereas competent rocks may not require any lining at all. In hydro power tunnels, lining is required to bear the external/internal loads apart from preventing the head losses on account of friction. Tunnels passing through low rock covers may require steel lining to bear the internal water pressure. A part of the head race tunnel in NathpaJhakri Project crossing MangladKhad area was provided with steel lining. The lining in water conveyance system may be plain cement concrete (PCC) or reinforced cement concrete (RCC) or steel lining depending on the design requirements. Lining should be provided after the deformations have stabilized.

As a thumb rule, at no point in the water conveyance system, the internal water pressure should be greater than the minimum stress in rock. In other words, the choice and design of lining system is primarily related to the vertical/lateral rock cover (Norwegian Criteria – Fig. 1). The design requirements are given in equations 1 and 2. Failure of concrete lining in head race tunnel of Kopili hydro project is a learning lesson for the hydro fraternity (Fig. 2). Therefore, the selection of appropriate lining plays a key role in safety of the structure and surrounding environment. Though looks simple, concrete lining itself requires specialized machinery, suitable construction materials and expertise.

$$h > \frac{H \times \gamma_w}{\gamma_r \times \cos\alpha} \quad (\text{Eq. 1})$$

$$L > \frac{H \times \gamma_w}{\gamma_r \times \cos\beta} \quad (\text{Eq. 2})$$

Steel lining requires Ferrule Workshop setup for fabrication as well as for facilitating the quality tests. Application of heat before, during and after welding is done to avoid cold cracking; minimize shrinkage and distortion; increase toughness of weld joint and reduce residual stresses.

The thickness of the steel liners is varied in accordance with the variation in internal water pressure and external stresses. Since, the liners are subjected to abrasion under high velocity and silt laden water; the inner surfaces need to be painted with abrasion resistant epoxy paint. Apart from the fabrication and erection, testing of these liners also require utmost attention. Quality of liners has to be maintained starting with the raw materials, fabricated pieces in the workshop and field testing of all the welds including joints and grout plugs. Hydrostatic testing of all the fabricated

units is mandatory. Manifolds or the Y-pieces need special attention as these are subjected to maximum pressure and cumbersome field weld joints.

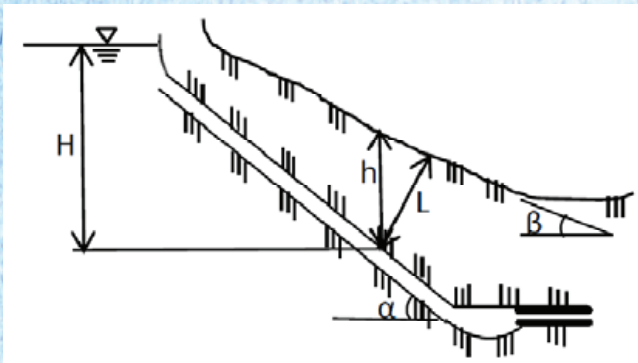


Fig. 1: Norwegian criteria for minimum rock cover

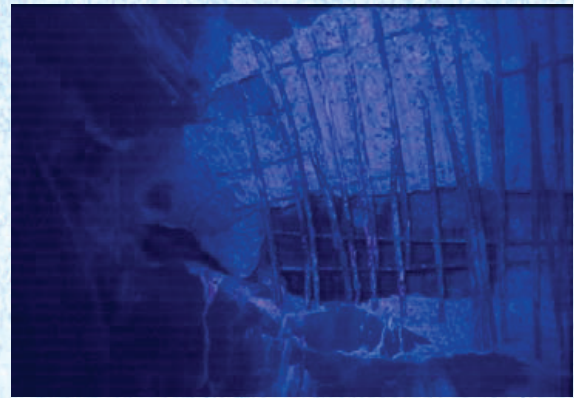


Fig. 2: Failure of RCC Lining in Kopili Project

Apart from tests for tensile properties and chemical composition of the steel plates, quality checks on fabricated pieces like dye penetration test; radiographic examination of all the longitudinal and circumferential joints; hydrostatic testing, magnetic particle and ultrasonic test for welding of stiffeners are the basic requirements. Plugs of grout holes through the liners being the critical part needs special attention. Even transportation of the pipes to the site, placing and backfilling also needs careful intervention to avoid damages. All the fabricated pieces as well as the grout plugs have to pass through 100 % quality checks. Strain measurements during hydrostatic testing of penstock bifurcations to the desired stress level should be done to ascertain the integrity of the liners under static and dynamic head. Measured strains can be used to calculate the actual stresses on the liners and can be compared with the corresponding theoretical values. Steel lining with stiffeners and comparison of measured and theoretical hoop stress for hydrostatic testing of penstock bifurcations at Tala Project in Bhutan are given in Figs 3 and 4, respectively.



