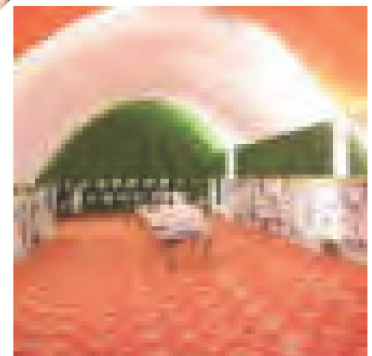




BIENNIAL REPORT 2021-23



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सीएसआईआर-केन्द्रीय भवन अनुसंधान संस्थान, रुड़की
विज्ञान एवं प्रौद्योगिकी मंत्रालय, भारत सरकार
CSIR - Central Building Research Institute, Roorkee
Ministry of Science & Technology, Govt. of India



*With Best
Compliments
From*

Prof. R. Pradeep Kumar
Director

CSIR-Central Building
Research Institute
Roorkee

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2021-23

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Ministry of Science & Technology, Govt. of India



Complied and Edited by

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From the Director's Desk

It gives me immense pleasure in presenting the Biennial Report of CSIR-Central Building Research Institute, Roorkee for the year 2021-2023. As we look back on the past years, we find ourselves amidst unprecedented challenges and remarkable achievements, all of which define the spirit of CSIR-CBRI fraternity. The CSIR-CBRI strives to be a research & knowledge centre for providing innovative solutions to achieve safety, sustainability, resilience, smartness, comfort, functional efficiency, speed, productivity in construction, environment preservation, energy efficiency, and economy as a leading R&D Institute in all aspects of building science & technology. This report highlights many notable accomplishments attained by the Institute during this period. I am delighted to commemorate this ongoing advancement in the quest for enhanced research and knowledge, contributing to the advancement and prosperity of the nation.

One of the Milestone event was CSIR initiated One Week One Lab programme with the inspiration and guidance of Hon'ble Minister of Science & Technology, Dr. Jitendra Singh and support and encouragement from DG, CSIR, Dr. N. Kalaiselvi, to showcase various R&D outputs of our Institute. CSIR-CBRI took first initiative in this direction to start this programme by arranging a weeklong series of events during 06-13 January 2023. The event was inaugurated by the Hon'ble Minister Dr. Jitendra Singh in the presence of Dr. N. Kalaiselvi, DG, CSIR and other dignitaries in a curtain raiser programme at New Delhi on 6th January, 2023. A total of 20 events were organized by the Institute at various locations, including New Delhi, Mumbai, Dehradun, Roorkee and Ghaziabad.

Additionally, I am thrilled to highlight the exceptional contributions made by CSIR-CBRI at some of India's most cherished heritage sites. Our institute's expertise has been instrumental in the structural analysis & design modification of Ram Mandir, Ayodhya and structural assessment of Mahakaleshwar Temple in Ujjain. These sites stand as testimonies to our commitment not only to scientific advancement but also to our cultural heritage. CSIR-CBRI also played a significant role in demolition of "Supertech Twin Tower" in Noida as directed by the Supreme Court of India, in partnership with the Noida

Authority. The Institute contributed its expertise in the planning and execution of the building demolition through implosion techniques. In Joshimath Uttarakhand tragedy, CSIR-CBRI demonstrated its competence by overseeing the secure demolition of hazardous hotels and residences in an area affected by land subsidence and helped the civil administration for identifying the dangerous buildings in the area.

In addition to the many research accomplishments featured in the report, I would like to highlight additional distinguished activities of the Institute during the year. Consistently, the Institute observed an open day celebration on CSIR Foundation Day, CSIR-CBRI Foundation day, Independence Day, Republic Day, International yoga day. On the occasion of Diwali, the Institute also organized a Diwali Mela. Various awareness campaigns, including Swachhta Pakhwada, Anti-Terrorism Day, Fit Freedom Run, World Environment Day, Sadbhavna Diwas and Vigilance Week were also organised by the institute. The Institute also celebrated the Hindi Pakhwada to honour our official language. Apart from this, lectures from eminent personalities various national & international skill development workshops and training programmes were also arranged.

As you read the report, I hope you will gain deeper insights into the Institute's activities. In my capacity as the Director, I assure you that the Institute remains steadfast in its pursuit of expanded knowledge, improved programs, and heightened research and development outcomes. My gratitude extends greatly to all individuals and collectives be it fellow researchers, technical personnel, or administrative staff whose enthusiasm and assistance uphold us.

I wish to extend my heartfelt appreciation to the Chairman and esteemed members of our Research Council for their invaluable advice, guidance, and unwavering support. My sincere thanks also go to the Director General of CSIR and my colleagues at CSIR Headquarters for their consistent support and guidance.

I express my gratitude to the editor for diligently presenting this Biennial Report in a refined manner. Lastly, I would like to cherish the joyful moment of acknowledging the support and collaboration received from our esteemed customers, sponsors, well-wishers, and former colleagues of CSIR-CBRI.

Amidst unparalleled expansion within the building and infrastructure sector, we eagerly anticipate a future filled with excitement and promise.



(Prof. R. Pradeep Kumar)

Date : 26.09.2023

Our Vision

To be a world class research and knowledge centre of national importance for providing innovative solutions to all aspects of building science and technology.



Our Mission

Devotion to research, development, and innovation (RD&I) in solving national challenges of planning, design, materials, capacity building and construction including disaster mitigation in buildings to achieve safety, sustainability, resilience, smartness, comfort, functional efficiency, speed, productivity in construction, environment preservation, energy efficiency and economy.

CSIR-CBRI Organogram



Research Council

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Principal Scientist
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Prof. R. Pradeep Kumar

Director

CSIR-Central Building Research Institute, Roorkee

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Director

CSIR-Central Scientific Instruments Organization,
Chandigarh

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Chief Scientist,
CSIR-Central Building Research Institute, Roorkee

Dr. Harish C. Arora

Principal Scientist,
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Senior Scientist,
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Member Secretary

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R&D Projects

Development of High-Strength Plaster Using FGD Gypsum & Fly Ash

Dr. Neeraj Jain, Dr. Soumitra Maiti, Dr. R. K. Verma & Team

In compliance to MoEF order 2015, all the coal based thermal power plants in India installed after Dec. 2017 have to achieve SO₂ emission standards of 100 mg/Nm³ or less. Therefore, to control SO₂ emission, installation of flue gas desulphurization (FGD) plants has started in which FGD gypsum is generated as by-product as a result of scrubbing of SO₂ with lime stone slurry. It is estimated that by 2024, about 20-22 million tonnes of FGD gypsum will be generated as waste which may create disposal problems. As gypsum has been used as building materials since ancient time, FGD gypsum may be used for as plaster or making building components. In present studies, development of high strength plaster/binder using FGD gypsum has been carried out. To start the studies, FGD gypsum was calcined for conversion in to β -hemihydrate plaster at 150°C for four hours in an oven. Development of high strength plaster (HSP) was carried out using β -hemihydrate plaster (60-75%) blended with dried fly ash (15-30%), ordinary Portland cement (10%) and suitable retarder in a ribbon mixer for a period of one hour to form uniform mixture. Mix compositions of high strength plasters are shown in Table 1. The physical and mechanical properties of all the mixes (P1-P5) are shown in Table 2. Mix P3 (β -hemihydrate plaster 75%, fly ash 15% and OPC 10%) gives best results in terms of strength and has been recommended for commercial manufacturing. The reason for higher strength of the P3 was formation of more and more secondary CSH gel during pozzolanic reactions due to addition of fly ash. The engineering properties of gypsum plaster has been determined as per standard methods along with durability. The hydration mechanism has been supported by advanced instrumentation like DTA-TGA, SEM, and XRD. Suitability of high-strength plaster (HSP) is also studied for application as masonry mortar.

Table1: Mix compositions of high strength plasters

Mix Designations	β -hemihydrate plaster (%)	OPC 43 Grade (%)	Fly ash (%)	Retarder (%)	Chemical Admixture (%)
P1	75	10	15	0.10	1.5
P2	70	10	20	0.10	1.5
P3	65	10	25	0.10	1.5
P4	60	10	30	0.10	1.5
P5	50	10	40	0.10	1.5

Table 2: Physical properties of mixes for high strength plaster

Parameters	Values				
	P1	P2	P3	P4	P5
Colour	Grey	Grey	Grey	Grey	Grey
pH	11.00	11.20	11.30	11.40	11.60
Loss on ignition (LOI)	6.20%	5.90%	5.20%	4.50%	4.10%

Bulk Density (powder)	840 kg/m ³	860 kg/m ³	878 kg/m ³	880 kg/m ³	885 kg/m ³
Dry set density of cube (dried at 42°C)	1587 kg/m ³	1590 kg/m ³	1594 kg/m ³	1602 kg/m ³	1620 kg/m ³
Specific Gravity	2.56	2.50	2.40	2.30	2.28
Fineness: Retention on 45 µm sieve (wet analysis)	4.0-5.0%	5.0-6.0%	5.0-7.0%	5.0-7.0%	5.0-7.0%
Soundness (Max. 5.0 mm as per IS:6909-1990)	~1.2 mm	~1.2 mm	~1.2 mm	~1.2 mm	~1.2 mm
Consistency (neat plaster)	40.0%	40.0%	40.0%	40.0%	40.0%
Setting time Initial Final	45-50 min 100-110 min	45-50 min 100-110 min	20-30 min 70-80 min	20-30 min 70-80 min	20-30 min 70-80 min
Compressive strength (without chemical admixture) 3 days 7 days 28 days	7.00 MPa 7.75 MPa 13.50 MPa	6.75 MPa 7.50 MPa 12.20 MPa	6.50 MPa 7.25 MPa 11.20 MPa	6.40 MPa 6.75 MPa 10.50 MPa	5.80 MPa 6.50 MPa 9.80 MPa
Compressive strength (with chemical admixture) 28 days	12.60 MPa	11.10 MPa	10.90 MPa	10.00 MPa	9.50 MPa
Flexural Strength 7 days 28 days	3.10 MPa 5.20 MPa	2.70 MPa 4.50 MPa	2.70 MPa 4.20 MPa	2.50 MPa 4.00 MPa	2.30 MPa 3.80 MPa

Development of Gypsum Vermiculite Plaster (GVP) Using FGD Gypsum & Vermiculite

Dr. Soumitra Maiti, Dr. Neeraj Jain & Team

It is estimated that about 2.69 tonnes of FGD gypsum is generated per tonne of SO₂ desulphurization and 1.56 tonnes of lime stone or 1.16 tonnes of lime is required for scrubbing in FGD plants of coal based thermal power stations. According to a study, India is about to become the largest emitter of SO₂ as its emission has increased by 50% in 10 years. Substantial availability of FGD gypsum from thermal power plants is also associated with problems like land, water and air contamination. The quality of FGD gypsum is at par or even better than mineral gypsum and since ancient time, gypsum has also been used as building material due to its unique hydration and dehydration property. It is well known that gypsum building materials are light weight, provide thermally insulation, fire resistance and possess good acoustic properties. In present studies, FGD gypsum has been used for the development of gypsum vermiculite plaster (GVP) after conversion into hemihydrate plaster. Vermiculite is a mica, a hydrated, magnesium–iron–aluminium trioctahedral sheet silicate of varied composition. Its basic unit is two tetrahedral silicate sheets interlayered by an octahedral sheet that contains aluminium and iron. Vermiculite is used in high temperature insulation, refractory insulation, packing material, fireproofing of structural steel and pipes, as loose fill insulation, light weight aggregate for plaster and cementitious spray fireproofing.

To start the work, hemihydrate plaster has been developed by calcining the FGD gypsum at 150°C for 3-4 hours in a tray in oven. The physio-chemical characterization of gypsum plaster has been carried out as per BIS: 2542: 1978 and IS: 8272-1984 for consistency, density, setting time density, flexural strength and compressive strength. The results of physical evaluation of gypsum plaster show that gypsum plaster conforms to the requirements laid down in the IS: 2547-1976. For the development of gypsum vermiculite plaster, various mix compositions were tried and are shown in Table 1. To develop GVP, FGD plaster was blended with vermiculite and suitable retarder in a ribbon mixer for a desired period to form uniform mixture.

The physical properties of GVP have been determined as per IS: 2542-1978 (Table 2) which show that maximum compressive strength of the plaster is 11.80 MPa at 3.0% of vermiculite. SEM image of 28 days hydrated GVP plaster (GVP3) is shown in Fig. 1a. Which shows very good interlocking of gypsum plaster crystals on vermiculite granules responsible for high bonding of the plaster. XRD of hydrated gypsum vermiculite plaster shown in Fig.1b which depicts major peaks of calcium sulphate dehydrate (G) at 2theta of 11.69°, 20.78°, 23.45°, 29.17°, 33.42° etc. This shows that hemihydrate plaster gets converted into dihydrate gypsum after hydration reactions responsible for binding properties.

Table 1: Mix compositions of Gypsum Vermiculite Plaster (GVP)

Mix Designations	β-hemihydrate plaster (%)	Vermiculite(%)	Retarder dose(%)
GVP3	97.0	3.0	0.05
GVP4	96.0	4.0	0.05
GVP5	95.0	5.0	0.05
GVP8	92.0	8.0	0.05
GVP10	90.0	10.0	0.05
GVP12	88.0	12.0	0.05

Table 2: Physical properties of Gypsum Vermiculite Plaster (GVP)

Parameters	Values					
	GVP3	GVP4	GVP5	GVP8	GVP10	GVP12
Colour	Creamy white	Creamy white	Creamy white	Creamy white	Creamy white	Creamy white
pH	7.40	7.38	7.35	7.30	7.28	7.26
Loss on ignition (LOI)	8.80%	8.90%	9.0%	8.70%	8.60%	8.50%
Dry Bulk Density (powder)	790-810 kg/m ³	770-790 kg/m ³	760-780 kg/m ³	750-760 kg/m ³	690-710 kg/m ³	640-660 kg/m ³
Set Bulk density of cube (dried at 42°C)	1370-1390 kg/m ³	1260-1280 kg/m ³	1210-1230 kg/m ³	1100-1120 kg/m ³	1010-1030 kg/m ³	1000-1010 kg/m ³
Specific gravity	2.17	2.12	2.07	1.96	1.86	1.76
Consistency	54.0%	55.0%	56.0%	55.0%	60.0%	65.0%
Fineness: Retention on 45 µm sieve	8.0-12.0 %	8.0-12.0 %	8.0-12.0%	10.0-15.0%	10.0-15.0%	10.0-15.0%
Setting time	20-25 min	20-25 min	20-25 min	20-25 min	25-30 min	30-35 min
Compressive strength 7 days 28 days	11.50MPa 11.80MPa	9.30 MPa 9.80 MPa	8.60 MPa 8.80 MPa	7.10 MPa 7.80 MPa	6.20 MPa 6.60 MPa	4.90 MPa 5.50 MPa
Flexural Strength 7 days 28 days	4.20 MPa 4.60 MPa	4.00 MPa 4.20 MPa	3.80 MPa 4.00 MPa	4.10 MPa 4.50 MPa	3.60 MPa 3.70 MPa	2.10 MPa 2.70 MPa
Soundness (Max. 5.0 mm as per IS:6909-1990)	~1.5 mm	~1.5 mm	~1.5 mm	~1.5 mm	~1.5 mm	~1.5 mm
Coverage (12-13 mm thick)	20 Sq ft in 25 kg bag	20 Sq ft in 25 kg bag	20 Sq ft in 25 kg bag	20 Sq ft in 25 kg bag	20 Sq ft in 25 kg bag	20 Sq ft in 25 kg bag

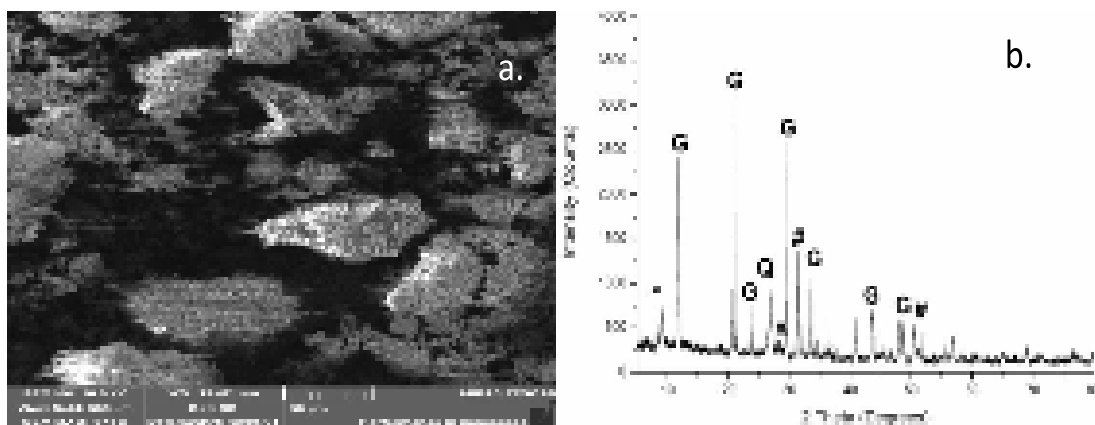


Fig. 1. a. SEM of hydrated gypsum vermiculite plaster, b. XRD of hydrated gypsum vermiculite plaster

Development of High-Volume Fly Ash-Gypsum Composite Binder for Interior Applications

Dr. Neeraj Jain & Dr. Soumitra Maiti

With the increase in population and urbanization, the demand of raw materials such as cement and aggregates has increased many folds in the construction industry all over the world. The mission of sustainable development has led to a pressure demand for improving environmental performance in the construction process by reducing consumption of natural resources extracted.

Utilization of fly ash, a by-product of coal based thermal power plants offers not only the solution of disposal problems, but also help to save cement, reduce carbon foot prints by reducing greenhouse gases emission, conserve natural resources for meeting increased demand of aggregates and save energy and environment.

Development of high-volume fly ash gypsum binder has been varied out using raw materials like fly ash, Ordinary Portland cement (43 grade) and plaster of Paris along with suitable retarder and chemical admixture. All the ingredients were mixed in a ribbon mixture for the desired period to form uniform mixture. Several trial mixes of high-volume fly ash gypsum binder have been studied prepared and the mix proportions are shown in Table 1 along with mix designations.

Characterization of the binder was carried out for various properties as per standard methods and it was observed that mix containing 40% of fly ash with 10-14% of OPC gives best performance in terms of compressive strength and results are shown in Table 2. This plaster is recommended for interior application as an alternative to cement.

Table 1: Mix compositions of high-volume fly ash-gypsum composite binder

Mix Designations	OPC (%)	β -hemihydrate plaster (%)	Fly ash (%)
AFGB40	10.0	50.0	40.0
AFGB50	10.0	40.0	50.0
AFGB60	10.0	30.0	60.0
AFGB70	10.0	20.0	70.0
BFGB40	12.0	48.0	40.0
BFGB50	12.0	38.0	50.0
BFGB60	12.0	28.0	60.0
BFGB70	12.0	18.0	70.0
CFGB40	14.0	46.0	40.0
CFGB50	14.0	36.0	50.0
CFGB60	14.0	26.0	60.0
CFGB70	14.0	16.0	70.0

Table 2: Physical properties of mixes for fly ash gypsum composite binder

Parameters	Values		
	AFGB40 (10% OPC)	BFGB40 (12% OPC)	CFGB40 (14% OPC)
Colour	Grey	Grey	Grey
pH	9.0-10.0	10.0-10.15	12.0-12.50
Loss on Ignition (LOI)	3.90-4.0%	3.70-3.80%	4.10-4.15%
Dry Bulk Density (powder)	630-640 kg/m ³	635-640 kg/m ³	650-660 kg/m ³
Set Bulk density of cube (dried at 42°C)	1490-1500 kg/m ³	1580-1585 kg/m ³	1590-1595 kg/m ³
Specific gravity	2.15-2.18	2.18-2.20	2.15-2.18
Consistency	45-48%	48-50%	48-50%
Fineness: Retention on 45 μ m sieve	10.0- 12.0%	10.0- 12.0%	10.0- 12.0%

Setting time (0.075% DTPA)			
Initial	85-90 min	90-95 min	40-45 min
Final	90-100 min	100-105 min	90-95 min
Compressive strength			
3 days	3.50-4.0 MPa	4.25-4.50 MPa	4.50-5.00 MPa
7 days	5.0-5.25 MPa	5.75-5.80 MPa	6.50-6.60 MPa
28 days	7.25-7.50 MPa	8.00-8.50 MPa	8.50-8.75 MPa
Flexural Strength			
7 days	3.00-3.20 MPa	3.25-3.40 MPa	3.35-3.45 MPa
28 days	3.60-3.70 MPa	3.80-3.90 MPa	3.70-3.75 MPa
Soundness (Max. 5.0 mm as per IS:6909-1990)	~1.5 mm	~1.5 mm	~1.5 mm
Water absorption	19.0-21.0 %	14.0-17.0 %	13.0-15.0 %
Coverage (12-13 mm thick)	20 Sq. ft. in 25 kg bag	20 Sq. ft. in 25 kg bag	20 Sq. ft. in 25 kg bag

Geotechnical Novel Solutions for Underground Infrastructures

Dr. Anindya Pain, Er. M.Vinoth, Dr. Manojit Samanta, Dr. Koushik Pandit,
Dr. S.Ganesh Kumar, Er. M.S. Aswathy, Er. Ajay Dwivedi &
Dr. R.D. Dwivedi

Objectives:

- Prediction of tunnel deformation due to adjacent deep excavation and suggest countermeasures.
- Development of a semi empirical method for the prediction of surface settlement due to tunneling.
- Methodology to assess the damage to the adjacent foundation/ structure due to staged tunneling.
- Evaluation of seismic response of underground structures.
- Quantification of uncertainties associated in underground rock excavation using advanced probabilistic method.
- Assessment of the stability of tunnel portals in rock slopes and providing solutions for slope strengthening and stability.

Deliverables:

- Development of design guidelines for the design of underground structures in seismic prone areas and efficient countermeasures to alleviate staged deep excavation effects on existing underground.
- Isolation material to minimize deformation of the underground structure during seismic loading.
- Simplified method to predict the settlement induced by tunneling.
- Prediction model for damage assessment to foundation for staged tunnel construction.
- Methodology to design tunnel support based on probabilistic analysis.

Support measures for tunnel portal stability and slope strengthening considering the regional rock mass variability.

Assessment of Tunnel Deformation Induced by Adjacent Deep Excavation and Countermeasures (V1W1)

Dr. Anindya Pain, Er. M.Vinoth, Dr. Manojit Samanta, Dr. Koushik Pandit,
Dr. S.Ganesh Kumar, Er. M.S. Aswathy, Er. Ajay Dwivedi &
Dr. R.D. Dwivedi

Objective:

Predicting underground tunnel deformation due to adjacent deep excavation and determine suitable countermeasures to alleviate deep excavation effects on existing tunnel.

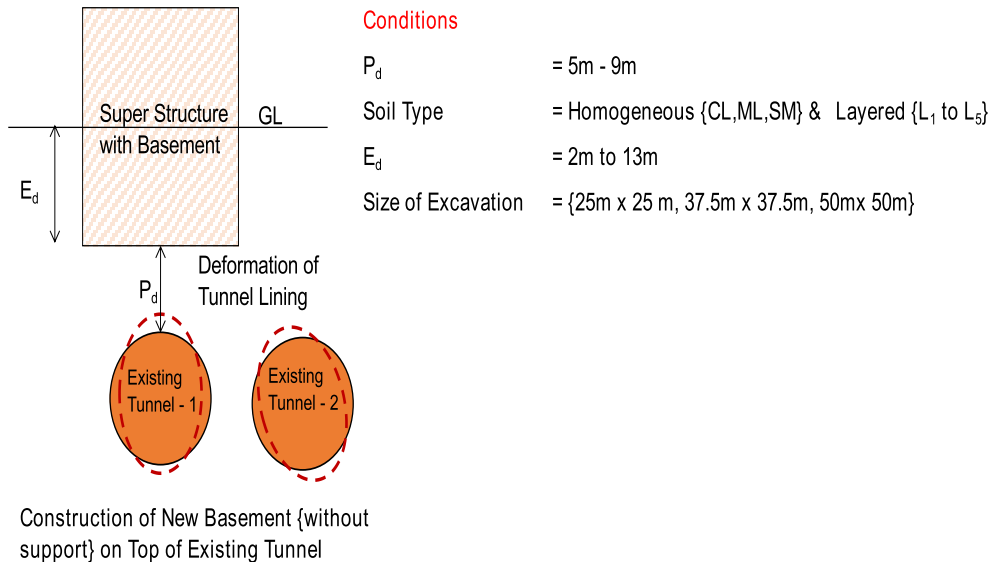


Fig: 1 Schematic representation of the problem

Numerical Modelling:

Developed and validated numerical model was used to predict tunnel deformation due to adjacent deep excavation. Parametric studies like varying the size of the excavation pit has been carried out for different soil conditions (Fig.2 & 3).

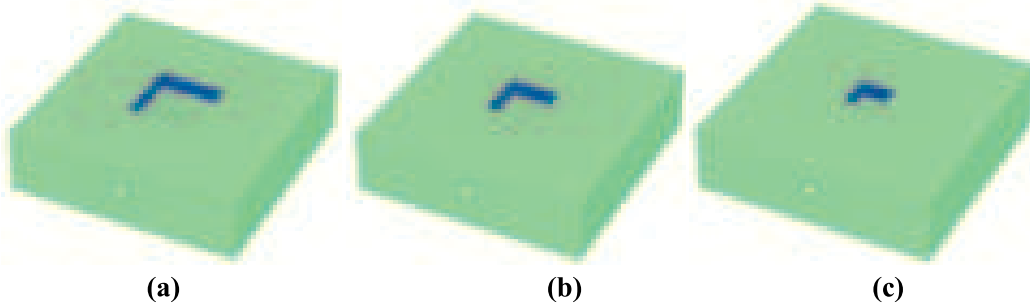


Fig: 2 Size of excavation varied under homogeneous soil condition: a) 50mx50m; b) 37.5mx37.5m; c) 25mx25m

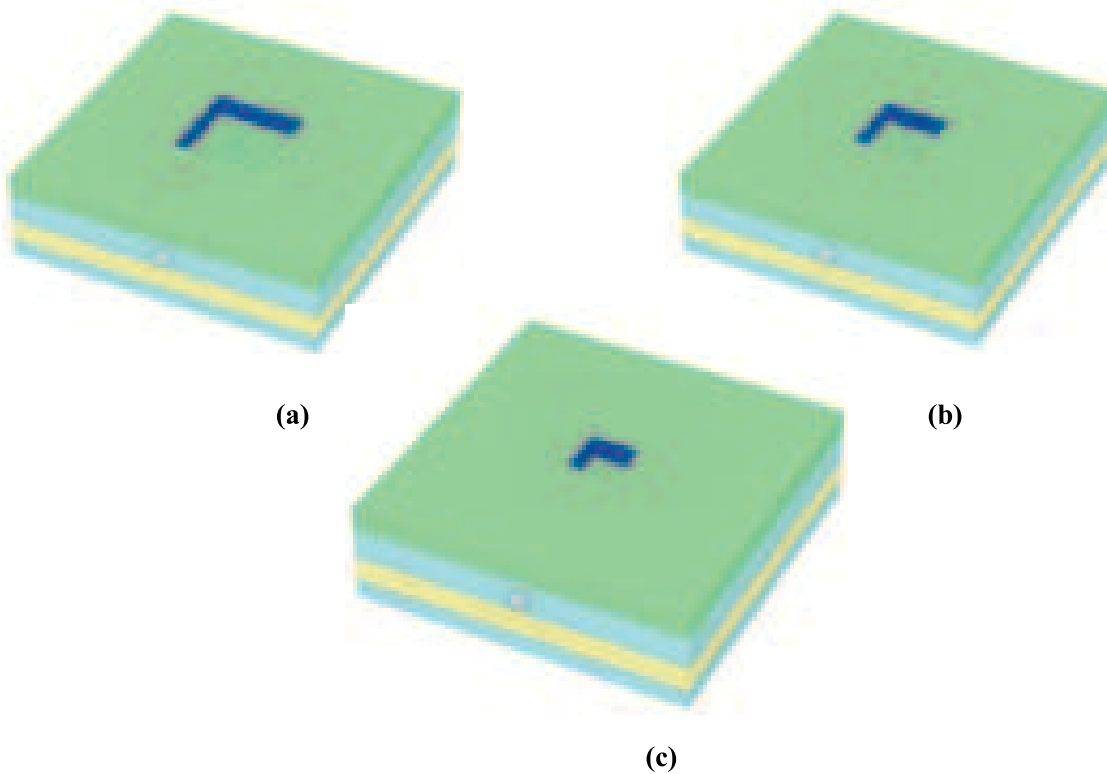


Fig: 3 Size of excavation varied under layered soil condition: a) 50mx50m; b) 37.5mx37.5m; c) 25mx25m

Following are some of the findings from the study,

1. Vertical elongation and horizontal compression are induced in crown-invert and left-right springline respectively.
2. As the excavation pit size increases, the change in tunnel diameter increases.
3. After final excavation, tunnel elongates and compresses by $\approx 0.06\%$ D.

4. The effect size of excavation on tunnel diameter is more predominant in homogeneous condition.
5. As the size of excavation increased from 25mx25m to 50mx50m, the tunnel elongation in crown-invert axis increased by 13%.

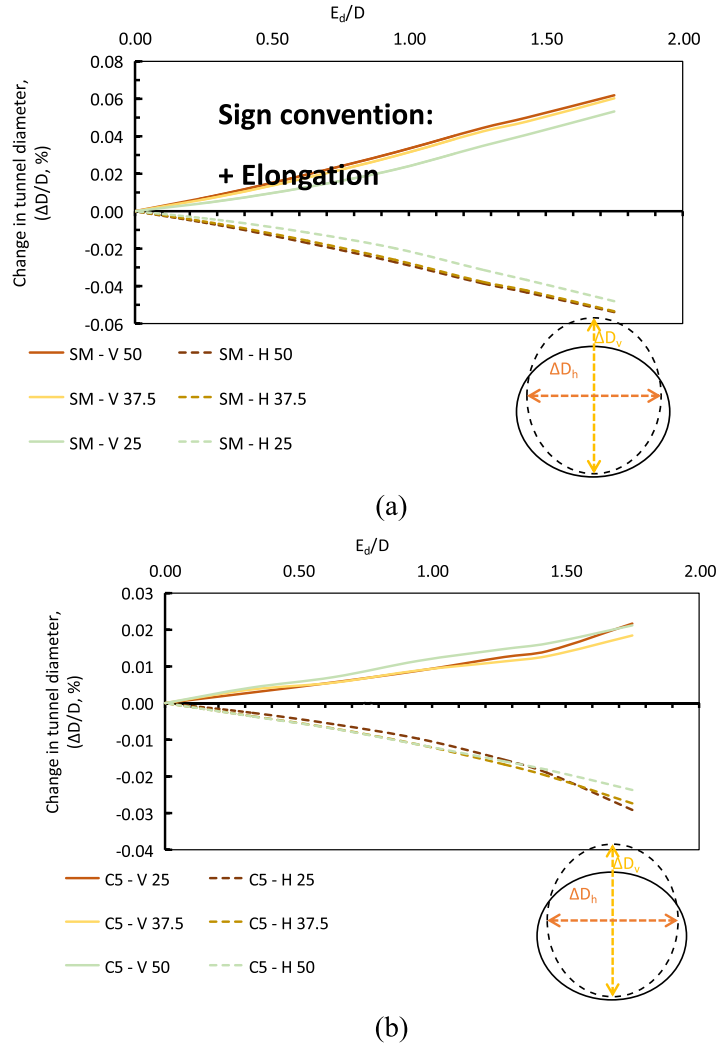


Fig: 4 Elongation and compression of tunnel located beneath basement centre:
a) Homogeneous Condition; b) Layered Condition

6. Maximum tunnel heave (0.093% E_d) was noticed at the centre of basement for 50mx50m and reduces to 0 at a distance of 2B from the basement centre.
7. When compared with layered condition in homogeneous condition deformation in longitudinal direction is larger. This difference in magnitude increase almost linearly as the size of pit is increased.
8. As the excavation pit size doubled, normalized vertical displacement increases by 1.63 times.
9. Due to symmetrical stress relief around the existing tunnel, the strain profile is symmetrical.
10. Tensile strain was induced at crown, invert, shoulder and knee. Compression strain was induced at spring line.
11. As the size of excavation increased by two folds the strain in induced in the tunnel in crown-invert axis increased by 1.64 times.

12. The effect of pit size on transverse strain in layered soil is in significant. It is substantiated by the deformation plot (Fig. 4b) in the transverse direction.
13. At the basement centre, hogging moments were induced in the existing tunnel.
14. The tensile strain decreases as an increase in the excavation length along the longitudinal tunnel direction.
15. The inflection point, where the shear force is at a maximum, located at $0.25B$, $0.325B$ and $0.45B$ for $50\text{m} \times 50\text{m}$, $37.5\text{m} \times 37.5\text{m}$ and $25\text{m} \times 25\text{m}$ respectively.
16. It is advisable to consider shear resistance of connections between tunnel rings at the point of the maximum shear force.
17. The reduction in longitudinal strain in layered condition was much larger than homogeneous condition as the excavation size was increased.
18. After the completion of the excavation, larger reduction in the normalized shear modulus was located at the top of crown and springlines and less at tunnel invert.
19. Normalized shear modulus in the soil decreased with increase in excavation size.

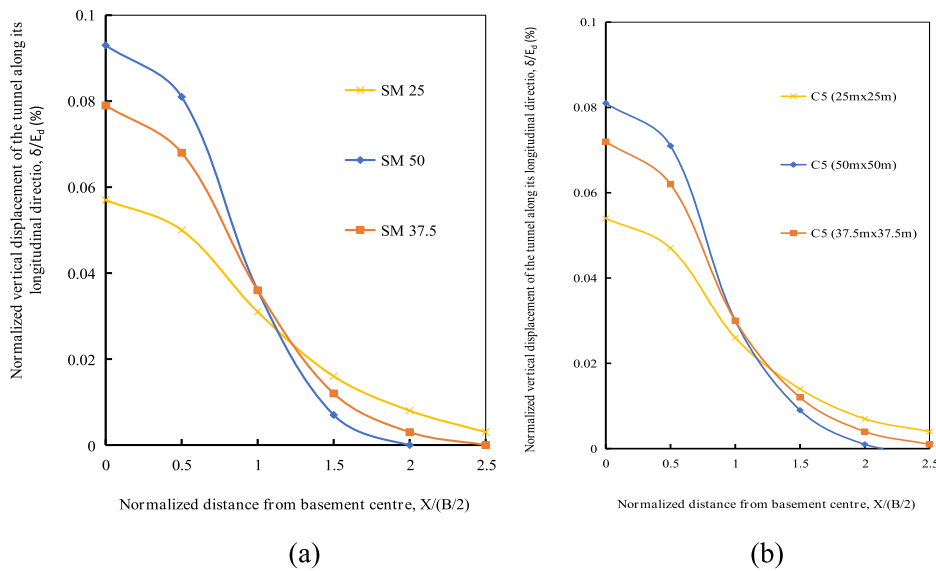


Fig: 5 Normalized vertical displacement of tunnel along its longitudinal direction. δ Vertical displacement of tunnel: (a) Homogeneous condition; b) Layered condition

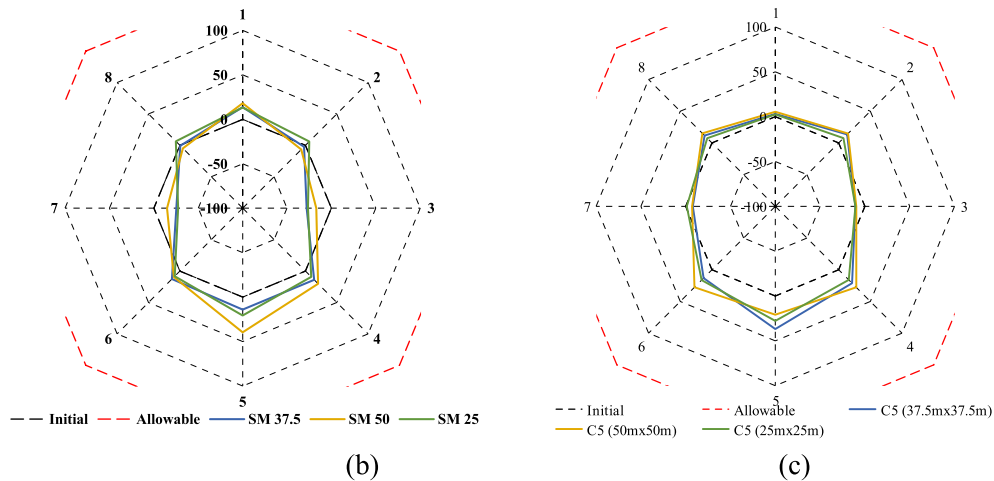


Fig: 6 Induced strain at outer surface of tunnel along its transverse direction: (a) Homogeneous condition; b) Layered condition

20. Lower reduction in shear modulus was obtained for invert when compared to crown and shoulder. This is because of lower mobilization of shear strain.
21. When size of excavation increased, the mobilization of shear strain at invert caused reduction in shear modulus.

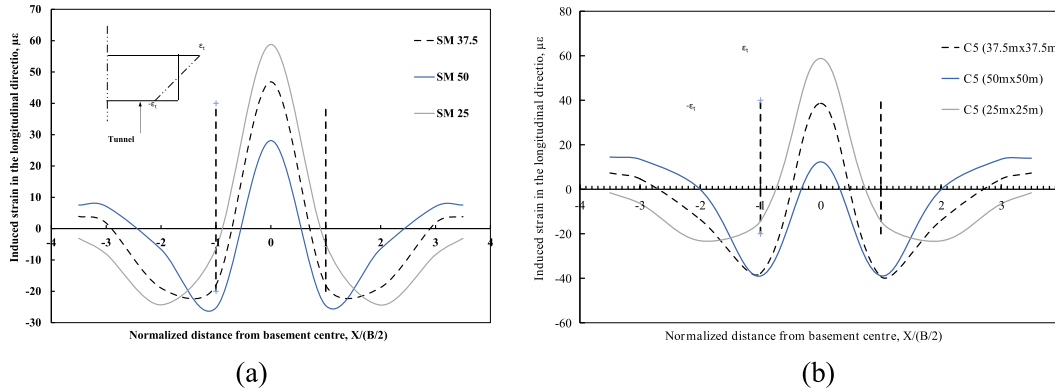


Fig: 7 Effects of excavation size on induced strain in tunnel along its longitudinal direction: (a) Homogeneous condition; b) Layered condition

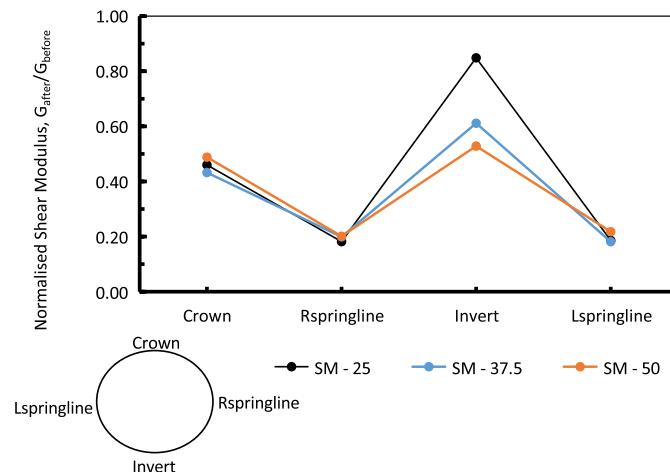


Fig: 8 Computed normalized shear modulus of soil at mid-plane cross-section after completion of deep excavation

Semi-empirical Method for Predicting Tunneling Induced Settlements (V1W2)

Dr. Anindya Pain, Er. M.Vinoth, Dr. Manojit Samanta, Dr. Koushik Pandit,
Dr. S.Ganesh Kumar, Er. M.S. Aswathy, Er. Ajay Dwivedi &
Dr. R.D. Dwivedi

Objective:

Development of a semi empirical method for the prediction of surface settlement due to tunneling.

Numerical Model:

- Studied the subsoil profile from the available database and obtained appropriate parameters to carry out the numerical analysis based on the field and laboratory soil investigation test results.
- Developed Numerical Model and validated the results with the field monitoring data.

Fig. 9. Numerical Model

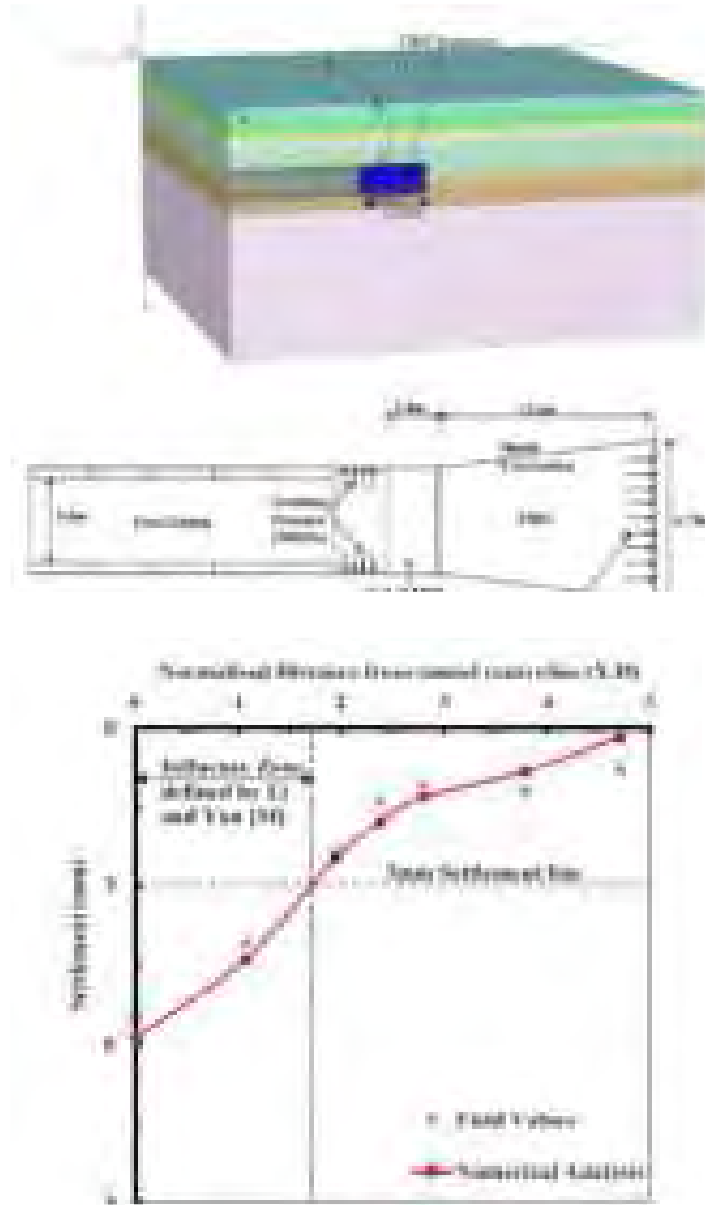


Fig. 10. Settlement Plot

- Conducted parametric studies under greenfield and with foundation conditions on the validated numerical model. A table of the parametric studies conducted is shown below:

Table 1: Parametric Analysis Cases

SI No.	Parameter	Variation	Actual Condition	Condition
1 to 5	Cover depth	6m to 30m	12m	Greenfield
6 to 10	Grout Pressure	100kPa to 500kPa	300kPa	Greenfield
11 to 18	Face Pressure	10kPa to 150kPa	70kPa	Greenfield
19 to 23	Tunnel Diameter	6.3m, 8m, 11m, 12m, 14.5m	6.3m	Greenfield
24 to 27	Elastic Modulus of soil	0.5E to 2E	1E	Greenfield
28 to 35	Volume Loss	0.25% to 2%	0.50%	Greenfield
36 to 135	Offset of foundation, Depth of Foundation, Foundation Pressure Width of Foundation	Offset - 0m, 5m, 11m, 17m and 23m Depth - 1m, 2m and 3m Pressure - 50kPa to 300kPa Width - 10m, 15m and 20m	Offset -0m Depth -2m Pressure - 100kPa Width - 10m	With Foundation
136 to 142	Cover depth	9m to 30m	12m	With Foundation
143 to 146	Tunnel Diameter	6.3m, 8m, 11m, 12m, 14.5m	6.3m	With Foundation
147 to 149	Elastic Modulus of soil	0.5E to 2E	1E	With Foundation
150 to 157	Volume Loss	0.25% to 2%	0.50%	With Foundation
158 to 163	Face Pressure	50kPa to 150kPa	70kPa	With Foundation

- A multiple linear regression was performed to predict the influence of different parameters like foundation pressure, location of foundation, width and depth of footing, C/D ratio, diameter of tunnel and Elastic modulus of soil on the induced settlement.
- The following regression equation with $R^2 = 0.92$ was obtained:

$$S = 51.28 + 5.04D - 0.75C - 1.40L + 0.068P - 0.0015E$$

Where S= Settlement, D= Tunnel dia, C= Cover depth, L= Offset from tunnel axis, P= Foundation Pressure and E= Elastic Modulus

- The predicted response of the regression model is plotted against the actual, true response in Fig. 11.



Fig.11. Predicted vs Actual Plot

- The regression equation was further validated with the available data and literature as shown in Fig.12.

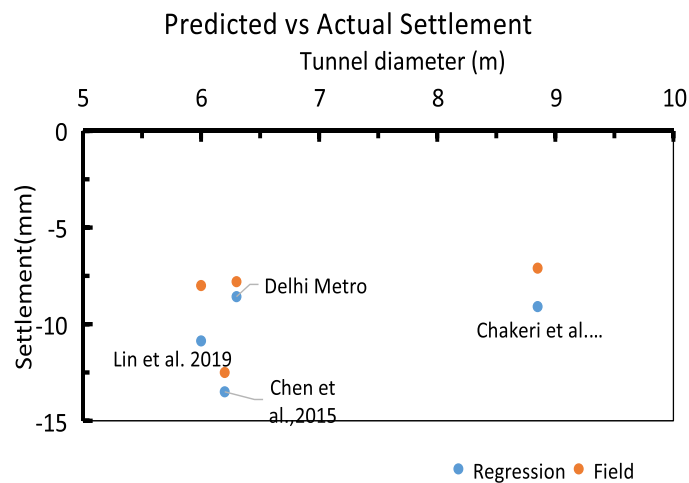


Fig.12. Validation with existing data

- From figures 11 and 12 it can be concluded that there exists a scope for further improving the existing regression model which needs additional data.

Influence of Staged Tunneling on Adjacent Pile/Pile Supported Buildings (V1W3)

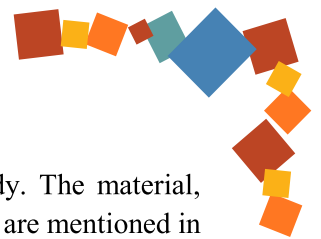
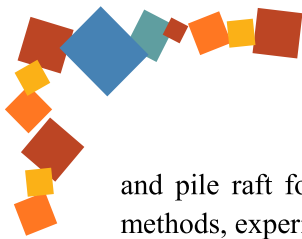
Dr. Anindya Pain, Er. M.Vinoth, Dr. Manojit Samanta, Dr. Koushik Pandit,
Dr. S.Ganesh Kumar, Er. M.S. Aswathy, Er. Ajay Dwivedi &
Dr. R.D. Dwivedi

Objective:

Methodology to assess the damage to the adjacent foundation/structure due to staged tunneling.

Lateral Response of Pile and Piled Raft

The main objective of the present study is to investigate the pile/pile supported building response during tunnelling. Different aspects of pile parameters are covered in the present study. Response of pile due to tunnelling has been studied for single, group of piles, piled raft through 1g reduced scale model and numerical investigations. Pile response are investigated for no working load conditions, with different level of working load, spacing between the piles, offset distance of piles from tunnel, pile toe to tunnel crown position. Both, axial and lateral response of the pile foundation due to tunnelling has been investigated. This chapter present the only the lateral deformation response of pile



and pile raft foundation for the different parameter considered in the present study. The material, methods, experimental and numerical procedure, parameters and range of parameters are mentioned in this chapter. Different results, observations and conclusions are also presented in this chapter.

Scaling Ratio and Flexibility

$$T = \sqrt[5]{E_p I_p / \eta_h}$$

$$E_p I_p / E_m I_m = n^5$$

Where, $E_m I_m$ is the flexural rigidity of model pile, (E_m and I_m are Elastic Modulus and moment of inertia of model pile respectively) and n represent the scaling ratio. 1 m of pile length represent 17 m of pile in prototype scale having 600 mm diameter and M25 grade of concrete.

Test schemes on single pile and piled raft

- All the tests are conducted for pile having smooth surface conditions.
- Piles are located at distance of 1000 mm from the tunnel start positions for single pile test.
- The centre line of the piled raft is located at a distance of 1000 mm from the tunnel start positions.
- C/D ratio is kept 6 for all the test
- Around 24 numbers of test have been conducted in this series.
- Load is applied towards the tunnel
- Pile head/Raft lateral deflection is measured in the same direction.

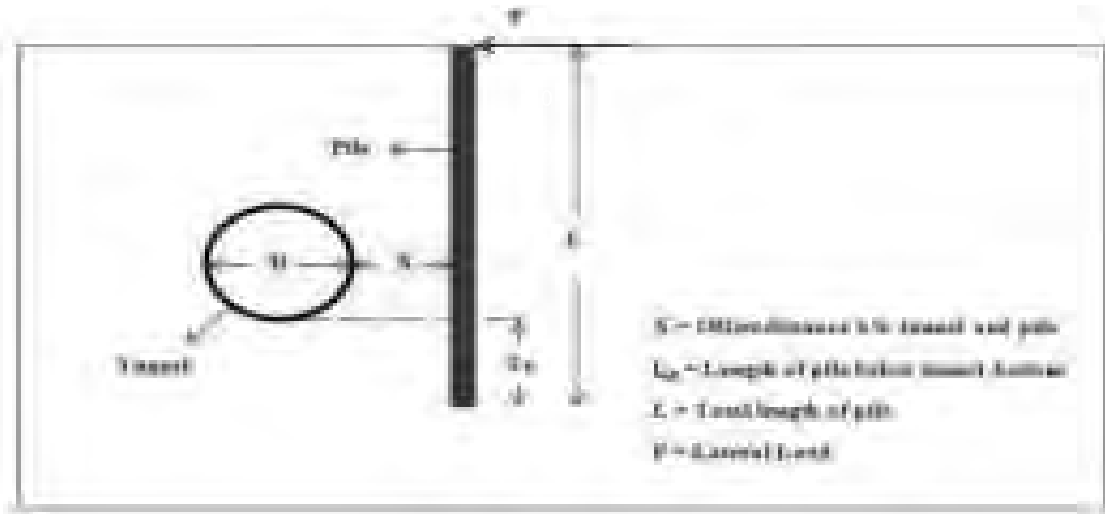
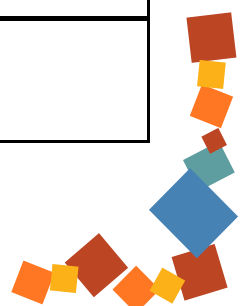
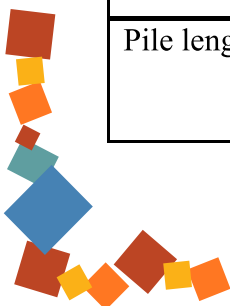


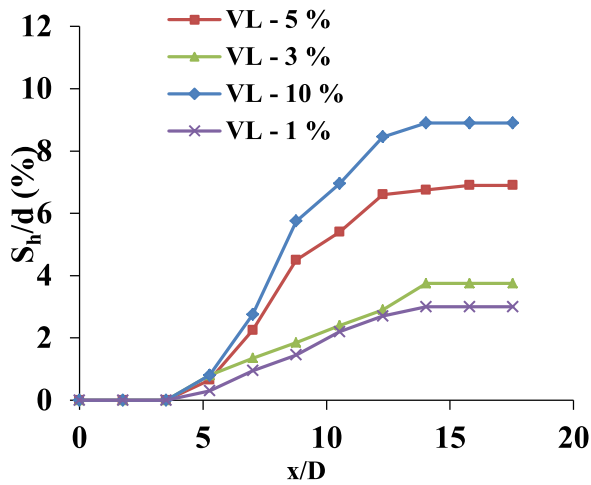
Fig. 13. Schematic diagram of test program

Table 2: Test schemes on single pile and piled raft

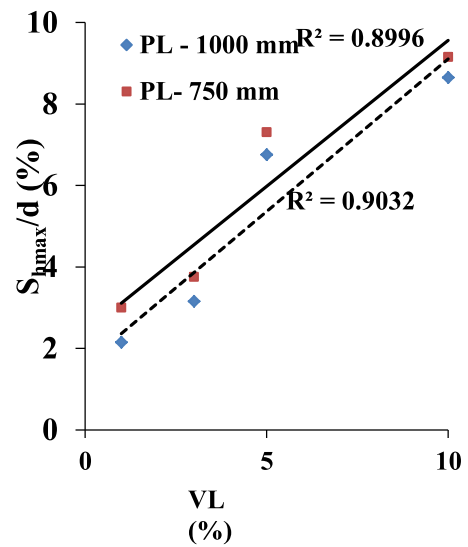
Description	Lateral load (N)	Volume loss (%)	Offset distance
Pile length: 750 mm & 1000 mm	-	10, 5, 3, 1	1



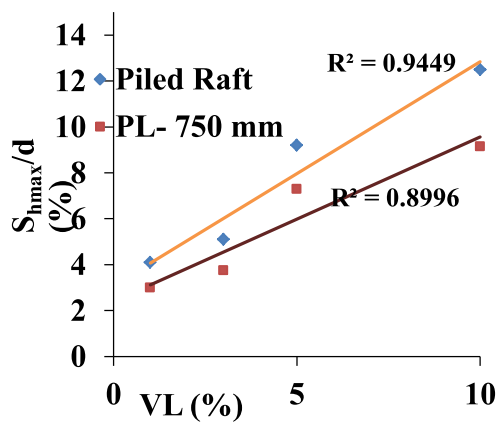
Pile length: 750 mm & 1000 mm	-	5	1, 2, 4, 6
Pile length: 750 mm	40	10, 5, 3, 1	1
Piled raft, 2 x 2, 3.5d c/c spacing, Pile length: 750 mm	-	10, 5, 3, 1	1



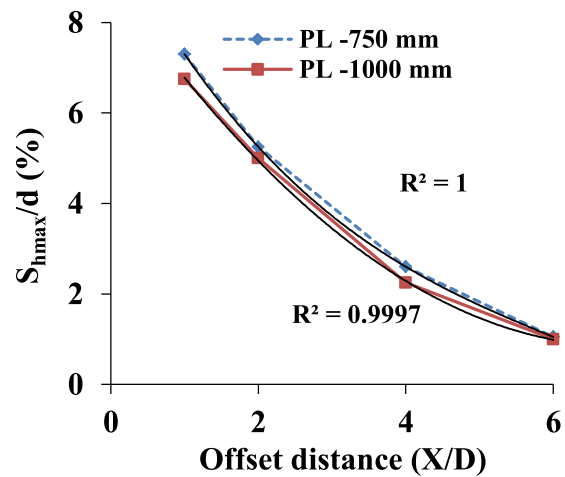
Lateral deflection of pile with progressive tunnelling

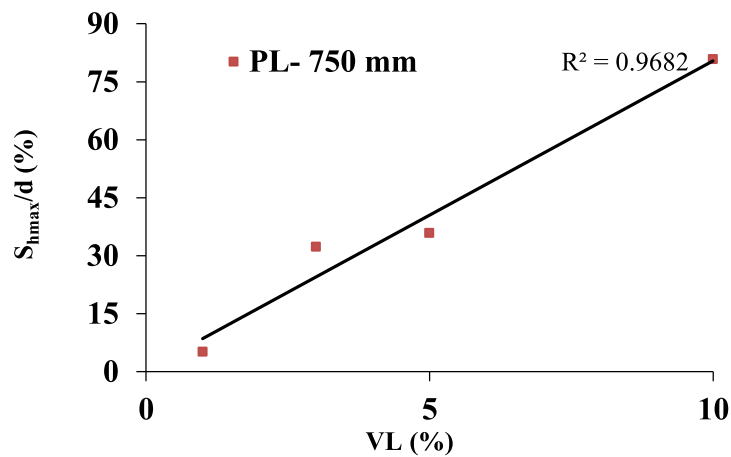


Maximum pile head deflection



Comparison of deflection of single and piled raft foundation Variation of maximum pile deflection with offset distances





Maximum pile head deflection with working lateral load

Fig. 14. Lateral Response of Pile and Piled Raft during staged tunnelling

Assessment of Underground Soil – Structure Interaction Under Seismic Conditions (V1W4)

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Dr. S.Ganesh Kumar, Er. M.S. Aswathy, Er. Ajay Dwivedi &
Dr. R.D. Dwivedi

Objective:

1. Interaction studies between underground structure-soil-structure interaction under dynamic loading conditions
2. Effect of ground induced displacement-structure interaction under repeated dynamic loading conditions

Progress during the period

During the review period, scaled down tunnel model was developed and its interaction with soil with varying saturation conditions subjected to dynamic loading condition was performed. Further, studies relating to soil-tunnel-surface structure interaction also studied under repeated shaking events. The tunnel model was scaled down to 1:20 to prototype condition and installed inside the soil having 60% density with 900 mm thickness. The properties of the soil used in this study are shown in Table 3.

Table 3. Properties of the soil model

Sl. No	Parameters	Value	Unit
1	Soil type (SP)	Poorly graded sand	
2	Specific gravity	2.66	No unit
3	Minimum density (γ_{min})	1.4023	g/cc
4	Maximum density (γ_{max})	1.6599	g/cc

5	Density(γ)	1.549	g/cc
6	Void ratio (e)	0.7201	No unit
7	Cohesion (c)	0	kPa
8	Angle of internal friction (ϕ)	34	°
9	Young's modulus	12000	kPa

To study the effect of varying water content and its saturation on tunnel confinement characteristics, ground having varying saturation i.e. 25%, 50%, 75% and 100% saturation was prepared. The scaled down tunnel model was located at 420 mm depth from ground level representing conventional shallow type tunnels in the actual conditions. Then the tunnel embedded ground was subjected to repeated incremental acceleration loading of 0.1 g, 0.2 g, 0.3 g and 0.4 g using 1g-uniaxial shaking table and tunnel-soil interaction was studied. Similarly for surface structure interaction, a scaled down G+3 building with a scaling ratio 1:20 with piled raft foundation was chosen. The gypsum material was chosen for the model tunnel structure due to its compatibility characteristics in elastic modulus relation in simulating prototype model. The similarity ratio in terms of elastic modulus was found to be 1/12.65. The similarity ratio in respect of the acceleration was selected as 1. Based on three fundamental scale factors i.e., geometry, material and dynamic conditions, the similarity ratios were obtained and listed in Table 4. The tests were performed with contact type instrumentation such as pore pressure transducers, accelerometers, earth pressure sensors. Typical instrumentation scheme for monitoring tunnel response under dynamic conditions is shown in Fig.15. For measuring tunnel and structural displacement 2-dimensional digital image correlation system (2-DIC) was used. The experimental arrangement is shown in Fig. 16.

Table 4. Similarity ratios of the tunnel model

Type	Parameters	Relationship	Similarity ratio
Geometry	Length l	λ_l	1/20
	Displacement D	$\lambda_D = \lambda_l$	1/20
Material	Elastic Modulus E	λ_E	1/12.65
	Density ρ	$\lambda_\rho = \lambda_E/\lambda_a\lambda_l$	1/0.63
	Stress σ	$\lambda_\sigma = \lambda_E$	1/12.65
	Strain ε	$\lambda_\varepsilon = \lambda_\sigma/\lambda_E$	1
Dynamic	Frequency f	$\lambda_f = \lambda_a^{0.5}\lambda_l^{-0.5}$	4.47
	Acceleration a	λ_a	1

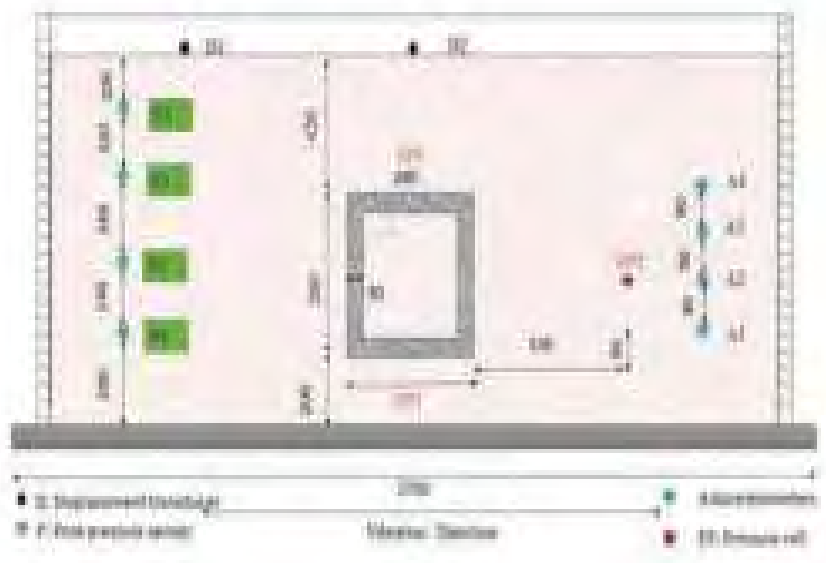
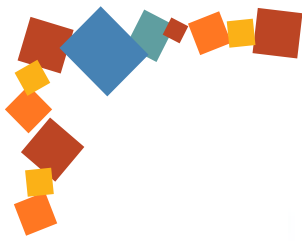


Fig. 15. Instrumentation Scheme selected for the study



Fig.16. Digital Image Correlation technique

Results and Discussions

I. Tunnel-soil Interaction during repeated shaking events

(a) Acceleration response

Typical acceleration response for the 50% saturated ground subjected to repeated incremental loading conditions condition is shown in Fig. 17. For comparison, accelerometers installed at 420 mm depth and 700 mm depth from ground level and 250 mm horizontal distance from tunnel position is chosen and compared.

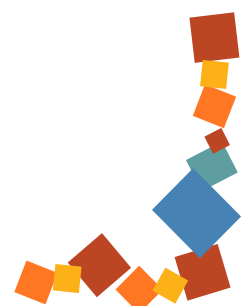
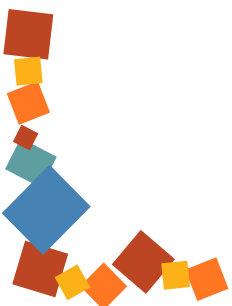




Fig. 17. Acceleration response for 25% saturated ground

The observations are as follows,

- The disturbances induced in soil deposition during repeated incremental loading results in occurrence of non-uniform densification in ground with varying saturation. Due to this, 16% to 30% increment in acceleration amplitude was observed during repeated shaking events.
- At lower saturation conditions, the induced uneven densification due to repeated shaking confines the tunnel model during initial shaking conditions and minimized tunnel displacements. However, at higher shaking intensity, increment in tunnel displacement was observed.
- The reduction in soil confinement was found higher at higher saturation conditions i.e., 75% and 100% due to repeated shaking and induces tunnel displacements during repeated shaking

(b) Pore pressure response for 50% saturated ground

- The influence of ground saturation during repeated incremental shaking events is assessed by monitoring pore pressure development during shaking. For monitoring pore pressure development, pore pressure transducers were installed at 100 mm, 420 mm, 560 mm and 700 mm depth respectively from ground level. To observed peak pore water pressures for ground with varying saturation is shown in Fig. 18. It can be seen from figure; the generation of pore water pressures were insignificant during 25% and 50% saturated ground. However, at higher saturation conditions, significant development of pore water pressures was observed throughout the depth which disturbs the ground. Around 65% to 80% increment in pore pressure generation was observed during repeated shaking which made the ground more susceptible to liquefaction. Due to this disturbances, uneven densification was observed during repeated shaking events which induces tunnel displacements

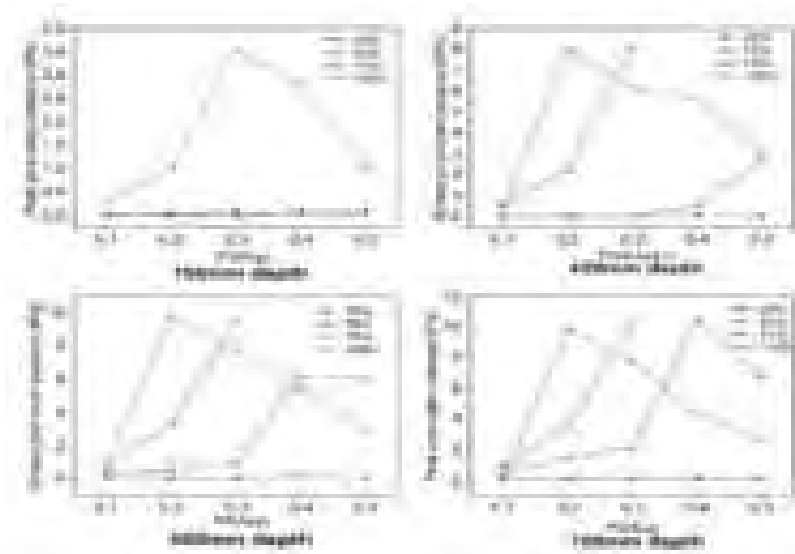
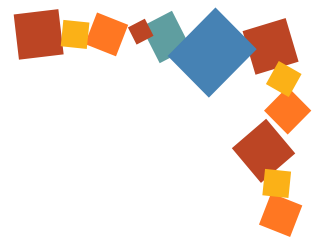
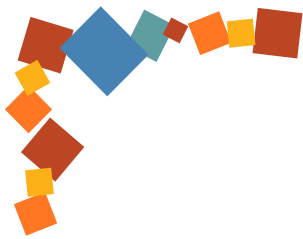


Fig. 18. Peak pore pressure response for ground with varying saturation conditions

II. Tunnel-soil surface structure Interaction during repeated shaking events

To assess soil-tunnel-surface structure interaction, 3 test conditions were selected. The conditions were shown in Fig. 19. Then tests were carried out with varying ground conditions to evaluate the soil-tunnel-surface structure interaction. Using conventional monitoring scheme and 2D DIC monitoring, the tunnel and surface structure interaction were studied and compared. Typical observed acceleration response for ground with 50% saturation subjected to repeated shaking events is shown in Fig. 20.

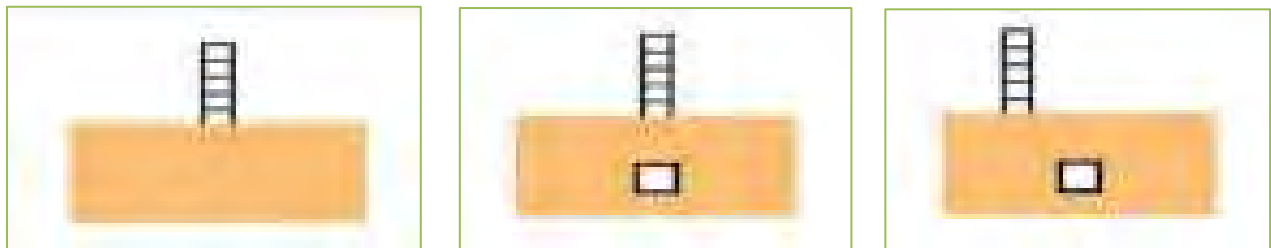


Fig. 19: Soil-tunnel-surface structure interaction studies

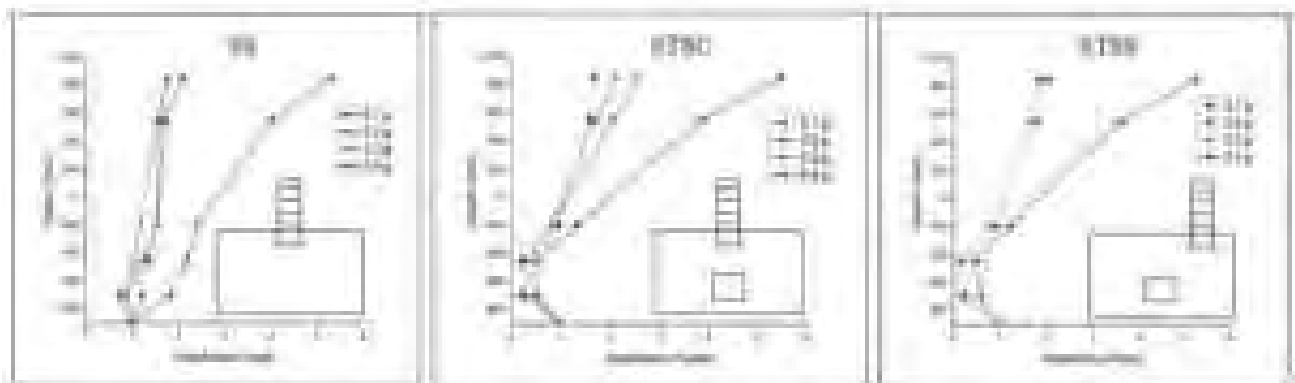
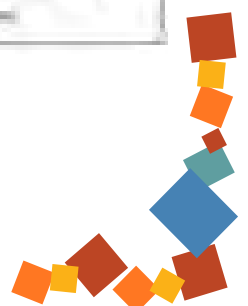
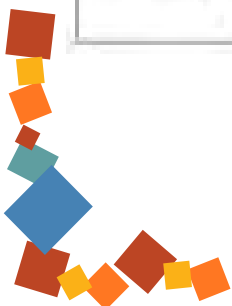
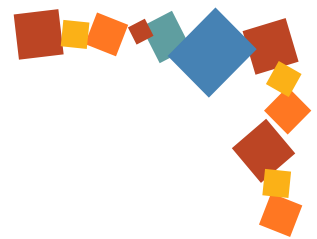
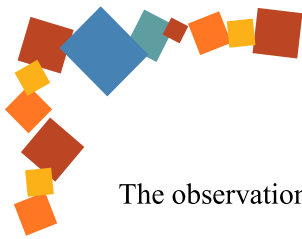


Fig. 20. Acceleration response

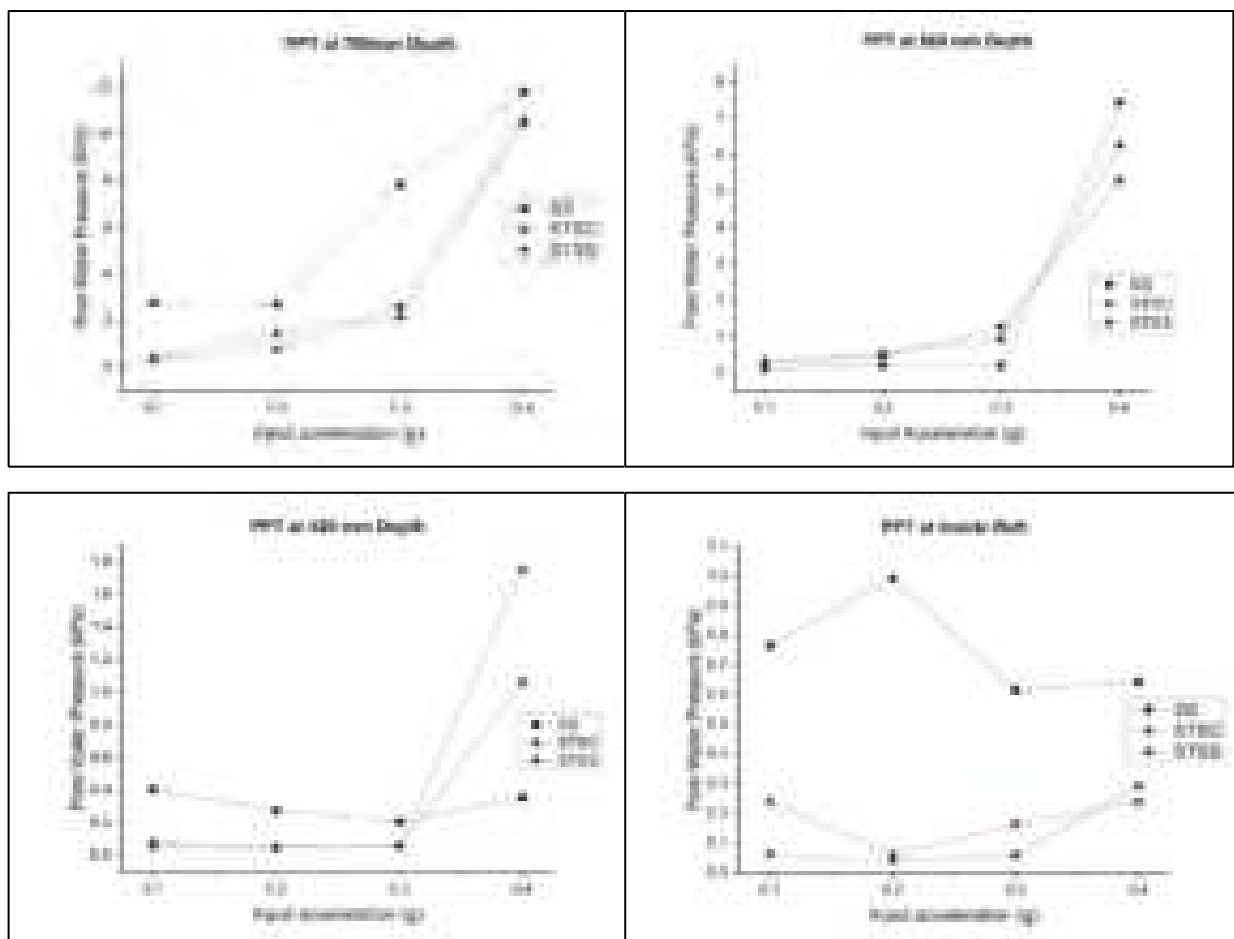




The observations on acceleration response are as follows:

- In the soil structure condition, the amplification factor at 0.2 g and 0.3 g is found lesser than that of 0.1 g acceleration loading due to the occurrence of soil densification and minimized structural displacement compared to other conditions.
- At 0.4 g, higher amplification was observed due to repeated disturbances in the soil together with higher acceleration loading. This resulting in higher displacement at surface structure.
- In STSC and STSS conditions, soil surrounding tunnel reduced acceleration amplification due to the inertial effect of the tunnel together with soil densification. However, at higher acceleration loading condition i.e., 0.4 g, the amplification factor found increases to about 20% to 30. % for both STSC and STSS condition which affects the stability of surface structure
- With increasing ground saturation, the response between structure-soil-surface structure also varies

Pore pressure response observed during 50% saturation ground at ground and structure



- Comparatively SS ground condition showed higher generation of pore water pressures than STSC and STSS due to occurrence of non-uniform soil densification during repeated shaking events. Due to undrained repeated loading conditions; increment in pore pressure generation was observed at all the depth during 0.1 g to 0.4 g shaking conditions.



- Both STSC and STSS ground showed similar behaviour in pore pressure generation up to 0.3g shaking conditions. This was mainly due to the induced densification tunnel embedment interaction which minimized generation of pore water pressure up to 0.3g. At higher acceleration loading i.e. 0.4g, disturbances in soil mass induced by the higher acceleration loading facilitate rapid generation of pore water pressures affecting the stability of structures.
- It was observed that, soil at shallow depth found more vulnerable in STSC and STSS ground condition at higher acceleration loading conditions due to rapid generation of pore water pressures and made soil more susceptible to liquefaction. This in turn affect the stability of structures located above tunnel system.

Tunnel Displacement

For monitoring tunnel displacement and strain development, non-contact based 2-Digital image correlation technique was used. The experimental test preparation and analysis of test result is shown in Fig. 21.

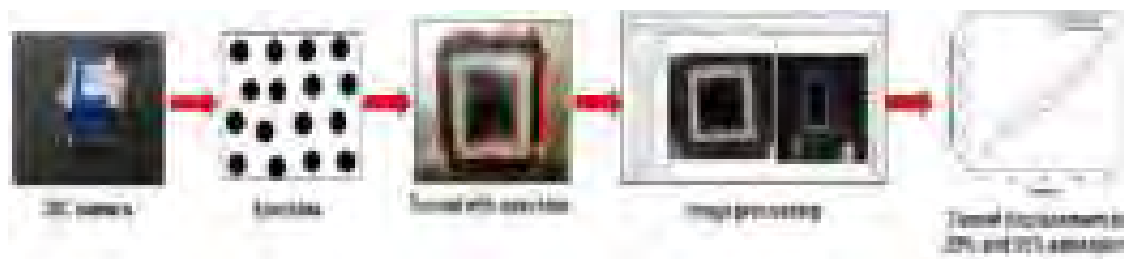


Fig. 21. Typical 2DIC experimental preparation and analysis

- The maximum displacement of tunnel at 25% Saturation found to be 2.1 mm, 4.4 mm, 5.7 mm and 7.7 mm respectively for 0.1g to 0.4g repeated shaking conditions.
- At 50% saturated ground, the maximum displacement of tunnel was 2.7 mm, 5.5 mm, 7.02 mm, 8.7 mm respectively during repeated shaking
- Around 11.5% to 22% increment in tunnel displacement was observed for 50% increment in ground saturation.
- Strain experienced by tunnel model also increases with the ground saturation. At 50% saturated ground, tunnel experiences higher strain response in all the loading conditions due to reduction in soil confinement from the surrounding soil.
- Around 70% to 90% increment in strains was observed due to repeat incremental shaking at 50% saturated ground.

Probabilistic Analysis of Underground Excavation in Rock (V2W1)

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Dr. R.D. Dwivedi

Objectives:

Quantification of uncertainties associated in underground rock excavation using advanced probabilistic method and probabilistic analysis of underground excavation.

Progress Highlights/ Significant Achievements:

The materials that exist in nature have the property of randomness i.e. uncertainty is always associated with the predictions about these natural materials, especially with the geotechnical materials e.g. rock and soils. Hence the stability of tunnels, constructed in these geotechnical media has found great attention of researchers to perform the analysis in a probabilistic manner. Several methods are available to perform the probabilistic analysis like Direct Monte Carlo Simulation (MCS), Response surface modelling and Moment-based methods. Each method has its specific advantages and shortcomings. In cases when only a limited number of samples are available, the moment-based methods are found more suitable than the others. In this present study, the Fourth-Moment Normal Transformation (FMNT) is used to find the failure probability. FMNT method requires only the knowledge of the first four moments. FMNT methods are incorporated in this study in two manners (FMNT-1 and FMNT-2); one in which the performance function is linearized by FORM. Another method in which the performance function itself is considered a random variable whose first four moments are estimated by the point estimate method (PEM). The tunnel is analyzed for different internal pressure (p_i) in two manners; analytically, by convergence confinement method (CCM) and numerically, by finite difference-based software $FLAC^{3D}$ (Fig.22). Two different solutions of CCM have been used namely Duncan Fama solution (based on Mohr-Coulomb (MC)) and Carranza-Torres solution (based on generalized Hoek-Brown (GHB)). The results obtained by both analytical and numerical models are found very much comparable (Table 5).



Fig.22. Analytical and numerical model for the circular tunnel.

Two performance functions are taken into the account as an indicator for reliability analysis. The first performance function is for the radius of the plastic zone and the second is for the radial displacement.

Table 5: Comparison of deterministic results of analytical and numerical model

(p_i)	MC		GHB	
	CCM	$FLAC^{3D}$	CCM	$FLAC^{3D}$
0.3	0.0291	0.0312	0.0368	0.034
0.4	0.0217	0.0227	0.0368	0.0285
0.5	0.0186	0.0191	0.026	0.0245
0.6	0.0168	0.017	0.0224	0.021

Both FMNT methods are employed for these performance functions and the corresponding probability of failure (P_f) is calculated. The results are found very comparable. In particular, when the internal

support pressure is considered as 0.4 MPa, in the case of MC criteria (uncorrelated $c-\phi$), the P_f of the analytical model obtained by direct MCS is 9.05 and the corresponding results obtained by FMNT-1 is 8.96 and by FMNT-2 is 8.26. P_f of the numerical model is coming as 8.79.

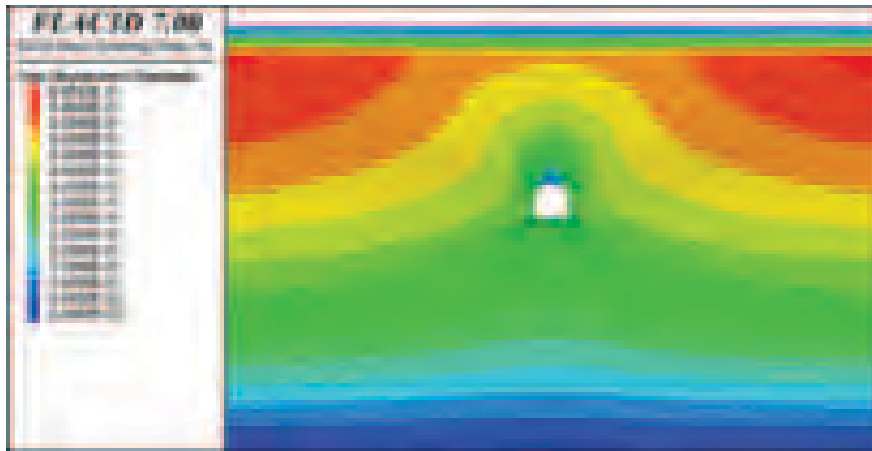


Fig.23. Numerical model of the horseshoe-shaped tunnel.

Moreover, this study intends to generalize this reliability analysis methodology for non-circular shapes, in near future. Hence a horseshoe-shaped tunnel is taken into consideration and result validation with MCS is ongoing (Fig.23).

Assessment and Support Measures for Tunnel Portals and Rock Slopes in the North-Western Himalayas (V2W2)

Dr. Anindya Pain, Er. M.Vinoth, Dr. Manojit Samanta, Dr. Koushik Pandit,
Dr. S.Ganesh Kumar, Er. M.S. Aswathy, Er. Ajay Dwivedi &
Dr. R.D. Dwivedi

Objective:

Assessment of the stability of tunnel portals in rock slopes and providing support design solutions for slope strengthening and portal stability.

Introduction:

The Himalayan Mountain ranges exhibit heterogeneous lithological rock formations and anisotropic rock mass behaviour due to presence of numerous unconformities, including faults, fractures, and joints. Difficult topography, challenging geology, unfavorable tunnel orientation and sometimes non-availability of a suitable excavation technology often cause instability issues during tunnel constructions in mountainous environments. The various ground conditions experienced during tunnel excavations are namely squeezing, rock burst and swelling etc., while tunnel roof collapse, cavity formations and water infiltration are some of the major concerns. Till date, many research works have been carried out to assess the stability of the tunnel sections, tunnel portals, and tunnel with support measures. For stability assessment of tunnels and slopes, the rock mass classification systems are often used in-prior. Both empirical and numerical approaches are frequently used to judge tunnel stability. The design and modelling of tunneling and under-ground excavation can benefit from techniques like geotechnical indices and rock mass classification established the Geological Strength Index (GSI) system, which is an easy, rapid, and reliable approach based on the visual evaluation of geological conditions. Tunnel failures may arise from nearby rock falls, landslides, liner cracking, and sinking of roadways that often occur in the hilly areas (Fig. 24). As a result, there are significant losses in terms of life, structures, and economy.



Fig. 24. (a) Collapsed tunnel portal at Tapovan Vishnugad hydroelectric plant, Uttarakhand, India (2021); (b) Under-construction tunnel collapse on the Jammu-Srinagar National Highway near Khooni Nallah, in Ramban, India (2022)

2. Methodology

For the present study, the rock mass has been selected as phyllite since it is one of the commonly observed rock masses in the North-Western Himalayas. Accordingly, a database has been prepared based on the information of the tunnelling sites in the States of Uttarakhand, Himachal Pradesh, and Jammu & Kashmir. From the database, it has been observed that the “D” shaped tunnel is a commonly used tunnel shape with overburden heights mostly varying from 50 to 100 m. The numerical models were developed in a two-dimensional finite element software (RS2) with their other dimensions chosen based on mesh sensitivity analysis and by varying model dimensions so that the global safety factor (FoS) of the models do not change significantly based on model dimensions and mesh density chosen. The FoS has been computed by using the Strength Reduction Factor (SRF) method. In this study, rock mass strength is selected in accordance with the Geological Strength Index (GSI) values, which represent from blocky with good, rough surface quality to disintegrated rock mass with poor surface quality. For this, GSI values of 25, 50, and 75 have been selected in the model studies. A D-shaped tunnel having dimensions of 12 m as width (B) and 10 m as the opening height (D) is used for the parametric studies. The obtained results were examined for the displacement at tunnel crown and the global FoS. In addition, the most susceptible cases were selected for further analysis with addition of adequate support measures.

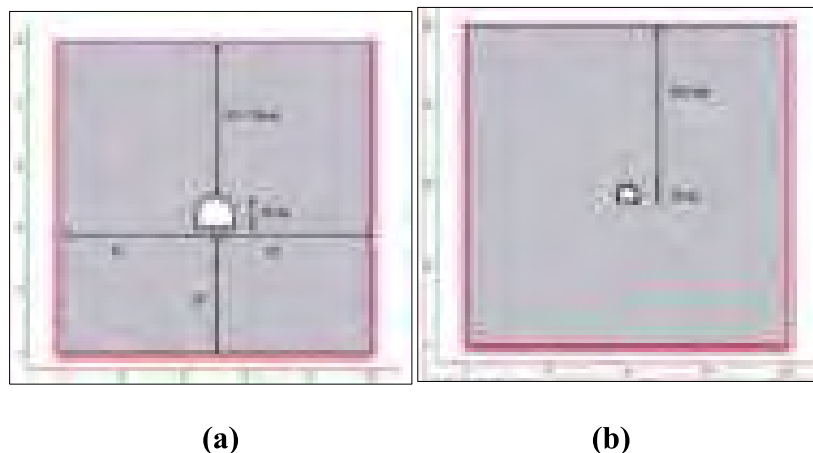


Fig. 25. Geometry of the numerical models with overburden thickness, (H) of (a) 50 m (b) 100 m

In continuation to this study, GSI values of 25, 50 and 75 have been selected with varying slope angles (β) of 40° , 50° and 60° and overburden heights (H_o) of 25 m, 50 m and 100 m. Three GSI

values are used in order to nearly cover all of the rock mass quality classes given by the GSI system in the analysis. We have chosen 'D' shaped tunnel of height (H_t) having dimensions of 12 m as width (B) and 10 m as the opening height (D) according data based on our literature review. Fig. 26 depicts a representative cross-section of the numerical models that were created and analysed.



Fig. 26. A typical numerical model of a tunnel portal excavation in a sloping rock mass

3. Results and Discussions

- For GSI = 25 case, with overburden thicknesses of 50 and 100 m, the crown displacement values obtained were 16 mm and 52 mm and the global FoS values were obtained as 1.09 & 1.08, respectively. So, the results of GSI = 25 case show that this condition may be a susceptible case for any impending tunnel failure which requires an appropriate design support strategy.
- The results of support system show that the percent reduction of displacement for shotcrete (with wire mesh) and shotcrete with rock bolting were found to be 69% for both the cases having overburden thickness of 50 m; and 81% and 83% respectively for overburden thickness of 100 m.

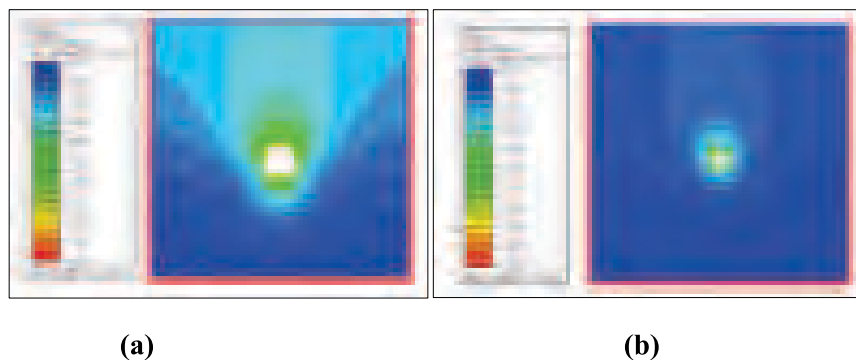


Fig. 27. Displacement contour for GSI = 25: (a) $H = 50$ m, obtained displacement at crown = 16 mm; (b) $H = 100$ m, obtained displacement at crown = 52 mm

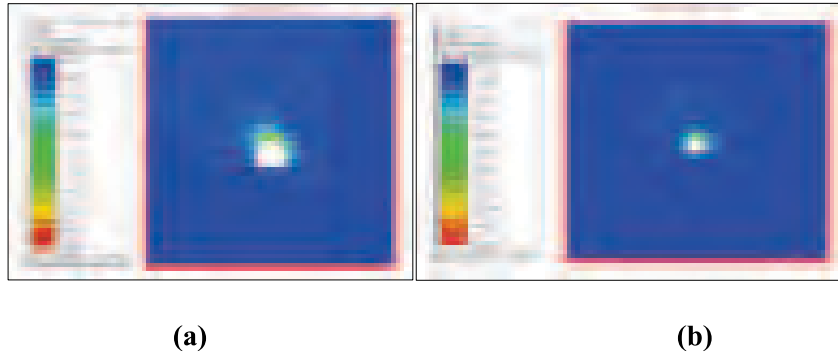


Fig. 28. Factor of safety contour for GSI = 25: (a) H = 50 m, obtained FoS = 1.09; (b) H = 100 m, obtained FoS = 1.08

- After installing support measure for GSI 25 case for H = 50 m & 100 m, displacement decreases.

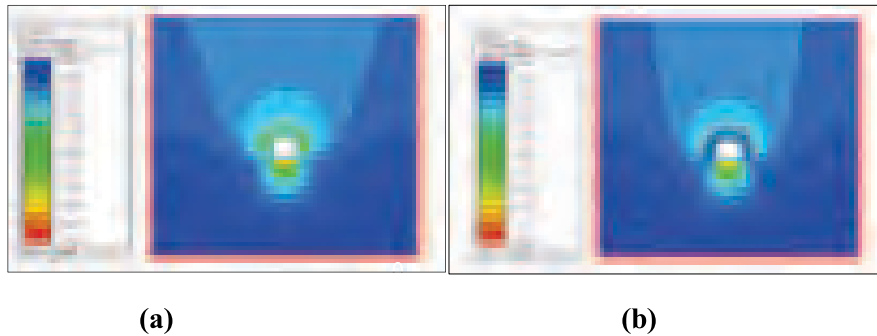


Fig.29. Displacement contours for GSI 25 & H = 50 m case with: (a) shotcrete with wire mesh, obtained displacement at crown = 5.0 mm; and (b) shotcrete with wire mesh along with rock bolting, obtained displacement at crown = 5.0 mm

- The outcome of the parametric study for static cases with varying slope angles (β) of 40° , 50° and 60° shows that the global factor of safety for GSI value (50 and 75) are within satisfactory bounds of 1.5, except for one case of GSI 50 with slope angle of 60° where FoS is 1.3, whereas for GSI 25 FoS is less than 1.5 which means these cases need proper support design installation scheme.
- Similarly, results of parametric study for Pseudo-static shows that the FoS for GSI 25 is less than the criteria of 1.2 for all the slope angles with varying overburden height. Whereas for GSI (50 and 75) FoS satisfies the criteria of 1.2 except two cases of GSI 50 with slope angle (β) of 50° and 60° for overburden height of 100m where FoS is less than 1.2.
- The outcome of displacement analysis for GSI (50 and 70) shows that the displacement is within permissible limit as slope angles (β) varies with overburden height of 25 m, 50 m and 100 m. Whereas, for GSI 25 displacement is more than the permissible limit which need further study and support installation scheme to reduce the displacement.

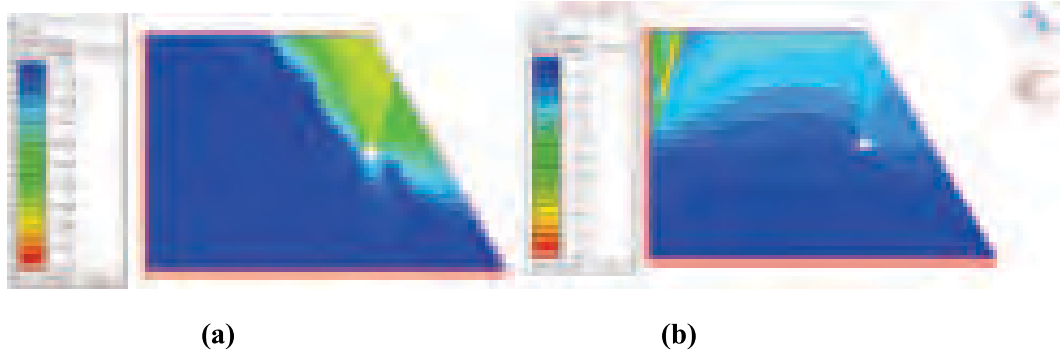


Fig.30. FoS analysis for GSI = 25: (a) H = 100 m (Static), slope angle = 60°; (b) H = 100 m (Pseudo-static), slope angle = 60°

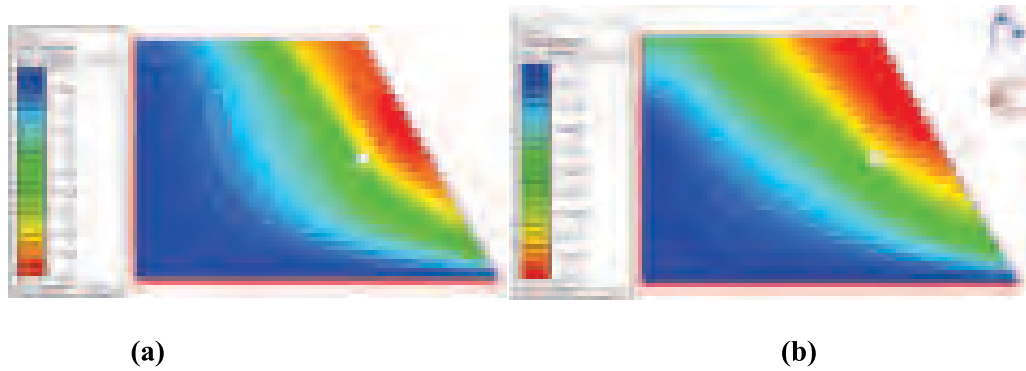


Fig. 31. Displacement contour for GSI = 25: (a) H = 100 m (Static), slope angle = 60°; (b) H = 100 m (Pseudo-static), Slope angle = 60°

The next stage was to carry out a parametric study of the tunnel's stability in rock mass that varies in terms of the degree of hardness ($m_i = 4, 7, 10$), the disturbance factor ($D = 0, 0.8$), and the overburden thickness ($H = 35, 65, 95, 125$), along with the strength parameters of the rock ($GSI = 45, 55, 65$). Then, it was to propose the stability charts of the tunnel for the two cases:

Case 1: For a constant value of $\lambda = \sigma_{ci} / \gamma H$, plotting charts between FoS and m_i values

Case 2: For a constant value of m_i , plotting charts between FoS and $\lambda = \sigma_{ci} / \gamma H$ values.

4. Conclusions

- The study covers a range of GSI values for phyllite rock-mass, from poorly interlocking, severely broken rock masses with low surface quality to well-interlocked, undisturbed rock masses with good surface quality.
- GSI of 25 was found to be the most susceptible case for overburden thickness of 50 and 100 m. Shotcrete with wire-mesh was observed to have enough strength to mitigate the tunnel portal collapse risk. However, use of rock bolting along with shotcrete with wire-mesh is suggested for better stability improvement.
- It was observed that the safety of the slope reduces as the slope angle rises for a fixed overburden thickness, rock mass quality, and portal opening size.
- The safety of the slope reduces as the overburden increases for a constant slope angle, rock mass quality and portal opening size.

- Similarly, the safety of the slope increases as the quality of the rock-mass improves for a given slope angle, overburden height, and portal opening size.
- Stability charts were developed for tunnel portal excavations.