Fig 3: Steel Liners for Penstocks with Stiffeners

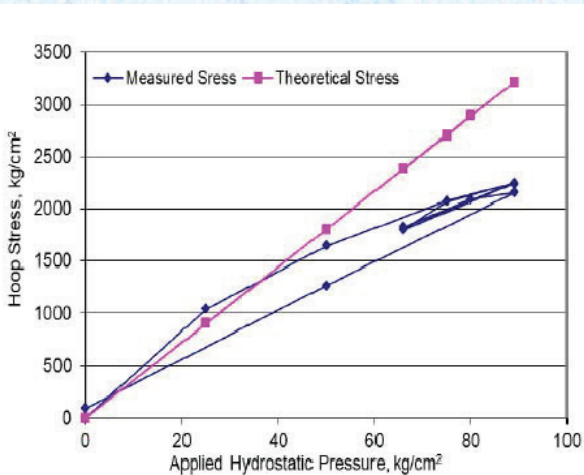


Fig. 4: Theoretical Stress vs measured stress

## NEW MEMBERS OF THE SOCIETY

We are happy to welcome all the new members to the family of Indian Society for Rock Mechanics and Tunnelling Technology (ISRMTT).

LM No.	Name of Member	RMTT	RMTT
2230	Mr. Fhani Kumar Kamaraju	Geo Technical Services, Secunderabad (AP)	2019
2231	Mr. Reyaz Ahamed	COWI Pvt Ltd, Gurgaon	2019
2232	Mr. Bhartendu Tiwari	AIMIL Ltd	2019
2234	Mr. Adapa Murali Krishna	IIT, Guwahati	2019
2235	Mr. Arul. S	WAPCOS Ltd	2019
2236	Mr. Sandeep Bhardwaj	CCS Haryana Agricultural University	2019
2237	Mr. D.V. Raghu Ram	-	2019
2238	Mr. Sujit Kumar	ERA Infra Engineering Ltd	2019
2239	Mr. Suvrajit Dash	M/s MECON Ltd, Ranchi	2019
2240	Mr. Vijay Kumar	MNNIT, Allahabad	2019
2241	Dr. Bineshian. H	Amberg Engineering	2019
2242	Mr. Narendra Singh Rana	L & T Construction	2019
2243	Mr. Vinayak Koundanya	WAPCOS Ltd	2019
2244	Mr. Mahendra N. Nilawar	MNEC Consultant Pvt. Ltd., Nagpur	2019
2245	Dr. Vinay Kumar Pandey	-	2019
2246	Mr. Nitin Narasinh Prabhune	-	2019
2247	Ms. Nirali Bhaskar Hasilkar	Babaria Institute of Technology	2020
2248	Ms. Bhavini Vandit Desai	Babaria Institute of Technology	2020
2249	Ms. Mayuri Nirav Makwana	Babaria Institute of Technology	2020
2250	Ms. Komal Ketan Dave	Babaria Institute of Technology	2020
2251	Mr. Mayur Dineshbhai Patel	Babaria Institute of Technology	2020
2252	Dr. L.S. Thakur	Babaria Institute of Technology	2020
2253	Mr. Avik Kumar Mandal	LEA Associates, South Asia Pvt. Ltd.	2020
2254	Mr. Kailash Chand	Indian Oil Corporation Ltd.	2020
2255	Mr. Mohammad Zaid	Aligarh Muslim University	2020
2256	Mr. Kiran Kumar Gadi	AAREE Associates	2020
2257	Mr. S. Ravinder	NGRI, Hyderabad	2020
2258	Mr. Sourav Kumar Agarwal	AECOM India Pvt. Ltd.	2020
2259	Mr. Dibyajyoti Singh	DMR Hydroengineering and Infrastructure Ltd.	2020

## **FORTHCOMING EVENTS IN ROCK MECHANICS AND TUNNELLING FIELD**

### **Forthcoming Events:**

#### ***International***

EUROCK 2020 - Hard Rock Excavation and Support - the 2020 ISRM International Symposium, Norway, 12-14th October, 2020

#### **26th World Congress on Advanced Materials, Japan, 22-23rd October, 2020**

GEO-EXPO 2020 Scientific and Expert Conference - Prijedor, Bosnia and Herzegovina, 22-23rd October, 2020