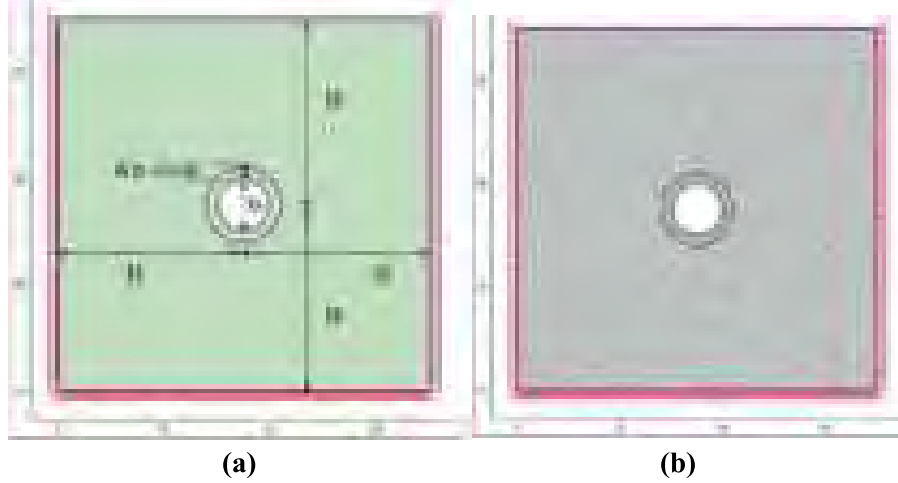


Fig. 32. (a) Numerical model; H = overburden thickness (35, 65, 95, 125 m); D_t = Dia. of tunnel (10 m); B.D. = Blast Damage (restricted up to 2 m of rock surrounding the excavation)

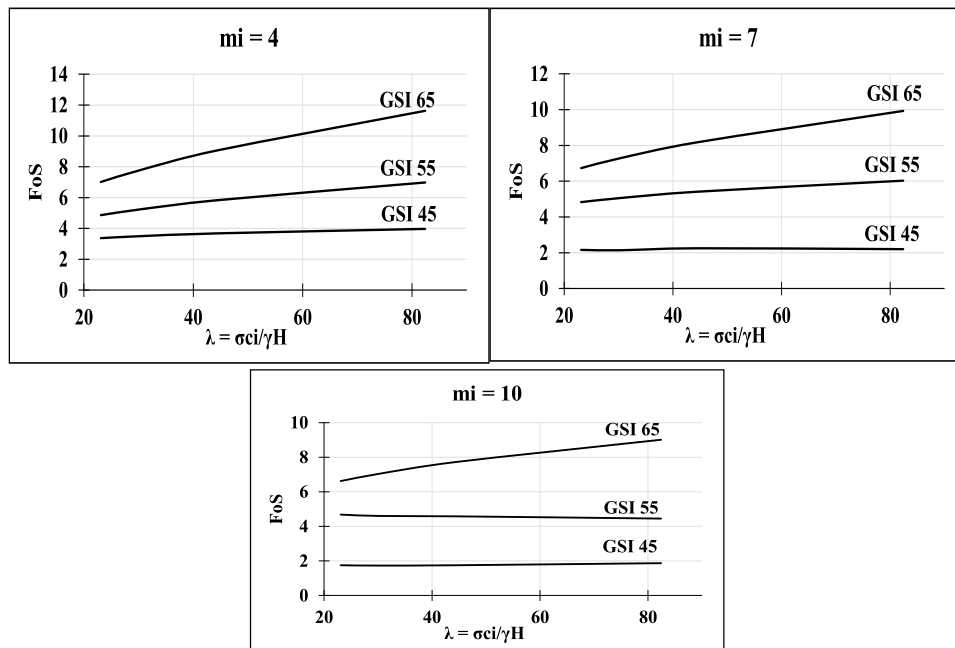


Fig. 33. Stability charts developed for tunnel portal excavations



Study and Development of Agro-Waste based Gypsum Blocks for Non-load Bearing Application

Dr. Siddharth Singh, Dr. R.S. Bisht, Dr. S.K. Panigrahi, Dr. S Maiti,
Dr. N. B. Balam, Dr. A. Aravind Kumar, Er. Sameer, Er. R Solanki &
Er. D. Kumar

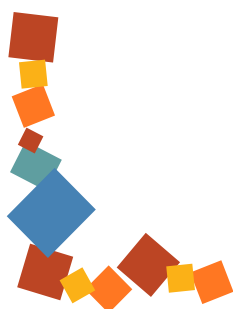
Objectives:

- To develop gypsum blocks for non-load bearing wall application from agricultural based residues.
- To achieve enhancement in acoustic (NRC) and thermal insulation.
- To evaluate fire resistant properties of the developed agro waste blocks.

Progress Highlights/ Significant Achievements:

- Effect of foaming agents and agro-waste in gypsum samples.
- Study of mechanical, thermal, acoustic and fire-resistant properties.
- Incorporation of agro-waste fibers in fly ash bricks.
- Study of agro-waste fly ash bricks and gypsum blocks for non-load bearing walls.

Crop residue management is a massive problem in the agriculture sector. Agricultural waste in the form of stubble which is usually burnt in the farm fields, causes severe air pollution and poses a threat to the environment. The present study investigates the effect of agro-waste in the form of rice straw in gypsum and foamed gypsum hollow-core blocks for partition walls as shown in Fig. 1 and Fig. 2 respectively. Various compositions of agro-waste-based gypsum samples have been studied for compressive strength, thermal, sound absorption, sound transmission loss, and as shown in Fig. 3 and Fig. 4. The addition of rice straw in gypsum reduces the density and compressive strength of straw added gypsum samples, making it lightweight for non-load bearing wall application. The thermal conductivity of the rice straw added gypsum samples show a decrease in thermal conductivity from 0.2 to 0.11 W/m.K. Acoustic properties viz., sound transmission class (STC) varies from 24-38 dB for various rice straw content. The fire-resistant properties viz., surface spread of flame, and fire propagation index test have shown good fire-resistant properties (Fig. 2e, 2f). The agro-waste-based hollow gypsum blocks may be used as a promising material for drywall partitions owing to its thermal insulation, low density, good acoustic and fire-resistant properties.



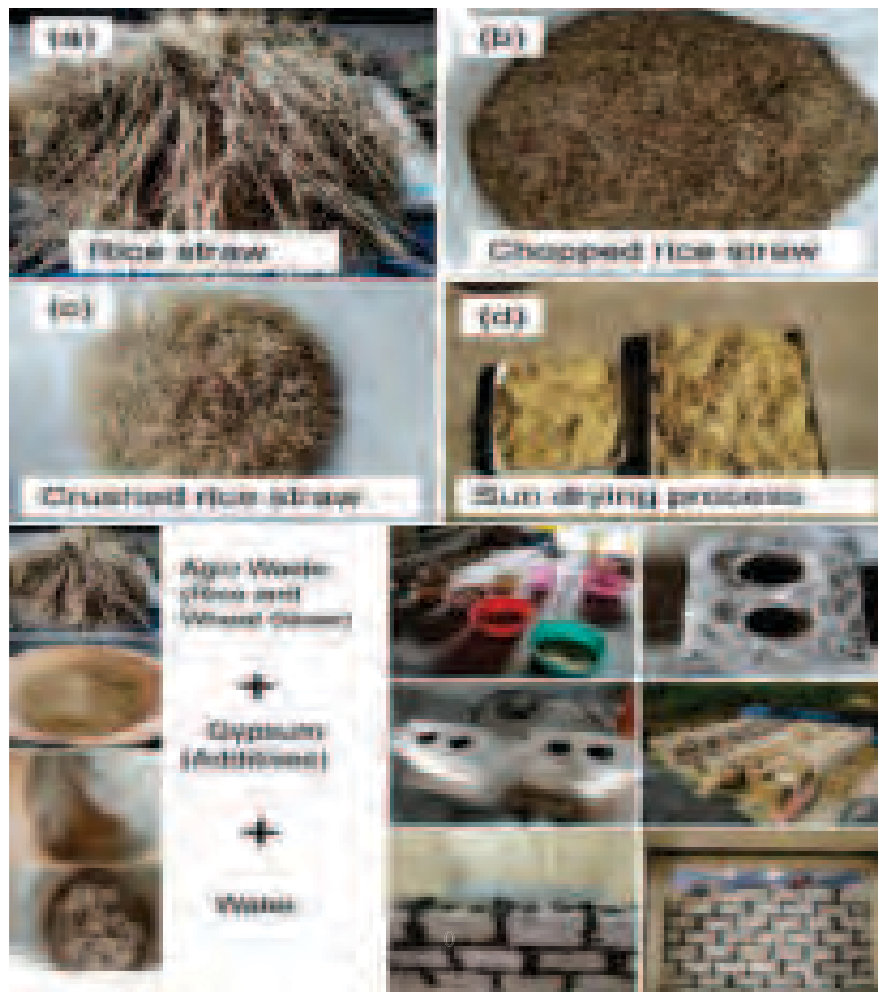


Fig. 1. (a) Collected rice straws from farm fields (b), (c) chopped and crushed rice straw; and (d) sun drying process for moisture removal. Process, casting, sun drying and wall construction of agro-waste gypsum blocks.



Fig. 2 (a-f) (Left Side) Casting of foamed hollow gypsum panels (Right Side) (a) Surface spread of flame test on gypsum-agro waste sample, (b) surface feature of agro-waste gypsum sample tested for surface spread of flame.

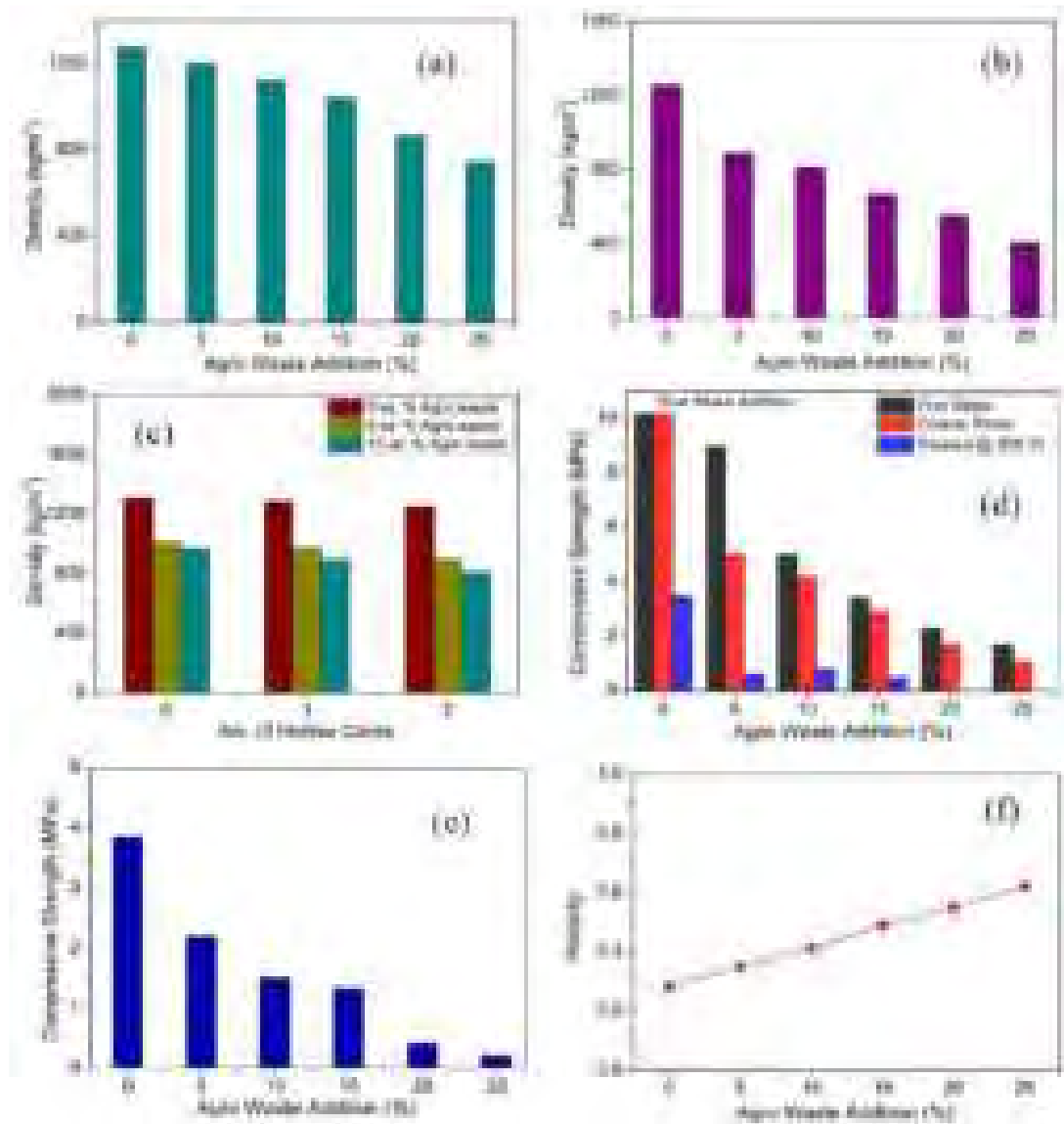


Fig. 3. Mechanical property variation of gypsum hollow blocks with agro-waste variation

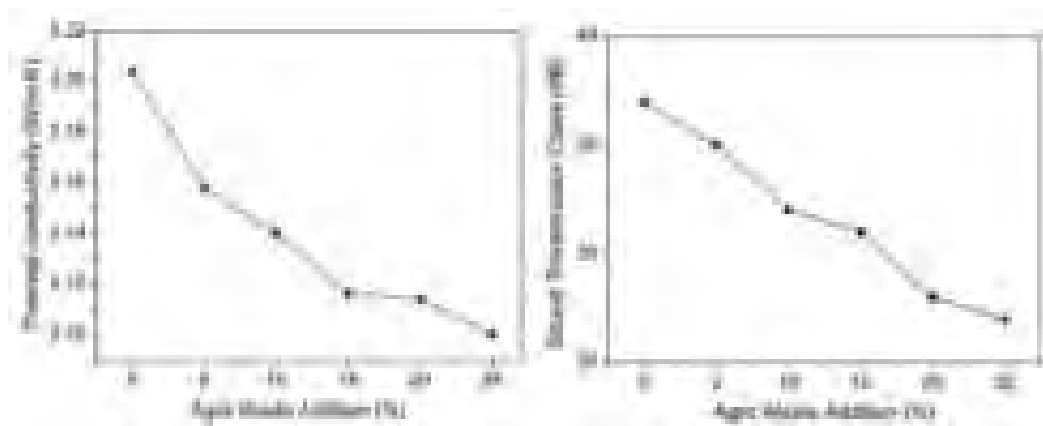


Fig. 4. Thermal conductivity and sound transmission class of gypsum samples.

Development of Robotic Inspection and Mechanized Sewage Cleaning System (Nodal agency: CSIR-CMERI Durgapur)

Dr. Ravindra Singh Bisht, Dr. S. K. Panigrahi, Dr. Ajay Chourasia, Dr. Siddharth Singh, Sh. Narendra Kumar, Sh. Sameer & Sh. Dinesh Kumar

Objective:

- To develop damage detection and assessment strategies for buried sewerage systems
- To develop novel retrofitting strategies for buried sewerage systems
- Laboratory trials and field implementation of the developed strategies

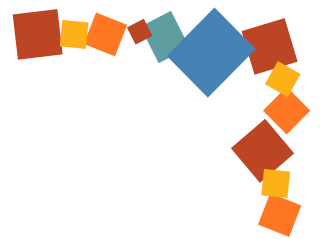
Progress Highlights/ Significant Achievements:

Damage detection, assessment and novel retrofit of buried sewerage systems:

The sewerage system could fail and damage at any time due to tree root intrusion, cracks, channeling, or misaligned pipeline connections, and land settlement due to earthquakes and other external loading conditions. Extreme symptoms of sewerage system deterioration include foundation issues such as cracks in the foundation slab, foundation settlement, and in some cases, formation of deep sinkholes. Severe failures in the sewerage system may also lead to flooding damage in building structures, environmental hazards such as degradation of groundwater quality, and public health hazards by epidemic diseases due to clogged sewerage wastewater. The wastewater from damaged pipe may find its way elsewhere apart from the mapped-out drainage system. It is extremely difficult to identify the damage location and quantification of the buried sewerage system manually. Mechanized retrofitting of the buried sewer pipeline is the key requirement to avoid major failures.

Direct human inspection and retrofitting is impractical for sewerage pipelines because of buried sewerage system networks, unsafe and unhealthy environment, low visibility, and small diameter pipe size. Sewer pipes are generally made of clay, concrete and PVC materials. The conventional retrofitting method of sewer lines requires heavy machinery, intensive manpower, and a longer time period for pipeline rehabilitation. Making open trenches and repairing the pipe line will create dust and pollution. The excavation and replacement of deteriorated pipelines as method of sewer rehabilitation along the path-way may disturb the traffic. Open trenching is time consuming and may also damage the nearby infrastructures and landscape. Also, about 80% of the total sewerage systems worldwide meet the non-man-entry classification for less than 800 mm diameters. Sewer defects can be categorized into three categories viz., structural, construction and maintenance type. Structural defects are due to cracks (longitudinal, circumferential and spiral types), joint flaws (angular, offset, separation and fracture), deformation and collapse. Construction defects are another type of irregularity due to aging and improper fixing of the sewer pipes. Maintenance defects are due to tree root intrusion, water infiltration, and obstacles due to deposits and running the service pipe without periodic inspection and maintenance.

The project work explores a complete solution for integrated inspection and sewage retrofitting using a HD camera and mechanized retrofitting system to address trenchless rehabilitation of sewer pipeline. The damage identification and retrofitting solution has been validated for domestic buried sewerage pipelines. The mechanized retrofitting system has been successfully tested for various sewer pipe materials (PVC and concrete) with diameters ranging from 75 mm to 300 mm over a length of 5-10 meters. The depth of repair site is extendable (up to 20 meters) and it is case-dependent.



Field trial and Implementation

The initial trials were started with different sizes of rubber bladder units where concept of small crack repair by epoxy resin was implemented. Hit and trial experiments were also conducted for selection of best ratio of epoxy resin and hardener mix to get minimum curing time and maximum strength. Pipes with small cracks were only treated with resin hardener mix. The epoxy resin has filled the minor cracks and holes and after completion of curing time, the resin - hardener mix gets settled hard into it. The testing for leaks has been done by flowing water through the pipe and no leaks have been seen except for the big cracks. Trials have been done on multiple pipes of different diameter size to check the limitation of the bladder unit. During field trials, the sewer pipe retrofitting required sequential procedures for successful implementation. After cleaning the internal pipe surface, the GFRP sheet was impregnated with the specified epoxy resin and hardener in a defined ratio (100:16). Then the prepared GFRP sheet was wrapped around the partially inflated rubber bladder, which is cylindrical in shape. The wheel locomotion system with GFRP wrapped bladder was introduced into the host pipe section in the next step. The bladder was gradually inflated using compressed air to uniformly press the impregnated GFRP against the host pipe's internal wall. The excess epoxy-resin penetrated into the pipe's cracks and voids, and the remaining one created a tight-fit, permanent bond against the host pipe. After completion of pot life, the bladder system was deflated and pulled back.

The complete integrated mechanized system has been developed for field trials and implementation in various concrete as well as PVC sewer pipes, as shown in Fig. 1(a). As evident from Fig. 1(b), the proper retrofitting of 250 mm PVC sewer pipe has been successfully implemented.

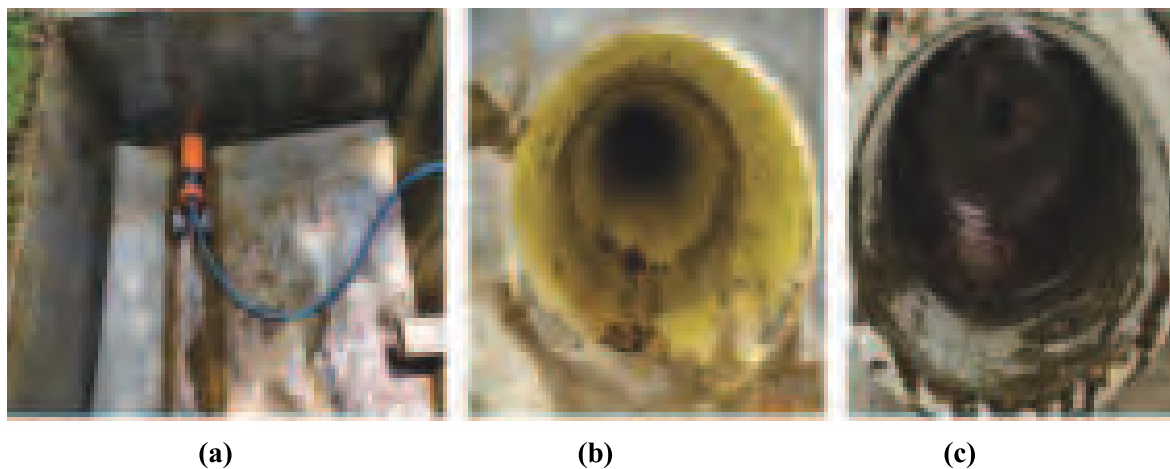
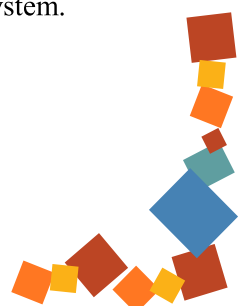
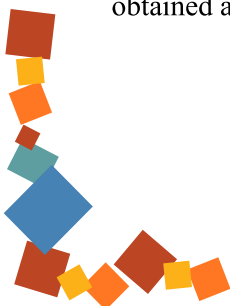


Fig. 1. Field implementation and retrofitting of sewer pipe line.

Similarly, Fig. 1(c) shows proper adhesion of GFRP on the concrete pipe surface with 250 mm diameter. The setting/curing time of epoxy and hardener mix is 3 hours which has to be given for proper setting of GFRP impregnated epoxy on cracked sewer surface. Fig. 2 (a) shows the size of crack repaired using GFRP sheet and Fig. 2(b) shows inside view of the repaired pipe. The results obtained are robust and high-quality retrofitting by the developed mechanized retrofitting system.





(a)



(b)

Fig. 2. Retrofitting trials of damaged sewer pipes

The mechanized retrofitting process is easy to use, simple and quick process compared to the other conventional techniques. The passive wheel of locomotion unit can be easily pushed to the desired fault location of the pipe, and if it is required, a push rod may be additionally used. The sewer can be used after the complete curing (3 hours) of the retrofitted portion of the pipe. As evident from the several trials, the epoxy coating and GFRP with epoxy retrofitting shows different strategies for damaged sewer pipe rehabilitation. First, the epoxy coating can be used only to waterproof the hairline minor (crack size ≤ 1 mm) cracked pipe. In contrast, the second approach of using epoxy with GFRP is used to attain strength as well as waterproofing of the damaged pipe. The second approach can be best suited for pipes with major damage (size: 75 mm to 300 mm), especially when large cracks are visible and measurable.

Development and Trials of a Gantry Robot for 3D Concrete Printing

Dr. Ravindra Singh Bisht, Dr. Soraj Kumar Panigrahi, Dr. Siddharth Singh, Mr. Shivam Kumar, Dr. Ajay Chourasia, Er. Soju J. Alexander, Er. Kanti Lal Solanki, Er. Chandra Bhan Patel, Er. Ashish Kapoor, Er. Mohd. Reyazur Rahman, Er. Dinesh Kumar & Er. Sameer

Objective:

- Design and development of a multi-axis gantry-based 3D concrete printer suitable for Indian scenario
- Conduct concrete printing trials and to scale-up the 3D printer design for onsite printing

Progress Highlights/ Significant Achievements:

Three-dimensional concrete printing (3DCP) is an emerging research field for additive construction technique without any formwork, and extensive research in the recent past has demonstrated great potential for the construction industry. The 3DCP technique can reduce environmental hazards, improve safety and health of workers, construction quality, productivity, and lifespan of the buildings. Constructability, sustainability benefits and challenges in 3DCP have also been discussed in detail by various researchers in order to implement Construction 4.0 or higher generation of construction.

Concrete printing process involves three major parts: robotic printer hardware, computer interface/software, and printing material. Various design configurations of 3-D robotic printers studied by many researchers in the recent past. In majority, there are four main types of robotic printers that are widely used and adopted for the 3DCP viz., gantry robot, serial robot, parallel/cable driven robot, and mobile serial robot. Apart from these main printers, advancement on other robotic printers (team of mobile robots, flying robot, tensegrity robot) for concrete printing have also been investigated, both in research and field evaluations by researchers.

The present project focuses on designing and developing a portable and cost-effective 3-D concrete printer with interactive control interface at laboratory scale. Design analysis has been carried out to select suitable hardware for developing robotic concrete printer. The design configuration of the proposed printer shall be a framed gantry type with simultaneous axis motion control in the cartesian system for maximum workspace. The printer concept based on the modular design can be easily extended for large-scale concrete printing. Successful concrete printing trials at laboratory level have shown potential application in 3-D concrete printing with minimum hassle with the proposed design concept, mechanisms, and interactive control interface.

The project presents design, analysis and development of a gantry robotic printer with pumping unit for 3-D concrete printing at laboratory level (Figure 1). The developed kinematic model is used for workspace analysis and the dynamic model is used to evaluate the motor sizing for printer development (Figure 1b). Various types of motorized mechanisms viz. lead-screw, trolley and rack-pinion with linear motion (LM) guides, have been incorporated to achieve precise and constraint motion of the gantry robot (Figure 1a, Figure 1d). An integrated programmable logic controller (PLC) with in-built human machine interface (HMI) through control algorithms has been implemented for more interactive, user-friendly and precise motion control of the printer. A separate control system is developed to monitor the feed rate of pumping unit during printing. The control scheme is validated using trajectory tracking for various input printing paths by HMI (Figure 2). Successful concrete printing trials at laboratory level of the printer have shown the potential application in 3-D concrete printing with minimum hassle with proposed mechanisms and interactive control interface (Figure 3 and Figure 4). The proposed framed gantry printer can be further easily scaled up using modular design concept for various build-volume.

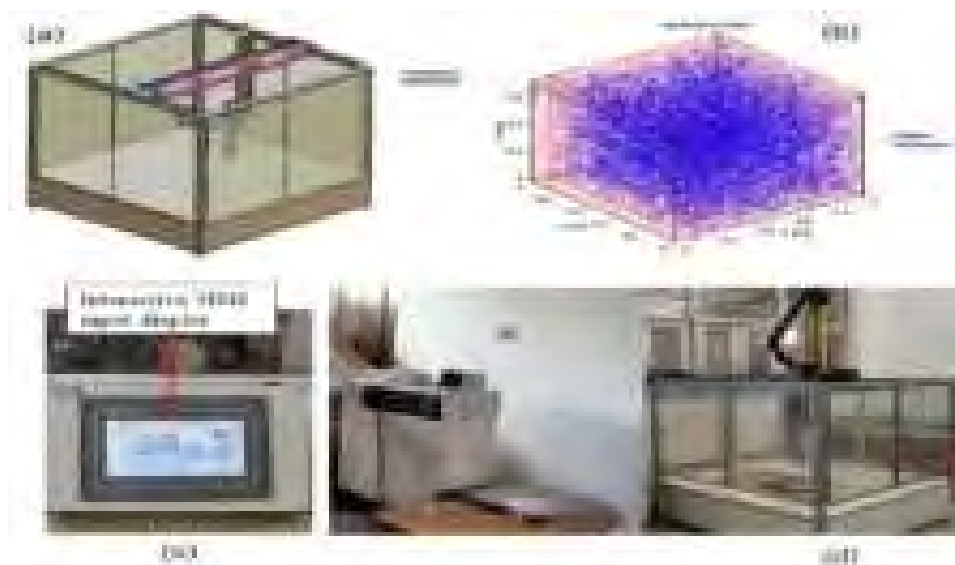


Fig. 1. Design and development of gantry robotic printer, (a) CAD design, (b) build volume, (c) HMI module, (d) developed laboratory printer for concrete printing trials.

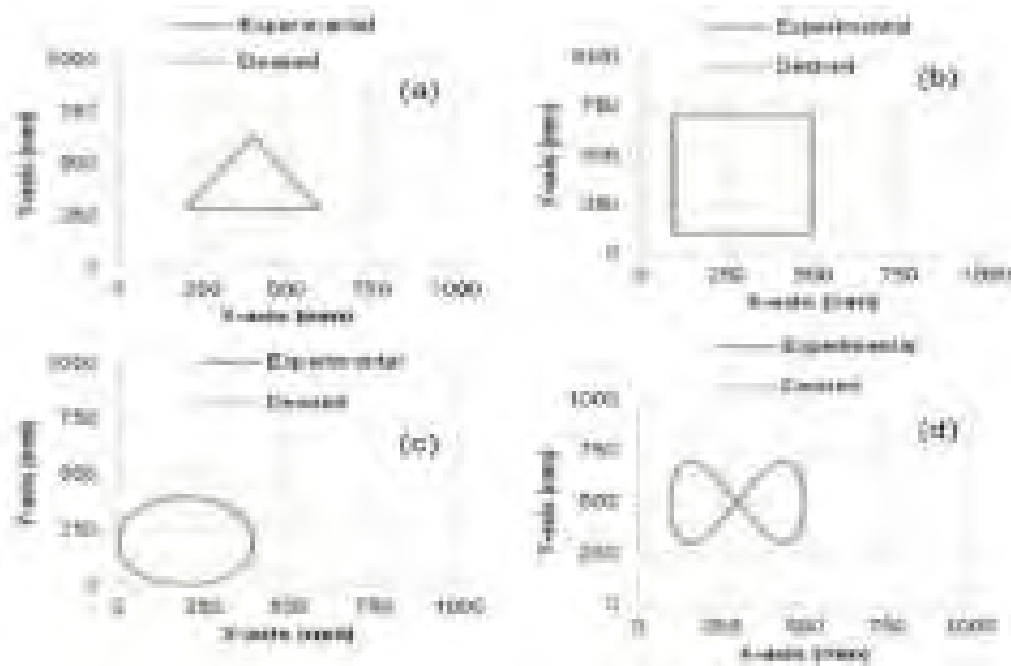


Fig. 2. Theoretical and experimental trajectory tracking of the 3-D printer end-effector: (a) triangle, (b) rectangle, (c) circle, (d) Lissajous input shapes.

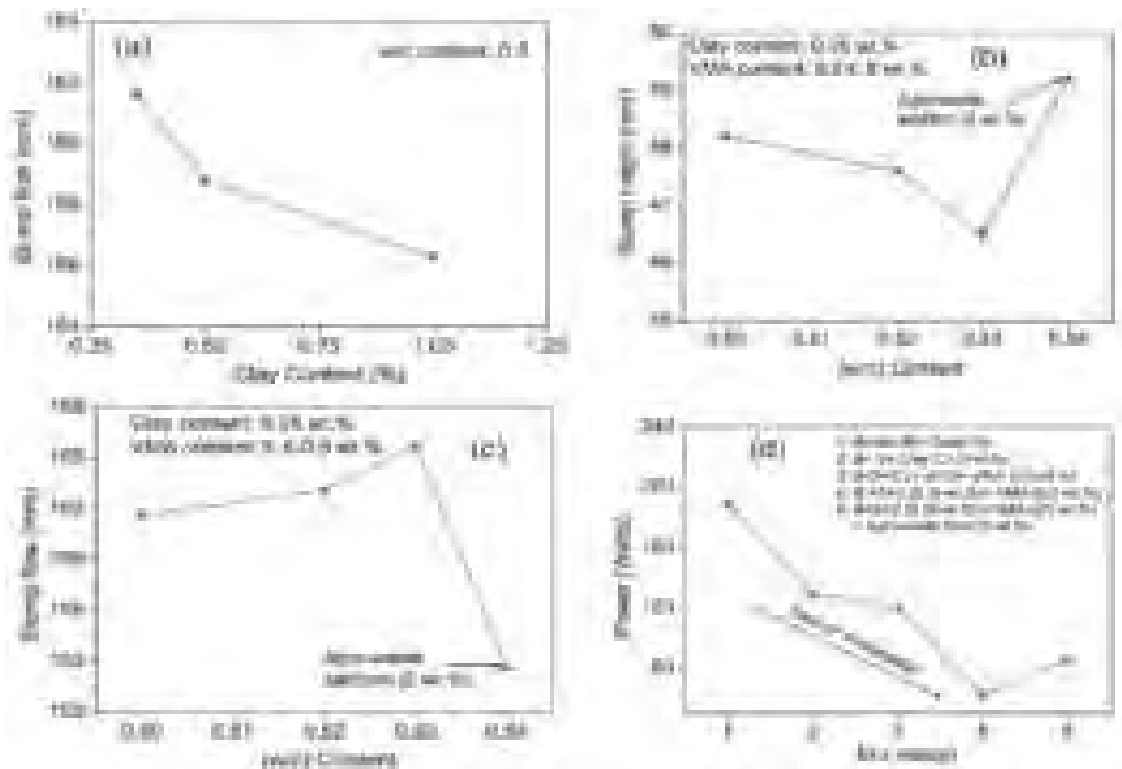


Fig. 3. (a)-(d) Workability and extrudability parameters for various mix design of the 3D printing concrete.



Fig. 4 (a)-(e) Experimental concrete printing trials using various mix design at laboratory level.

Development of Low Toxicity Fire Retardant Intumescent Coating for Steel and GI Duct Applications

Dr. A. Aravind Kumar, Dr. Harpal Singh, Mr. Rakesh Kumar,
Dr. Naval Kishor, Dr. Banti Geddam, Mr. Rajiv Bansal, Ms. Bhavana &
Mr. Sushil Kumar

Objective:

- Minimization of Toxic gases generation during fire accidents.
- Development of optimum fire-retardant intumescent coating composition.

Progress Highlights/ Significant Achievements:

Chemicals used as fillers, additives, and binders in intumescent coatings have been identified. Binders and fillers to produce a low toxic intumescent coating have been identified. Work is in progress to develop water based intumescent coating composition which can be most advantageous to achieve a low toxic intumescent coating. Additionally, solvent based and epoxy-based coating composition identification is in progress.

Preparation of Book on “Understanding Life Safety Components” in Design of Buildings.

Dr. Shorab Jain

Objective:

- The life safety components given in National Building Code of India (2016) - Part (IV) “Fire & Life Safety” are integral part of building design. These include egress components, exits based on occupant load, types of egress components, arrangement of exits and smoke control in exits, etc.
- In this book, the clauses on life safety components will be illustrated graphically i.e. in 2D (Plan and sectional views) / 3D graphical illustrations to make it interesting to read and for easier understanding. The book will also provide additional guidelines on exit components for differently abled.
- This book will serve as a valuable resource not only for students of architecture and engineering but also for professionals such as architects, engineers, fire officers, safety officers, builders, etc. as a ready reckoner for diagrammatic/pictorial illustrations, which would help them in enhancing their building designs leading to construction of more fire safe buildings and will also help in guiding fire officers to evaluate building designs for approvals and audits.

Progress Highlights/ Significant Achievements:

A hand book titled “Design of Fire Safe Buildings - Understanding and Using NBC Provisions” has been prepared, ISBN number received and published.

Mr Neeraj Sehgal, MD Sehgal Doors had given financial support for publication of the book.

The cover page is enclosed.



A Multi Usable Self-Rescue Descent Device to Escape from High Rise Buildings During Disasters

Dr. S K Panigrahi, Dr. R S Bisht, Dr. Ajay Chourasia, Mr. Dinesh Kumar,
Mr. Sameer, Er. Chandra Bhan Patel, Er. Kanti Lal Solanki &
Dr. Siddharth Singh



Objective:

- Development of a fire rescue device with combined different developed concepts/ mechanisms with more efficacy and with extra security features for more adoptability among the public
- Guidelines for installation and maintenance of the fire rescue device
- Field implementation and commercialization

Progress Highlights/ Significant Achievements:

High rise buildings are not only masterpieces of architecture but also represent the success and wealth of the city or nation. Fire accidents are one of the major causes which harm buildings but most importantly human beings. During fire accidents in multistory buildings, major failure aspects include the closing of escape routes and failure of the working condition of firefighting equipment, therefore people can't get away to escape from the situation. Lifts and exit stairs provide access and egress for inter-floor transportation during a normal situation. However, in a fire emergency situation, lifts are often shut down automatically, so exit stairs are the only way of escape. Whereas due to the stack effect, it is not safe enough to evacuate all occupants via the stairs in case of fire.

According to the literature survey, a number of patents and devices are available particularly for self-rescue descent device for high rise buildings. Maximum patents are in concept form only. They are lack in speed control and are costly whereas some seem to be impractical. The products/ technologies available in the market are having gaps viz. Single usable and very costly, not user friendly for children and older people, regular maintenance to be done by competent person. The device is to be carried with the user which is not easy and not having extra security feature. Some devices can only work max for four story building. The devices available for fireman or rescue team during a disaster are multi-usable but not suitable for common residents of a building.

The proposed descent device is affordable for common people and also can be used multiple times during a disaster. It requires less maintenance in comparison to available products.

Progress highlights:

- The design and preparation drawings for combined centrifugal break mechanism along with the cam follower mechanism have been completed.
- The electronic circuits with accelerometer in a black box has been completed and trailed in free fall state for further study of the break mechanism.
- The fabrication and installation of fire resuce device has been completed (Fig 1).
- Alifting mechanism for lifting of different weights have been fabricated and installed on the structure (Fig. 2).
- The trials of the developed mechanism are ongoing with different loads for studying the dynamics of the braking mechanisms (Fig. 3).
- The detail fabrication drawings of the mechanism for making it more light weight have been finalized and fabrication is under progress
- The analysis of available accelerations time graph (Fig 4) is under progress.

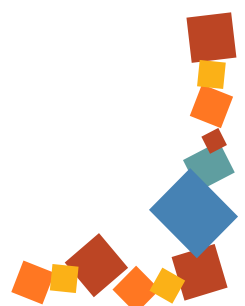
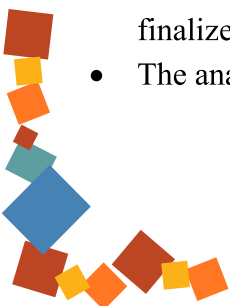




Fig 1: Fabricated Fire Rescue Device on structure

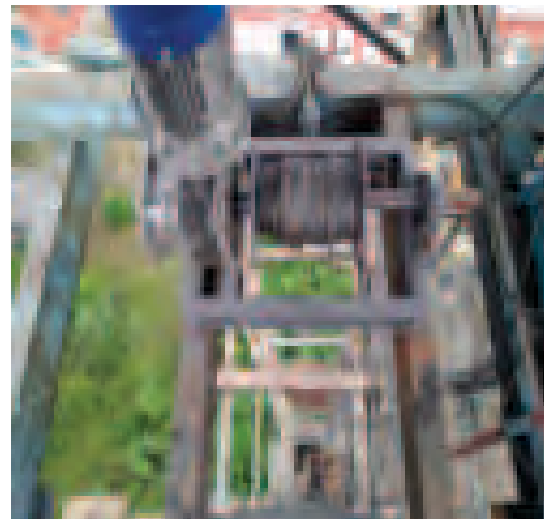


Fig 2: Fabricated Lifting Mechanism on structure

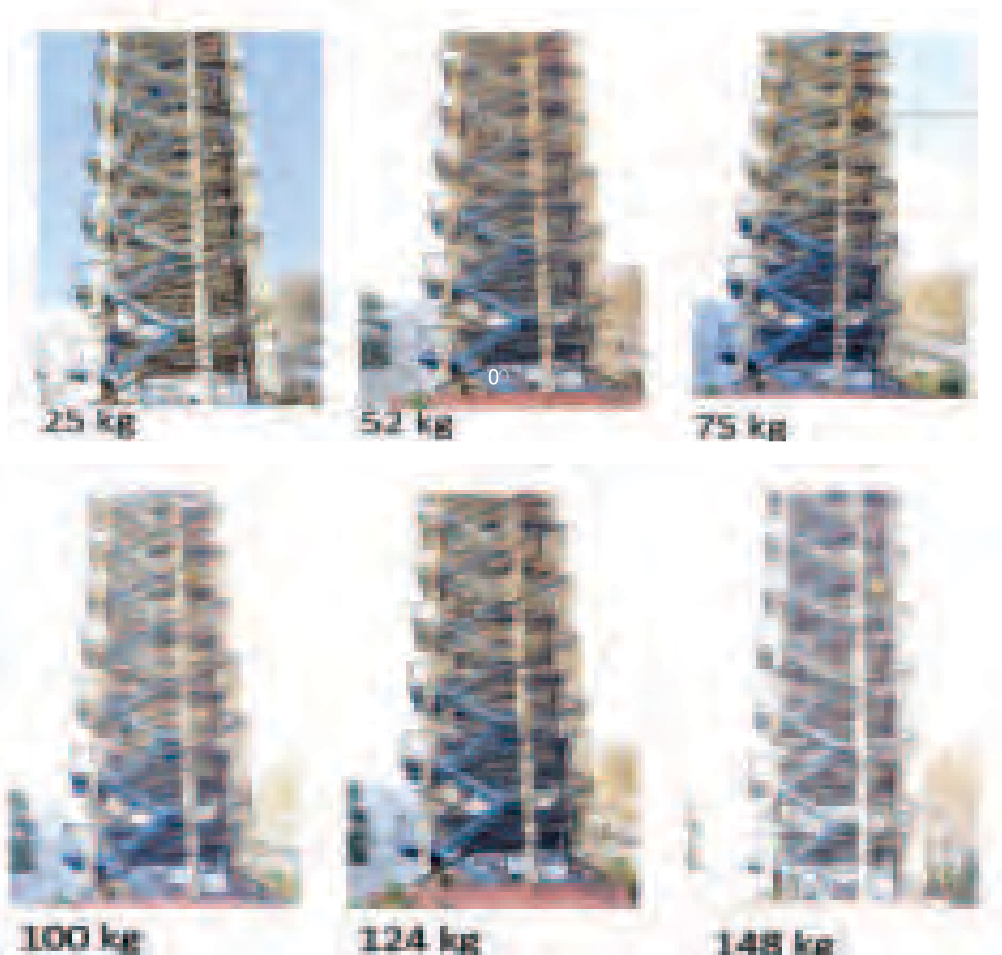


Fig 3. Testing of Rescue device with different weights

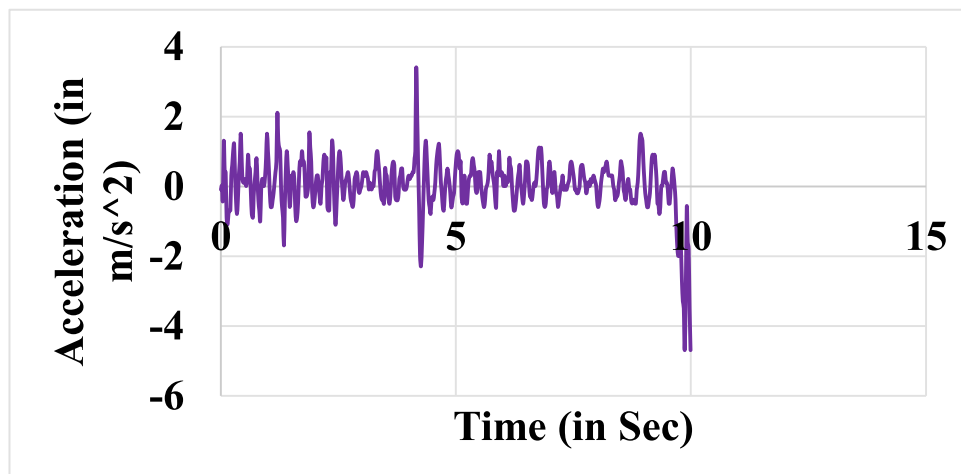


Fig. 4. Acceleration-Time Plot for a case of 100kg Load

An Embedded PZT-Based Transducer for Monitoring Curing of Cementitious Materials

Er. Soju Alexander

Objective:

Development of a dual PZT-based transducer for monitoring concrete curing with enhanced peaks for frequency shift identification.

Progress Highlights/ Significant Achievements:

- An embedded smart sensing device with piezoelectric patches using the EMI technique is developed, that can be utilized as an NDT sensor to measure early-stage concrete hydration.
- The developed transducer was adopted for monitoring the curing of different cementitious materials, using EMI technique, and was tested for different curing conditions, plate size, specimen sizes, temperature and viscosity. The long-term integrity and reusability of the sensor was also established.
- An embedded monitoring system is demonstrated using the developed transducer, AD5933 IA, and a simple peak tracking algorithm. This system is compact, economical, field applicable, and provides real-time status of strength development.

Design and Development of Thermoelectric Module System for Conditioning a 1m x 1m Model Space with Improved Coefficient of Performance

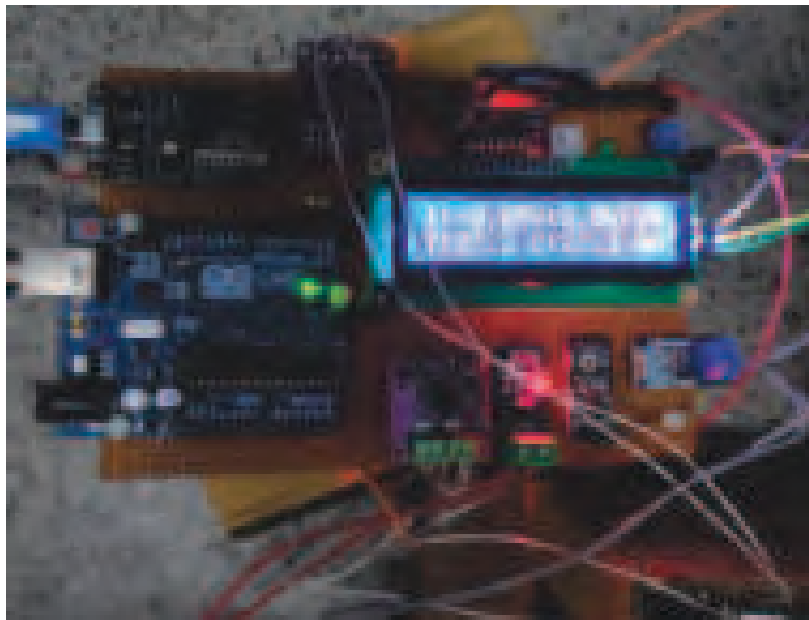
Er. Chandrabhan Patel, Er. V. Chakradhar, Er. Kanti L. Solanki,
Dr. SK Panigrahi, Er. Sachin Kumar, Er. Sameer & Er. Dinesh

Objective:

- Development of an IoT based temperature monitoring system
- Analysis to improve coefficient of performance of TEM module for building applications based on heat sink and driving power.
- Development of TEM based mini space conditioning system

Progress Highlights/ Significant Achievements:

- IoT based Monitoring Controlling system (MCS) –



A low-cost, IoT-enabled monitoring data logger system (MDLS) to control and monitor TEM-AC system have been developed. The developed unique system can monitor all the necessary parameters of the TEC and calculate the COP. MDLS comprise three temperature sensors, a current sensor, a voltage detector, an LCD, a memory card, and two dual-channel drivers to control the input supply. The incorporation of the ESP8266 microcontroller enables MDLS for IoT connectivity, which helps to control and monitor the TEM-AC system from remote locations. MDLS has four remaining slots to connect analog and digital sensors.

Now, experiments will be done with –

- Various heat sink
- Different current pulses applied to TEM

Controlling of thermoelectric module to improve the COP

To perform different case study, a 16inch x12inch test box made of Sun-board is used as shown in Fig. A TEC1-12706 with two different size of heat sink is mounted on the side of the box. An exhaust fan at cooling side and axial fan at hot side heat sink is mounted to keep hot side temperature as minimum as possible. In this paper, controlling is provided to cooling side of fan to control the airflow from cold surface of the TEM, to improve the cooling capacity of the system, and to test developed MCS unit. 11.8-volt constant voltage applies to operate the TEC and 12 volts to fans. Power consumption and temperature drop of each experiment is calculated using MCS. Experiments have been done normal mode of operation and control mode of operation. Improvement in COP of TEM-AC system using control mode of operation have been also discussed and compared with normal mode of operation.



Fig. Experimental setup for case study: MCS with Sun-board test box and Different heat sink configurations

- Normal mode of operation:

All the devices are operated without any control unit, and an aluminium heat sink of size $45 \times 45 \text{ mm}^2$ is mounted on the cold side with a 12-volt fan to transfer heat flux from TEC to the setup box. The experiment was done at an ambient temperature of 27°C . Fig (a) shows the temperature of the cold side of the TEC module. The temperature of the cold side reaches 18°C when the fan runs at full speed then the temperature becomes constant, and a 1°C drop occurs in box temperature when there is heat leakage in the setup box. Similar procedures were also done using another aluminium alloy heat sink of size $60 \times 60 \times 22 \text{ mm}^3$ and cold side temperature variation shown in Fig (b). The power consumption of the system is listed in table.

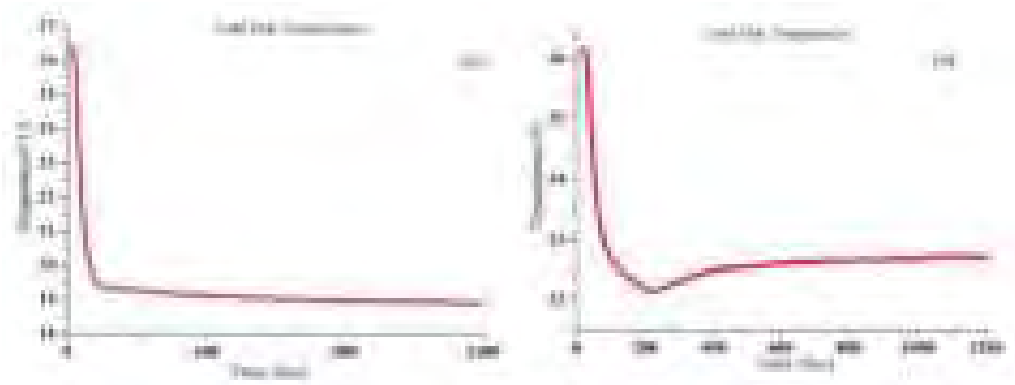
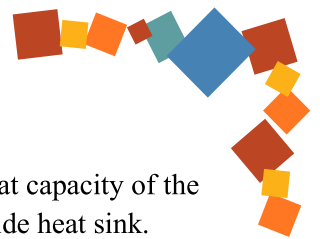
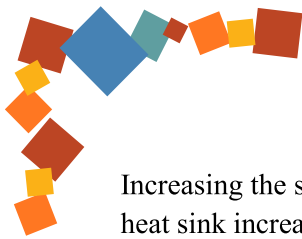


Fig. 8 Cold surface temperature of TEM-AC under direct operation: (a) Cold side heat sink is of $45 \times 45 \text{ mm}^2$. (b) Cold side heat sink is of $60 \times 60 \times 22 \text{ mm}^3$

Table: Power consumption of TEM-AC with direct operation

S.No.	Device	Formula	Power Consumption (watt)
1	TEC	$P_{\text{TEC}} = V_{\text{TEC}} \cdot I_{\text{TEC}}$	35.4 W
2	Fan	P_{Fans}	8.6 W
3	Total	$P_{\text{Total}} = P_{\text{TEC}} + P_{\text{Fans}}$	44 W



Increasing the size of the heat sink restrict the temperature drop at the cold side as heat capacity of the heat sink increases. TEC needs to do extra work to drop the temperature of the cold side heat sink.

Development of Performance Improved Precast Light Weight Composite Materials using Solid Waste

Dr. Rajni Lakhani, Ms. Abhilasha, Shri Shubham Semwal,
Shri Sachin Kashyap & Dr. R.Siva Chidambaram

Objective:

- Development of light weight composite using stone waste and waste pozzolanic materials.
- Development of light weight composite with fly ash content should be produced in tile making.
- Performance improvement by using natural/synthetic fibres.
- Scale up of the developed process up to pilot level.

Progress Highlights/ Significant Achievements:

Expanded polystyrene (EPS) sheet-based sandwich composite

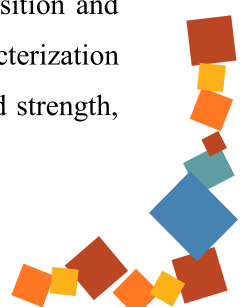
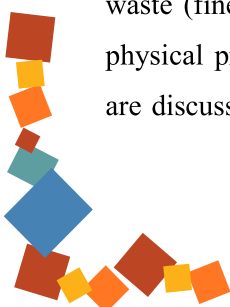
1.1 Panel geometry

Sandwich panel consist of two exterior fiber reinforced high performance concrete having 25 mm thickness each as structural layer, two vermiculite cementitious composite having 10 mm thickness, and expanded polystyrene (EPS) sheet having thickness 70 mm was used as insulating layers. Basalt fiber reinforced polymer (BFRP) were used as connector between the fiber reinforced concrete wythes. Lightweight aggregate concrete containing vermiculite is also used in core layer to enhance shear strength of composite. The objective of composite panel to optimize the weight vs strength, stiffness and thermal transmittance while using various connector (type & spacing) and solid waste such as lime-stone slurry, fly ash and vermiculite. The adopted panel dimension is 1000 mm (length) × 600 mm (width) × 140 mm (total thickness).

*The panel dimensions used in this study are not intendent to optimize geometry. It is only for ease of testing of developed sandwich composite.

1.2 Fiber reinforced high performance concrete wythes

Self-compacting concrete was developed using cement (OPC 43 grade), fly ash (class F), limestone waste (fine aggregate & slurry) and fiber (polypropylene & basalt). The chemical composition and physical properties of cement, fly ash, kota-stone slurry was investigated. Material characterization are discussed in details in earlier reports. Various mix trials were performed to get desired strength,



workability of facing layers. Polypropylene & basalt fiber, super plasticizer dosages are adjusted to obtain required flexural strength and workability. Several mechanical and thermal tests are performed to find compressive strength, flexural strength and thermal conductivity of fiber reinforced concrete wythes (Fig. 1).

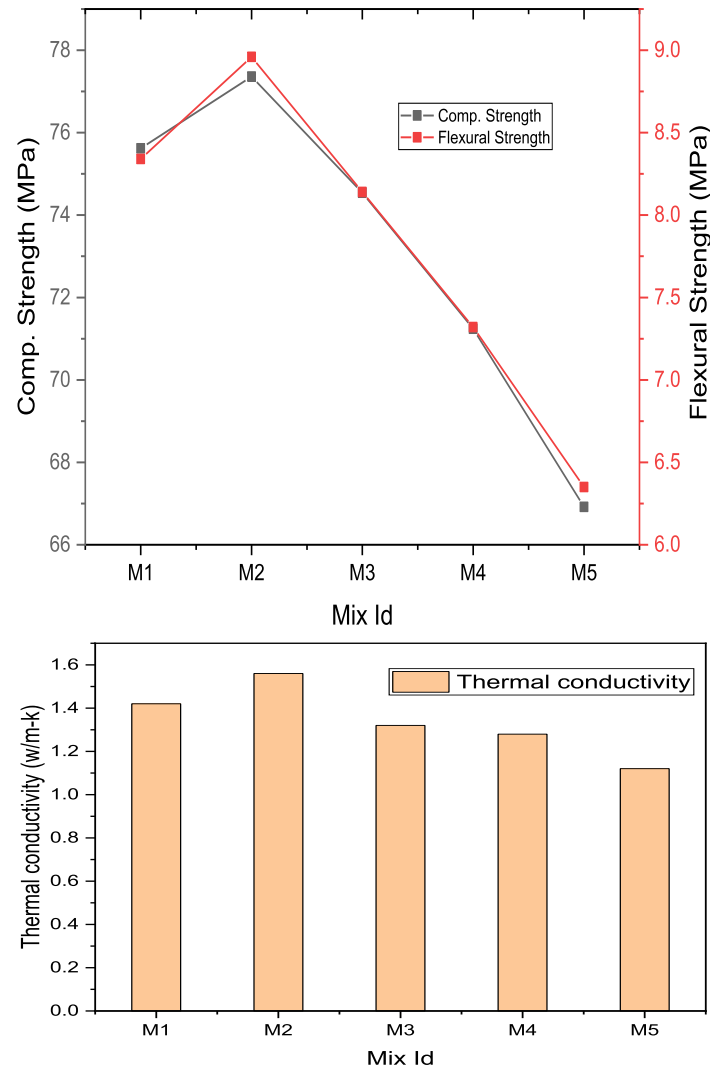


Fig. 1 Mechanical and thermal properties of high performance fibre reinforced

1.3 Expanded polystyrene (EPS) sheet

Expanded polystyrene (EPS) sheets were purchased from market and performed several tests in laboratory of CSIR - CBRI as per IS 4671: 1984. Table 1 given below, presents the various properties of EPS sheet.

Table 1. Characterization of Expanded polystyrene (EPS) sheet.

Characteristics	Results	Criteria	Test method
Bulk density (kg/m^3)	30	≥ 15	IS 5688: 1984
Thermal conductivity (W/m-K)	0.0284	0.029	IS 3346: 1980
Compressive strength @ 10 % strain (MPa)	0.52	≥ 0.14	IS 4671: 1984 Appendix A
Cross breaking strength (MPa)	0.86	≥ 0.22	Appendix B
Water vapor permeance (g/m^2)	15	≤ 20	Appendix C
Thermal stability (%)	0.8	≤ 1	Appendix D
Moisture absorption (%)	1	≤ 1	Appendix E
Fire rating	E	Self-extinguishable	Appendix F

1.4 Fiber reinforced polymer (FRP) connector

The connectors join the insulation (thermal layer) and concrete (structural layers) together. It helps to maintain the structural integrity of sandwich composite. They can also transfer lateral shear forces between the two concrete layers to achieve composite action. The degree of composite action is dependent on the type of connector used. Early PCSPs used cast-concrete connectors, but in modern panels metal and plastic ties are more common. All ties bridge the insulation layer creating a thermal bridge. The extent of which depends on the size and material of the connector. The challenge is to provide structural shear transfer while minimizing the thermal bridge. FRP materials are a composite material made up of a polymer matrix embedded with fibres. These composite materials are inherently variable, and their properties vary as a consequence. Table 2 summarized the various different FRPs that could be used as connectors and their relevant parameters.

Alkali-resistant Basalt FRP is used as connector which is purchased and tested in our lab. Basalt FRP having several advantages because it provides good structural stiffness while limiting the thermal bridging. Also, basalt fiber having high melting point which enables to enhanced the performance of panel subjected to fire.

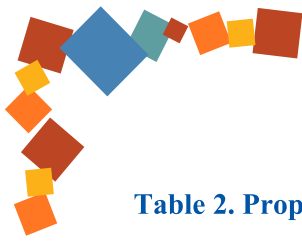


Table 2. Properties of steel compared with different FRP materials, used in concrete sandwich panels.

Material	Tensile strength (MPa)	Young's modulus (GPa)	Thermal conductivity (W/m-K)
Steel	483-690	200	50
CFRP	600-3690	120-580	5-8
GFRP	483-1600	35-51	0.3-1
BFRP	1100-1700	65-70	0.8-1
BFRP*	1457	72	-

* Test performed in our lab.

2. Methodology

2.1 Structural performance (3 – Point bending)

Precast FRC concrete sandwich panels were fabricated and tested under three points flexural load to evaluate their flexural performance. Each PCSPs was assembled with two rows of BFRP connectors. The dimensions of the PCSPs were 1000×600×140 mm (i.e., length × width × thickness). The reinforced concrete wythe was 25 mm thick, and the core EPS insulation was 70 mm thick. A linear variable differential transformer (LVDT) was placed at the mid-span to measure the deflection. Two LVDTs were also attached at the two ends of the specimens to measure the relative end slips between the two concrete wythes. The load was applied by a hydraulic jack. Strain gauges were attached along the longitudinal rebars and on the top surface of the specimens at the mid-span locations to measure the compressive strains of fiber reinforced high performance concrete.

2.2 Thermal transmittance (U- value)

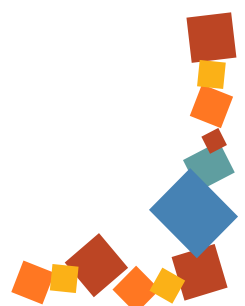
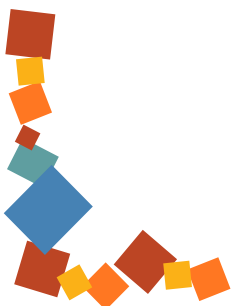
As per ASTM C168, Thermal transmittance is the heat transmission in unit time through unit area of a material construction and the boundary air films, induced by unit temperature difference between the environments on each side. This is more of an engineering term used to designate the thermal performance of a system as opposed to a homogeneous material. The lower the U-value, the lower the rate of heat flow for a given set of conditions. A well-insulated building wall system will have a much lower U-value, or thermal transmittance, than an uninsulated or poorly insulated system.

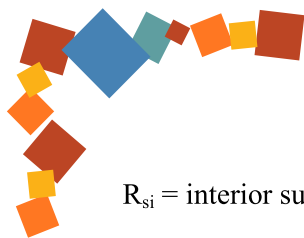
$$U - value = \frac{1}{Rt}$$

$$Rt = R_{si} + R_1 + R_2 + R_3 + \dots + R_{se}$$

Where Rt = sum of total thermal resistance

R_1, R_2, R_3 are the thermal resistance of each layer





R_{si} = interior surface thermal resistance &

R_{se} = exterior surface thermal resistance is taken from Table 4.1 of

ECBC user guides result based on empirical studies.

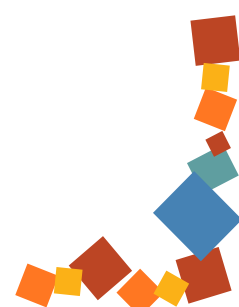
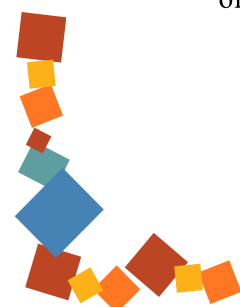
2.3 Test Results

Table 3. Sandwich precast composite panels

Properties	Results	Criteria	Test method
Dimension(mm)	1000×600×75	-	
Dry density (kg/m^3)	1146	-	IS 2380(III):1977
Axial load (kN/m)	In process	600	ASTM E-72: 2015
Bending (kN)	31.2	5	ASTM E-72: 2015
Flexural Strength (MPa)	8.3	5.8	IS 2380(IV):1977
Thermal transmittance ($\text{W/m}^2\text{-K}$)	0.425	0.44	IS 3346(1980)/ BS 4370(IV):1993
Fire resistance (minut), 50 mm	In process	60	IS 3809:1979 / BS 476(20-22):1987
Fire Propagation index (I), 50 mm	In process	3.7	BS 476(6):1989
Surface spread of flame, 50 mm	In process	Class I	BS 476(7):1997
Ignitibility, 50 mm	In process	Class P	BS 476(5):1979

Findings/Observations

1. The thickness of wythes did not have much influence on the failure mode. In case of axial compression test, the specimens cracked along the height and both the wythes and the core acted together during the test.
2. Unit weight and thermal transmittance significantly reduced by expanded polystyrene (EPS) sheet. Shear stiffness of EPS was considerably enhanced by vermiculite lightweight concrete.
3. The panels showed signs of post cracking residual strength after significant cracking of the concrete due to both the BFRP shear grid and fibres. This resulted in an overall ductile failure of the panel. Further studies is going on.



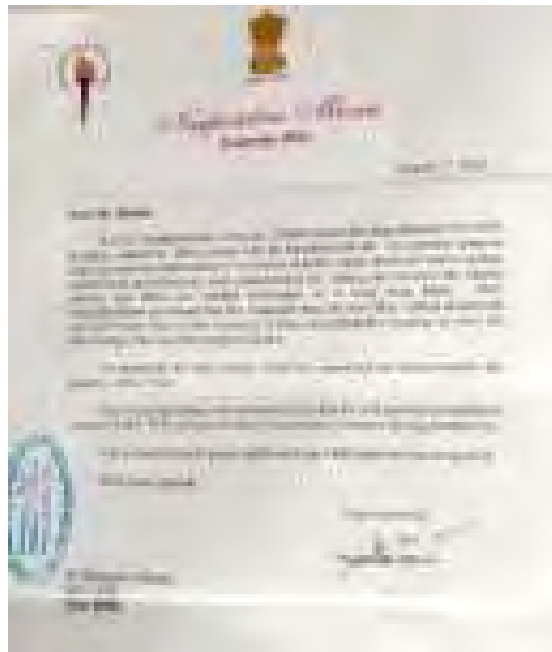
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The work done for the Structural Analysis and design modifications towards the design of Shri Ram Mandir, Ayodhya are being practically implemented and was also well appreciated by Shri Nripendra Mishra Ji, Chairman Ram Mandir Construction.



**Appreciation from Shri Nripendra Mishra Ji, Chairman Ram Mandir Construction
for the Structural Analysis and design of Shri Ram Mandir, Ayodhya**



Shri Ram Mandir Ayodhya - Wooden model fabricated at CSIR-CBRI

Structural Assessment of Mahakaleshwar Temple, Ujjain

Dr. Achal K. Mittal, Dr. Siddharth Behera, Dr. Debductta Ghosh,
Er. Sh. Rajeev K. Sharma, Sh. D.S. Dharmasaktu and Sh. Rishabh Aggarwal

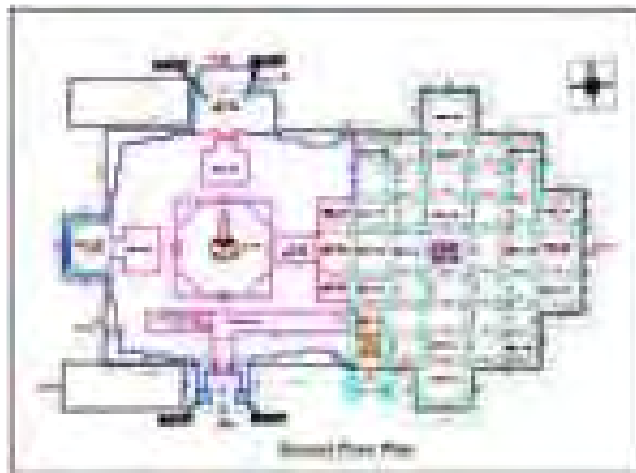
Mahakaleshwar Jyotirlinga is a Hindu temple dedicated to Lord Shiva and is one of the twelve Jyotirlingams, shrines which are said to be the most sacred abodes of Lord Shiva which is located in

Ujjain, M.P. The temple has five levels, in which the under-ground, ground, first and second floor level are respectively installed the lingams of Mahakalesvara, Omkaresvara and Nagachandresvara. The temple itself is located in a spacious courtyard surrounded by massive walls near a lake/pond.

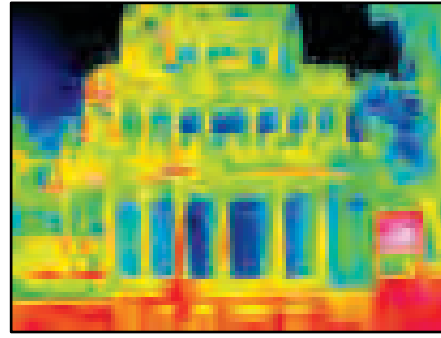
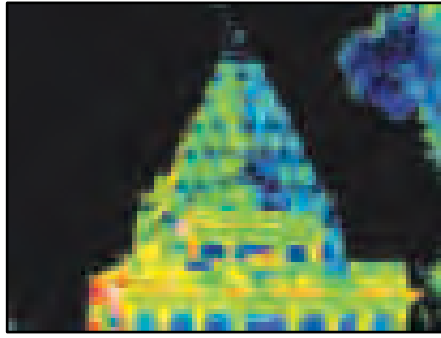


Eastern Face and Western Face of Mahakaleshwar Temple

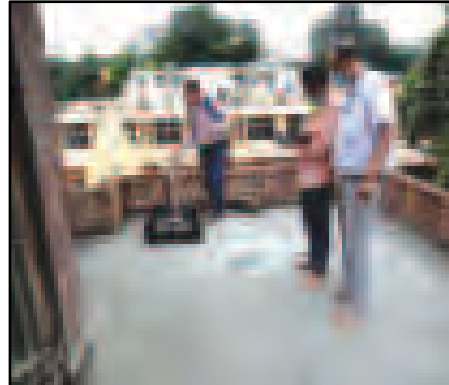
The Mahakaleshwar temple made up of two types of material i.e., basalt stone (Upto second floor) and brick masonry with lime mortar (above second floor). However, parapet and chajjas are made using red sand stone. The total height of the temple is around 30m (Basement to Top) and the height from ground floor level, it is 25.7m. The main wall of temple is around 3m thick from basement floor to second floor level. The temple is load bearing masonry structure. Veranda is constructed towards the eastern side of the temple. Flooring of veranda is made up of flat stone slabs or curved domes which intern are supported on stone beams. Finally, the load of the veranda portion is transferred to the ground through stone columns.



For the overall maintenance and preservation of the Mahakaleshwar temple, CSRI-CBRI identified the distress location in the structure during detailed visual inspection and did further NDT for evaluation. Thermal Imaging, Ground Penetration Radar (GPR) Test, Core Cutting and Compression testing at CBRI were carried out. A Structural Stability Analysis has also been carried out by generation of 3D model in Revit which was later analysed using Ansys 15.0 to identify the maximum stressed locations.



Thermal Imaging



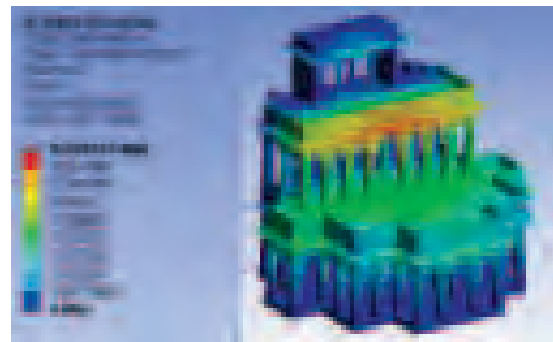
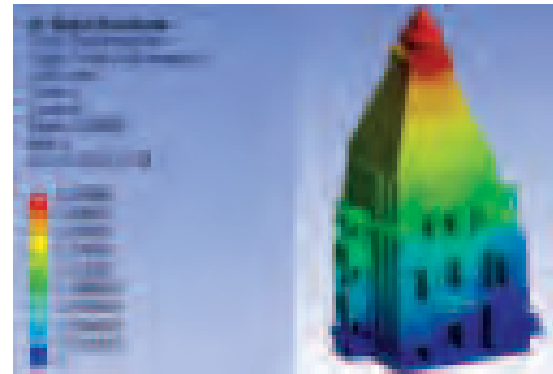
GPR Investigation



Core Samples



3D Revit Model



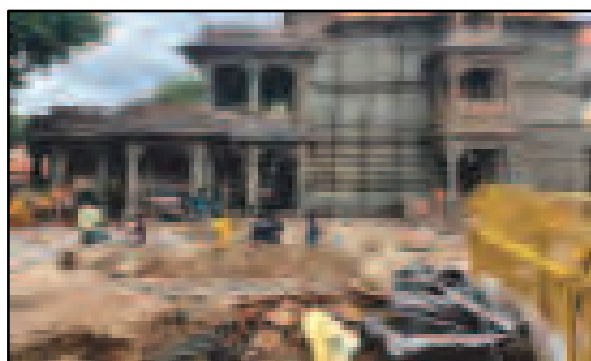
Structural Analysis of Mahakaleshwar Temple in Ansys

At the time of inspection, CSIR-CBRI team was informed that there are thousands of devotees who come to worship on Nagpanchami and there is a narrow staircase leading to Nagachandresvara Temple (second floor). This temple opens only once in a year for nearly 24 hours. Therefore, there was a need to facilitate darshanas for large number of devotees during Nagpanchami Day without compromising the structural safety of the Mahakaleshwar Temple.

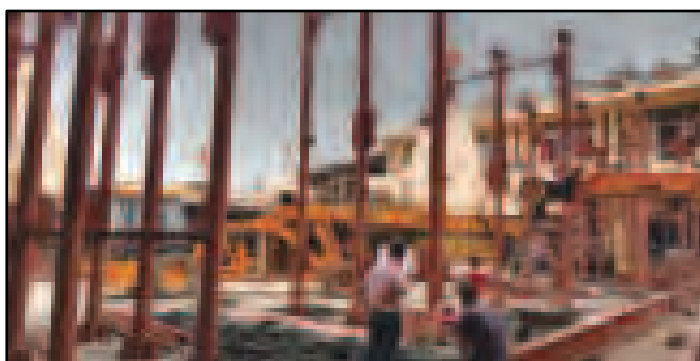
CSIR-CBRI proposed for an aerobridge to be constructed for the devotees taking them directly to the Nagachandresvara temple. The aerobridge is to be designed in such a way so that no load is transferred to the main temple structure.

CSIR-CBRI interacted with the designer and held several online and offline meetings to discuss various design issues. Accordingly, the designer revised the structural drawings based on CSIR-CBRI suggestions. CSIR-CBRI finally checked the design and shared the drawings of the aero bridge to the Mandir Samiti for further necessary action.

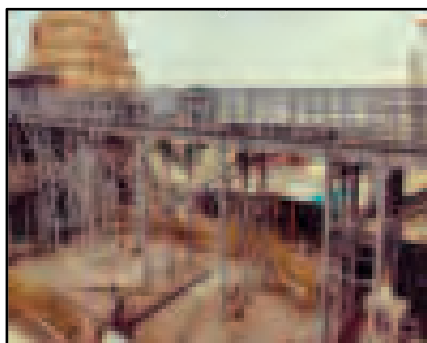
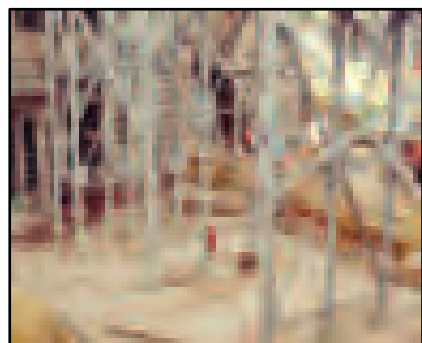
CSIR-CBRI carried out inspection during the construction of the aerobridge and provided on-site suggestions. The aerobridge was completed and in the year 2022, the devotees used it without any hassles. It also facilitated the district administration for managing the crowd in and around the Mahakaleshwar Temple premises.



Excavation work



Construction of Aerobridge

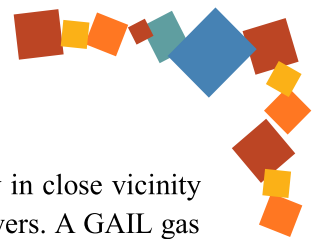
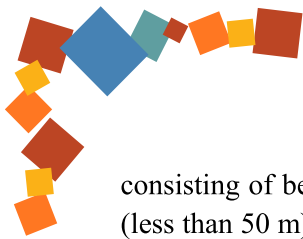


Construction of Aerobridge nearly Completion at Mahakaleshwar Mandir

Safe Demolition of Twin Towers in Noida: Role of CSIR (CBRI & CIMFR)

Dr. N. Gopalakrishnan, Dr. Anjan Ray, Dr. D.P. Kanungo, Dr. C. Sawmliana,
Dr. Harsh Verma, Dr. Manojit Samanta, Er. Mickey Mecon Dalbehera,
Dr. Debdutta Ghosh & Mr. Suman Kumar

Honourable Supreme Court passed an order on dated: 31.8.2021 to carry out the demolition of Supertech Twin Tower, NOIDA Buildings (Tower 16: Ceyane, 97 m in height) and Tower 17: Apex, 103 m in height). The Honourable court also asked Noida authority to engage CSIR-Central Building Research Institute (CSIR-CBRI) to carry out the demolition work to ensure the overall safety of adjacent structures. A team of seven scientists from two CSIR labs (CBRI & CIMFR) are involved in various aspects of the project. The scope of work includes the safe demolition of twin towers and preventing the distress to the adjoining structures. The twin towers are reinforced concrete structures



consisting of beams, columns and shear walls. Seven adjacent towers of 9-12 storey in close vicinity (less than 50 m) are located. The closest one is at a distance of 9 m from the twin towers. A GAIL gas pipe line is located at a horizontal distance of 15 m from the twin tower. The depth of gas pipe line is 3-4 m subsurface and diameter of 450 mm. The full operating pressure of the gas pipe line is about 40 - 47 kg/cm². The presence of utility structures and functional building in close proximity poses the challenge of twin tower demolition. CBRI in consultation with NOIDA engaged M/s Edifice, India for the demolition of the twin towers. M/s Edifice collaborated with M/s Jet Demolition of South Africa as implementation agency. The CSIR Team was involved in the whole execution process of the demolition. The team consisting of both the laboratory involved in blast design and quality review, numerical modelling of progressive collapse of building, review of strategy to reduce the flying debris and air over pressure through wire mesh and geo-textile fibre wrapping, prediction of ground vibration and safety of adjacent structures, review of pre- and post-demolition structural audit and analysis, pre-demolition strengthening measures of adjacent structures (permanent and temporary), vibration reduction measures for ground and GAIL gas pipe line. Around 9640 holes (approximately 19 km length) are drilled and 3700 kgs of explosive are used for the demolition.

An extensive instrumentation scheme comprising of nineteen seismographs and air over pressure measurement units around 250 m zone, thermal imaging of building during demolition, imaging through high speed camera for collapse mechanism and pre-, during and post-demolition drone survey for collapse mechanism and debris footprint estimation was adopted. Further, 10 black boxes containing IMU sensor units for monitoring the falling interim characteristics were installed at different floors of twin towers.

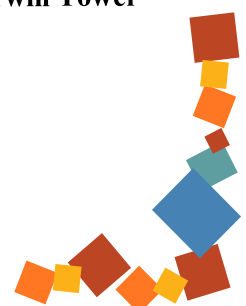
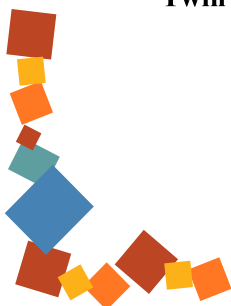
The twin towers were demolished on 28.08.2022 at 2:30 PM. The post demolition survey shows the no distress of the adjacent structures and debris foot print in designed location.



Twin Tower with geotextile protection



Debris footprint after demolition of Twin Tower



A Tale of Joshimath Land Subsidence

Safe Demolition/Dismantling of Hotels and Residential Buildings

**Dr. D.P. Kanungo, Dr. Manojit Samanta, Dr. Debdutta Ghosh,
Er. Ashish Pippal and Dr. Suman Kumar**

CSIR-CBRI was entrusted by the administration of Joshimath and Govt. of Uttarakhand for safe demolition of hotels and other residential buildings posing high risk to the surrounding structures and lives in the land subsidence affected area in Joshimath. The task before CSIR- CBRI was to provide technical guidance and overall supervision of safe demolition process. Initially two hotels namely Malari Inn and Mount View had to be demolished and subsequently another four residential buildings were safely demolished as per the order of the local administration.

The journey started with a meeting in Uttarakhand State Disaster Management Authority Secretariat and subsequently 3 scientists including Director, CSIR-CBRI were airlifted to Joshimath on 9th January 2023 to inspect both the hotels and fix the strategy for immediate safe demolition. On 10th January 2023, a team of 5 scientists with past experience of safe demolition of Supertech Twin Towers in Noida were deployed at site for the operation. As the surrounding area was densely habituated and the both the multi-storeyed hotels were standing on a very steep slope, it is unanimously decided to go for a mechanical way of demolition/dismantling with the locally available tools and manpower keeping utmost importance to the safety of lives, properties and surrounding structures. It was also decided that Uttarakhand PWD in Joshimath will execute the operation with technical guidance and overall supervision from CSIR-CBRI team.

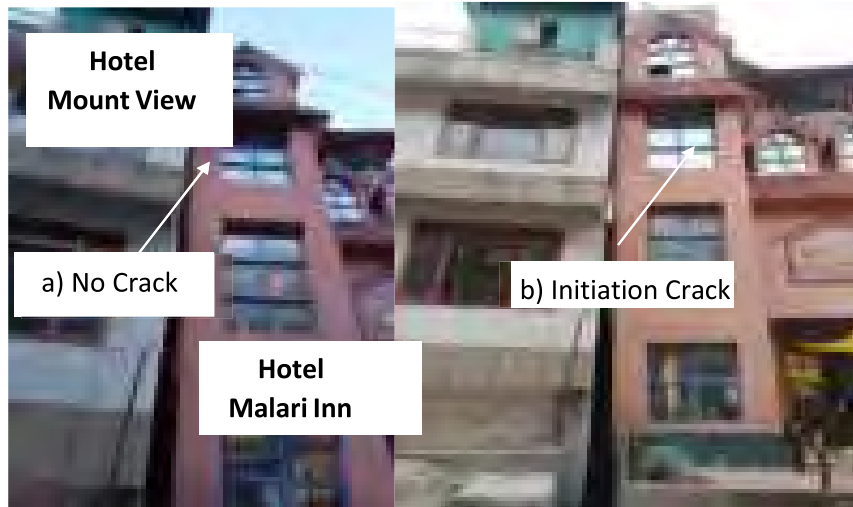


The Director, CSIR-CBRI departed a team of scientist for safe execution of the operation (Dr. D.P. Kanungo, Dr. Manojit Samanta, Dr. Debdutta Ghosh, Mr. Ashish Pippal and Dr. Suman Kumar) on 10th January 2023

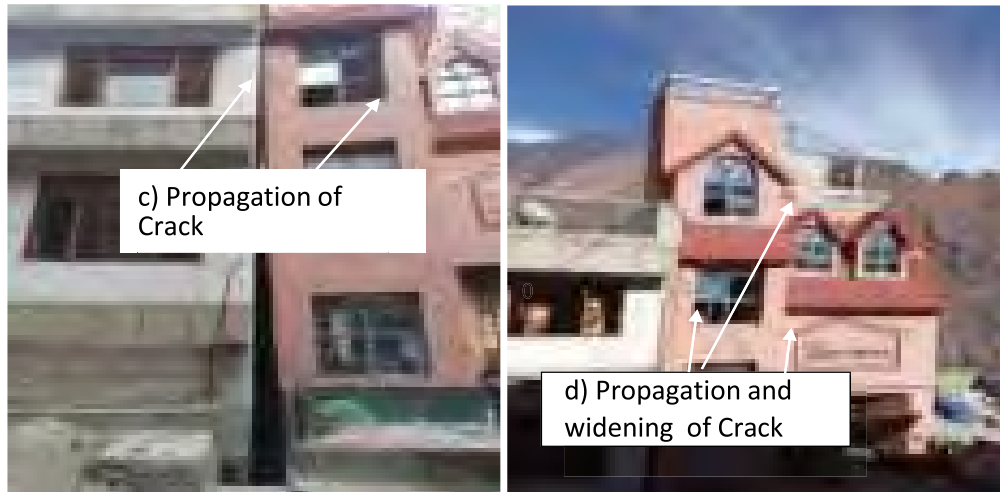
Safe Demolition of Mount View and Malari Inn Hotels:

The demolition and dismantling of two hotels Malari Inn (7 storeyed including 2 basements) and Mount view (4 storeyed including 2 basements) in Joshimath started from 12th January, 2023. To execute the task, general guidelines and necessary instructions along with SOPs have been issued to PWD (the executing department) and State Administration from CSIR-CBRI. The safety measures to control the vibration and sudden impact have been given. It was decided that the two hotel buildings are to be demolished by mechanical means with minimal vibration possible. All necessary list of equipment/tools, operators and instruments have been shared with Administration and PWD. The administration is requested to deploy SDRF and NDRF with all human safety measures and police force to control the movement of people and vehicular traffic.

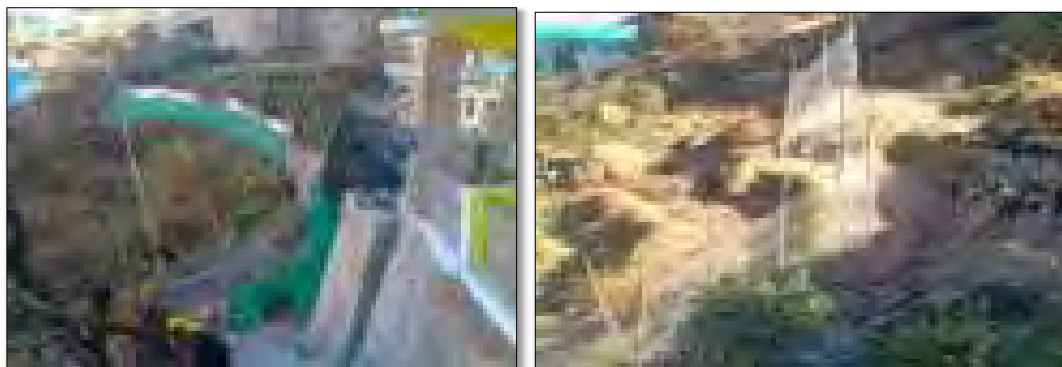
Progression of cracks in Malari Inn and reduction of GAPS between two Hotels with time



a(11.1.2023), b(12.1.2023), c(14.1.2023), d(15.1.2023).



On the downhill side of these two hotels, two temporary barricading fences with 4 layers of wire mesh have been erected to arrest the unforeseen fall of demolition debris (if at all) for the safety of houses, people and vehicular traffic on the downhill road. All the houses in at least 25 m radius have been vacated prior to starting of demolition/dismantling process.



Barricading fences on downhill side of hotel buildings

With the time the distresses in both the buildings are increasing. One building is pounding over the other and forces are getting transferred from each other. Based on the prevailing circumstances, the

strategy for demolition is getting changed from time to time. Initially, it was planned to dismantle the Malari Inn hotel as it was leaning towards Mount View Hotel; however, with passing of time it was observed that the Mount View Hotel is shifting towards downhill side and started leaning on Malari Inn Hotel. Hence, it is decided that Mount View will be dismantled at the first instance and simultaneously the height of Malari Inn will be reduced through dismantling.



Post-demolition View of Hotels Mount View and Malari Inn

Safe Demolition of PWD Inspection House (RCC Building):



Safe Demolition of Buildings in Manohar Bagh Ward:



RCC building demolition in progress



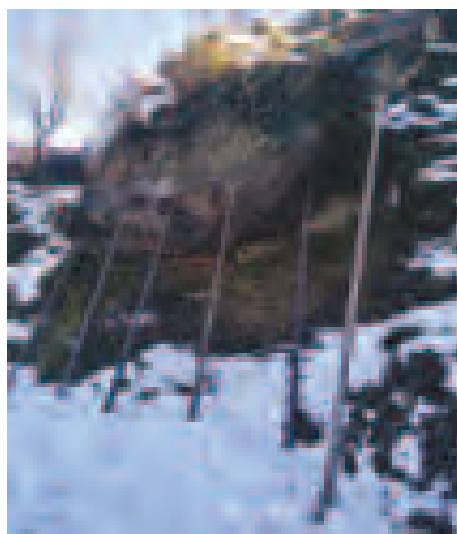
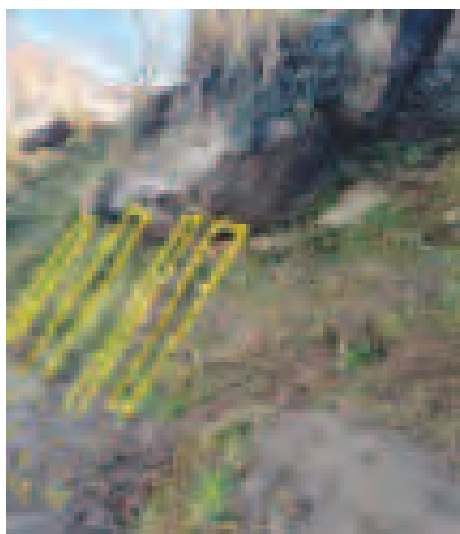
Stone-Mud mortar House under demolition

Safe Demolition of Building in Sunil Ward:

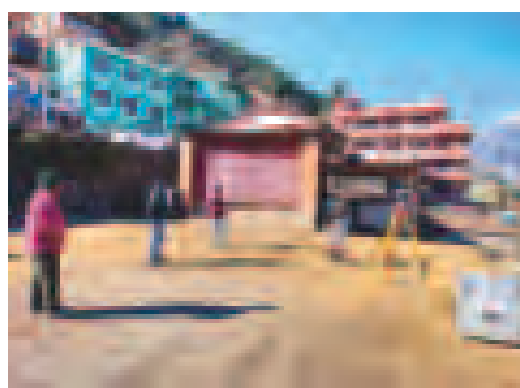


RCC building demolition in Sunil Ward

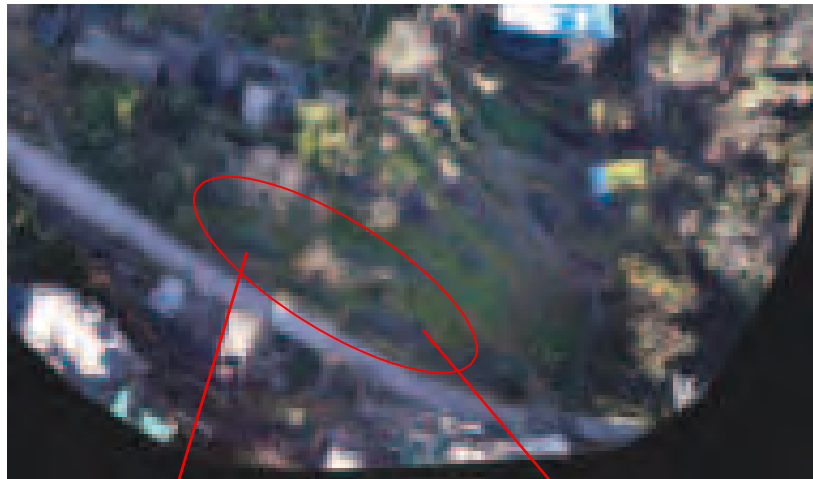
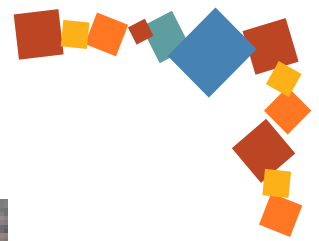
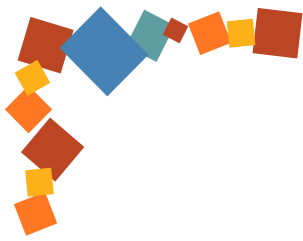
Apart from the safe demolition/dismantling of different buildings, CSIR-CBRI also extended on the spot technical guidance for arresting the huge hanging rock boulders on hill slope in and round the habituated areas.



Additionally, CSIR-CBRI also carried out drone survey using RGB Photogrammetry sensor (camera) in parts of the affected areas to explore the possibility of interpreting ground based information.

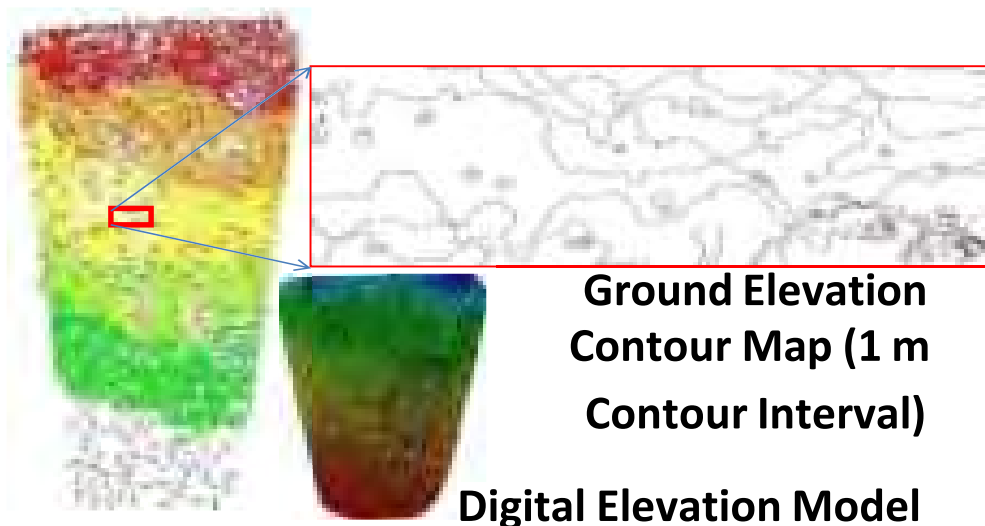


**CSIR-CBRI Drone Survey Team (Dr. D.P. Kanungo, Er. Shashank Bhatnagar,
Dr. Rajesh Kumar Dash & Ms. Rajashree Pati)**



Drone based Orthomosaic Image with 40 cm resolution

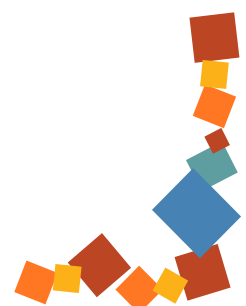
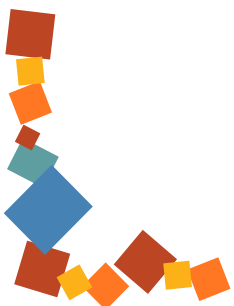
Drone based Ground Crack Mapping (Crack width up to one pixel (i.e., 20 cm))



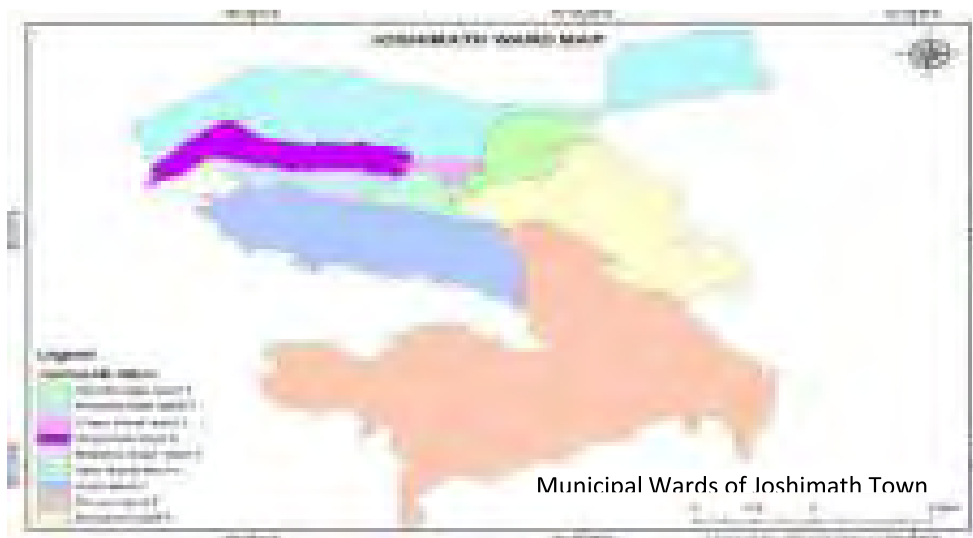
**Ground Elevation
Contour Map (1 m
Contour Interval)**

Digital Elevation Model

Drone based Elevation Contouring



Safety Assessment of Buildings in Joshimath



Joshimath Land Subsidence issue refers to the gradual sinking of land in the area located near Joshimath - Auli road at a height of 2,180 meters. In September 2022, a report of the Government of Uttarakhand confirmed that the hill town Joshimath is sinking gradually. But sudden land descends were noticed on just 12 January 2023. A large number of homes developed cracks, forcing people to move into government-run shelters.

Joshimath, a gateway to well-known pilgrimage sites (like Badrinath and Hemkund Sahib), is a holy cave, where Adi Shankaracharya is claimed to have practised tapasya during the 18th Century. An ancient temple of Lord Vishnu in Narsingh Avtar is located in Joshimath as the main temple in the area. Also, Auli (a hill station close to Joshimath) is a well-known international skiing resort. Joshimath has significant presence of the Indian Army; this army post is the one nearest to the Indo-Tibetan Border.

Joshimath Tehsil has nine wards, namely Gandhinagar, Marwari, Lower Bazar, Singdhar, Manoharbagh, Upper Bazar, Sunil, Parsari and Ravigram shown in above figure. As per 2011 Census of India, Joshimath town has a population of 16,709; in 2022, it is estimated to be 48,000. The livelihood of the local people is mainly revenues from tourism, agriculture and livestock.

The Joshimath town (which grew over time) rests on 500 m thick landslide debris; the soil has low bearing capacity. Joshimath experienced soil subsidence in the year 1976, which caused cracks in some homes. The report of the then-Commissioner of the Garhwal Division, stated that cavities between the earth and the boulders are the result of the existing soak pits, which cause soil erosion and water seepage; in addition, the absence of adequate drainage facilities accounts for the land subsidence. At present the issue is aggravated resulting in large number of cracks on the ground and buildings in many wards.

To address the issue, CSIR-CBRI undertook the task of safety assessment of buildings in Joshimath.