#### **The 4th International Conference on Rock Dynamics and Applications (RocDyn-4), Australia, 26-28th October, 2020**

5th Symposium of the Macedonian Association for Geotechnics - an ISRM Specialized Conference, Macedonia, 29-31st October, 2020

#### **CouFrac2020: the 2nd International Conference on Coupled Processes in Fractured Geological Media: Observation, Modeling, and Application, Korea, 11-13th November, 2020**

SBMR2020 - 9th Brazilian Rock Mechanics Symposium - an ISRM Specialized Conference, Brazil, 27-30th April, 2021

#### **EUROCK 2021 - Mechanics and Rock Engineering from Theory to Practice - the 2021 ISRM International Symposium, Italy, 21-25th June, 2021**

5th International Workshop on Rock Mechanics and Engineering Geology in Volcanic Fields - an ISRM Specialized Conference, Japan, 9-11th September, 2021

#### **LARMS 2022 - IX Latin American Congress on Rock Mechanics, Rock Testing and Site Characterization - an ISRM Regional Symposium, Paraguay, 15-18th May, 2022**

EUROCK 2022 - Rock and Fracture Mechanics in Rock Engineering and Mining - an ISRM Regional Symposium, Finland, 13-17th June, 2022

#### **15th ISRM International Congress in Rock Mechanics, Austria, 9-14th October, 2023**

#### ***National***

#### **Indian Geotechnical Conference 2020 at Visakhapatnam, 17-19th December 2020**

#### **JRMTT Contents, Vol.26, No.1, Jan, 2020**

- **Editorial on Entropy Management**  
- *Bhawani Singh*
- **Modulus of Deformation and Shear Strength Parameters of Rock Material and Rock Mass in Underground Powerhouse**  
- *Rajbal Singh, Vivek Sharma and Sanjeev Kumar Garg*
- **Cross Passage Construction Methods for Twin-Tube Tunnel Projects in Urban Areas**  
- *C.S.Khokhar, Vishal Bansal and Eshita Mishra*
- **Stress - Deformation Properties of Rock Material and Rock Mass – An Overview**  
- *Hari Dev*
- **Seismic Refraction Survey for High Rise Buildings – A Case Study**  
- *P. Senthil, Alex Varughese and Hari Dev*

## **INDOROCK-2019: 8th India Rock Conference**

INDOROCK-2019: 8th Indian Rock Conference was organised by ISRMTT in association with Central Soil and Materials Research Station and WAPCOS Ltd., at India International Centre, New Delhi on 4-5th November 2019. The conference was inaugurated by HE Hans Jacob Frydenlund, Ambassador of Norway to India. The conference proceeding included 50 papers and more than 150 delegates participated in the event. The Conference Lecture was delivered by Dr. H.S. Vankatesh, Director, National Institute of Rock Mechanics (NIRM), 7 Keynote lectures by experts in various fields, presentation of 38 papers in 9 technical sessions. ISRMTT Awards were presented to the eminent personalities having notable contributions in the field of Rock Mechanics and Tunnelling Technology for the year 2017 and 2018. Authors of 15 Best Papers published in ISRMTT events and JRMTT were also awarded with Cash prizes and Certificates.



Lighting lamp by the Dignitaries during inauguration



Release of Proceeding Volume



Life Time Achievement Award, 2017 – Dr.Rajbal Singh



Life Time Achievement Award, 2018 – Dr. Gopal Dhawan



Outstanding Contribution to Rock Mechanics Award, 2017  
Ms. KanuPriya



Outstanding Contribution to Rock Mechanics Award, 2018  
Sh. Hari Dev



Excellence Performance Award, 2017 – Sh. Anupam Mishra



Excellence Performance Award, 2018 – Dr. N.K. Samadhiya



Felicitatio to the Founder Members of ISRMTT



View of the Conference Hall

## **Request to Members**

Email contacts of old members are not available with the society, hence, it is requested to update email address and telephone contacts of members for better communication. List of ISRMTT members is available on the website. For any query, feel free to contact us.

### **Sh. Amit Gupta**

Honorary Secretary, ISRMTT  
C/o WAPCOS Limited,  
Kailash Building, 5th Floor,  
K. G. Marg, New Delhi  
Mobile: 7838302325

### **Dr. D.V. Sarwade**

Editor & Treasurer, ISRMTT  
C/o Central Soil and Materials Research Station,  
Olof Palme Marg, HauzKhas, New Delhi-110016  
Mobile: 8130676942