Distress evaluation in houses:

Cracks in buildings

The majority of buildings in Joshimath region are constructed using brick, concrete block or stone with mortar joints. These materials possess significant compressive strength but their ability to

accommodate tension is limited. As a consequence, if tension stress develops cracking frequently occurs. There are numerous possible causes of cracking. There may be a single cause or a combination of several causes, or one primary cause with several contributory factors. Some common causes of cracking are listed below:

Foundation subsidence: Foundation subsidence is the downward (or upward or lateral) movement of the foundation and takes place independent of the load from the building foundation.

- Typical causes of subsidence are:
 - ✓ The expansion and shrinkage of clay soils with changes in moisture content
 - ✓ Leaking drains which causes “washout” or softening of the soils supporting the foundation
 - ✓ Landslip of sloping ground
 - ✓ Made or filled ground

Structural damage

In general, the damage in building varies depending on masonry material, workmanship, construction practice and geometrical configuration. The damage limitation requirements are important to define usability and displacement capacity of building. The damages in building have been uniformly classified in different grades at European Macroseismic Scale (Grunthal,1998).

EMS-1998 classifies the damages in building based on its typology and its deformation characteristics when subjected to lateral loads. A subjective assessment of the damage as recommended by European Macroseismic Scale (Grunthal, 1998) was implemented in the study. Based on the progressive crack width, change in crack-width as after a regular time interval described in the table given below, were considered for classification of vulnerability of the buildings.

Vulnerability Classification

S.No.	Vulnerability Class	Change in Crack width during monitoring period
1	Highly Vulnerable	>5 mm
2	Moderately Vulnerable	Between 2-5 mm
3	Slight Vulnerability	Between 0.5-2 mm
4	Safe	< 0.5 mm

A detailed study of prevailing construction material used, construction practices, building typology and foundation system of identified buildings in 9 wards of Joshimath region was performed at the first instance. Subsequently, the installation of crack-meters at appropriate locations followed by detailed crack measurements and monitoring is performed at frequent intervals. The anomalous increase in crack-widths in most of the identified buildings is compelling evidence that ground subsidence/movement is the root cause of distress in buildings. The team does not have any information of cracks in buildings prior to the initiation of reported activity in the area and hence cannot determine the cause of the structural damage with absolute certainty.

The buildings constructed along the road, with one or more storeys below the road level and connected to the road, have shown excessive cracking in the structural elements in the direction of the slope. The probable cause of this distress may be due to excessive lateral load due to backfill of the road, movement of heavy vehicles over the road and non-engineered construction. The above conclusions are drawn based on limited data collected during the monitoring period. However, it will be prudent to establish this fact through further extensive monitoring of these buildings in the future also.



Safety Assessment of Buildings, Joshimath, Uttarakhand



Shear failure due to settlement and rising of floor

Horizontal crack in masonry

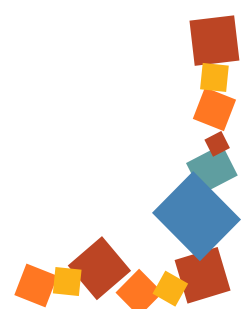
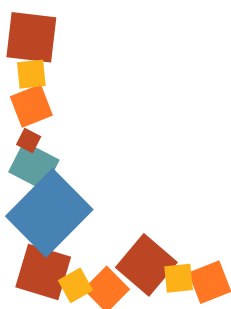


Shear failure towards hill slope

Land Subsidence and fracture



Crack Monitoring in buildings in Joshimath region





Academy of Scientific & Innovative Research (AcSIR)

AcSIR Activities during 2021-22

The institute has been conducting an integrated M.Tech - Ph.D. (IMP) programme under the aegis of the Academy of Scientific & Innovative Research (AcSIR) since 2010 in the area of ‘Building Engineering & Disaster Mitigation (BEDM)’, which is now changed to “Building Engineering & Construction Technology” from 2019. From this year, Integrated Dual Degree Programme (IDDP) has been started, in which M.Tech & Ph.D. degrees will be awarded together after completion of the course. The institute also offers Ph.D. in the area of Engineering Sciences, Chemical Sciences, and Physical Sciences. The details of different batches are given below:

IDDP Program:

- 1st Batch (Aug,21) - 04 Students joined the institute
- 2nd Batch (Jan,22) – No Admission

Ph.D. Program:

- In Aug, 2021, 5 students joined Ph.D. Programme in Engineering Sciences, and 3 students in Chemical Sciences.
- In Jan 2022, there is no admission in this semester.

Presently, a total of 34 Ph.D. students and 13 IDDP students are enrolled in AcSIR at CSIR-Central Building Research Institute (CBRI), Roorkee.

Some of the highlights of student activities in the current year are:

Awards and Recognitions:

1. **3rd prize (Engineering category) in Saransh** awarded to Ekansh Agarwal – 3 min national level thesis competition for Ph.D. students organized by Indian National Young Academy of Sciences (INIAS) - the first and only recognized young scientist academy of India.
2. **HDR Engineering Prize** awarded to Ekansh Agarwal by STEM College. RMIT Australia for achievements in 2021.
3. **Best paper presentation** awarded to Moka Vijay Tarun Kumar, Chidambaram RS for the paper titled “Role of Coupler in Structural Behavior of RC Elements- A review” in “2nd International Conference on Recent Trends in Construction Materials and Structures (ICON2021)” organized by Department of Structural and Geotechnical Engineering, School of Civil Engineering, VIT Vellore & Swinburne University of Technology, Sarawak campus, Malaysia, during 25th - 26th, November 2021.

Fellowships:

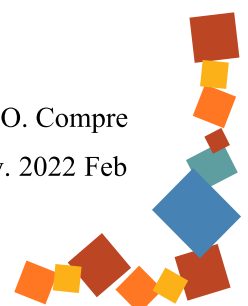
1. **Science and Engineering Research Board (SERB)–Overseas Visiting Doctoral Fellowship (OVDF) 2021** awarded to Ekansh Agarwal to pursue research for 12 months at Purdue University, West Lafayette, USA (25 students are selected from various Institutes of Repute throughout the country).
2. **AcSIR – RMIT Joint Badge Ph.D. fellowship 2021** awarded to Ekansh Agarwal to pursue Joint Ph.D. from Royal Melbourne Institute of Technology (RMIT), Australia.



3. **Indo-German Science & Technology Centre** awarded to Kuchipudi Naga Venkata Sai Teja – Ph.D Industrial Exposure Fellowship (IGSTC-PIEF), Call 2022. (Declared-July 2022)

Publications (SCI):

1. Agarwal E, Pain A, Mukhopadhyay T, Metya S, Sarkar S. Efficient computational system reliability analysis of reinforced soil-retaining structures under seismic conditions including the effect of simulated noise. *Engineering with Computers*. 2022 Jun;38(2):901-23.1-23. <https://doi.org/10.1007/s00366-020-01281-8>. (IF: 7.963)
2. Agarwal E, Pain A. Efficient Probabilistic Stability Analysis of Geosynthetic Reinforced Slopes Using Collocation-Based Stochastic Response Surface. *International Journal of Geomechanics*. 2021 Oct 1;21(10):04021189. [https://doi.org/10.1061/\(ASCE\)GM.1943-5622.0002157](https://doi.org/10.1061/(ASCE)GM.1943-5622.0002157). (IF: 3.819)
3. Agarwal E, Pain A. Probabilistic stability analysis of geosynthetic-reinforced slopes under pseudo-static and modified pseudo-dynamic conditions. *Geotextiles and Geomembranes*. 2021 Dec 1;49(6):1565-84. <https://doi.org/10.1016/j.geotexmem.2021.07.005>. (IF: 5.292)
4. Agarwal E, Pain A. Reliability assessment of reinforced slopes with unknown probability distribution. *Géotechnique*. 2022 Jan 24:1-36. <https://doi.org/10.1680/jgein.21.00106> (IF: 3.663)
5. Agarwal E, Pain A, Sarkar S. Stochastic stability analysis of geosynthetic reinforced slopes subjected to harmonic base shaking. *Transportation Geotechnics*. 2021 Jul 1;29:100562. <https://doi.org/10.1016/j.trgeo.2021.100562>. (IF: 3.293)
6. Solanki A, Singh LP, Karade SR, Sharma U. Functionality of silica nanoparticles on hydration mechanism and microstructure of tricalcium aluminate. *Construction and Building Materials*. 2021 Sep 13;299:124238. <https://doi.org/10.1016/j.conbuildmat.2021.124238>. (IF: 7.693)
7. Solanki A, Singh LP, Karade SR, Sharma U. Mineralogy of tricalcium aluminate hydration with silica nanoparticles. *Construction and Building Materials*. 2022 Jul 18;340:127707. <https://doi.org/10.1016/j.conbuildmat.2022.127707> (IF: 7.693)
8. Sharma U, Solanki A, Singh LP. Granulometric effect of silica nanoparticles on hydration kinetics and microstructure of cement based materials. *European Journal of Environmental and Civil Engineering*. 2022 May 20:1-3. <https://doi.org/10.1080/19648189.2022.2080768> (IF: 2.516)
9. Kapoor NR, Kumar A, Kumar A, Kumar A, Mohammed MA, Kumar K, Kadry S, Lim S. Machine learning-based CO2 prediction for office room: a pilot study. *Wireless Communications and Mobile Computing*. 2022 Mar 7;2022. <https://doi.org/10.1155/2022/9404807> (IF: 2.146)
10. Kumar A, Arora HC, Kapoor NR, Mohammed MA, Kumar K, Majumdar A, Thinnukool O. Compressive strength prediction of lightweight concrete: machine learning models. *Sustainability*. 2022 Feb 19;14(4):2404. <https://doi.org/10.3390/su14042404> (IF: 3.889)

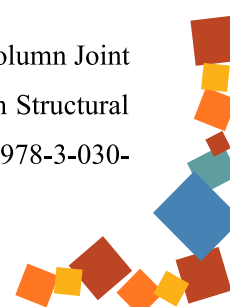


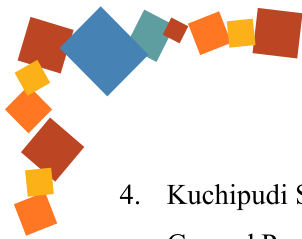


11. Kapoor NR, Kumar A, Alam T, Kumar A, Kulkarni KS, Blecich P. A review on indoor environment quality of Indian school classrooms. Sustainability. 2021 Oct 27;13(21):11855. <https://doi.org/10.3390/su132111855> (IF: 3.889).
12. Kapoor NR, Kumar A, Meena CS, Kumar A, Alam T, Balam NB, Ghosh A. A systematic review on indoor environmental quality in naturally ventilated school classrooms: a way forward. Advances in Civil Engineering. 2021 Feb 18;2021. <https://doi.org/10.1155/2021/8851685> (IF: 1.843).
13. Mittal V, Samanta M. Causes of Failure and Strengthening Measures of a Pile Foundation Supporting Transmission Line Tower. Journal of Performance of Constructed Facilities. 2021 Aug 1;35(4):04021034. 10.1061/(ASCE)CF.1943-5509.0001592 (IF: 2.372).
14. Mittal V, Samanta M. Closure to “Causes of Failure and Strengthening Measures of a Pile Foundation Supporting Transmission Line Tower. Journal of Performance of Constructed Facilities. 2022 Aug 1;36(4):07022004. [https://doi.org/10.1061/\(ASCE\)CF.1943-5509.0001592](https://doi.org/10.1061/(ASCE)CF.1943-5509.0001592). (IF: 2.372).
15. Das S, Sarkar S, Kanungo DP. GIS-based landslide susceptibility zonation mapping using the analytic hierarchy process (AHP) method in parts of Kalimpong Region of Darjeeling Himalaya. Environmental Monitoring and Assessment. 2022 Mar;194(3):1-28. <https://doi.org/10.1007/s10661-022-09851-7> (IF: 3.307).
16. Kuchipudi ST, Ghosh D, Gupta H. Automated Assessment of Reinforced Concrete Elements using Ground Penetrating Radar. Automation in Construction. 2022 Aug 1;140:104378. <https://doi.org/10.1016/j.autcon.2022.104378> (IF: 10.517).
17. Kumar A, Arora HC, Mohammed MA, Kumar K, Nedoma J. An optimized neuro-bee algorithm approach to predict the FRP-concrete bond strength of RC beams. IEEE Access. 2021 Dec 31;10:3790-806. <https://doi.org/10.1109/ACCESS.2021.3140046>(IF: 3.476).
18. Kumar A, Arora HC, Kumar K, Mohammed MA, Majumdar A, Khamaksorn A, Thinnukool O. Prediction of FRCM–Concrete Bond Strength with Machine Learning Approach. Sustainability. 2022 Jan 12;14(2):845. <https://doi.org/10.3390/su14020845>(IF: 3.889).

Publications (Non-SCI):

1. Moka VT, Rajendran SC. Role of coupler in structural behavior of RC elements. Materials Today: Proceedings. 2022 May 18. <https://doi.org/10.1016/j.matpr.2022.05.097>.
2. Mittal V, Samanta M. A Critical Review on Design Philosophies of Different Design Standards on Seismic Soil–Structure Interaction. Seismic Design and Performance. 2021:1-3. https://doi.org/10.1007/978-981-33-4005-3_1.
3. Gaur H, Moka VT, Rajendran SC, Kwatra N. Hysteretic Performance of Precast Beam-Column Joint with Improved Energy Dissipation Capacity. In International Conference on Advances in Structural Mechanics and Applications 2022 (pp. 336-349). Springer, Cham. https://doi.org/10.1007/978-3-030-98335-2_22.

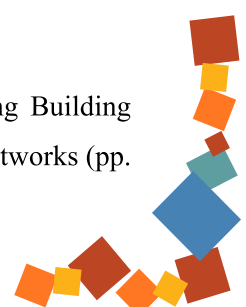
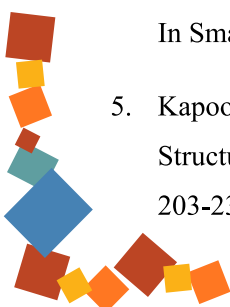




4. Kuchipudi ST, Ghosh D, Yumnam M, Gupta H. Detection of Debonds in Reinforced Concrete Using Ground Penetrating Radar. In Advances in Non Destructive Evaluation 2022 (pp. 219-232). Springer, Singapore. https://doi.org/10.1007/978-981-16-9093-8_18.
5. Baariu K, Moka VT, Chidambaram RS, Karade SR. A Critical Review of the Performances of Precast Structure under Different Types of Loading. Structural Engineering Digest Journal, pp. 102-112, Indian Association of Structural Engineers, 2022.
6. Amith K S, Ganesh Kumar S. "Assessment of Underground Structure- Soil Interaction under Dynamic Conditions through Shaking Table Testing", 8IYGEC-IIT Madras- September 2021.
7. Amith K S, Ganesh Kumar S. "Assessment of Underground Structure- Soil Interaction under dynamic conditions". IGC Trichy -December 2021.
8. Aman Kumar, Amith K S. Vaishnavi , Ganesh Kumar, "Numerical study on Tunnel-Soil Interaction under dynamic loading conditions, December 2021.
9. Neeraj, Pandit K, Sarkar S (2021) Numerical Analysis for slope stability evaluation in rockfall prone area- A case study from Garhwal Himalayas India. Proceeding of international conference EGCON-2021.
10. Dahiya N, Pandit K, Sarkar S (2022) A comparison of slope stability assessment techniques using different rock mass classification systems and finite element method (FEM): A case study from Garhwal Himalayas, India. J. Earth Syst. Sci.
11. Stability assessment of a Himalayan rock slope: a case study using rock mass classifications, kinematic analysis and numerical techniques in EGCON 2021, the international conference on Recent Advances in Geotechnics.

Book Chapter contributions:

1. Jami T, Karade SR, Singh LP. Current Trends in Applications of Cannabis/Hemp in Construction. In Cannabis /Hemp for Sustainable Agriculture and Materials 2022 (pp. 203-237). Springer, Singapore. https://doi.org/10.1007/978-981-16-8778-5_8.
2. Karade SR, Jami T. Application of vegetal concrete for carbon-neutral built environment. Handbook of climate change mitigation and adaptation. Springer, New York/New York, NY. 2021:1-42.
3. Pain A, Agarwal E. Retaining walls–reliability-based approach. In ICE Handbook of Geosynthetic Engineering: Geosynthetics and their applications 2021 (pp. 105-114). ICE Publishing. <https://doi.org/10.1680/icehge.65000.105>.
4. Kumar A, Kapoor NR, Arora HC, Kumar A. Smart Cities: A Step toward Sustainable Development. In Smart Cities 2022 (pp. 1-43). CRC Press.
5. Kapoor NR, Kumar A, Arora HC, Kumar A. Structural Health Monitoring of Existing Building Structures for Creating Green Smart Cities Using Deep Learning. In Recurrent Neural Networks (pp. 203-232). CRC Press.



Workshops attended:

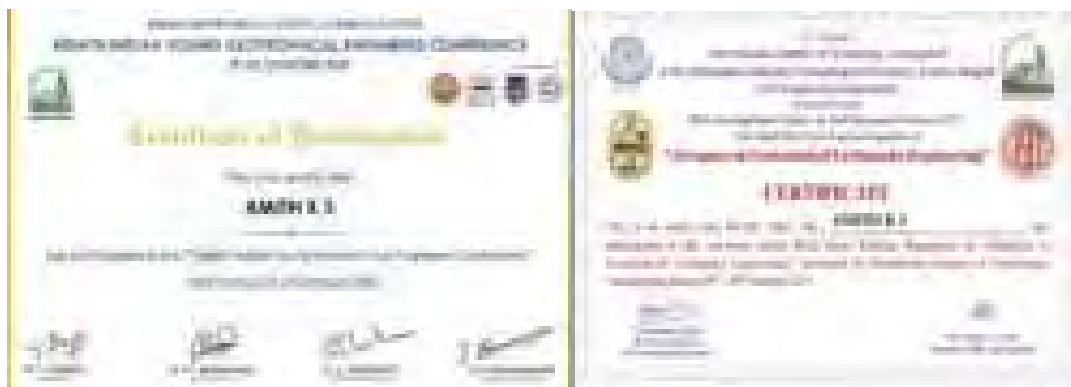
1. Amith KS attended workshop on Advances in Geotechnical Earthquake Engineering, organized by Marthwada Institute of Technology Aurangabad on 25th to 29th October 2021.
2. Amith KS participated in online Faculty Development Programme on Advances in Geosynthetics Engineering, organized by NIT Warangal on 28th Feb to 9th March 2022.
3. Amith KS attended lecture Series on Advanced Finite Element Modelling of Geotechnical Constructions, an International Short-Term Course organized by IIT Roorkee on March 10th to May 26th 2022.

Ph.Ds. Awarded:

1. **Mr. Shubham Singhal** successfully defended his Ph.D. viva-voce examination on 27th December, 2021. His thesis title was “Performance Evaluation of Precast Reinforced Concrete Structural Systems subjected to Cyclic Loading”. He worked under the supervision of Dr. Ajay Chourasia and Dr. Suvir Singh.
2. **Mr. Rajesh Kumar Dash** successfully defended his Ph.D. viva-voce examination on 08th December, 2021. His thesis title was “Debris Flow Hazard Assessment in Garhwal Himalaya, India”. He worked under the supervision of Dr. DP Kanungo.

Certificates:





AcSIR Activities during 2022-2023

IDDP Program:

- 1st Batch (Aug,22) - 04 Students joined the institute
- 2nd Batch (Jan,23) – 02 joining

Ph.D. Program:

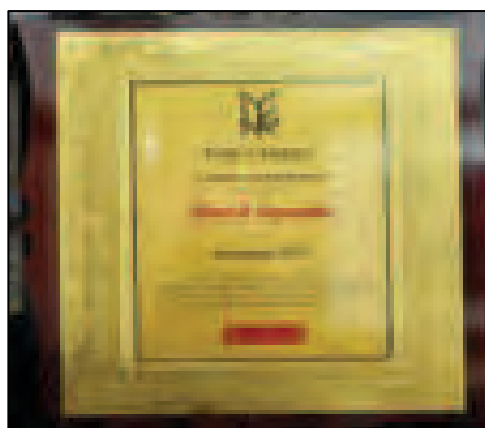
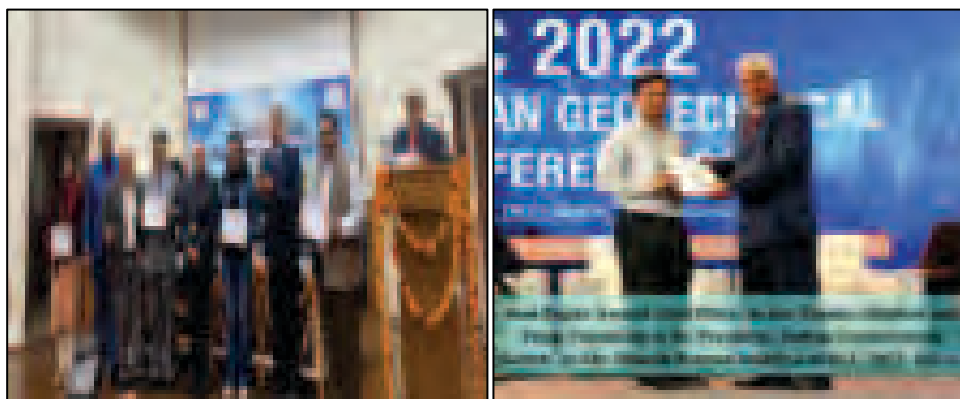
- In Aug, 2022, 2 students joined Ph.D. Programme in Engineering Sciences, and 2 students in IDDP programme.
- In Jan 2023, 2 students joined in PhD (Engg Sc)

Presently, a total of 40 Ph.D. students and 15 IDDP students are enrolled in AcSIR at CSIR-Central Building Research Institute (CBRI), Roorkee.

Some of the highlights of student activities in the current year are:

Awards and Recognitions:





1. **Aarati Solanki** received “Diamond Jubilee Best Research Paper Award” for the year 2022 by CSIR-CBRI on 76th Foundation Day of CSIR-CBRI, Roorkee.
2. **Kuchipudi S.T** awarded with ‘Indo-German Science Technology Centre – PhD Industrial Exposure Fellowship’ to collaborate and work with Fraunhofer Institute for Non-destructive Testing, Saarbrücken for 6 months.
3. **Mr. Ekansh Agarwal** awarded with 1st prize (Engineering category) in Saransh 2022 – 3 min national level thesis competition for PhD students organized by Indian National Young Academy of Sciences (INYAS) - the first and only recognized young scientist academy of India.
4. **Mr. Ekansh Agarwal** awarded the Higher Degree by Research (HDR) Engineering Prize by the School of Engineering (SoE), RMIT University, Australia. The prize is given to only one HDR candidate every year from SoE.
5. **Mr. Ekansh Agarwal** won the 3-Minute Thesis (3MT) competition 2022 from the School of Engineering at RMIT University.
6. **Mr. Ekansh Agarwal** awarded the People’s Choice Award in the 3-Minute Thesis (3MT) competition 2022 at the university level by RMIT University, Australia.
7. **Aarti Solanki** became the winner of the event on “Building Technology Hackathon 2023” by CSIR-CBRI on ONE WEEK ONE LAB program held at CSIR-CBRI, Roorkee.
8. **Mr. Shubham Chaudhary** became second runner-up on the event Building Technology Hackathon 2023 under CSIR OWOL program held at CBRI Roorkee on 9th Jan. 2023.
9. **Dinesh Kumar Malviya** awarded Best Paper Award (2nd Prize) in Indian Geotechnical Conference 2022, Kochi.



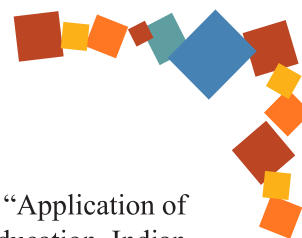
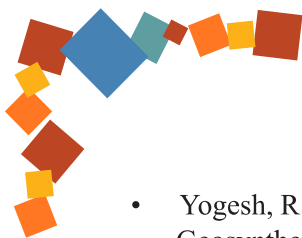
Fellowships:

1. **Mr. Shubham Chaudhary** received SERB Overseas Visiting Doctoral Fellowship 2023 (University of Alberta, Canada) for 2023-2024.

Workshops / Conference attended/ workshop:

- Mahesh Gaikwad, Suvir Singh (2022), “Flexural Strengthening of Fire Damaged Reinforced Concrete Structural Member”, Structural Engineering Convention 2022, ASPS Conference Proceedings, pp. Vol. 1, No. 4. <https://doi.org/10.38208/acp.v1.642>.
- Mahesh Gaikwad, Harpal Singh, Suvir Singh, N. Gopalakrishnan (2022), “Numerical Investigation of a Concrete Stress Block in The Post-Heating State of An Idealised Fire Scenario”, 8th International Conference on Computational Mechanics and Simulation [ICCMS 2022], organized by Indian Institute of Technology Indore.
- Conference paper presented in CSIR, One week one lab (OWOL) program by Supriya*, M. Hanifa, P. Rawat, R. Agarwal, H. Athar, P.C. Thapliyal, L.P. Singh Composition design and studies of low-carbon calcium silicate binders.
- Shubham Chaudhary, Suvam Das, Anindya Pain, Shantanu Sarkar (2022). “Numerical stability analysis of a jointed rock slope in the Sikkim Himalaya” under Theme: Technological advancements in investigation and monitoring” EGCON-2022 Dated- 17 November 2022 at Novotel Hotel, New Town, Kolkata.
- Vaibhav Mittal, Manojit Samanta (2023), “Investigation on Influence of Embedment Depth of Shallow Foundation on Seismic Response of Building Considering Soil– Structure Interaction.” Proceedings of 17th Symposium on Earthquake Engineering (Vol. 3). Lecture Notes in Civil Engineering, Vol 331, Springer, Singapore. DOI: 10.1007/978-981-99-1579-8.
- Vaibhav Mittal, Manojit Samanta, D.P. Kanungo (2023), “Investigation on Influence of Pile Foundation on Seismic Response of Irregular Building Considering Soil-Structure Interaction.” Proceedings of IGC Kochi Chapter 2022. Lecture Notes in Civil Engineering, Springer, Singapore.
- Agarwa E, Pain A, & Zhou A. (2022). Probabilistic assessment of reinforced soil walls using fourth moment normal transformation. In: Proceedings of TV Seminars and Mining One International Slope Stability Conference (TMIC 2022). December 12-13, 2022. Scopus Indexed, Atlantis Press, Springer Nature. https://doi.org/10.2991/978-94-6463-104-3_6.
- Agarwal E, Verma A. K, Pain A, & Sarkar S. (2022). Probabilistic Analysis of a Geosynthetic Reinforced Soil Retaining Structure under Seismic Conditions using Machine Learning based Genetic Programming. In: Proceedings of Indian Geotechnical Conference (IGC 2021), NIT Trichy, India, December 16-18, 2021. Lecture Notes in Civil Engineering, Scopus Indexed, Springer. https://doi.org/10.1007/978-981-19-6998-0_20.
- Malviya DK, Samanta M (2022) Evaluation of nonlinear load sharing ratio of pile and raft in piled raft foundation in cohesionless soil. Proceedings of Indian Geotechnical Conference, Kochi. (Paper ID: TH-03-028)
- Mohan Lal, R Siva Chidambaram, S R Karade. Critical Review of the Rehabilitation Techniques of Corrosion-Damaged Reinforced Concrete (RC) Beams using Composites. 28th International Conference & Expo on Corrosion, CORCON2022, AMPPNACE, September 2022, Udaipur, India
- Yogesh R.V, Ganesh Kumar, S., Santha Kumar, G.: Experimental investigations on pervious concrete piles in the saturated ground under repeated shaking conditions. 17th Symposium on Earthquake Engineering 2022, LNCS. Springer.





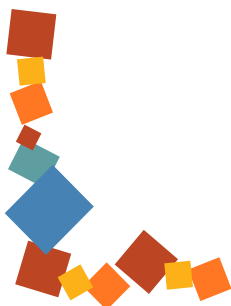
- Yogesh, R.V attended two-week online skill development and training course on “Application of Geosynthetics in infrastructure projects” conducted by the centre of continuing education, Indian Institute of Science (IISc), Bengaluru.
- Yogesh, R.V attended 2 weeks GIAN lecture series on “Integrated Approach on Geological & Geotechnical Aspects of Earthquake Engineering: Review & Revisit” at VNIT, Nagpur.
- Mohan Lal Attended one-week workshop on Technologies for Low-carbon and Lean Construction (TLC2) at IIT Madras, Chennai, Tamil Nadu, India.
- Shubham Chaudhary attended workshop on “Disaster Management Action Frontiers” organised by Centre of Excellence in Disaster Mitigation and Management, IIT Roorkee and SAADRI in October 2022.
- Mohd Hanifa, U. Sharma, P.C Thapliyal and L.P. “Development of Artificial Aggregates using Carbide Sludge and Fly ash through CO₂ sequestration” Conference on Advances in Catalysis for Energy and Environment (CACEE-2022) & CO₂ India Network 1st Annual Meet, Mumbai TIFR / 31 Oct. 2022.
- U. Sharma, Mohd Hanifa, Aarti Solanki, and D. Ali, “Alternate Construction Theme Area” Participated in Matrial Next 3.0 Programme conducted by Tata Steel under, 1st June 2022, successfully qualified for the pre-finale round.


Ph.Ds. Awarded:

- **Mr. Nishant Raj Kapoor** successfully defended his Ph.D. viva-voce examination in Jan 2023.

Foreign Visit:

- **Kuchipudi S.T** Nov 2022 – Apr 2023: Visit to Fraunhofer Institute for Non-destructive Testing, Saarbrucken, Germany.





INFORMATION, EXTENSION & PROJECT MANAGEMENT

Publication Group

The Publication Group continued to serve as the nerve centre of the Institute conducting and coordinating multifunction activities, such as, collection, storage dissemination of R&D information; handling scientific and technical enquiries; publicity and public relation; compilation, editing and publication of Annual report to meet the inter and intra-institutional information needs; editing and publication of Bilingual CSIR-CBRI Newsletter and भवनिका (Newsletter in Hindi) periodically; publication of Building Research Notes, Project Profile, Technical and Divisional Brochures etc.; preparation of scientific/technical reports and filling up of questionnaires; providing inputs for CSIR Annual Report as well as for CSIR News and CSIR Samachar; reporting of the scientific and technical work carried out at the Institute in Hindi and English and Publicity of the Institute's R&D capabilities through Print & Electronic Media.

1. CSIR-CBRI Annual Report

- R & D Highlights
- Research Output
- Glimpse of Activities
- R & D Projects
- Consultancy Projects
- Sponsored Projects
- Information, Extension and Project Management
- CSIR-CBRI Family
- Visits, Lectures, Meeting etc.
- Faculty Training, Motivation and Adoption of Schools & Colleges by CSIR-CBRI Roorkee
- Training Programmes
- Date line



Task Involved: Manuscript evaluation, editing, proof-reading, graphic design, layout, illustration, print production, binding, publishing, dissemination and feedback.

2. CSIR-CBRI in CSIR News and CSIR Samachar

3. News- items/ R & D Stories in Media covering Functions, Events, Conferences, Workshops etc.



4. Publicity through Advertisement in Conference/Souvenir/Symposium Proceedings etc.

5. Outreach through Articles in Magazines, Periodicals etc. including

- निर्माणिका 2021-22



6. Press Meet

Regular press meets were organized to apprise the public at large about the various technologies and research carried out at the institute.

Development, Construction & Extension Group & CSIR Network Project CSIR Integrated Skill Initiative (NWP-100)

Dr. R. Dharmaraju, Ar. S.K. Negi, Er. Ashish Pippal & Dr. Hemlata

Objective

It aims to equip the target groups with the necessary technological skills, through exposure to innovative building technologies developed by the Institute. It addressed the critical needs for the enhancement of building design/ construction/ technological skills of the individuals etc. It will strengthen the building construction sector by making the individuals more educated and skill oriented for building the sustainable habitat. It is planned to target the people working at all the levels in the society starting from masons to engineers/administrators etc for unified skill development to achieve the task of the programme.

The main objectives of this initiative are:

- ✓ To create a certified talent pool;
- ✓ To upgrade the knowledge base & skill set of people at different levels.
- ✓ To generate better earning options for masses (From Unskilled Manpower to Skilled Manpower and Skilled Manpower to Highly Skilled Manpower)
- ✓ To spread awareness among grass root level workers about engineered structures.

Significant Achievements

CSIR has mandated for the collection and dissemination of information in regard not only to research and development but to industrial matters in general. The tacit knowledge of CSIR laboratories along with the advanced R&D facilities has to be made available to the industry for creating a knowledge driven economy. The emphasis is given to create a robust and sustainable training module that is trans-disciplinary in nature addressing the needs of workforce among various technical areas that enhances multifaceted livelihood skilled workforce generation for industrial requirements. In tune with Government Policy on Skill Mission, CSIR has launched a major programme on CSIR Integrated Skill Initiative in 2016. The skilled/training programmes would also link to possible employment generation including small scale technopreneurship. This ensures a sustained supply of skilled workforce in the country.

With technical and scientific capability possessed by many CSIR institutions excellence in national skill mission in various identified S&T domains could be establish which will be a breeding ground for all the Skill/Training initiatives of laboratories to be taken up. It will host facilities for providing skill training to grass root level functionaries/ students/ Engineer/ Industry personnel's/ farmers etc. It will also envisage being a hub to connect with industrial people for guiding the skill/ training programme. Further, the CSIR integrated skill/ training programme will also bring in all the CSIR capabilities under one umbrella that will provide a unique knowledge driven platform under National Skill Mission. The programme also has the potential to enhance the CSIR brand image towards its Scientific Social Responsibility contributions by amalgamating its on-going and new skill/ training programmes.

CSIR-CBRI has been actively involved in providing scientific and technological housing solutions for the construction of safe built environment in the service of the nation from more than six decades.

The institute has been assisting the building construction and building material industries, rural and urban housing, energy conservation, efficiency, fire hazards, structural and foundation problems and disaster mitigation. The Institute has mandate to transfer the building technologies developed by the institute to the construction industries.

In this direction, the institute has been conducting short duration skill development training programmes through CSIR-CBRI Webinar series and in-house training programmes for students, masons, functionaries, engineers, supervisors, work professionals and unemployed youth all over the country on various Building Science Technology related topics with live demonstrations for implementation of building technologies that are cost effective, durable, energy efficient building materials and comfortable for living.

CSIR-CBRI, under CSIR Integrated Skill Initiative has planned to regularize its skill development trainings across the country to develop skilled manpower for the construction sector.

During FY 2021-22 & FY 2022-2023; CSIR-CBRI has provided value addition to the skills and knowledge by training and skill upgradation to more than 1465 participants on Housing Technologies, Disaster Resilient Building Constructions, Pest Management, Landslide Risk Mitigation & Control Measures, Climate Change, Waste to Wealth, Disaster Awareness and Preparedness which resulted in successful enforcement of innovative housing technologies for the societal benefit.

The major participating agencies are Uttarakhand State Disaster Management Authority (USDMA), Dehradun, PWD Uttarakhand, Himachal Pradesh State Disaster Management Authority (HPSDMA), Shimla, UNDP & PRED, Odisha, Jawaharlal Nehru Govt. Engg. College, Sundernagar (Himachal Pradesh), J K Cements Ltd, Leading Pest Management Industries such as envu, UPL, ITEM, GHARDA & Local District Administrations etc.

CSIR-CBRI in its each skill development training programme keeps a balance of technical sessions and practical demonstration; in order to generate interest towards science & technology in the trainees. CSIR-CBRI, during its in-house training programme, encourages the participants to visit different laboratories of CBRI and interact with the Scientists & Researchers to understand about the laboratory facilities and R&D activities.

Under CSIR Integrated Skill Initiative and other sponsors from different states, CSIR-CBRI has successfully organized a total of 23 Skill development training programmes including 8 webinar & 15 training programmes during the FY 2021-2022 & FY 2022-23. A total of 1465 participants were trained during this period and the details of programmes are given below;

<i>S. No</i>	<i>Sponsoring/ Collaborative Agency</i>	<i>Name of Webinar/Training/Workshop</i>	<i>Duration</i>	<i>No. of Trainees</i>
<u>FY 2021-22</u>				
1.	CSIR Integrated Skill Initiative	Webinar 11.0 - Advanced Course on Green Building Materials	Apr 26-28, 2021	151
2.	CSIR Integrated Skill Initiative	Webinar 12.0 - Advances in Rapid Construction	May 27-28, 2021	224
3.	CSIR Integrated Skill Initiative	Webinar 13.0 - Recent Advances in Sustainable Construction Materials	Jul 07-09, 2021	150
4.	CSIR Integrated Skill Initiative	Webinar 14.0 - Indoor Air Quality & Ventilation concerning Covid-19 Pandemic	Aug 26-27, 2021	105
5.	Participants Sponsored	Webinar 15.0 - Structural Pest Management	Oct 04-08, 2021	41

6.	CSIR Integrated Skill Initiative	Webinar 16.0 - Energy Efficient Building Technologies for Hot & Cold Climate	Nov 17-18, 2021	110
7.	DDMA, Chama	Training Programme on Safe Construction Practices At Bachat Bhawan Chamba	Nov 25-26, 2021	54
8.	CSIR Integrated Skill Initiative	Webinar 17.0 – Bamboo- A Sustainable Eco-friendly Materials for Buildings	Dec 27-29, 2021	125
9.	DDMA, Chama	Training Programme on Retrofitting of Buildings	Mar 28-Apr 02, 2022	10

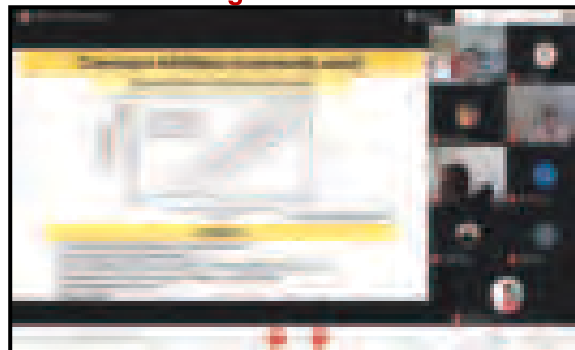
<u>FY 2022-23</u>				
1.	CSIR Integrated Skill Initiative	Training Programme on Transparency & office Management: Leading to Good Governance	Apr 05-07, 2022	33
2.	Pest Management Industries	Training Programme on Structural Pest Management	May 09-13, 2022	35
3.	MoRD, Govt. of India	Training Programme on Construction of PMAY-G Demonstration Units & Technical Guidance to Willing Beneficiaries for Construction of Houses in Assam	Jun 27-28, 2022	15
4.	MoRD, Govt. of India	Training Programme on Construction of PMAY-G Demonstration Units & Technical Guidance to Willing Beneficiaries for Construction of Houses in Uttar Pradesh	Jul 11-12, 2022	12
5.	UPL Ltd, Mumbai	Advanced Training Programme on “Structural Pest Management”	Aug 01-06, 2022	32
6.	JK Cement Ltd	Residential Capacity Building Programme on "Good Construction Practices"	Aug 08-09, 2022	25
7.	Participants Sponsored	Training programme on "Rural Housing - Appropriate Construction Techniques"	Aug 22-26, 2022	15
8.	CSIR Integrated Skill Initiative	“Orientation of CSIR-CBRI Activities, Policies and Guidelines”	Oct 12-14, 2022	19
9.	Participants Sponsored	Training Programme on “Disaster Resilient Building Construction Practices”	Nov 14-16, 2022	28
10.	Participants Sponsored	Training Programme on Landslide Risk Mitigation & Control Measures	Nov 28-30, 2022	29
11.	PWD, Uttarakhand	Training Programme on Landslide Risk Mitigation	Dec 22-23, 2022	28

12.	CSIR Integrated Skill Initiative	Hands on Training Programme- Simulia Abaqus Software	Feb 07-10, 2023	36
13.	CSIR Integrated Skill Initiative	Webinar on 'Urban Underground Space'	Mar 13-14, 2023	98
14.	CSIR Integrated Skill Initiative	Training Programme on Village Problems –A Solution Journey	Mar 25, 2023	90

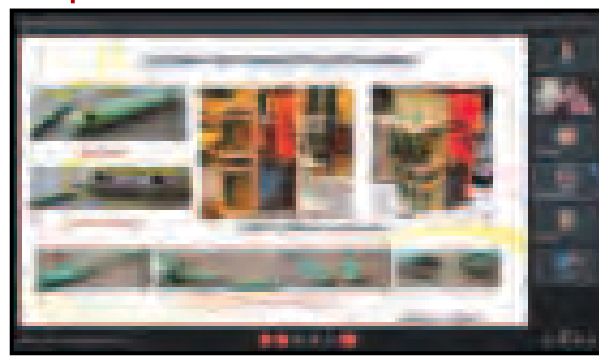
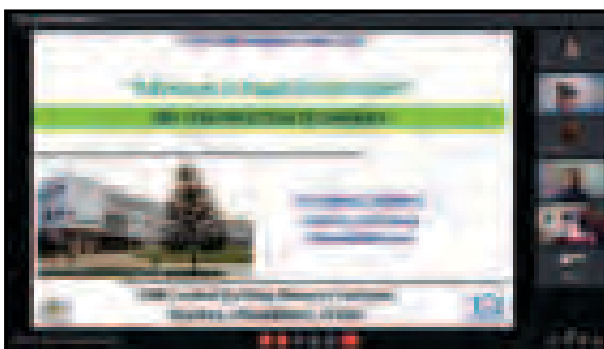
Glimpses of Webinars/ Skill Development Training Programmes

FY 2021-22

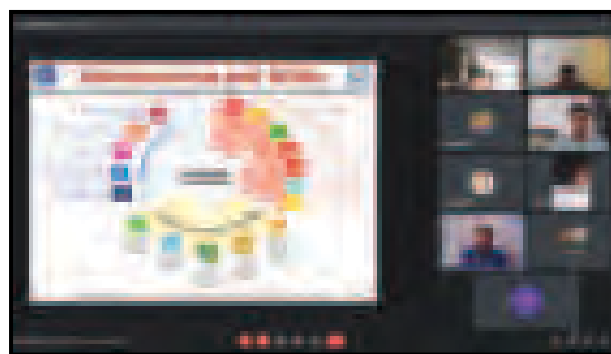
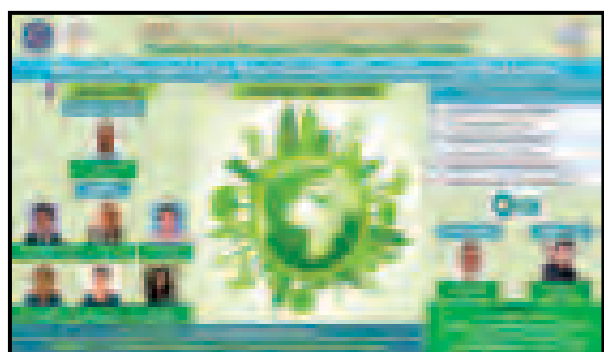
Webinar 11.0 on 'Advanced Course on Green Building Materials'



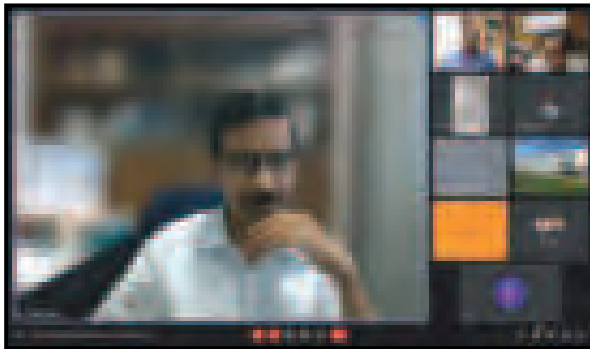
Webinar 12.0 on 'Advances in Rapid Construction'



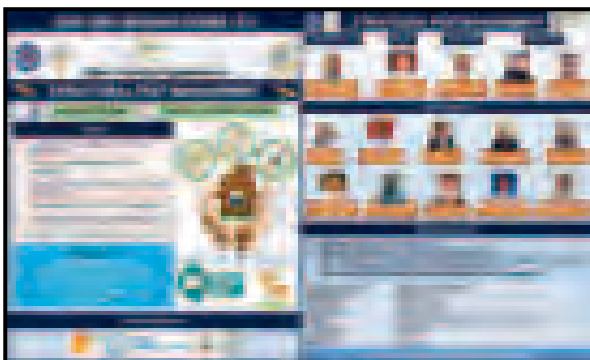
Webinar 13.0 on Recent Advances in 'Sustainable Construction Materials'



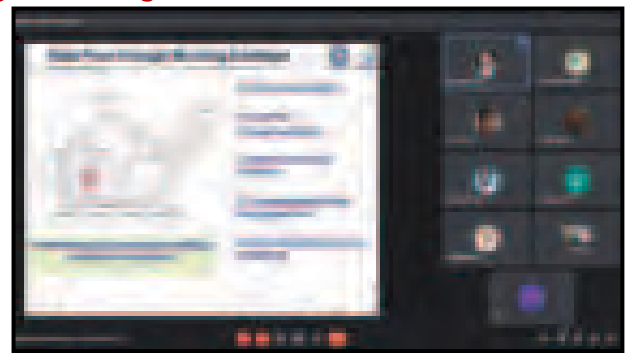
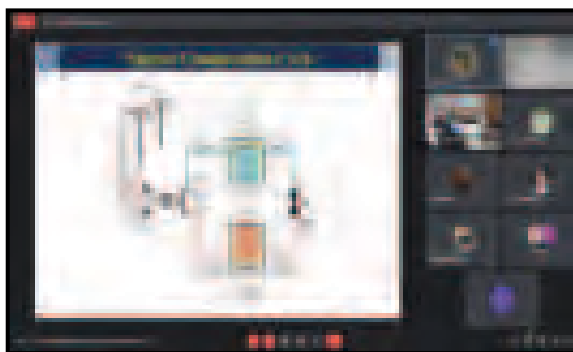
Webinar 14.0 on 'Indoor Air Quality & Ventilation concerning Covid-19 Pandemic'



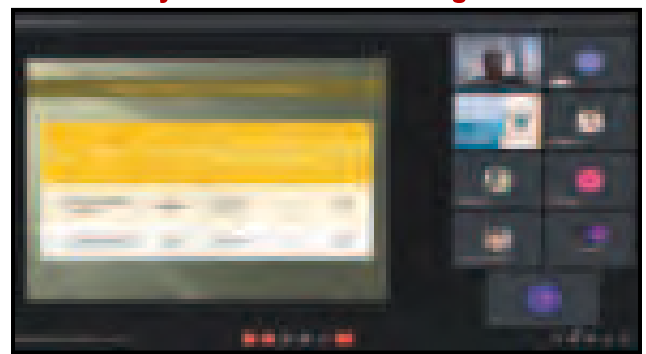
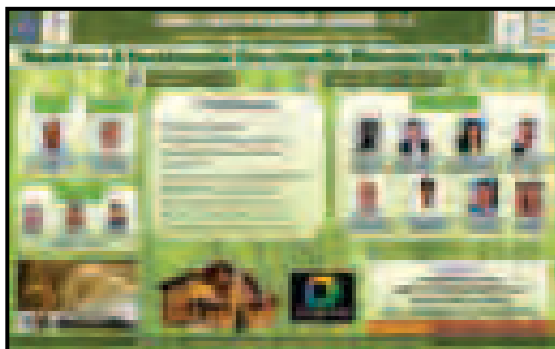
Webinar 15.0 on 'Structural Pest Management'



Webinar 16.0 on Energy Efficient Building Technologies for Hot & Cold Climate



Webinar 17.0 – Bamboo- A Sustainable Eco-friendly Materials for Buildings

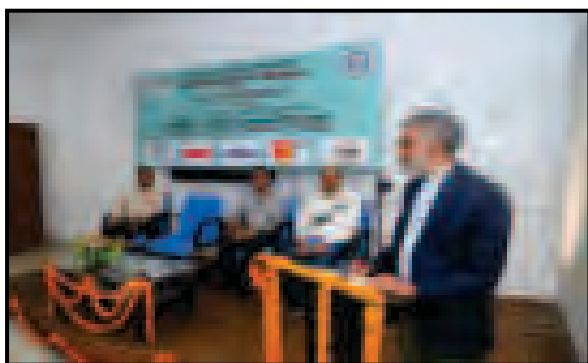


FY 2022-23

Training Programme on 'Transparency & office Management: Leading to Good Governance'



Training Programme on 'Structural Pest Management'



Advanced Training Programme on 'Structural Pest Management'



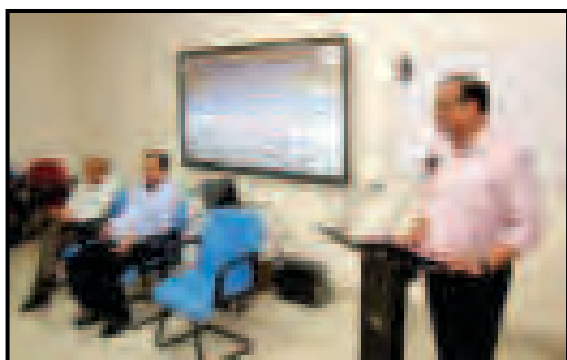
Residential Capacity Building Programme on 'Good Construction Practices'



Training Programme on 'Rural Housing - Appropriate Construction Techniques'



Orientation Programme on 'CSIR-CBRI Activities, Policies & Guidelines'



Training Programme on 'Disaster Resilient Building Construction Practices'



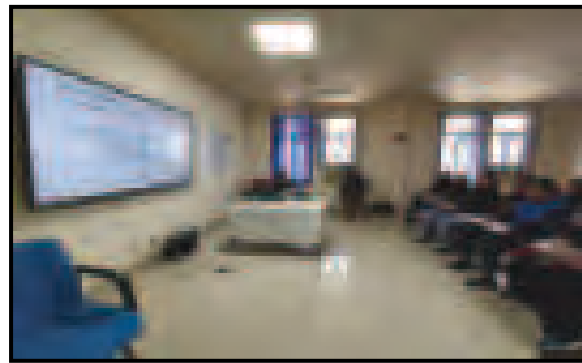
Training Programme on 'Landslide Risk Mitigation & Control Measures'



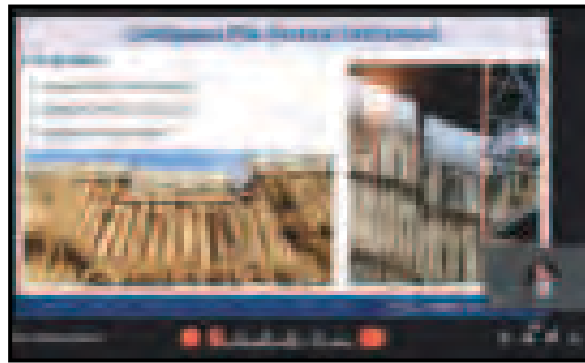
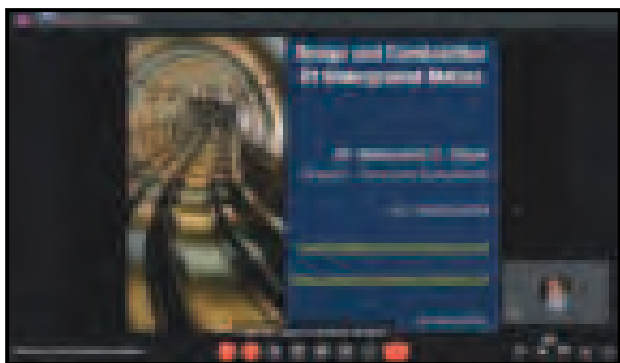
Training Programme on 'Landslide Risk Mitigation'



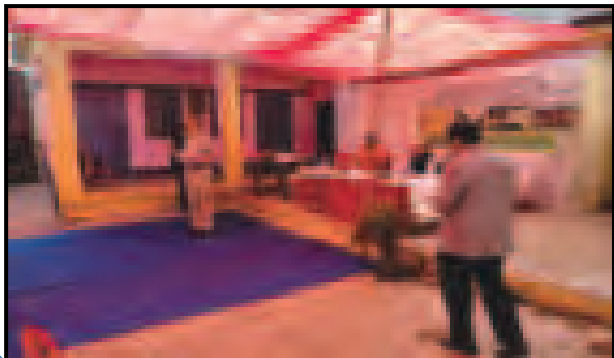
Hands on Training Programme - 'Simulia Abaqus Software'



Webinar on 'Urban Underground Space'



Training Programme on 'Village Problems - A Solution Journey'



Knowledge Resource Centre

‘Knowledge Resource Centre’ (KRC) of CSIR-CBRI is actively engaged in acquisition, technical processing, updating the collection and providing the platform for e-access of information sources to expand the horizon of information base to the scientific community. Now it is fully automated and RFID enabled system and services.

Acquisition:

Books: During the year 2021-2022, KRC purchased 49 numbers of books and received 10 numbers on gratis basis. Journals: The library has subscribed 45(28 foreign + 05 foreign print and 12 Indian) journals. KRC purchased 45 numbers of books and received 03 numbers on gratis basis. Journals: 89 of Bound Volumes have been added during 2022-23.

Library statistics: The position of library collection during the year 2021-2022: Book including reports; standards; conference proceedings; theses & maps contain 45353 numbers and 20877 bound volumes of journals. The position of library collection during the year 2022-2023: Book including reports; standards; conference proceedings; theses & maps contain 45401 numbers and 20966 bound volumes of journals.

Institutional Membership: CSIR-CBRI is a member of four national and three international professional /learned societies. KRC receive their publications against the annual membership fees. CSIR-CBRI is a member of three national and three international professional / learned societies. KRC receive their publications against the annual membership fees.

National (India): Indian Geotechnical society (IGS) Delhi; Indian Science Congress Association (ISCA) Kolkata and Indian Building Congress (IBC) Delhi.

International / foreign: International Union of Laboratories & Experts in Construction Materials, System and Structures (RILEM) Bagneux France; International Federation for structural Concrete (FIB) Lausanne, Switzerland and American Concrete Institute (ACI) USA.

Exchange of publication: Besides membership, the library received Annual Reports; News Letters; Technical Reports; Reprints and other materials in exchange from National and International Organizations.

Resource Sharing and Local Networking: CSIR-CBRI KRC is maintaining continuously good relationship with the libraries located in Roorkee viz. Indian Institute of Technology; National Institute of hydrology library and providing resource sharing through inter library loan. Besides the local Network, KRC is maintaining the liaison and relationship with the KRC's of CSIR Laboratories /DST Labs and other academic / research institutions.

Services: KRC is playing a coordinating role between users and the literature, providing personal information service through Current Awareness (CAS) and Selective Dissemination of Information (SDI) using modern information technology Besides the day-to-day circulation, reference and Xeroxing services, KRC is also rendering the following specific services: -

Documentation:

- a) **List of Latest Addition:** KRC is bringing out a quarterly list of latest arrivals of books for the general awareness of library users.
- b) **Bibliographic Service:** KRC is providing bibliographic service to users on demand of the subject of interest from in house data base as well as international database.
- c) **Current Contents Page (CCP):** CCP of print journals and e-journals are providing through attachment of mass e-mail to S&T members for current awareness.

- **Web-OPAC Search:** KRC has created a bibliographic database of documents and providing search facility through computer. Users can search any document through any access point like author, class no., subject, title, keyword and combination of search (Boolean search).
- **CD-ROM:** CD-ROMs are available in KRC viz. CIB Conference proceeding, ACI Manual, Pate state: a database of CSIR Patents; heritage building and sites.
- **In-House Database:** KRC is maintaining in-house bibliographic database of books and bound volumes of journals.
- **Internet Facility:** KRC has internet connectivity node with PC's as well as wi-fi connectivity for users to access of e-resources.
- **Access of E-Journals:** Now, access to over 2000 full text of e-journals of leading S&T publishers viz., ASCE, full text of ASTM Standards, Elsevier (selected), ICE(UK), IEEE Nature, OUP, RSC, T&F, Wiley, science database like Web of science (WOS), patent database viz. QPAT/ORBIT and iThenticate, plagiarism check software is available online under National Knowledge Resource Consortium as well as direct subscription.
- **Knowledge Repository:** KRC has created Institutional Repository (IR) through dspace software. Large number of records has already uploaded contains full text database along with metadata of published research papers of S&T staff members of the institute as well as all Building Research Notes (BRN), Project Profiles, Annual Reports of CSIR-CBRI since 1953 and conference proceedings volumes, organized by CBRI. This database can be accessed at <http://KRC.cbri.res.in/dspace>.

Planning & Business Development

PBD group acts as the main facilitator of the Institute for effective planning, monitoring, evaluation and project management of all R&D and Externally Funded Projects such as Consultancy Sponsored Projects, Grant-in-Aid and technical services, etc. Important documents for externally funded projects, MC agenda and R&D agenda for the Research Council are also dealt by PBD group. Besides this, this group manages technology transfer to the industries, IPR management activities and execution of agreements & MoUs with various industries/institutes/organizations.

PBD group monitors and compiles the Monthly Progress Report (MPR) and Quarterly Progress Report (QPR) of the research activities of the institute as well as the Research Utilization Data (RUD) for onward transmission to CSIR, New Delhi. The group regularly maintains and monitors the project records in terms of physical and financial recommendations of internal monitoring committees, Research Council (RC) and Management Council (MC).

R&D Projects

Internal review meetings and meetings with external experts are organized for review of new R&D projects. The ongoing projects are monitored for progress and/or mid-course corrections. Comments of experts are conveyed to concerned PIs and it is ensured that the same are incorporated before the projects are placed to RC. R&D projects were processed under the R&D areas of the institute, namely, Housing-Structure & Foundation, Conservation of Heritage Structures, Innovative Building Materials, Disaster Mitigation, and Energy Efficient System & Building Process & Automation.

Project Evaluations & Peer Reviews

Internal and external peer review meetings and project evaluation meetings were organized for new and on-going In-house R&D projects as well as for the CSIR Coordinated & FTT Projects during the year. PBD group coordinated the scheduling of presentations & interacted with the project leaders for putting up the relevant documents. The inputs as an outcome of the meetings were incorporated in the projects prior to placing the same before the Research Council.

Research Council Agenda

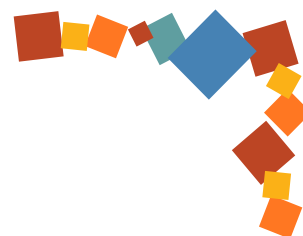
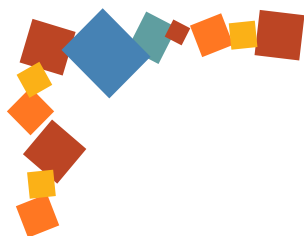
Research Council Meetings are held to monitor the progress of R&D projects of the Institute. The R&D agenda of RC meetings was prepared. The agenda covered the progress of ongoing projects as well as completed projects during the period and new projects taken by S&T staff. The outcome in terms of suggestion/direction/guidance was communicated to the concerned project leaders.

Other Documents

The group coordinated replies to various audits (CAG, CSIR and Service Tax), attended to RTI and Parliament questions.

Externally Funded Projects

The Institute has undertaken various externally funded projects on the basis of the expertise in different areas in the form of Consultancy, Sponsored, Grant-in Aid and Testing. The number of externally funded projects awarded is shown in Figure:



Budget & ECF

CSIR Resource Input

Revenue

2020-2021	3292.551 Lakh
2022-2023	3692.899 Lakh

Capital

2021-2022	283.423 Lakh
2022-2023	182.592 Lakh

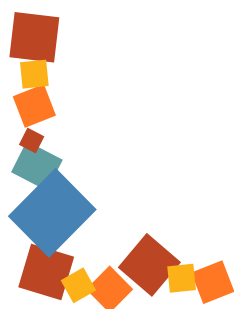
Special Projects

2021-2022	2.178 Lakh
2022-2023	54.400 Lakh

External Cash Flow (ECF)

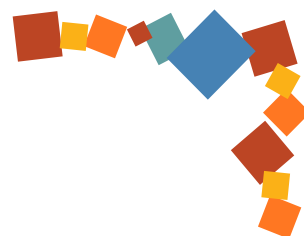
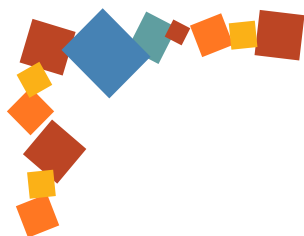
Govt +PSU+ Private

2021-2022	2854.696 Lakh
2022-2023	3618.382 Lakh



The page features decorative geometric patterns in the corners, consisting of overlapping triangles and squares in various colors including teal, orange, purple, and brown. The central area is a plain, light beige background.

Special Events



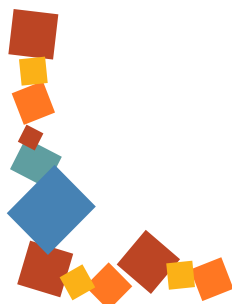
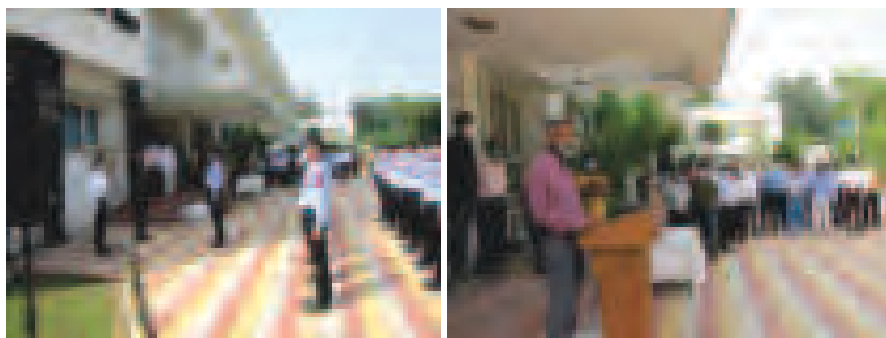
Year 2021-2022 COVID-19 Vaccination Drive

On April 8th, 2021, a highly anticipated COVID-19 vaccination drive was successfully organized at CSIR-Central Building Research Institute, Roorkee. This drive aimed to provide vaccination to the staff members of CBRI and their families, who actively participated in the event. More than 100 people received their COVID-19 vaccination dose from this campaign. This vaccination drive demonstrated the commitment of the institution towards the health and welfare of its staff and their families.



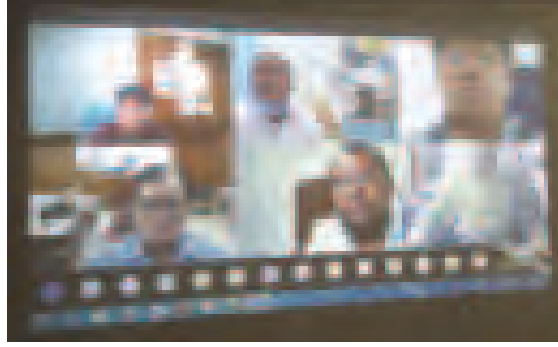
Independence Day

On August 15, 2021, the Central Building Research Institute (CBRI) celebrated India's Independence Day with great fervour and enthusiasm. Dr. N. Gopalakrishnan, director, CSIR-CBRI hoisted the tri-colour and took the guard of honour by security guards. In his address he remembered the freedom fighters who sacrificed their lives for country's Independence. The function was celebrated by following the Covid-19 guidelines.



हिंदी पखवाड़ा आयोजन

सीएसआईआर-केंद्रीय भवन अनुसंधान संस्थान, रुड़की में 14 से 29 सितंबर, 2021 तक हिंदी पखवाड़े का आयोजन किया गया कार्यक्रम का उद्घाटन संस्थान के निदेशक डॉ. एन. गोपालकृष्णन ने 'राजभाषा शपथ' दिलवा कर किया। यह कार्यक्रम ऑनलाइन आयोजित किया गया।



उसी दिन अपराह्न 3.00 बजे संस्थान के पुस्तकालय में “हिंदी पुस्तक प्रदर्शनी” भी लगाई गई। जिसका उद्घाटन संस्थान के निदेशक द्वारा किया गया। हिंदी पुस्तक प्रदर्शनी के संयोजक डॉ. एस.के. सेनापति थे। हिंदी पखवाड़े के दौरान संस्थान में अनेक प्रतियोगिताएं आयोजित की गईं।



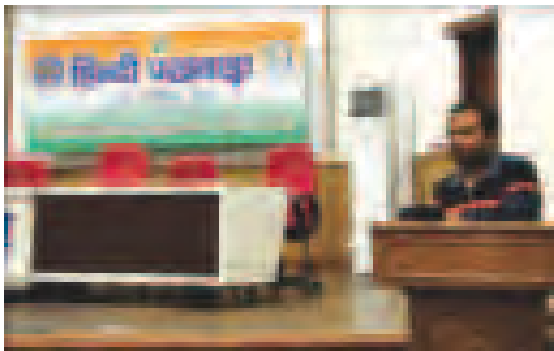
17 सितंबर को 'हिंदी टिप्पण एवं आलेखन प्रतियोगिता' का आयोजन हुआ। जिसके संयोजक श्री मेहर सिंह, हिन्दी अधिकारी थे। जिसमें संस्थान के कार्मिकों, शोध छात्रों, और प्रशिक्षुओं ने बढ़-चढ़कर हिस्सा लिया।



20 सितंबर को 'ग' क्षेत्र के हिन्दीतर भाषी कार्मिकों, शोध छात्रों और प्रशिक्षुओं के लिए 'हिंदी लेखन प्रतियोगिता' का आयोजित की गई। इस प्रतियोगिता में संयोजक की भूमिका डॉ. हेमलता ने निभाई।



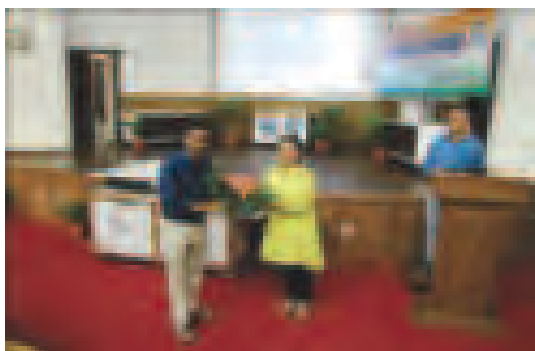
23 सितंबर को 'आशु भाषण प्रतियोगिता' आयोजित की गई, जिसमें प्रतिभागियों को ऑन द स्पॉट विषय बताया गया। जिस पर प्रतिभागियों ने बड़ी बेबाकी और सूझ-बूझ से अपने विचार रखे। प्रतियोगिता में डॉ. बी.एस. रावत, वरिष्ठ प्रधान वैज्ञानिक ने निर्णायक की भूमिका निभाई। जिसके संयोजक डॉ. किशोर कुलकर्णी थे।



28 सितंबर को संस्थान में हिंदी काव्य पाठ का भी आयोजन हुआ जिसमें शोध छात्रों, प्रशिक्षुओं एवं कार्मिकों ने बड़े उत्साह एवं भावपूर्ण ढंग से अपनी कविताओं की प्रस्तुति दी। इस प्रतियोगिता के संयोजक डॉ. प्रदीप चौहान थे। प्रतियोगिता में निर्णायक की भूमिका में रुड़की की जानी-मानी कवित्री डॉ. प्रेरणा कौशिक ने निभाई।



29 सितंबर को हिंदी पखवाड़े का समापन किया गया। इस कार्यक्रम की अध्यक्षता संस्थान के मुख्य वैज्ञानिक डॉ. शांतनु सरकार द्वारा की गई। इस अवसर पर संस्थान के अन्य मुख्य वैज्ञानिक श्री एस.के. नेगी भी उपस्थित थे। संस्थान के राजभाषा प्रभारी डॉ. प्रदीप चौहान ने हिंदी पखवाड़े के दौरान आयोजित विभिन्न कार्यक्रमों की रूपरेखा प्रस्तुत की। तत्पश्चात डा. शांतनु सरकार ने संस्थान की गृह पत्रिका **‘निर्माणिका-2020-21’** का ऑनलाइन विमोचन किया गया। इस अवसर पर बोलते हुए डॉ. सरकार ने कहा कि हिंदी सबसे बड़ी संपर्क भाषा है। अतः हम सभी को वर्ष भर अधिक से अधिक हिंदी में काम करना है।



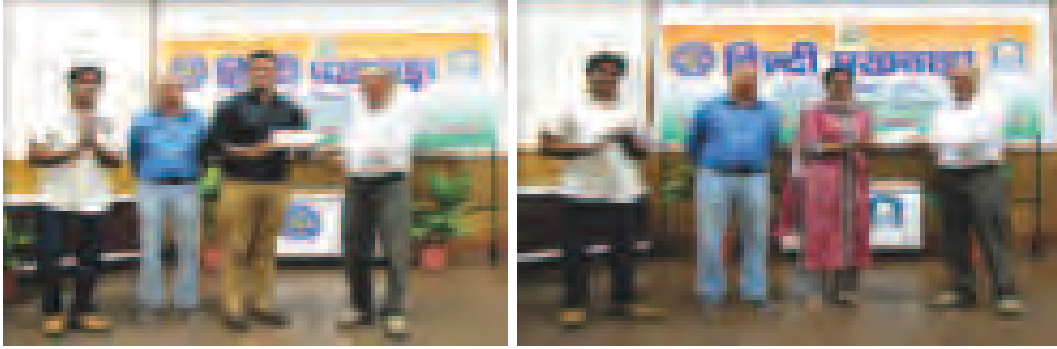
इस अवसर पर सरकारी कामकाज हिंदी में करने के लिए प्रोत्साहन योजना के पुरस्कार भी प्रदान किए गए। इसमें श्री सुशील कुमार, वरिष्ठ तकनीशियन को प्रथम, श्री सुधीर कुमार, सहायक अनुभाग अधिकारी को प्रथम, अनित कुमार पाल और श्री सुभाष चंद्र को द्वितीय तथा श्री सुभान सिंह, श्री शिव कुमार तथा श्री अमित कुमार को तृतीय पुरस्कार प्रदान किया गया।



इसके अलावा संस्थान में वैज्ञानिक एवं तकनीकी कामकाज के लिए डॉ. अतुल कुमार अग्रवाल, मुख्य वैज्ञानिक को प्रथम, श्री राकेश कुमार, वरिष्ठ तकनीकी अधिकारी को द्वितीय तथा श्री सुशील कुमार, प्रधान तकनीकी अधिकारी को तृतीय पुरस्कार प्रदान किया गया। इनके अलावा डॉ. पी.सी. थपलियाल, डॉ. हेमलता, डॉ. किशोर कुलकर्णी तथा डॉ. सुशांत कुमार सेनापति को प्रोत्साहन पुरस्कार प्राप्त हुआ।



हिन्दी पखवाड़े के दौरान आयोजित हिंदी टिप्पण एवं आलेखन प्रतियोगिता में श्री अमन कुमार, सहायक अनुभाग अधिकारी (वित्त एवं लेखा) को प्रथम, श्री सुधीर कुमार, सहायक अनुभाग अधिकारी को द्वितीय और श्री नीतीश राज चंद्रा तथा सुमेधा परमार को संयुक्त रूप से तृतीय पुरस्कार प्रदान किया गया।



हिन्दीतर भाषी कार्मिकों (ग क्षेत्र) के लिए हिंदी लेखन प्रतियोगिता में कुमारी प्रियंका शर्मा को प्रथम, कु. भवानी को द्वितीय और श्री कौशिक पंडित को तृतीय पुरस्कार प्रदान किया गया।

हिंदी आशु-भाषण प्रतियोगिता में श्री हिमांशु शर्मा, वरिष्ठ तकनीशियन को प्रथम, श्री कौशिक पंडित, वैज्ञानिक को द्वितीय तथा श्री सक्षम भारद्वाज, प्रोजेक्ट फैलो को तृतीय पुरस्कार दिया गया।



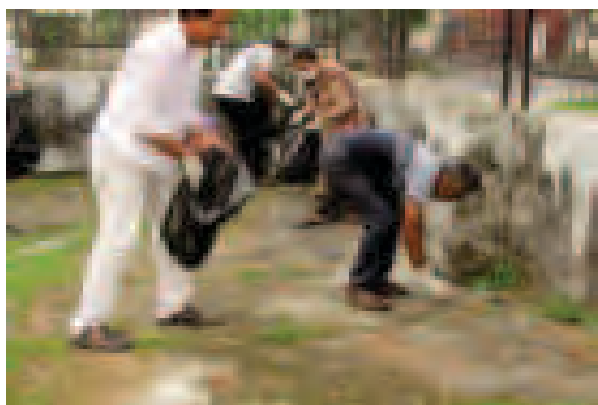
हिंदी काव्य पाठ प्रतियोगिता में श्री आशुतोष द्विवेदी को प्रथम प्रियंका शर्मा को द्वितीय नितिन प्रधान और सुप्रिया टम्टा को संयुक्त रूप से तृतीय पुरस्कार प्रदान किया गया।

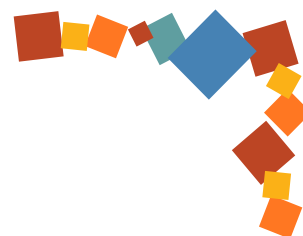
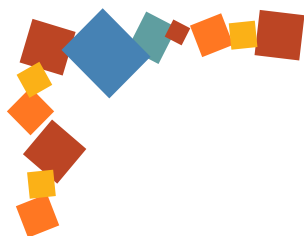


ये पुरस्कार मुख्य वैज्ञानिक श्री एस.के. नेगी द्वारा विजेताओं को पुरस्कार वितरित किए गए तथा पुरस्कार विजेताओं को बधाई दी और उनका उत्साहवर्धन किया। श्री मेहर सिंह, संयोजक एवं हिन्दी अधिकारी ने पुरस्कार वितरण का संचालन किया तथा श्री सूबा सिंह ने सभी का आभार व्यक्त किया। इस अवसर पर श्री अनिल कुमार, वरिष्ठ प्रशासन नियंत्रक, श्री हरीश कुमार, श्री समीर, श्री प्रदीप कपूरिया तथा श्री देवेन्द्र कुमार आदि उपस्थित थे।

Swachhta Abhiyan

On the occasion of Gandhi Jayanti October 2, 2022, a Swachhta Abhiyan (cleanliness campaign) was organized at CSIR- CBRI Roorkee. Dr. N. Gopalakrishnan, Director CSIR-CBRI along with the staff, took the initiative to clean the CSIR-CBRI Campus area. This activity was a part of government of India's Swachh Bharat Samridh Bharat initiative launched by Prime Minister Shri Narendra Modi. CSIR-CBRI staff actively participated in the clean-up, ensuring a clean and healthy environment of the CSIR-CBRI Campus. Their efforts inspired Society members and children to take part in maintaining cleanliness in their surroundings.





Fit India Run

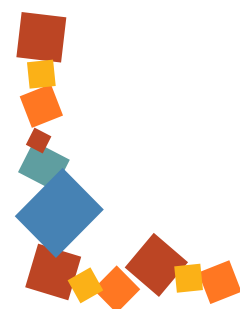
CSIR-Central Building Research Institute (CBRI) celebrated the Fit Freedom campaign from August 13th to October 2nd with great enthusiasm and participation. This special event aimed to promote a healthy and active lifestyle while commemorating the spirit of freedom. Throughout the duration of the Fit Freedom run, various activities such as running, cycling, and yoga camp were organized, encouraging staff members and participants to engage in physical activities and embrace fitness as a way of life.



The campaign began on August 13, 2021, at CSIR-Central Building Research Institute. CSIR-CBRI Director, Dr. N. Gopalakrishnan, and staff members actively participated in the run. The atmosphere was filled with enthusiasm and a shared commitment to embracing a healthy lifestyle. Continuing the momentum, another Fit Freedom run was organized on August 29, 2021.



On September 5, 2021, a Fit Freedom cycling event was organized at Roorkee. CSIR-CBRI staff members enthusiastically pedalled their way through the city streets, not only promoting fitness but also advocating for eco-friendly transportation methods.





To cater to the holistic well-being of the participants, a yoga camp was organized on September 11, 2021. Which was led by Sh. Manu Sharma, a retired Squadron Leader from the Indian Air Force, the yoga camp provided a serene and calming experience. Participants indulged in various yoga asanas, fostering physical flexibility, mental clarity, and inner peace.



The Fit Freedom campaign at CSIR-CBRI was a resounding success, exemplifying the institute's commitment to promoting a healthy lifestyle among its members. By actively participating in running, cycling, and yoga activities, the CBRI community not only celebrated freedom but also embraced the freedom of being fit and leading a balanced life.

Vigilance Awareness Week

The CSIR-Central Building Research Institute (CBRI) in Roorkee celebrated Vigilance Awareness Week from October 26th to November 1st, 2021. This week-long event aimed to promote and raise awareness about vigilance, integrity, and anti-corruption measures among the institute's staff members.

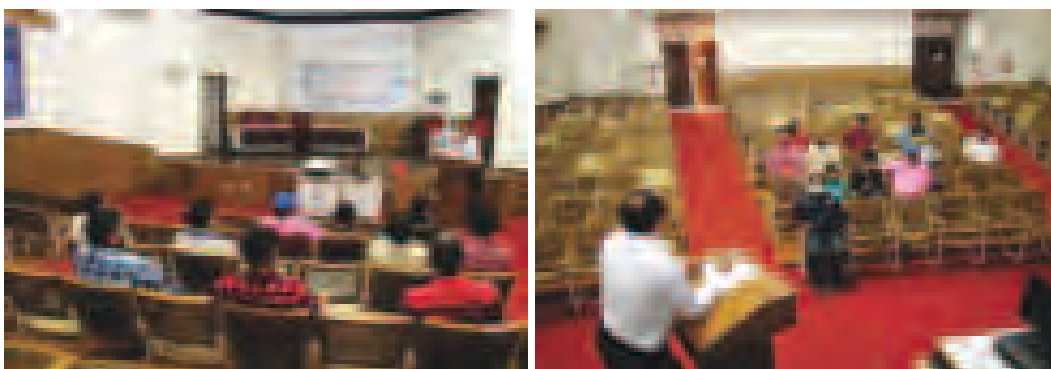
The Vigilance Awareness Week commenced with an oath taking ceremony, administered by Dr. Ashok Kumar. During this ceremony, the staff members took an oath of integrity, reaffirming their commitment to uphold honesty and sincerity in all their professional endeavours.



One of the highlights of the week was a visit to the Panchayat Bhavan. Interacting with officials at the Panchayat Bhavan allowed participants to gain insights into the challenges and practices related to vigilance and corruption prevention in the public sector. Furthermore, interactive sessions were conducted at a government primary school and Scholars Academy, where students were actively involved in discussions on vigilance and integrity. These sessions aimed to inculcate ethical values and foster a sense of responsibility among the younger generation. By engaging with school students, the participants not only shared their knowledge and experiences but also inspired the next generation to uphold integrity and honesty in their lives.



Another significant event during the Vigilance Awareness Week was a quiz competition that tested participants' knowledge of vigilance-related topics. The Vigilance Awareness Week, ended with a closing ceremony held on November 1, 2021. The certificates were distributed to winners for the quiz competition.



Constitution Day

On November 26, 2021, Constitution Day (Samvidhan Divas) was celebrated at CSIR-CBRI with great enthusiasm. The occasion marked an oath-taking ceremony where the staff of CBRI actively participated. Dr. Ashok Kumar administered the oath to the staff members. The oath-taking ceremony served as a reminder of the commitment to uphold and protect the ideals of the Indian Constitution. By actively participating in this event, the staff demonstrated their dedication to the constitutional values and their responsibility towards building a just and inclusive society.



Republic Day

On January 26, Republic Day was celebrated by CSIR-CBRI with great enthusiasm. The director of CBRI, Dr. N. Gopalkrishnan, hoisted the national flag, and took salute at the parade presented by security guard, symbolizing the spirit of unity and patriotism. In his address to the staff members of CBRI he highlighted the, significance of Republic Day and emphasizing the importance of upholding the values of democracy and freedom. The function was celebrated by following the Covid-19 guidelines.



CSIR-CBRI Foundation Day

On February 10, 2022, CSIR- Central Building Research Institute (CBRI) celebrated its foundation day through online mode due to the ongoing pandemic. This virtual gathering brought together esteemed individuals from diverse fields to commemorate the occasion. The event was graced by the presence of Shri. Vidyashankar C., Chief Guest, who was the Founder and COO at TVASTA. He gave a talk on “3 D Printing and its Application for Transformation of Indian Infrastructure”

Adding to the prestige of the celebration, Shri. Adithya V. S., the Founder and CEO of TVASTA, took on the role of the Guest of Honour. He enlightened the attendees about “3 D Printing and its Underlying

Principles of Working. The event also embraced the virtual presence of Dr. Shekhar C. Mande, the Director General of the Council of Scientific and Industrial Research (CSIR). Dr. N Gopalkrishnan, Director CSIR-Central Building Research Institute delivered a welcome address to all the attendees and guests. The online celebration was coordinated by Dr. P.K.S. Chauhan.

Year 2022-2023 Swachhta Pakhwada

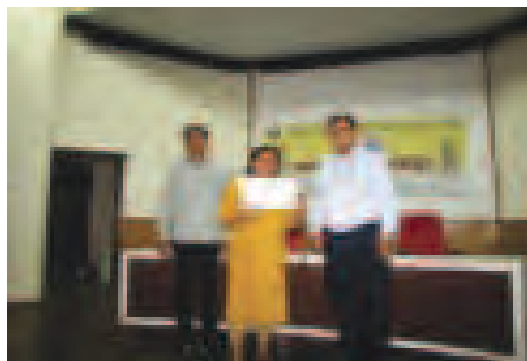
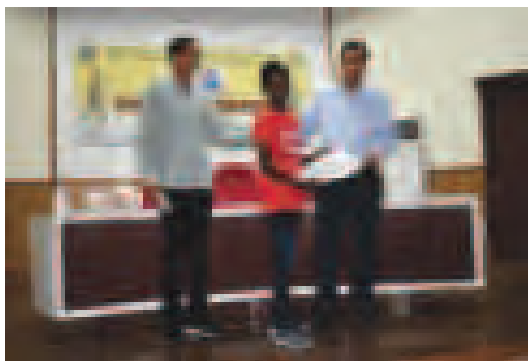
Swachhta Pakhwada was celebrated at CSIR-Central Building Research Institute (CBRI) for a duration of 15 days, from 1st May to 15th May 2022. The event aimed to promote cleanliness and hygiene among the staff members and the local community. Various cleanliness drives and competitions were organized throughout the 15-day period.



The opening ceremony of Swachhta Pakhwada took place on 1st May 2022 and it commenced with an oath-taking ceremony. During this ceremony, all the participants and attendees pledged their commitment to maintaining cleanliness and adopting hygienic practices. Following the inauguration, a cleanliness drive was carried out in the CSIR-CBRI office area. Staff members actively participated in this initiative, joining hands to clean the premises and create a more conducive and hygienic working environment. On 4th May, the focus shifted to cleaning the office rooms. Staff members collaborated and dedicatedly cleaned their respective workspaces, ensuring a clutter-free and sanitized atmosphere.



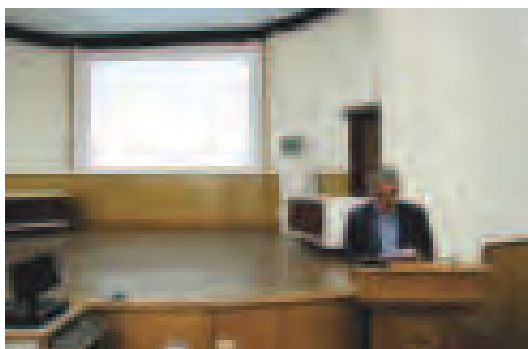
Continuing the series of events, on 5th May, a drawing competition was organized for the children of CSIR-CBRI staff members. This competition aimed to engage the young ones and spread awareness about cleanliness and hygiene in a fun and creative way. On 9th May, a slogan competition was organized, which witnessed active participation from the CSIR-CBRI staff. The participants came up with innovative and impactful slogans that emphasized the significance of cleanliness and its impact on the well-being of everyone.



On 13th May, the closing ceremony of Swachhta Pakhwada was held. During this event, prizes were distributed to the winners of the various competitions held during the 15-day celebration. The ceremony also served as an opportunity to recognize and appreciate the efforts of all the participants who contributed to making the Swachhta Pakhwada a resounding success.

Anti-Terrorism Day

On May 20, 2022, CSIR-Central Building Research Institute (CBRI) solemnly observed Anti-Terrorism Day with a strong commitment to combat terrorism and promote peace and harmony in society. The occasion was marked by an oath ceremony, which was presided over by the esteemed Director, Dr. N. Gopalakrishnan. During the ceremony, the staff and participants took a collective pledge to stand united against terrorism and to uphold the values of unity, peace, and tolerance.

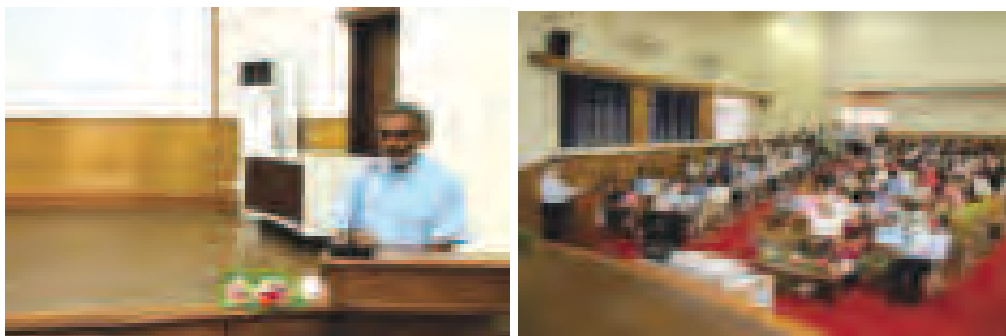


Director's Farewell

On May 25, 2022, a signing-off ceremony was held to bid farewell to Dr. N. Gopalakrishnan, who superannuated from the position of Director at CSIR-CBRI. During the ceremony, Dr. Anjan Ray, Director, CSIR-IIP Dehradun, took over additional charge of Director, CSIR-CBRI.



The event was graced by the presence of former CSIR Director General, Dr. Shekhar C. Mande. Dr. N. Gopalakrishnan took the opportunity to share his experiences and reflections on his tenure as the Director of the institute. He spoke about the achievements, challenges, and advancements made during his tenure at CSIR-CBRI, Roorkee.



Dr. Anjan Ray, addressed the audience and expressed his gratitude and enthusiasm for the upcoming responsibility. He also expressed his gratitude to Dr. N. Gopalakrishnan, for his leadership and contributions to CSIR-CBRI. The farewell ceremony was coordinated by Dr. P.K.S. Chauhan.

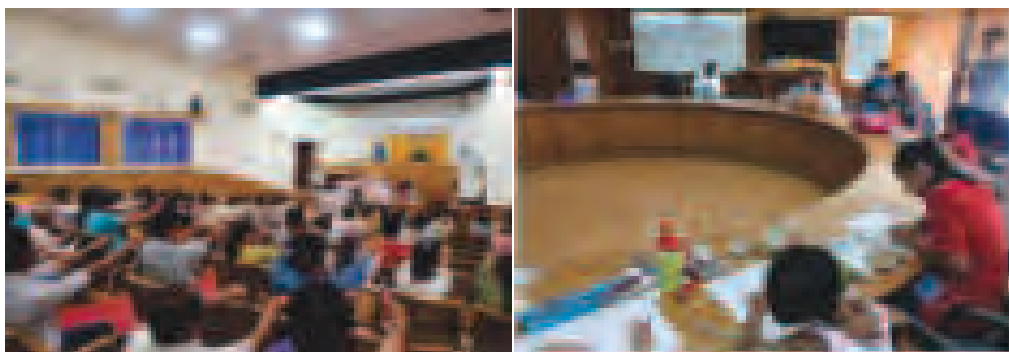
World Environment Day

On June 5, 2022, CSIR-CBRI celebrated World Environment Day as part of the occasion, a tree plantation activity was organized, symbolizing the commitment to environmental conservation and sustainability. This initiative aimed to raise awareness about the importance of preserving our environment and the role trees play in mitigating climate change. By engaging in this tree plantation activity, CSIR-CBRI demonstrated its dedication to creating a greener and healthier future for generations to come. On this occasion Sr. scientist along with their families planted the trees.



International Yoga Day

International Yoga day was celebrated on 21st June, 2023 at CSIR-CBRI. In which an informative lecture on the topic Yoga for Humanity was delivered by Yogi Rajnish Ji from Arogyam Yoga Mandir, Kankhal Haridwar. More than 100 staff members were present during the lecture. A drawing competition was organized for the wards of staff members to spread awareness and importance of Yoga in daily life. A quiz competition on the theme Yoga for Humanity was also organized for the staff members to spread awareness and benefit about Yoga in daily life. More than 45 staff members participated in the quiz competition. International Day of Yoga-2022 was successfully completed with prizes distribution by chief guest to the winners of various competitions organized.



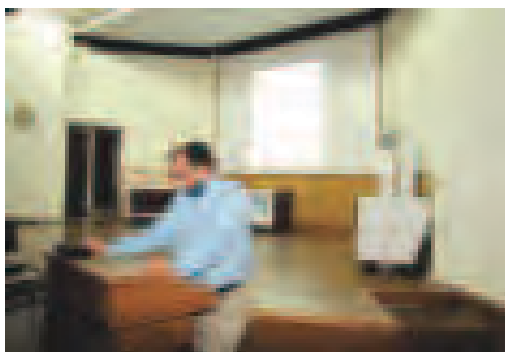
Independence Day

On August 15, 2022, CSIR-Central Building Research Institute (CBRI) celebrated India's Independence Day with great fervour and enthusiasm. The flag hoisting was done by Dr. Ashok Kumar, Outstanding Scientist. The atmosphere was filled with patriotic spirit as students from various schools through captivating performances. The young performers mesmerized the audience with their songs and dances, paying homage to the freedom fighters who fought for India's independence.



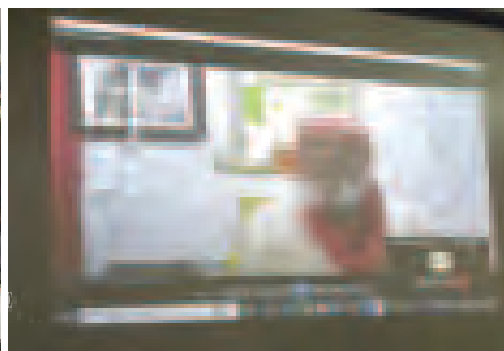
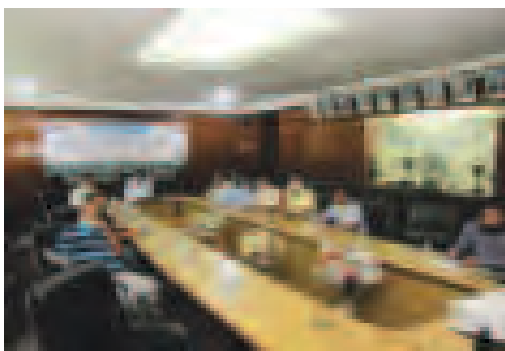
Harmony Day

On August 18, 2022, Harmony Day (Sadbhavna Diwas) was observed at CSIR-CBRI with an aim to promote communal harmony, peace, and unity among individuals. As part of the observance, the Dr. Ashok Kumar Outstanding Scientist administered the Sadbhavna pledge to the staff members of CSIR-CBRI. This pledge emphasized the importance of maintaining goodwill, understanding, and respect for all individuals, irrespective of their caste and religion.



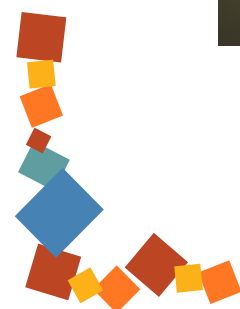
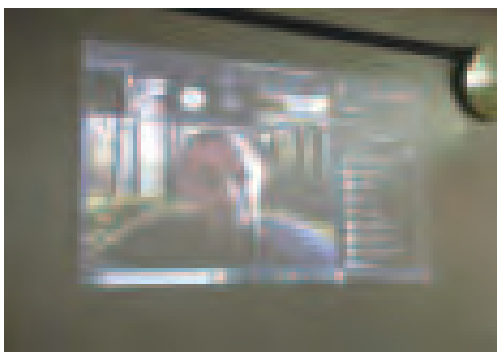
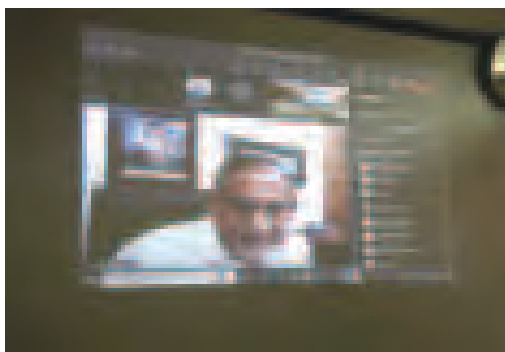
Himalayan Day

On September 9th, 2022, the 13th Himalayan Day was celebrated with great enthusiasm at CSIR-Central Building Research Institute (CBRI). The celebration took place in an online lecture mode. The theme for this year's Himalayan Day was "Himalaya: the Climate Governor."



Dr. Anil P. Joshi, a renowned expert in Himalayan studies and environmental conservation, was invited as the keynote speaker for the occasion. Dr. Joshi's presence added immense value to the event, as he shared his extensive knowledge and research findings on the Himalayas, their ecological importance, and the urgent need for their conservation in the face of climate change.

The majestic mountain range is not only an iconic landscape but also serves as a vital ecological system that influences weather patterns, precipitation, and climate conditions across the Indian subcontinent and beyond.

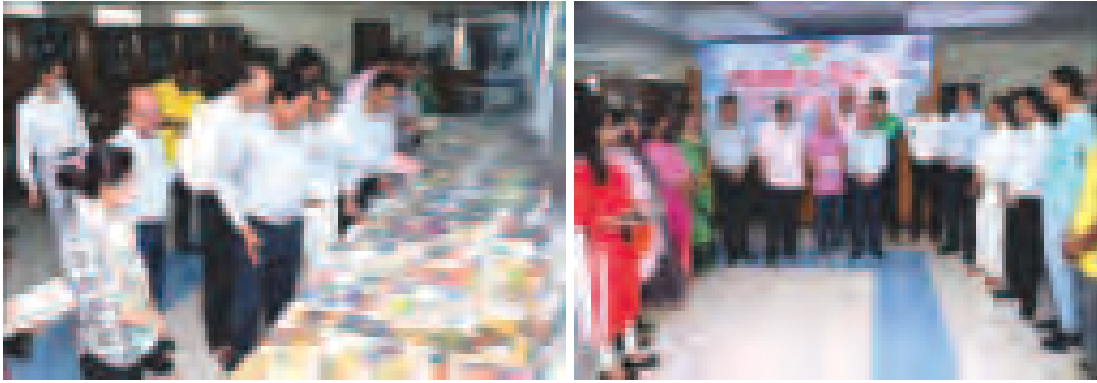


सीएसआईआर – केन्द्रीय भवन अनुसंधान संस्थान, रुड़की हिन्दी पखवाड़ा रिपोर्ट-2022

सीएसआईआर- केन्द्रीय भवन अनुसंधान संस्थान में हिन्दी दिवस 14 सितम्बर के उपलक्ष्य में 14 से 29 सितम्बर, 2022 तक हिन्दी पखवाड़ा मनाया गया। संस्थान के मुख्य वैज्ञानिक डॉ. सुवीर सिंह ने हिन्दी पुस्तक पुदर्शनी के उद्घाटन के साथ ही हिन्दी पखवाड़े का भी शुभारंभ किया।



इस अवसर पर संस्थान के निदेशक डॉ. अंजन रे का संदेश सभी को पढ़कर सुनाया गया। डॉ. रे ने अपने संदेश में कहा कि हिन्दी हमारी संस्कृति और संस्कारों की जड़ है। अतः हिन्दी को अपनाएं और अपनत्व बढ़ाएं।

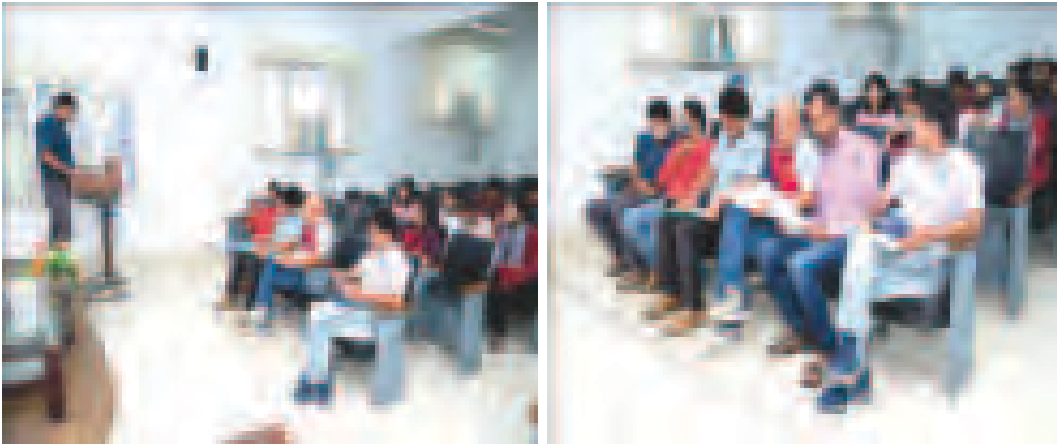


उद्घाटन के अवसर पर डॉ. सुवीर सिंह ने अपने विचार रखते हुए कहा कि हिंदी पखवाड़े के दौरान सभी कर्मचारी अपना अधिक से अधिक काम हिन्दी में ही करें तथा इस दौरान आयोजित की रही प्रतियोगिताओं में कार्मिक बढ़-चढ़कर हिस्सा लें। हिन्दी पुस्तक प्रदर्शनी में राजनैतिक, धार्मिक, साहित्यिक, पर्यावरण, कम्प्यूटर तथा बच्चों से संबंधित विभिन्न विषयों की पुस्तकें लगायी गई थीं। डॉ. सुशांत कुमार सेनापति, पुस्तकालय अधिकारी हिन्दी पुस्तक प्रदर्शनी के संयोजक की भूमिका निभायी थी।



हिन्दी पठन प्रतियोगिता

संस्थान में 'ग' क्षेत्र के मातृभाषी कार्मिकों के लिए दिनांक 16 सितम्बर, 2022 को 'हिन्दी पठन प्रतियोगिता' का आयोजन किया गया। इस प्रतियोगिता में 20 से अधिक वैज्ञानिक, शोध छात्र तथा परियोजना सहायक सम्मिलित हुए।



प्रतियोगिता में कु. प्रियंका शर्मा, शोधार्थी को प्रथम, डॉ. राजेश दाश, वरिष्ठ परियोजना सहायक और श्री कौशिक पंडित, वरिष्ठ वैज्ञानिक को द्वितीय, श्री साई तेजा, शोधार्थी और डॉ. श्रीनिवासराव नायक बी., प्रधान वैज्ञानिक को तृतीय तथा डॉ. नागेश बाबु बालम, प्रधान वैज्ञानिक, डॉ. प्रसांत कर, वैज्ञानिक, कु. मीनु सुनील, परियोजना सहायक तथा सुश्री अस्वथी एम.एस., वैज्ञानिक को प्रोत्साहन पुरस्कार प्रदान किया गया। डॉ. सौमित्र मैती, प्रधान वैज्ञानिक इस प्रतियोगिता के संयोजक थे। डॉ. पी.सी. थपलियाल ने प्रतियोगिता में निर्णायक की भूमिका निभायी।

हिन्दी वाक् प्रतियोगिता

संस्थान में 20 सितम्बर, 2022 को 'हिन्दी वाक् प्रतियोगिता' का आयोजन किया गया। इस प्रतियोगिता में भी 15 से अधिक कार्मिकों ने प्रतिभाग किया। प्रतियोगिता का प्रथम पुरस्कार कु. पूजा ठाकुर, परियोजना एसोसिएट, द्वितीय पुरस्कार श्री हिमांशु शर्मा, वरिष्ठ तकनीनियन, तृतीय पुरस्कार श्री सुशील कुमार, प्रधान तकनीकी अधिकारी तथा प्रोत्साहन पुरस्कार डॉ. चन्दन स्वरूप मीणा, वैज्ञानिक एवं डॉ. किशोर कुलकर्णी, वरिष्ठ वैज्ञानिक ने प्राप्त किया। प्रतियोगिता के संयोजक की भूमिका श्री सूबा सिंह हिन्दी अधिकारी ने निभाई।



हिन्दी प्रश्नोत्तरी प्रतियोगिता

हिन्दी पखवाड़े के दौरान संस्थान के रविन्द्रनाथ टैगोर सभागार में दिनांक 22 सितम्बर, 2022 को 'हिन्दी प्रश्नोत्तरी प्रतियोगिता' आयोजित की गई। इसमें संस्थान के विभिन्न अनुभागों/समूहों को मिलाकर छह टीमों बनाई गई थीं।



इस प्रतियोगिता का प्रथम पुरस्कार श्री अमन कुमार, कु. मेधा, श्री शिवम त्यागी, कु. गीतिका तथा श्री नवीन निशांत की टीम को मिला। द्वितीय पुरस्कार श्री अजय द्विवेदी, श्री शुभम चौधरी, श्री नितीश राज चन्द्रा, श्री विनीत कुमार सैनी तथा डॉ. प्रदीप कुमार यादव की टीम को प्राप्त हुआ। तृतीय पुरस्कार के लिए डॉ. चन्दन स्वरूप मीणा, डॉ. नवल किशोर, डॉ. हेमलता, डॉ. राजकुमार और कु. भावना की टीम व डॉ. विना चौधरी, श्री रजत कुमार, कु. नेहा, कु. शिवी निगम और श्री अनुप कुमार प्रसाद की टीम संयुक्त विजेता रही। इस प्रतियोगिता का प्रोत्साहन पुरस्कार श्री वीपीएस रावत, कु. मीनू, डॉ. श्रीनिवासन राव नायक बी., कु. रूपाली और डॉ. प्रकाश चन्द थपलियाल की टीम और डॉ. राजेश कुमार वर्मा, डॉ. नीरज जैन, सुप्रिया टमटा, सुश्री हुमैरा अथहर और श्री अभिजीत की टीम को संयुक्त रूप से प्राप्त हुआ। प्रतियोगिता के संयोजक की भूमिका डॉ. प्रदीप चौहान ने निभायी।

स्टाफ के बच्चों के लिए कविता पाठ और भाषण प्रतियोगिता

दिनांक 27.09.2022 को संस्थान के स्टाफ के बच्चों के लिए कवितापाठ और भाषण प्रतियोगिता का आयोजन किया गया। कक्षा पांच तक के बच्चों के लिए हिन्दी कवितापाठ में 15 से अधिक बच्चों ने बड़े रोचक ढंग से कवितापाठ किया।



इस प्रतियोगिता में कु. मायरा पुत्री श्री अर्पण महेश्वरी को प्रथम, कु. देवा हंसिनी पुत्री श्री श्रीनिवासराव नायक बी. को द्वितीय, मा. तक्ष पुत्र श्री आशीष पिप्पल को तृतीय तथा कु. प्रानवी सुपुत्री श्री रवीन्द्र बिष्ट को प्रोत्साहन पुरस्कार मिला। बच्चों के वरिष्ठ वर्ग (कक्षा VI से X तक) के हिन्दी भाषण प्रतियोगिता में कु. अम्बरा पुत्री श्री अमन कुमार को प्रथम, कु. काव्या पुत्री श्री अर्पण महेश्वरी को द्वितीय, कु. कौशिकी पुत्री श्री अजय द्विवेदी को तृतीय तथा श्रद्धा पुत्री डॉ. उषा पुरोहित को प्रोत्साहन पुरस्कार प्राप्त हुआ। इस प्रतियोगिता के संयोजिका की भूमिका डॉ. हेमलता ने निभायी। निर्णायक की भूमिका रुड़की को प्रसिद्ध कवयित्री डॉ. प्रेरणा कौशिक ने निभायी।

पुरस्कार वितरण एवं समापन समारोह

संस्थान के रवीन्द्रनाथ टैगोर सभागार में 29 सितम्बर, 2022 को हिन्दी पखवाड़े का समापन एवं पुरस्कार वितरण समारोह का आयोजन किया गया। इस अवसर पर प्रोफेसर धर्मेन्द्र सिंह, विभागाध्यक्ष, इलेक्ट्रॉनिक्स एवं संचार विभाग, भारतीय प्रौद्योगिकी संस्थान रुड़की, मुख्य अतिथि थे। प्रोफेसर सिंह ने कहा कि अपने दिन-प्रतिदिन के कामकाज में सरल हिन्दी का प्रयोग करें ताकि सभी उसे आसानी से समझ सकें।



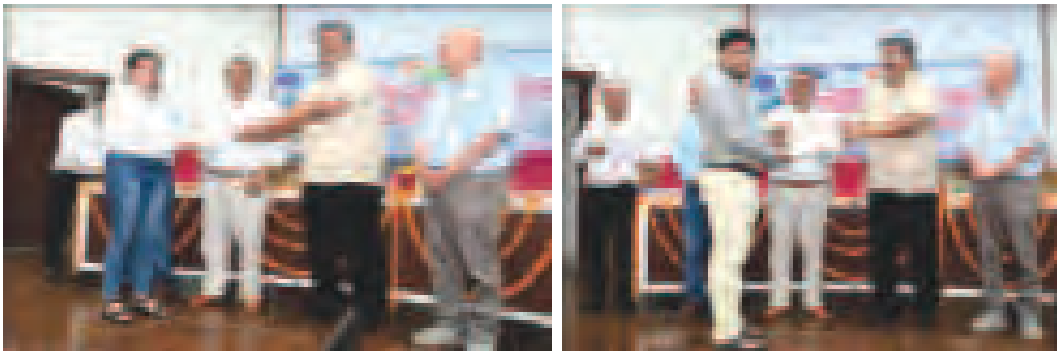


कार्यक्रम की अध्यक्षता करते हुए संस्थान के मुख्य वैज्ञानिक डॉ. सुवीर सिंह ने भी कामियों से अपना सरकारी कार्य अधिक से अधिक हिन्दी में करने का आह्वान किया। डॉ. प्रदीप चौहान ने मुख्य अतिथि का परिचय प्रस्तुत किया। हिन्दी पखवाड़े के संयोजक एवं हिन्दी अधिकारी श्री मेहर सिंह ने हिन्दी पखवाड़े के दौरान आयोजित की गई गतिविधियों के बारे में जानकारी दी। संस्थान के प्रशासनिक अधिकारी श्री परवेश चन्द ने सभी उपस्थित कार्मिकों, अतिथियों, छात्रों और बच्चों का धन्यवाद किया।

इस अवसर पर संस्थान की वार्षिक पत्रिका **“निर्माणिका 2021-22”** का विमोचन भी किया गया। संस्थान में संचालित सरकारी कामकाज मूल रूप से हिन्दी में करने के लिए प्रोत्साहन योजना के पुरस्कार भी प्रदान किये गए।

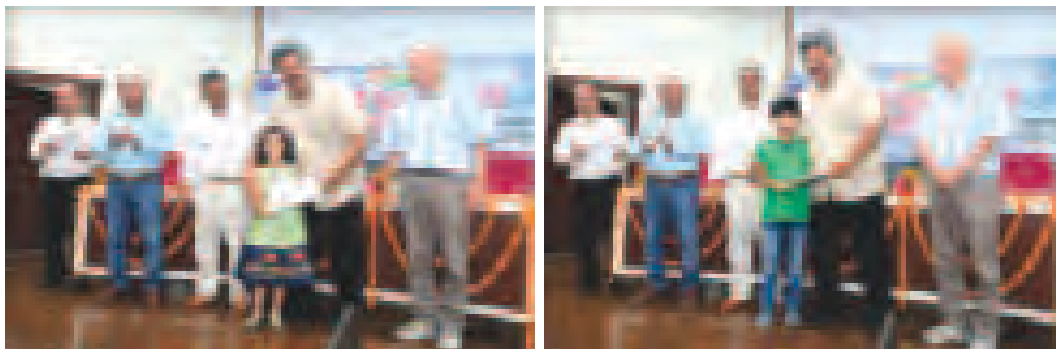


श्री सुशील कुमार, वरिष्ठ तकनीशियन और श्री सुधीर कुमार, सहायक अनुभाग अधिकारी को प्रथम पुरस्कार, श्री सुभाष चन्द, लैब सहायक को द्वितीय, सुश्री गायत्री देवी, वरिष्ठ तकनीकी अधिकारी और श्री अमित कुमार, एमटीएस को तृतीय पुरस्कार प्राप्त हुआ।



इसके अलावा संस्थान में वैज्ञानिक एवं तकनीकी कामकाज हिन्दी में करने वाले वैज्ञानिकों और तकनीकी अधिकारियों को भी पुरस्कृत किया गया। इस प्रोत्साहन योजना के अंतर्गत श्री इतरत अमीन सिद्दिकी, वरिष्ठ तकनीकी अधिकारी को प्रथम, डॉ. अतुल

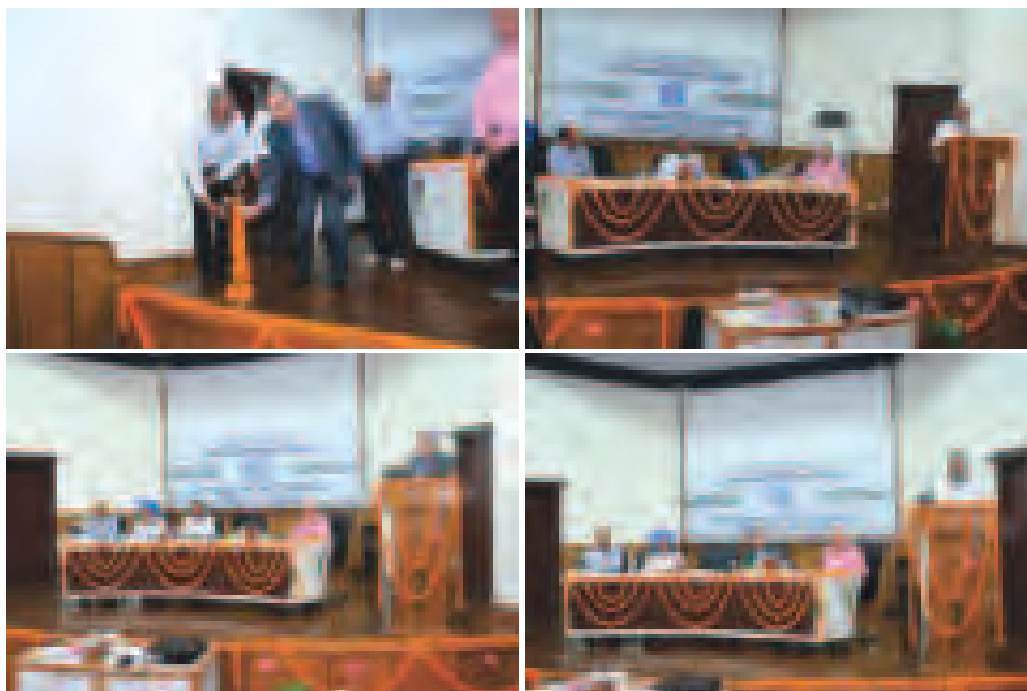
कुमार अग्रवाल, मुख्य वैज्ञानिक को द्वितीय, श्री सुशील कुमार, प्रधान तकनीकी अधिकारी को तृतीय तथा श्री राकेश कुमार, प्रधान तकनीकी अधिकारी, डॉ. सुशांत कुमार सेनापति, प्रधान तकनीकी अधिकारी, डॉ. विनीत कुमार सैनी, प्रधान वैज्ञानिक तथा डॉ. नीरज जैन, प्रधान वैज्ञानिक को प्रोत्साहन पुरस्कार प्रदान किए गए।



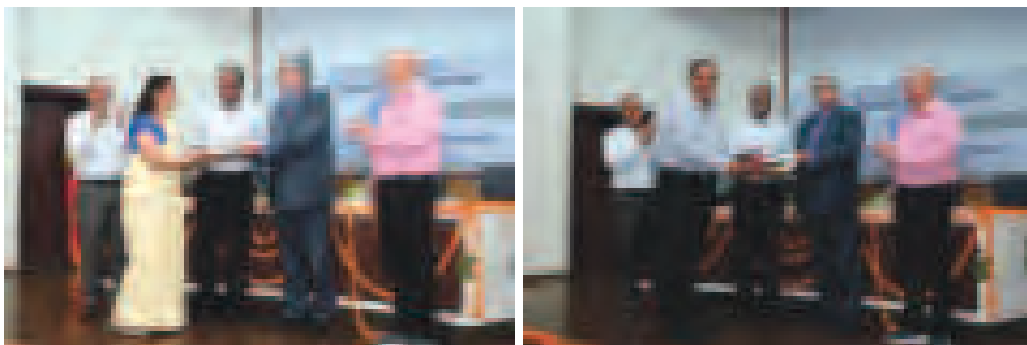
हिन्दी पखवाड़े के अंतर्गत पहली बार Valley of Words – साहित्य सम्मेलन में विभिन्न लेखकों के साथ संस्थान के राजभाषा प्रभारी डॉ. प्रदीप चौहान ने उनकी साहित्यिक रचनाओं पर समीक्षात्मक चर्चा की। हिन्दी पखवाड़ा आयोजन में डॉ. पी.सी. थपलियाल, डॉ. एस.के. सेनापति, डॉ. किशोर कुलकर्णी, डॉ. हेमलता, डॉ. सौमित्र मैती, श्री राजीव बंसल, श्री किरणपाल, श्री देवेन्द्र कुमार आदि ने महत्वपूर्ण भूमिका निभायी।

CSIR Foundation Day

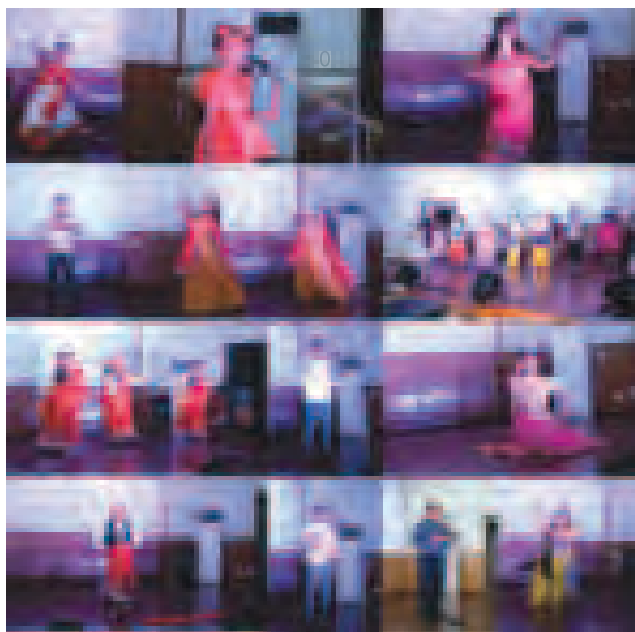
On October 1, 2022, the CSIR Foundation Day was celebrated at the CSIR- Central Building Research Institute Roorkee. The Rabindranath Tagore Auditorium of the institute served as the vibrant venue for this significant event. Dr. Sudhir Kumar, Director of the National Institute of Hydrology in Roorkee, graced the occasion as the Chief Guest, lending his distinguished presence to the proceedings.



The event commenced with a soulful 'Saraswati Vandana' invoking blessing for the proceedings, followed by the ceremonial lighting of the lamp a symbolic gesture of igniting knowledge and enlightenment. Ar. S.K. Negi, Chief Scientist and Chairman of the organizing committee, extended a warm welcome to the attendees through his address, also providing a comprehensive overview of the event's agenda and activities.



Dr. Anjan Ray, the Director of CSIR-Central Building Research Institute Roorkee, delivered a notable presidential address, lauding the CSIR family and expressing heartfelt congratulations on this momentous occasion. Celebration was continued with prize distribution for presentations, recognizing outstanding contributions in various domains. Subsequently, the distinguished Chief Guest shared his insights and thoughts. The proceedings culminated with a harmonious rendition of the national anthem, invoking a sense of patriotism and unity.



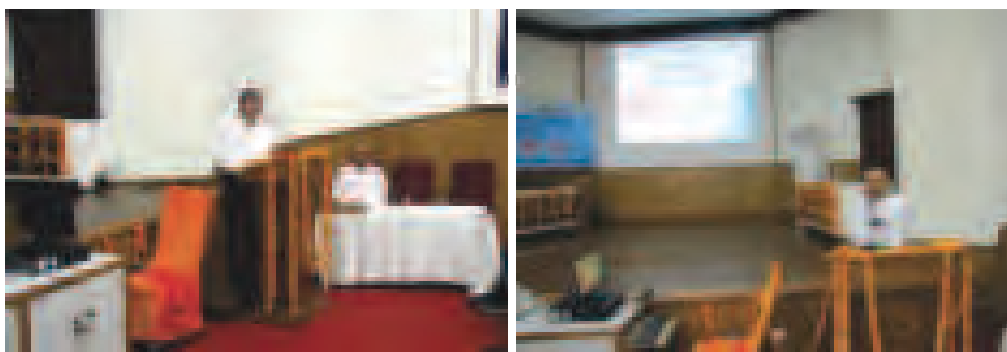
In the evening, the festive spirit continued to thrive with a captivating cultural evening that showcased the institute's vibrant diversity. The event saw enthusiastic participation from CSIR-CBRI staff, students, and children who dazzled the audience with their cultural performances. The stage came alive with a kaleidoscope of talents, enriching the evening with dance, music and various artistic expressions. The Foundation Day celebrations stood as a remarkable occasion.

Ayurveda Diwas

On 18th October 2022, the Ministry of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homeopathy), Government of India, along with the Regional Ayurveda Research Institute, Raniakhet, organized the 7th Ayurveda Day at CSIR-CBRI, Roorkee. The main guest of honor at the event was Dr. S. K. Joshi, Vice-Chancellor of the Ayurveda University in Dehradun and an expert in Marma Chikitsa (a specialized therapeutic practice in Ayurveda).



The event was attended by renowned Ayurvedic practitioners, including Dr. Tekvallabh from Roorkee, Dr. Deshraj from Rishikul Medical College, Dr. Priyaranjan Tiwari from Gurukul Kangri Ayurvedic Hospital, and Dr. Anjali Tiwari and Dr. Gajendra Rao from Region Ayurveda Research Institute, Raniakhet



During the event, Dr. Tekvallabh spoke about the history and importance of Ayurveda, Dr. Gajendra Rao emphasized the economic significance of Ayurvedic herbs and plants, and Dr. Priyaranjan Tiwari provided insights on diabetes, including myths, facts, and Ayurvedic treatments. Dr. Tiwari also explained in detail about the symptoms, precautions, and Ayurvedic remedies for Dengue fever. Dr. Deshraj Singh covered the topic of Ayurvedic mental healthcare, while Dr. Anjali Tiwari discussed the incorporation of Ayurveda into a healthy lifestyle. Throughout the event, speakers highlighted the importance of Ayurveda and raised awareness about its benefits, encouraging people to adopt Ayurvedic practices in their lives.

Diwali Mela

On the auspicious occasion of Diwali, a vibrant and captivating Diwali fair illuminated the premises of CSIR-CBRI on the 22nd of October, 2022. The fair was a true celebration of creativity, culture, and community, as it brought together a myriad of stalls showcasing an array of innovative and handcrafted items. The ambiance was filled with the aromas of delectable cuisines from the various food stalls, enticing visitors to indulge in the festive flavors.



The event commenced with great grandeur as Dr. Anjan Ray Director, CSIR-CBRI along with newly appointed Director CSIR-CBRI, Prof. R. Pradeep Kumar inaugurated the fair. With excitement in the air, attendees explored the diverse stalls, marvelling at the skill and imagination that went into crafting each creation.



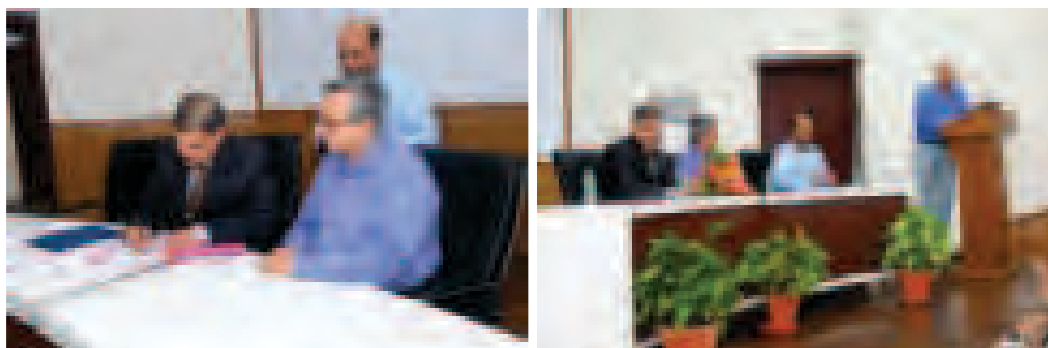
As the Director strolled through the fair, he immersed himself in the jovial atmosphere, participating in games, relishing the delectable treats, and engaging with the stall owners. To infuse the event with a cultural fervour, a series of captivating performances were arranged. Enthralling dance performances and spirited fancy dress competitions brought out the best in these young participants, adding an endearing touch to the festivities.

The Diwali fair reached its crescendo with the distribution of prizes to all the enthusiastic participants. The recognition of their efforts and contributions brought smiles and a sense of accomplishment to their faces. This celebration of Diwali at CSIR-CBRI not only brought together the community but also highlighted the spirit of togetherness and creativity that thrives within its walls.

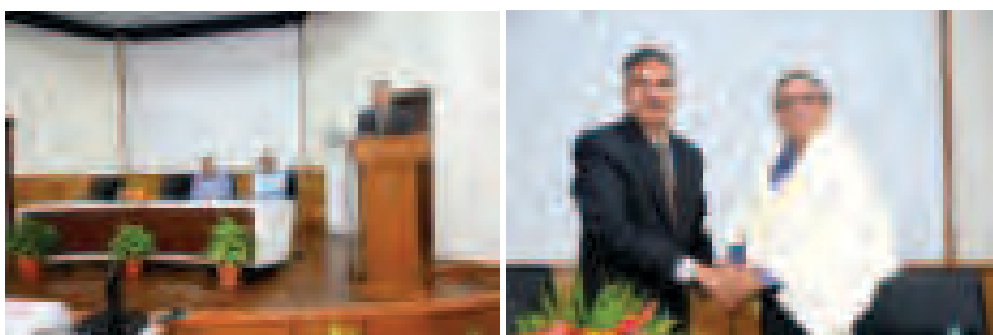


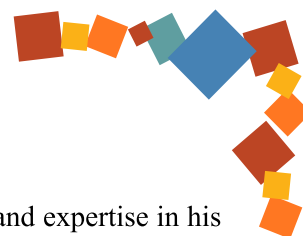
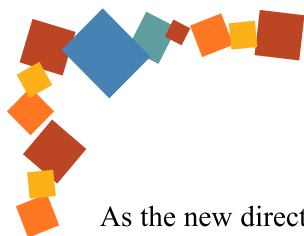
Charge of New Director

On October 21, 2022, a momentous occasion took place at CSIR-CBRI as Prof. R. Pradeep Kumar officially took over charge as the new Director of the institute. The appointment marked the beginning of a new chapter in the institute's history, as Prof. R. Pradeep Kumar succeeded Dr. Anjan Ray, who had been serving as the Director until then.



The transition of power was conducted with utmost professionalism and adherence to official procedures by Shri Pravesh Chand. Among the notable attendees was Mrs. R Pradeep Kumar, who graced the event with her presence, adding a touch of personal support and warmth to the proceedings.





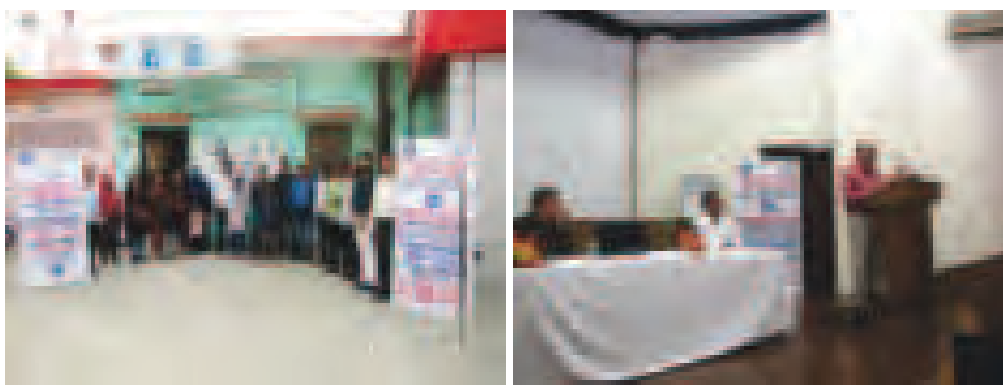
As the new director, Prof. R Pradeep Kumar brought with him a wealth of knowledge and expertise in his field. He outlined his vision for the institute's future, emphasizing collaborative research efforts, nurturing talent, and fostering an environment conducive to cutting-edge scientific advancements. Overall, the ceremony was a moment of pride and celebration for CSIR-CBRI as they welcomed their new director and expressed gratitude to Dr. Anjan Ray for his service.

Vigilance Week

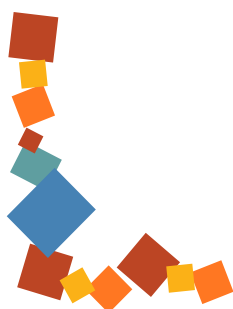
CSIR-CBRI, the Central Building Research Institute, marked a significant milestone as it celebrated a vigilance week from 1st November, 2022 to 4th November, 2022. The week-long event was filled with various engaging programs and activities, highlighting the institute's commitment to fostering vigilance and ethical practices.

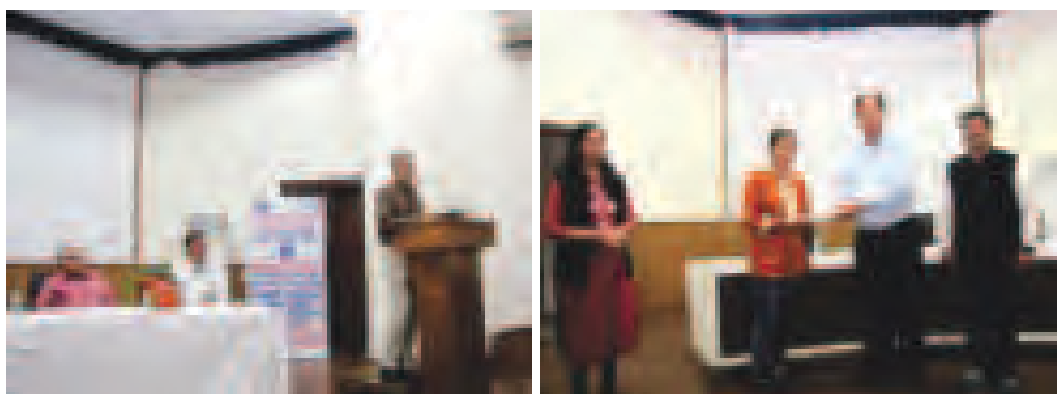


The event commenced with an oath taking ceremony administered by Ar. S.K. Negi Chief scientist, CSIR-CBRI and an awareness march by the staff, who traversed the campus area to spread awareness among the employees and students.



As part of the awareness program a visit to the Panchayat house in Haridwar was arranged, allowing participants to witness the governance and decision-making processes at the grassroots level.

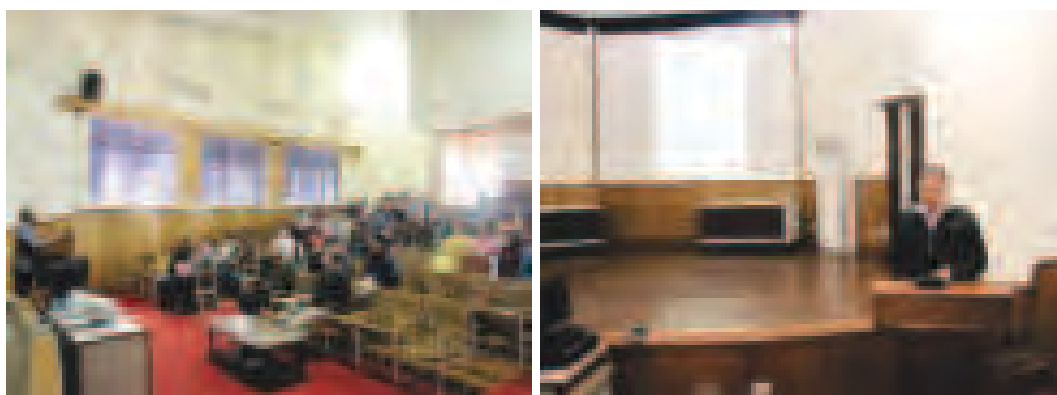




A lecture session by Sh. A.K. Razdan was organized during the event, who shared their insights on the significance of vigilance in research and development. Finally, the vigilance week concluded on 4th November, 2022 with a closing ceremony and prize were distributed to participants for various competitions.

Rastriya Ekta Diwas

On November 23, 2022, CSIR-CBRI celebrated the Rastriya Ekta Diwas in which Oath ceremony was administered by Prof. R. Pradeep Kumar, director CSIR-CBRI. The event witnessed the active participation of CSIR-CBRI staff, who eagerly took part in the proceedings. With great enthusiasm, CSIR-CBRI staff members pledged their commitment to upholding the principles of unity, integrity, and harmony that form the foundation of a strong and prosperous nation.



“One Week One Lab Programme”

Press Meet on One Week One Lab & Inauguration of Exhibition, CSIR-CBRI

Before commencement of the “One Week One Lab (OWOL)” events a Press Meet was organised on 5 January, 2023 in CSIR-CBRI. The Director, Prof R. Pradeep Kumar, briefed the press about the OWOL program, its purpose and various events planned by the institute during 6-13 January, 2023 at various locations. He informed that CSIR- One Week One Lab Campaign had been announced by Honourable Minister of Science & Technology, Dr Jitendra Singh to showcase the technological breakthroughs and innovations in CSIR Institutes across the country. In this connection, CSIR-Central Building Research Institute, Roorkee organised an Exhibition on “Innovation and Sustainable Construction Materials & Technologies” at CSIR-CBRI.



The news about organisation of OWOL by CSIR-CBRI was widely covered by the local newspapers and other media.

Curtain Raiser, Delhi

The Curtain Raiser of 'One Week One Lab' CSIR's initiative and CSIR-CBRI's 'One Week One Lab' program was launched by Hon'ble Minister for S&T and Vice President, CSIR, Dr. Jitendra Singh Ji on January 6th, 2023, in the august presence of Dr N. Kalaiselvi, DG, CSIR and Prof. R. Pradeep Kumar, Director, CSIR-CBRI at Stein Auditorium, India Habitat Centre, New Delhi. The logos of CSIR's initiative 'One Week One Lab' and CSIR-CBRI'S OWOL program were unveiled during the event. Bhavan Tarang, an official YouTube Channel of CSIR-CBRI was also launched by Dr. Jitendra Singh. He also released Workshop Proceedings on "Innovative and Sustainable Construction Materials & Technologies" (ISCMT 2023). Directors of various CSIR labs, Heads, RC members, and other dignitaries graced the event with their presence.



Director, CSIR-CBRI, Prof. Pradeep Kumar Ramacharla gave a brief overview of the events scheduled throughout the week under the campaign. He told that the institute would showcase the developed technologies by holding 20 events that include a workshop, exhibition, industry meets, MSME & Startup meet, stakeholders' meet, competitions such as quizzes and technology hackathons for college students, visit of school students, meetings with the state & district administration, academia meet, meetings with the local public representatives and interaction with press & media.

Dr. N. Kalaiselvi, Director General, CSIR & Secretary DSIR, in her opening remarks highlighted the importance of CSIR, being "The Innovation Engine of India" in its contribution in the field of Science & Technology. She said that CSIR's 'One Week One Lab' campaign will help to establish appropriate connections, not only for the technological breakthroughs and innovations at the CSIR institutes but also

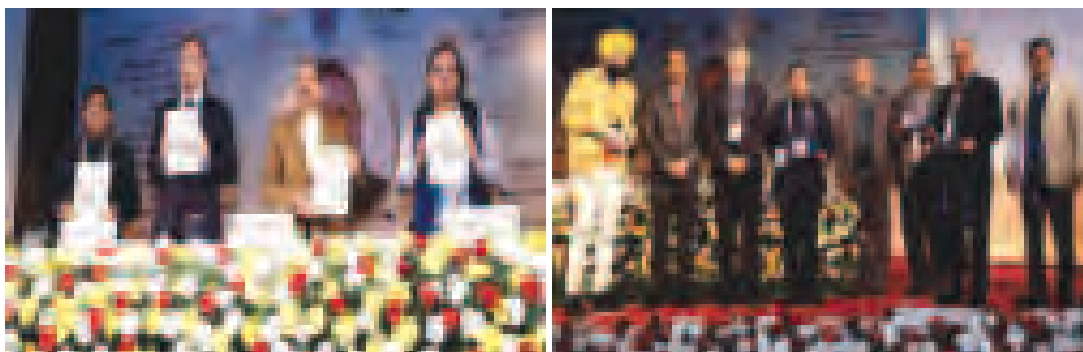
for the future technologies on which research is ongoing in these labs. She further stated that during the campaign scientists would interact with the school students and through programs such as Jigyasa and Atal Tinkering Lab. She further stated that these students are future scientists and it is important to inculcate the temper of science in them.

In his address, Dr Jitendra Singh stated that with "One Week One Lab" campaign 37 premier CSIR Labs spread across India, will showcase their legacy, exclusive innovations, and technological breakthroughs. It is an opportunity to reach out to unfamiliar stockholders including undiscovered Startups. He further mentioned that with the active and constant support of the Prime Minister Shri Narendra Modi for all the scientific ventures, India is touching new heights each day in Science, Technology, Innovation (STI) eco-system. The programme was conducted by Dr. PKS Chauhan and vote of thanks was proposed by Dr. SR Karade.

Workshop & Exhibition on Innovative And Sustainable Construction Materials & Technologies (ISCMT-2023)

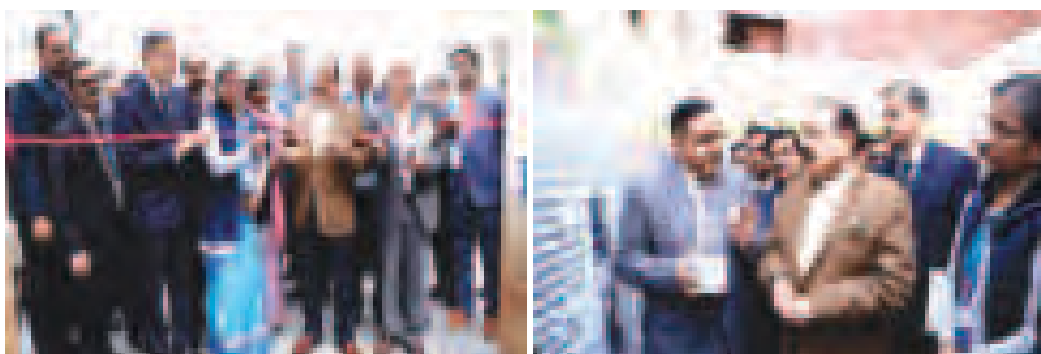
A Workshop and an Exhibition on “Innovative and Sustainable Construction Materials Technologies (ISCMT 2023)” was organized by CSIR-Central Building Research Institute on 6th January, 2023 at Stein Auditorium, India Habitat Centre, New Delhi with an aim of "Moving Towards Net Zero Emissions & Zero Wastes" as a part of CSIR - One Week, One Lab Program.

Dr. Jitendra Singh, Hon'ble Minister of Science & Technology released proceedings of the Workshop in the august presence of Dr (Mrs) N. Kalaiselvi, Director General, CSIR and Secretary, DSIR, Govt. of India, Prof. R. Pradeep Kumar, Director, CSIR-CBRI and Directors of other CSIR labs.



More than 350 participants attended the workshop. In the workshop, two Plenary Sessions were organised, in which 10 keynote speakers delivered the lectures and 24 others papers were also presented during the workshop. These Plenary Sessions were chaired by Dr. Shailesh K. Agrawal, Executive director, BMTPC, New Delhi and Dr. M. Parida, Director, CSIR-CRRI, New Delhi. In this session 5 senior researchers presented their work. In the workshop three technical sessions were also organised in which were moderated by Dr. Ashok Kumar, Prof. P. N. Ojha and Prof. Gaurav Goel.

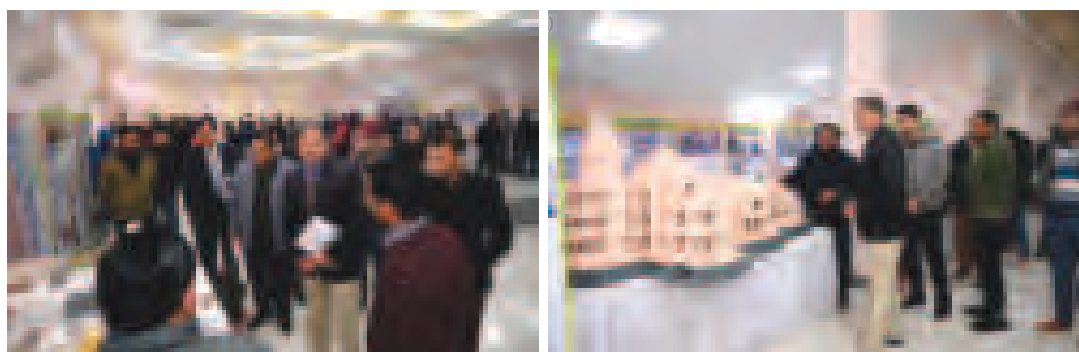
A ‘Technical Exhibition’ was organised as a part of this event. Various technologies of CSIR-CBRI were presented through various posters and models. During his visit in the exhibition area of CSIR-CBRI, the Hon’ble Minister for Science & technology Dr. Jitendra Singh interacted with the scientists of CSIR-CBRI and gave several suggestions further improvement.



The events served as platforms for exposure of the latest technologies and interactions among the delegates from various industries, national laboratories and educational institutions for the advancement in the field of Sustainable infrastructure.

Exhibition of CSIR-CBRI Technologies

During the week-long event CSIR-CBRI organized “Exhibition of CSIR-CBRI Technologies” exhibited banners, models, material samples, in the premise based on R & D activities conducted under different projects. Prof. R. Pradeep Kumar, Director, CSIR-CBRI inaugurated the Exhibition in the Museum Hall at CSIR-CBRI. Video lectures by various CSIR- CBRI scientists were also telecast on digital platform in the museum hall. The target audience for this were mainly professionals, academia, researchers, industries, executing agencies, public representatives, and administrators.



Industry Meet, Mumbai

A one-day **Industry Meet on Building & Construction** as Event No. 4 of CSIR-CBRI’s OWOL program was organized at Hotel Bawa International, Mumbai on January 07, 2023 with an aim to have a better engagement with Industries and identify the common goals of safe, sustainable, affordable, comfortable and ecological solutions in the construction sector.

The event was inaugurated by the Chief Guest Dr. V. Ramachandra, Member, Research Council, CSIR-CBRI & Technical Advisor, UltraTech Cements, and Guest of Honors namely Mr. Samir Surlekar, Director, Assess Build Chem Pvt Ltd and Mr. Nilotpol Kar, Director, Master Builders Solutions Pvt Ltd with Prof. R. Pradeep Kumar, Director CSIR-CBRI. Initially, Dr. R. Dharmaraju, Chief Scientist & Event Coordinator welcomed the dignitaries & participating industry officials and gave the brief note on the agenda of the

program. Dr. S.R. Karade, Chief Scientist has elaborated about the CSIR-CBRI One Week One Lab, a week-long program and details of the Building & Construction Industry Meet.

Prof. R. Pradeep Kumar, Director CSIR-CBRI in his opening remarks highlighted the importance of the event by stating five vital objectives such as to develop collaboration with state/industries, development of futuristic technology & products, create the network of academia, industry & government, and to motivate the youngsters/entrepreneurs to create the startups for glorifying the nation. This industry meet was attended by about 75 industry partners/academic professionals from various parts of the country.



To apprise the latest knowledge on the R&D activities, innovations in building technologies at CSIR-CBRI, scientists made brief presentations in the different areas of the institute. Afterwards the opportunities have been given to the industry partners to present their expertise and expressed their expectation from CSIR-CBRI for possible collaboration to serve the society.



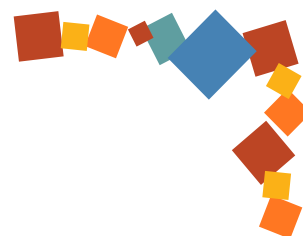
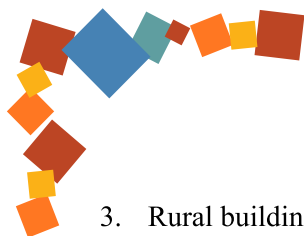
Finally, an interactive panel discussion was held with different area of buildings and construction experts. The technical deliberations held during the meet was discussed in details and also other views/clarifications of participants have been considered by the panelist.

Technology Challenge Hackathon

CSIR-Central Building Research Institute, Roorkee under the flagship of CSIR One Week One Lab (OWOL) initiative organized Technology Hackathon at CSIR-CBRI on January 09, 2023.

Technology Hackathon was based on the three themes aligned with CSIR-CBRI.

1. Green building materials
2. Disaster resilient buildings



3. Rural building technology

CSIR-CBRI invited students from nearby engineering colleges including IIT, Roorkee. More than 100 students participated in the event. Students prepared their innovative ideas in the form of presentation on the given themes. Students presented their ideas in front of a panel of expert. Trophies were awarded to the winner, first-runner-up and second-runner-up. The Director, CSIR-CBRI encouraged and motivated all the students to participate in such kind of events in the future as well.

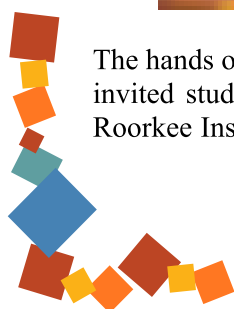


Hands on Training & Quiz for Students

As a part of One Week One Lab (OWOL) celebrations organized by CSIR CBRI, Hands on Training and Quiz competition was organized in RNT Auditorium on 9th January 2023. The organizing team for Quiz competition comprised of Dr. Manojit Samanta, Mr. M. M. Dalbehara, Mr. Kaushik Pandit, Dr. Sandeep Gupta, Dr. Veena Chaudhary, Mr. Shashank and Mr. Nirmal. About 80 students from four engineering colleges attended the program. At the beginning, all participating students and accompanying faculty members were addressed by the Director, CSIR-CBRI, Prof R. Pradeep Kumar, Dr. S.R. Karade, Dr. Harpal Singh and Ar. SK Negi, in the morning session. The Director, CSIR-CBRI encouraged and motivated all the students to participate in such kind of events in the future as well. The Quiz culminated with a big round of applause by the audience for the Winners (Roorkee College of Engineering, RCE) and the Runner-up (Roorkee Institute of Technology). Award ceremony included eminent scientists of the institute Dr. Harpal Singh, Ar. SK Negi, Dr. Karade, Chief Scientist and was presided over by the Outstanding Scientist Dr. Ashok Kumar. Mementos and award certificates were given to the Winner, Runner-up team and for all who participated in the competition.



The hands on Training was conducted in two stages namely, technical and hands-on training. CSIR-CBRI invited students from nearby engineering colleges including College of Engineering Roorkee (COER), Roorkee Institute of Technology (RIT). More than 100 students were participated in the event. The event





was addressed by the Director, CSIR-CBRI followed with the display of CSIR-CBRI film at Rabindra Nath Tagore Auditorium to all the students and faculty members.



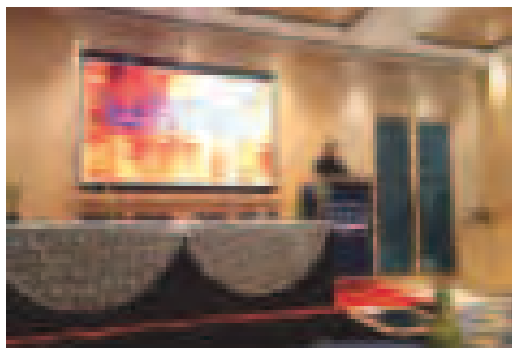
Firstly, technical sessions were delivered by various eminent speakers of this institute mostly based on the outcome of the R&D activities conducted under different projects on various areas

This event helped the students to generate and upgrade their skillsets. This program was organised with an aim of interacting with students of various institutes and give them a platform where they can learn & understand the different aspects of building sciences that helped in clearing out various doubts as well as to explore new ideas running in the mind of the students. Hence, this event was successfully accomplished with a huge participation of students with great enthusiasm.

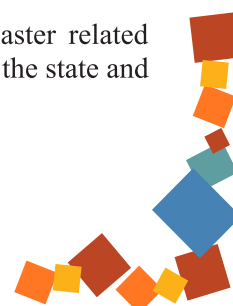
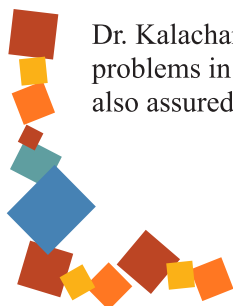
State & District Administration Meet, UK

CSIR-Central Building Research Institute, Roorkee under the flagship of CSIR one week one lab (OWOL) initiative organized a District and Administration, UK Meet at Dehradun on January 10, 2023. The main motive of the meet was to discuss disaster and rehabilitation related problems in the state and their mitigation.

Dr. Kalachand Sain, Director, Wadia Institute of Himalayan Geology was the Chief Guest and Shri Ashok Kumar, DGP, Uttarakhand was the Guest of Honor. Many dignitaries were present from state and district administration and research organisations. Dr. Harpal Singh, Dr. Ajay Chourasia and Dr. PKS Chauhan made presentations on R&D achievements and capabilities of CSIR-CBRI to provide solutions towards disaster and rehabilitation.



Dr. Kalachand Sain and Shri Ashok Kumar in their address expressed their views on disaster related problems in the state. Director, CSIR-CBRI gave his view on the disaster related problems in the state and also assured full support and collaboration from CSIR-CBRI, Roorkee.



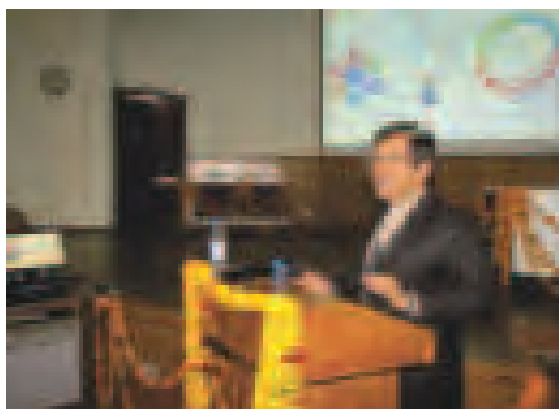
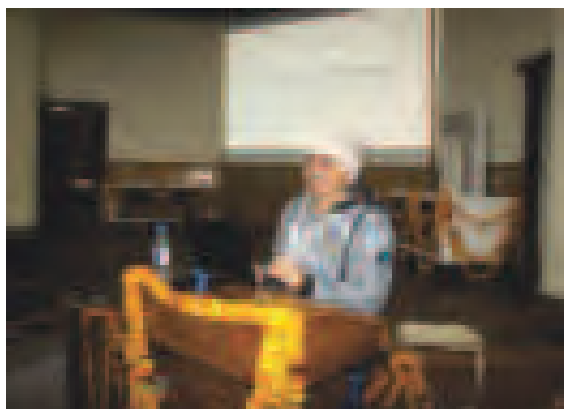
An exhibition also was organised during this event where the administrators of Uttarakhand state attended and CSIR-CBRI offered various customised solutions for the technical problems in the state. The meet was successfully accomplished with a huge participation of state and district administration officials and research organizations with great enthusiasm.



Nurturing Local Talent for Entrepreneurship Opportunities

CSIR-CBRI Roorkee under CSIR-One Week One Lab (OWOL-2023) programme organized 'Nurturing Entrepreneurship and Start-ups (NES)' as Event no. 08 on 10th January 2023. This event provided an opportunity for young minds, Micro, Small and Medium Enterprises (MSME) and entrepreneurs to participate and discuss problems, ideas, solutions and to come forward with startup ideas. The program also provided opportunities for interaction between small local industries and young minds/entrepreneurs for future collaboration.

A total of 134 students from various colleges in Roorkee and Dehradun and 27 persons from industries in Roorkee, Bhagwanpur and Haridwar participated in the event. Two keynote speakers from IIT Roorkee and one from NRDC, Delhi delivered lectures related to startups and business model. There was an open interactive session related to new ideas and marketing strategy among industry people, students and entrepreneurs. Director, CSIR-CBRI, Prof. R. Pradeep Kumar addressed the gathering.

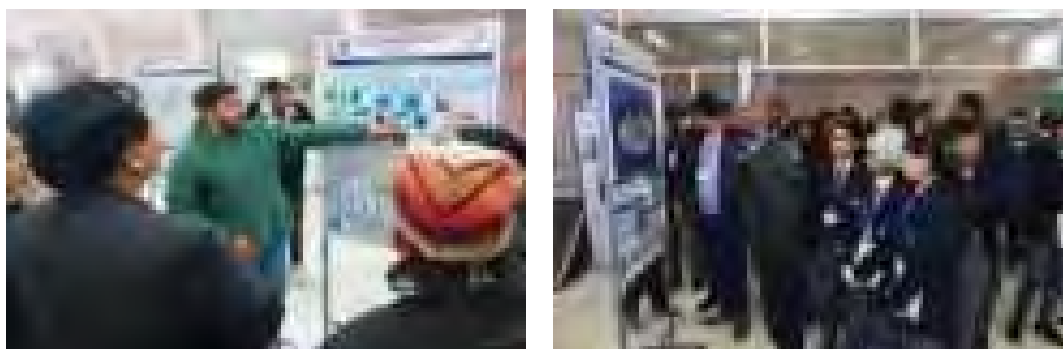




Subsequently, Dr Rajat Agarwal addressed the gathering on marketing and business model. Prof. Pushparaj Mani Pathak, founder of 'Robolife', a startup incubated at TIDES Roorkee briefed in his keynote lecture about his startup, product innovation, concept, business etc. Dr. Sanjeev Majumdar delivered his lecture on IPR and startups. He briefed the audience about the functioning of NRDC which involves technology transfer, patent filing and seed funding for new startups. After keynote lectures, the event was opened for interactions and discussions. The event concluded with a vote of thanks by Dr. S. K. Panigrahi.

Posters on Futuristic Ideas by Young Scientists

CSIR-CBRI organized an event titled "Futuristic Ideas by Young Scientists - A Poster Presentation" (Event No. 9) as a part of the One Week One Lab (OWOL) festival on 10th January, 2023 in its campus. The poster presentation event on Futuristic Ideas by Young Scientists was conducted with the objective to encourage and inspire young talents to participate in a healthy competition and present their innovative and out-of-the box ideas.



About 80 young scientists, AcSIR students, trainees, project staff of the CBRI team presented 55 posters showing enthusiastic participation. Each team presented their novel and future bound ideas to the jury. During the programme, the Director of the Institute, Prof. R. Pradeep Kumar was present to encourage the participants. The posters were also explained to the enthusiastic visitors and students from various schools

and institutions to inspire in these aspiring scholars a vision of the future. The jury, comprised of Dr. Pankaj Agarwal (Professor, IIT Roorkee), Dr. Ashok Kumar (Outstanding Scientist, CSIR-CBRI Roorkee), and Dr. P.C. Thapliyal (Senior Principal Scientist, CSIR-CBRI Roorkee). The participants were encouraged by offering 5 awards on this occasion.



Stakeholder's Meet

CSIR-CBRI, Roorkee under OWOL, organized a “Stakeholders Meeting” (Event No. 10) under the flagship of CSIR One Week One Lab (OWOL) initiative at India Habitat Centre, New Delhi on 11th January 2023. The event was inaugurated by Dr. N. Kalaiselvi, Director General, CSIR & Secretary DSIR.



CSIR-CBRI invited many eminent stakeholders and industries from Government, public and private sectors. The meeting with the stakeholders drew huge participation. Stakeholders from various ministries and organization such as Ministry of Defence, Ministry of External Affairs, INTACH, TATA steel, UAL Industries, PWD, etc. were also present during the event. In all, more than 150 people attended the meet. Dr. N Kalaiselvi, DG, CSIR appreciated the efforts of CSIR-CBRI in organizing this stakeholder meet. She assured all the stakeholders of continuous support and help from CSIR-CBRI Roorkee. Further, Director, CSIR-CBRI, Prof. R. Pradeep Kumar also assured full support and collaboration from CSIR-CBRI Roorkee.

Dr. Achal Mittal, Chief Scientist gave a presentation on the R&D achievements and capabilities of CSIR-CBRI with futuristic goals. Several stakeholders acknowledged CSIR-CBRI for the services offered in the field of repair and retrofitting and also work done for the development of nation as a step towards “Atmanirbhar Bharat”.

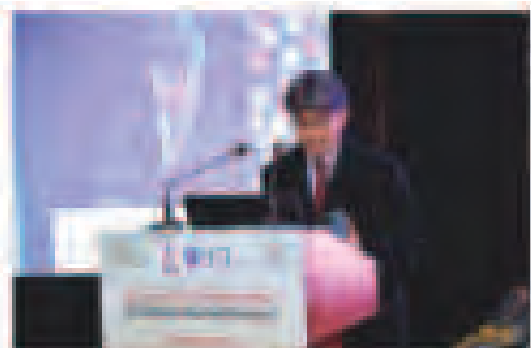


Eminent speakers expressed their views and suggested various focus areas viz. standardization and suitability of identified technologies as per relevant seismic zone, preservation of old and heritage structures and solutions for various geotechnical conditions, development of standard soil testing facility, highways that generate electricity, noise reduction from the building roofs, solar roofs, green and net zero buildings, modular and cheap 3D concrete printing, lightweight aggregates, geo-polymer roads and sand replacement. There was also an open interactive session where other stakeholders discussed about their works, challenges and areas where CSIR-CBRI can contribute and provide solutions. The program was successfully accomplished with a huge participation & discussion.

Industry & MSME Meet

Under CSIR-One Week One Lab program, a meeting was organized between CSIR-Central Building Research Institute, Roorkee and different Industries and MSME- Startups at India Habitat Center, New Delhi on 11th January, 2023. The aim of the meet was to bring in academia, industry, MSMEs and Start-Ups, all on one platform and identify the common goals of safe, sustainable, affordable, comfortable and ecological solutions in the construction sector. The meet focused to bridge the gap between Research & Development organizations and Industry - field implementation by keeping Industry partners on board. The event was inaugurated by Dr. B. N. Mohapatra, DG, National Council for Cement and Building Materials (NCB).

The meet focused to bridge the gap between Research & Development organizations and Industry - field implementation by keeping Industry partners on board. The following Industrialists and MSME delegates shared their knowledge acquired through years of experience in both academic and industrial domains in the form of presentations.



They have presented in various areas such as Energy efficient buildings, Building Construction technologies, and Construction chemicals, Demolition and Geo-hazards, Structural Health Monitoring etc.

Everyone got to know a number of new technologies, innovative ideas, opportunities and challenges for further collaboration and exploratory activities which will benefit to the society at large.

Around 40 Industry partners, 25 MSME-Start-ups and more than 50 delegates took part with full enthusiasm and had dialogues with the scientists of CSIR-CBRI. This meeting helped us to look into the purpose, goals, scope, timeline and roles in redefining the path of CSIR-CBRI, keeping SDG, IPCC and National Missions objectives in focus.



JIGYASA - School Students and Scientist Interaction

A one-day interaction of school students along with the Principals and teachers from Kendra Vidyalaya 1 (KVS 1), Kendra Vidyalaya 2 (KVS 2) Jigyasa – School Students and Scientist Interaction program was organized at Rabindranath Tagore Auditorium (RNT) at CSIR-Central Building Research Institute, Roorkee on January 11, 2023. The aim was to interact with school students and their principals and teachers to inculcate the scientific thoughts in the students.

The event was started with an address of Dr. P.K.S. Chauhan. In his opening remarks he highlighted the importance of science and discussed about the ancient science and current science relation and encouraged the students.

Further, Dr. Atul Kumar Aggarwal, former Chief Scientist shared his views and motivated the students. Dr. Veena Chaudhary, discussed the role of women scientists in India. The popular science lectures were delivered by the Dr. Rajesh Kumar and Dr. Kishor Kulkarni. At the end of the lecture session, the students of the participating schools were presented with caps featuring the event logo and theme as a gesture for their involvement and to encourage them and make them curious about learning things.

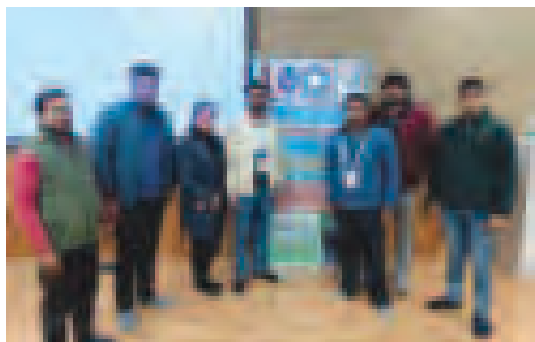


In the last various laboratories were shown by the CBRI Scientists to the students. The active participation of students in the interaction with the scientists during laboratory visit displayed their curiosity and eagerness to get enlightened about the concepts.



Lectures & Interaction With Students

As a part of CSIR-CBRI One week one lab program, a CSIR-CBRI team interacted with students as well as their teachers of Delhi Public School, Ghaziabad on 13th January, 2023. They explained about CSIR, its 37 laboratories and CSIR-CBRI's achievements, then a quiz competition was organised for students and about 50 students participated in it and top three winners were awarded prizes.



Atal Tinkering Labs

Under the CSIR-CBRI's OWOL program a one-day interaction of school students along with the respective Principals and teachers from four different schools, Atal Tinkering Labs event was organized at Rabindranath Tagore Auditorium (RNT) at CSIR-Central Building Research Institute Roorkee on January 12, 2023. The main aim was to interact with school students and teachers to inculcate the scientific thoughts in the students. In all total 200 students from 4 schools of Roorkee participated along with staff members. The event was inaugurated by Prof. R. Pradeep Kumar, Director CSIR-CBRI.



In his address to the school students along with the Principals, Teachers, and Scientist of CSIR-CBRI, he highlighted the importance of learning and focusing on the value of learning. After that Dr. Hemlata and Dr. Chandan Swaroop Meena, Scientist, CSIR-CBRI, informed about the program and distributed the caps with One Week One Lab logo. During the opening session, the Director appreciated a student selected for science competition.



Then Dr. Veena presented the role of women in science. She also discussed about our DG CSIR and Secretary DSIR, Dr. N. Kalaiselvi. Later, Dr. P.K.S. Chauhan, Sr. Principal Scientist, CSIR-CBRI in his presentation on “Bharat ka Prachin Vigyan” discussed about ancient science and its importance and relevance to the present context.

Academia Meet

Academia Meet was organized at CSIR- CBRI Roorkee on 12th January 2023 under CSIR-CBRI's One week One Lab Program. A number of experts including Prof. Ravi Sinha (IIT Bombay), Prof. B. Battacharjee (IIT Delhi), Prof. Subrata Chattopadhyay (IIT Kharagpur), Prof. B. K. Maheshwari (IIT Roorkee), Prof. Raghukanth (IIT Madras), Prof. Dhiman Basu (IIT Gandhi Nagar), Prof. B. M. Pathak (IIT Roorkee), Prof. D. Srinagesh (IIT Madras), Prof. R. N. Dubey (IIT Roorkee) participated in panel discussions. Prof. R. Pradeep Kumar (Director CSIR-CBRI, Roorkee) and CSIR-CBRI Scientists also participated in the panel discussions. The event was coordinated by Prof. S.K. Singh and Prof. Ajay Chourasia, Chief Scientists.





Lecture by Eminent Experts

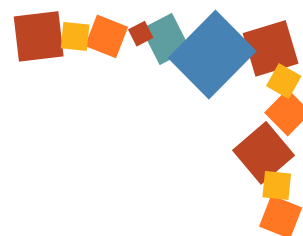
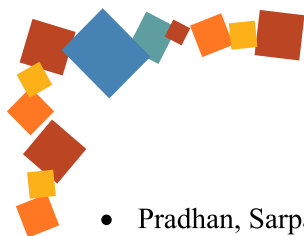
Eminent Expert Lectures were organized at CSIR - Central Building Research Institute on 12th January, 2023 under One Week One Lab Program. Experts such as Prof. Raghukanth (IIT Madras), Prof. B. Battacharjee (IIT Delhi), Prof. Subrata Chattopadhyay (IIT Kharagpur), Prof. B.M. Pathak (IIT Roorkee), Prof. D. Srinagesh (IIT Madras), delivered expert lectures in their domain. The event was coordinated by Prof. SK Singh (Chief Scientist) and Prof. Ajay Chaurasia (Chief Scientist) of CSIR-CBRI.



Meeting with the Local Public Representatives

CSIR-CBRI, Roorkee under “One Week One Lab” (OWOL), organised a “Meeting with the Local Public Representatives” on 13th Jan., 2023 at RNT Auditorium & Technology Park CSIR-CBRI, Roorkee. The meeting with the Local Public Representatives drew huge participation. It was attended by:

- Chief Guest - Sh. Pradeep Batra, MLA, Roorkee City & his team
- Guest of Honour - Sh. Gaurav Goel, Mayor, Roorkee City & his team
- Jt. Magistrate, Roorkee- Sh. Abhinav Shah
- Members of Industries Association
- Sh. Kiran Choudhary, President (Jila Panchayat),
- Ward members of Roorkee city,



- Pradhan, Sarpanch of Panchayats of nearby Villages
- Engineers from Uttarakhand Electricity Board, Jal Board, Irrigation department, PWD, etc., and
- Training Students

In all, more than 150 people attended the meet. Shri Pradeep Batra, MLA Roorkee and Sh. Gaurav Goel, Mayor Roorkee addressed the audience. They praised CSIR-CBRI for their work and informed about cities problems. During the meeting, Sh. Kiran Choudhary, President (Jila Panchayat) also addressed the audience and demanded that such type of programs should be organised in the future for rural area and nearby villages.



Closure

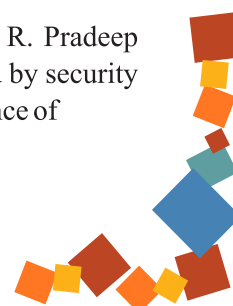
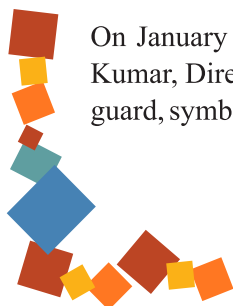
The Closure Ceremony of the One Week One Lab program of CSIR - Central Building Research Institute was organised on 13th January, 2023 in the afternoon. With this function the week-long programme was successfully completed. During the function, all the coordinators of 20 events presented a summary of the respective events.



Prof. R. Pradeep Kumar in his closing speech talked about the idea of One Week One Lab program & vision of the Hon. Minister for S&T, Dr. Jitendra Singh and support & motivation received from Dr. N. Kalaiselvi, DG, CSIR. He also appreciated the team spirit and contribution of each employee and others in conducting different events. Dr. S. R. Karade coordinated the event. All the team members congratulated each other on this accomplishment.

Republic Day

On January 26th, Republic Day was celebrated by CSIR-CBRI with great enthusiasm. Prof. R. Pradeep Kumar, Director, CSIR-CBRI hoisted the national flag, and took salute at the parade presented by security guard, symbolizing the spirit of unity and patriotism. In his address, he highlighted the, significance of



Republic Day and emphasizing the importance of upholding the values of Indian Constitution. The highlight of the event was the cultural program presented by school children, who enthralled the audience with their performances. A festive cricket match was also organized between President-XI and Secretary-XI of staff club CBRI on this occasion.



CSIR-CBRI Foundation Day

CSIR-Central Building Research Institute celebrated its foundation day on 10th February, 2023. The event was organized in Rabindranath Tagore Auditorium of the Institute. Shri Rajendra Singh, Member, National Disaster Management Authority graced the event with his presence as Chief Guest. In his address he praised the work done by CBRI in Joshimath and appreciated the “One Week One Lab” program organized by CBRI. He deliberated that due to technological advancements now it is easier to get the solution for majority of the problems in every field of life. The event began with a National Song and lighting of the lamp. Ar. S.K. Negi, chief scientist and chairman of the organizing committee presented the welcome address and briefed about the program.

Prof. R. Pradeep Kumar, Director of the CSIR-Central Building Research Institute Roorkee, gave his presidential address and congratulated CSIR- CBRI Family on this great occasion. He appealed to all the staff to give their best in solving the problems related to building sector.

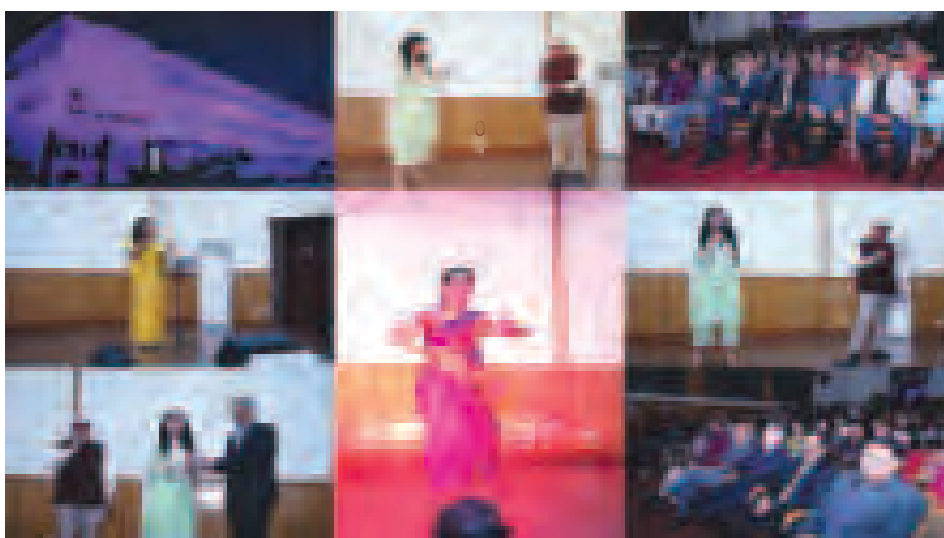


Dr. S.R. Karade presented a brief report on the “One Week One lab” program organized by CBRI Roorkee. The work of CBRI at Joshimath was highlighted by Dr. D.P. Kanungo and Dr. Ajay Chaurasia with the help of short presentation.

On this Occasion Director’s Award for Best Research Paper and Best Technology were given to the scientist of the institute by Shri Rajendra Singh, Chief Guest of the function. He also released the book "Fire safe Building" by Dr. Saurabh Jain. He also released the monthly e-Newsletter of the Institute. The program was conducted by Dr. P.K.S Chauhan, he also introduced the chief guest Shri Rajendra Singh. Dr. R. Dharmraju presented the vote of thanks. The function ended with National Anthem. To celebrate our foundation day sports activities were organized for entire CSIR-CBRI staff. The whole CSIR-CBRI family was grouped in four houses i.e. Kalam House, Visvesvaraya House, Bhabha House and Sarabhai House.



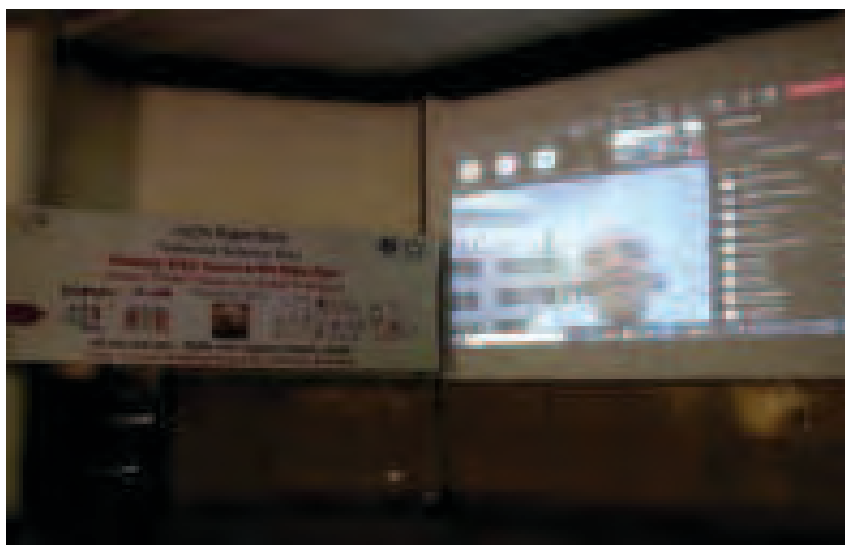
This year Table Tennis, Badminton, Carrom and Cricket events were organized. The Sarabhai House emerged as winner and Bhabha House was runner up of the sports events. The prizes were given during the Foundation Day Program.



A cultural evening was organized in the evening on 10th February, 2023 on the occasion of Foundation Day. The CBRI Staff, Students, Children of CBRI Family, participated in the event with joy and enriched the evening with their cultural performances. In the last Director Prof. R. Pradeep Kumar gave mementos to the participants. The anchors for the show were Dr. P.K.S Chauhan and Ms. Akriti. The cultural evening was followed by dinner to the entire CBRI Family.

National Science Day 2023

National Science Day was celebrated in the institute on March 3, 2023 with the theme “Global Science for Global Well Being”. The Chief Guest was Prof R.N. Iyengar, Distinguished Professor, Jain University, Bangalore & Former Director, CSIR-CBRI, Roorkee. He delivered an online lecture on this occasion.



CSIR-CBRI, Roorkee organised one Day Training Program on Building Construction for "गांव की समस्याओं के लिए - एक समाधान यात्रा / Village problems - A Solution journey" at Matlabpur Village, Roorkee on 25th March, 2023 for the residents of Matlabpur. In all, 150 people attended the training program and in his inaugural speech Prof. R. Pradeep Kumar, Director CSIR-CBRI, informed all the participants about the aim of such type of training program and offers an opportunity to showcase the activities of the Institute to the society/stakeholders.

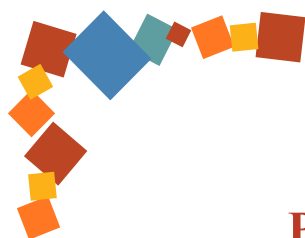
Apart from this Sh. Manoj, ward members Matlabpur, Roorkee also addressed the audience. He praised the work of CSIR-CBRI and informed about Matlabpur area problems. Ar. SK Negi, Chief Scientist gave a presentation on the works of CSIR- Central Building Research Institute Roorkee from its inception. Dr. B.S. Rawat, Senior Principal Scientist gave his presentation on the topic Prevention of Termites in buildings. Engineer Itrat Amin Siddiqui expressed his views on the subject How to make your dream home. An exhibition was also organised by the institute on CSIR-CBRI technologies and Er. Ashish Pippal elaborated these technologies to participants during exhibition. There was an open interactive session where people discussed about their problems and concerned scientists provided the appropriate solutions to the general public. The program concluded with vote of thanks by Mr. Vineet Saini, Principal Scientist. The program was successfully accomplished with a huge participation & discussion. Program was coordinated by Sh. Nadeem Ahmad, Senior Principal Scientist, CSIR-CBRI, Roorkee.





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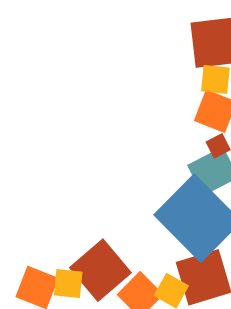
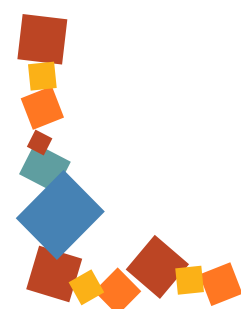
Students-Scientists Connect Programs



Programs Implemented under Jigyasa 2.0

FY (2022-23)

S. No.	Date	Programme Implemented	Model of Engagement	No. of Days	No. of Students	No. of Teachers	No. of Schools
1.	April 12 th , 2022	Students-Scientists Connect Jigyasa Event	Popular Science Awareness Day	1	110	6	1
2.	April 19 th , 2022	Students-Scientists Connect Jigyasa Event	Popular Science Awareness Day	1	125	6	1
3.	July 7 th , 2022	Students-Scientists Connect Jigyasa Event	Popular Science Awareness Day	1	250	50	25
4.	July 15 th , 2022	Students-Scientists Connect Jigyasa Event	Vishwa Yuva Kaushal Diwas Celebration	1	80	8	2
5.	September 22 nd , 2022	Students-Scientists Connect Jigyasa Event	Global Science Experiment	1	30	4	1
6.	December 2 nd , 2022	Students-Scientists Connect Jigyasa Visit	Scientist Visit to School/ Outreach Program	1	150	12	1
7.	January 11 th , 2023	Students-Scientists Connect Jigyasa Event	Popular Science Awareness Day	1	110	8	3
8.	January 12 th , 2023	Students-Scientists Connect ATL Event	Popular Science Awareness Day	1	220	15	1
9.	February 22 nd , 2023	Students-Scientists Connect ATL Visit	Scientist Visit to School/ Outreach Program	1	30	6	1
10.	February 22 nd , 2023	Students-Scientists Connect ATL Visit	Scientist Visit to School/ Outreach Program	1	90	9	1
11.	February 23 rd , 2023	Students-Scientists Connect ATL Visit	Scientist Visit to School/ Outreach Program	1	60	10	1
12.	March 21 st , 2023	Students-Scientists Connect Program	Scientist Visit to School/ Outreach Program	1	180	30	20
13.	March 24 th , 2023	Students-Teachers Connect Program	Teacher workshop	1	0	32	8



Students-Scientists Connect

On 7th July, 2022, CSIR-Central Building Research Institute, Roorkee organized an event under CSIR's Jigyasa 2.0. Along with teachers, 200 students from 25 Kendriya Vidyalayas throughout the state participated in the event, including those in Haridwar, Mussoorie, Hathi Badkala, Dehradun, Gopeshwar, Pithoragarh, Almora, Raiwala, Roorkee, and Rishikesh. Dr. Pradeep Chauhan, Coordinator Jigyasa welcomed everyone. Dr. Suvir Singh while presiding over the function called upon the students to take interest in the laboratories of the institute. Dr. Atul Agarwal spoke about the institute's glorious history. Dr. Suvir Singh, Dr. Atul Agarwal, Dr. Pradeep Chauhan, Dr. Hemlata, Dilshad, Ku. Janvi, Kiran Pal, Devendra etc. were present at the event. At the end of the program, copies of 'Vigyan Pragati' and 'Science Reporter' were distributed to all the students by institute.



Vishv Yuva Kaushal Divas

50 Students of class 10th from Cantt Board School and 30 students of Shivalik Gange School visited CSIR-Central Building Research Institute, Roorkee under CSIR's JIGYASA program. The event was organized at CSIR-CBRI as part of World Youth Skills Day. The objective of this program is to develop scientific temper in children so that they can move forward in the field of science. Dr. Suvir Singh, Chief Scientist of the Institute, gave a lecture to the children to develop scientific thinking and interestingly told the children about the methods and precautions to be taken in case of fire. Apart from these, Dr. LP Singh, Senior Principal Scientist of the Institute, presented a lecture to the students on building materials used from ancient times till date. Former Chief Scientist of the Institute, Dr. Atul Kumar Aggarwal put forward his views to develop positive thinking in an interesting way to the students through interesting stories. Senior Principal Scientist Dr. Pradeep Chauhan conducted the program and called upon the children to take inspiration from the life of Srinivasa Ramanujan. The students were also taken on a tour of various laboratories of the Institute. At the end of the program, copies of 'Vigyan Pragati' and 'Science Reporter' were distributed to all the students.



Global Science Experiment

On 22nd September 2022, CSIR- Central Building Research Institute organized a Scientist–Student Connect Program under Jigyasa 2.0 with an aim to interact with school students to inculcate the scientific and experimental thoughts within the students. Around 70 Students from Bal Vidhya Mandir Junior High School CBRI participated in this program. Students were divided into groups and hands-on activities were performed.



Students-Scientists Interaction

On 2nd December, 2022 Dr. P.K.S Chauhan visited DLF Ghaziabad to judge a model competition and interact with the students. The competition provided a platform for students to showcase their scientific knowledge, creativity, and problem-solving skills. The competition was centred around the theme of Artificial Intelligence. The students put in tremendous effort to create innovative and informative models, demonstrating their understanding of scientific principles. Following the competition, Dr. P.K.S Chauhan interacted with the students by delivering an insightful lecture on earthquakes. This lecture aimed to educate the students about the science behind earthquakes, their causes, and the impact, they have on our planet.



Students-Scientists Interaction

On 22nd February, 2023, “Scientist student Interaction” was organized at CJ D.A.V Public School Meerut under “Jigyasa 2.0” in which around 160 students and 12 teachers participated from the school. The motive of this interaction was to trigger a scientific approach in the student's mind. The event was inaugurated by school Principal Dr. Alpna Sharma. She welcomed the team of CSIR-CBRI scientists with the mementoes. Later Dr. P.K.S. Chauhan delivered a lecture on the ancient science and attracted students towards the ancient science of India.



Students-Scientists Interaction

On 22 Feb, 2023 Scientists from CSIR-CBRI (Dr. P.K S Chauhan, Senior Principal Scientist, Dr. Chandan Swaroop Meena, Senior Scientist, Dr. Veena Chaudhary, Scientist and Shreya Negi, Project Associate) visited G.D. Goenka School Muzaffarnagar for interacting with the students and teachers of the school. School Principal Surekha Singh welcomed the CSIR-CBRI team and had a general discussion regarding the ATL Labs. After that the ATL incharge Satendra Prajapati guided the CSIR-CBRI team to the Atal Tinkering Lab where the Scientists interacted with the students and encouraged them about the importance of science. Scientist also had a talk with the science faculty of the school.(Anu Malik, Nikunj Kumar, Ayush , Paijol, Nitin Rathi, Sachin Garg, Abdul Kadri, Sachin Garg, Harshita Singhal).



Students-Scientists Interaction

On 23 Feb, 2023 Jigyasa team (Dr. P.K.S. Chauhan, Dr. Chandan Swaroop Meena, Dr. Veena Chaudhary, Shreya Negi) from CSIR- CBRI visited D.P.S. Ghaziabad for interacting with students and teachers of the schools. In the interactive session Dr. Veena Chaudhary discussed about role of women in science and Dr. P.K.S Chauhan talked about Ancient Science lastly, Dr. Chandan Swaroop Meena presented lecture on the Heat Pump, Refrigeration and AC's. After interacting with students, scientist had a general discussion with school Principal Sangeeta Mukherjee Roy.





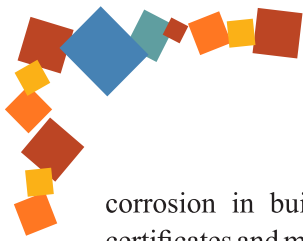
Students-Scientists Interaction

Saraswati Vihar Girls's School Sharanpur organised a Mandal Level Science Model Competition with a theme "Global Science for Global Well Being" on 21st March, 2023, where CSIR-CBRI Scientists Dr. P.K.S. Chauhan Principal Senior Scientist, Dr. Chandan Swaroop Meena Senior Scientist, visited as a jury member. The competition started at 11:00 am, and all the judges started analysing the models that students from various institutions presented. 45 models brought by students from three districts were examined. (Sharanpur, Muzaffarnagar, Shamli). Ten models were chosen for the state level science model competition. The event concluded with a prize distribution ceremony and photo session.

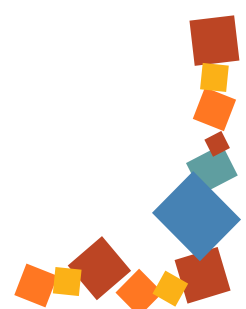
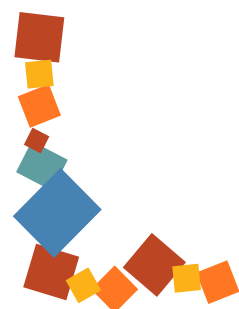


Scientists-Teachers Connect

On 24th March, 2023 a "Scientist Teacher Connect" workshop was organized at CSIR- Central Building Research Institute under "Jigyasa 2.0" in which around 35 teachers from 8 schools i.e., D.A.V. Meerut, D.P.S. Haridwar, Cantt Board Roorkee, Anand Swaroop Arya Inter College, Scholars Academy Roorkee, Army Public School No.1, Kendriya Vidyalaya No.1, Bal Vidya Mandir CBRI Roorkee participated. The workshop was inaugurated by CSIR-CBRI, Director Prof. R. Pradeep Kumar and Ar. S.K. Negi, Chief Scientist CSIR-CBRI shared the dice and talked about the CSIR-CBRI technologies. Dr. Suvir Singh, Former Chief Scientist CSIR-CBRI, Dr. S.R. Karade, Chief Scientist, Dr. L.P. Singh, Sr. Pr. Scientist and Dr. P.K.S Chauhan, Sr. Pr. Scientist CSIR-CBRI enlightened teachers about the importance of fire safety, the



corrosion in buildings, Climate change and Earthquakes. Program was successfully completed by certificates and momentos distribution to the teachers.





Projects

CSIR Funded Project 2021-2023

Sl. No.	Title of Project	Name of PI/Co-PI	Project Number
1.	A multi usable self-rescue descent device to escape from high rise buildings during disasters (FTC)	S.K. Panigrahi (PI) R.S. Bisht (Co-PI)	MLP012204
2.	Commercialization of technology on manufacturing of internal fuels based eco-friendly and energy efficient burnt clay bricks (FTC)	Neeraj Jain (PI) L.P. Singh (Co-PI)	MLP022204
3.	Development of low toxicity fire retardant intumescent coating for steel and GI duct applications (FTT)	A. Aravind Kumar (PI) Rakesh Kumar (Co-PI)	MLP032204
4.	Development and trials of a gantry robot for 3D concrete printing (FTT)	R.S. Bisht (PI) S.K. Panigrahi (Co-PI)	MLP042204
5.	Development of Strengthening and Retrofitting Technique for RC Structures using Hybrid Textile Reinforcement (FTT)	R. Siva Chidambaram (PI) Prasanta Kar (Co-PI)	MLP052204
6.	Jigyasa 2.0 programme with the concept of Virtual Lab integrated (CJVL)	Dr. PKS Chauhan	HCP0101
7.	CSIR Integrated Skill Initiative Phase-II	Dr. R Dharamraju	NWP-100
8.	Structural Performance Assessment of Connections in Bamboo Structures (FBR)	Er. M M Dalbehera	MLP 092002
9.	Geotechnical Novel Solutions for Underground Infrastructures (NCP)	Dr. Anindya Pain, Pr. Scientist, GE and Er. M. Vinoth, Scientist, GHRR	MLP 062002
10.	Multi-temporal Optical Imaging Drone based Landslide Monitoring and Warning (NCP)	Dr. D.P. Kanungo	MLP 102002

List of OLP Project during 2021-23

Sl No	Project No	Title of the Proposal	Start Date	End Date	Principal Investigator	Co-Investigator
1	OLP2201	Development of CO ₂ sequestrated artificial aggregate using fly ash and lime sludge	Jun. 2022	May. 2023	Dr. L.P. Singh	Dr. Ashok Kumar/ Ms. Humaira Athar
2	OLP2202	Development and commercialization of valorized lime sludge through environmental friendly low cost building products	Aug. 2022	Jul. 2023	Prof. S. K. Singh	
3	OLP2204	Study and development of agro-waste based gypsum blocks for non-load bearing indoor application	Jul. 2022	Jun. 2023	Dr. Siddharth	Dr. Ravindra Singh Bisht
4	OLP2205	Design and development of thermoelectric module system for conditioning a 1m x 1m model space with improved coefficient of performance.	Aug. 2022	Jul. 2023	Mr. Chandrabhan Patel	V Chakrdhar
5	OLP2207	Design and development of standalone IoT based radiant cooling unit coupled with earthenware heat rejection and mini DOS	Jul. 2022	Aug. 2023	Mr. V Chakrdhar	Mr. Chandrabhan Patel
6	OLP2214	Preparation of Book on “Understanding Codes for Life Safety Components” in design of buildings	Aug. 2022	Feb. 2023	Dr. Shorab Jain	
7	OLP2221	Development of Fire Retardant/Resistant Temporary Shelters/Huts for Rann of Kutch Poor Salt Workers	Oct. 2022	Sep. 2023	Dr. Harpal Singh	Dr. Aravind Kumar
8	OLP2216	Development of green sustainable composite building material using biochar	Aug. 2022	Jul. 2023	Dr. Hemlata/ Dr. Srinivasarao Naik B	
9	OLP2219	Development of framework for controlled building destruction of tall structures using numerical technique	Sep. 2022	Aug. 2023	Suman Kumar	Dr. Debdutta Ghosh

Externally Funded Projects Undertaken during 2021-23

Project No	Title	Name of Client	PI
CNP0072	Performance Evaluation of HDPE Membrane	Executive Engineer, Health Project Division (Central), PWD, L. N. Hospital, New Delhi	Md. Reyazur Rahaman
CNP0812	Development of Master Plan for Shri Mansa Devi Complex, Panchkula	Shri Mata Mansa Devi Shrine Board, Panchkula	S. K. Negi
CNP0952	Performance Evaluation of Pre-applied HDPE waterproofing membrane and post applied self-adhesive modified bitumen membrane	M/s NCC Limited, AIIMS Project, Awantipora, Near Islamic University of Science and Technology, Pulwama	S. K. Singh
CNP0962	Performance Evaluation of Geo-spray (Geopolymer Mortar) in Bond Test with Brick against the ASTM C1583 standard	M/s Deogourdi Engg. & Infra Solution Pvt. Ltd., 205, 2nd Floor, 4262/3, Ansari Road, Dariyaganj, New Delhi	S. K. Singh
GAP0012	Third Party Quality Assurance Services	Ex. Engineer, CPWD-II, Room No. A-205, I.P. Bhawan, New Delhi	Santha Kumar
GAP0022	Construction of Appropriate PMAY-G Demonstration Units and Technical Guidance to willing beneficiaries for Construction of Houses	Ministry of Rural Development, New Delhi	S. K. Negi
GAP0152	Agro-Industrial Alkali Activated Composite for Prefabricated Building Elements & 3D Volumetric Construction	Ministry of Housing and Urban Affairs, Govt. of India, New Delhi	Ajay Chourasia
GAP0212	Establishing a center of innovation and manufacturing eco-system in industrial IoT	Ministry of Electronics & Information Technology, Delhi	S. K. Panigrahi
GAP0222	Condition Assessment & Suggesting Repair, Rehabilitation and Retrofitting of Middle Block ARTRAC Building at Shimla	Ex. Engineer, Shimla Central Division-II, CPWD, Kennedy Cottage, Shimla	S. K. Singh
GAP0232	Technical Advice and vetting of estimates of repair, rehabilitation and restoration of basement and kitchen wing of Vice Regal Lodge Shimla (HP)	Ex. Engineer, Shimla Central Division-I, CPWD, Kennedy Cottage, Shimla	S. K. Singh
GAP0262	Fire Performance Assessment of Fire Door	Ex. Engineer, CPWD, Chennai-4 Division, Nirman Bhawan, GPRA Campus, Thirumangalam, Chennai	Harpal Singh

GAP0322	Conditional Assessment of Existing Bhawans for Sky Walk Provisions & Suggesting Rehabilitation Measures	CEO, Shri Mata Vaishno Devi Shrine Board, Katra, Udhampur	S. K. Singh
GAP0342	Landslide Mapping, monitoring and early warning using optical imaging drone and geo-integrated rainfall threshold-based models along National Highway corridor of Bhagirathy valley, Uttarakhand	Director, Indian Institute of Remote Sensing, 4, Kalidas Road, P.B. No. 135, Dehradun	D. P. Kanungo
GAP0512	Fire Performance Assessment of Fire Curtain	M/s Ex. Engineer (E), Parliament House Electrical Works Division, CPWD, New Delhi	Harpal Singh
GAP0552	Installation of Landslide Monitoring System at NLA Landslide Site, Kohima	Secretary, Govt. of Nagaland, Nagaland State Disaster Management Authority, Nagaland, Kohima	D. P. Kanungo
GAP0802	TPQC and Monitoring of Construction of Central University of Gujarat (CUG) Permanent Campus (Phase-I) at Vadodara	Ex. Engineer & Sr Manager, CUG Project Division, Gram Kundhela, Vadodara	S. K. Singh
GAP0872	Condition Assessment and Conservation / Restoration / Retrofitting of Old Heritage Building Dhenkanal House (DAG Office), Puri, Odisha	Executive Engineer-I, Central Public Works Department (CPWD), Unit VIII, Nayapally, Bhuvaneshwar	S. K. Singh
GAP0892	Fire Performance Assessment of Fire Door	Airport Authority of India, , Jolly Grant Airport, Dehradun	Harpal Singh
GAP0912	Fire Performance Assessment of Protected I-Beam	Executive Engineer, Health Project Division (Central), PWD (GNCTD), L.N.J.P. Hospital, New Delhi	Harpal Singh
GAP0972	Performance Evaluation of Crystalline Waterproofing Admixture for the Work-Improvement to Rengali Dam under DRIP Phase-II & III	M/s Balaji Drillers and Engineers-Rakesh Kumar JV, Khetrapur, Sambalpur	S. K. Singh
GAP0982	Fire Performance Assessment of Fire Door	Ex. Engineer, C-4 Division, CPWD, Nirmal Bhawan, GPRA Campus, Thirumangalam, Chennai	Harpal Singh
GAP1002	Technical Advice & TPQA od Construction of 100 Bedded ESIC Hospital & 32 Nos. of Staff Quarters with Boundary Walls including Horticulture & all other related services at Bahadurgarh, Haryana	Ex. Engineer, CPWD, NDRI Campus, Near SBI, Karnal	S. K. Singh

SSP0032	Health Assessment and Remedial Measures of Residential and Non-Residential Buildings of Dakpathar Colony and Yamuna Colony, Dehradun	Ex. Engineer (Civil), PCM, Dakpathar, UJVNL	S. R. Karade
SSP0042	Structural Stability Assessment and Remedial Measures for Compression Moulding Building	AGM (Facility Management), Panasonic Life Solutions India Pvt. Ltd., Plot No. 1A/1B, Sector 8B, SIDCUL, Haridwar	S. R. Karade
SSP0093	Development of High-Volume Fly Ash Gypsum Composite Plaster for Interior Applications	M/s MSP Steel & Power Ltd., PO & Vill. Jamgaon, Raigarh	Neeraj Jain
SSP0112	Testing and Evaluation of Concrete made through a new 4th Gen. Technology	Saroj Vanijya Pvt. Ltd., 7th Floor, 3A, Ecospace, Plot No. 2F/11, New Town, Rajarhat, Kolkata	Humaira Athar
SSP0162	Stack Monitoring of High Draught Brick Kilns and Determination of Pollution Load in Dist. Jhajjar, Haryana	Bhagat Singh BKO, Village Pelpa, Dist. Jhajjar	Neeraj Jain
SSP0372	Technical guidance on the safe demolition of Supertech Twin Tower, Noida	M/s Supertech Ltd, E-Square, Plot No. C2, Sector 96, Noida	D. P. Kanungo
SSP0422	Fire Performance Evaluation of uPVC window profiles	M/s Saint Gobain India Pvt. Ltd. (SGIPL) - Research & Development, IIT Madras Research Park, No. 1FA, Phase-II, Block C, Kanagam Road, Taramani, Chennai	A. Aravind Kumar
SSP0432	Health Assessment and Repair of Buildings in Township of NTPC, Vindhyanagar	Sr. Manager (Civil), NTPC-Township, Vindhyanagar, Dist. Singrauli	S. R. Karade
SSP0522	Studies on Mechanical and Durability Properties of Normal and High Strength Concrete with Graphene	M/s Reliance Industries Ltd., Reliance Corporate Park, 5 TTC Industrial Area, Thane-Belapur Road, Ghansoli, Navi Mumbai	R. Siva Chidambaram
SSP0572	Sustainable Development of Bricks / Blocks from Glass Wool Wastes	Ms UP Twiga Fiberglass Ltd., 9, SIA, Sikandrabad, Dist. Bulandshahr	S. K. Singh
SSP0592	Advise on the Waterproofing at Rashtrapati Bhawan Museum, New Delhi	General manager, SBG Office - NCR & UKD, NBCC India Ltd., NBCC Place, Pragati Vihar, New Delhi	A. K. Mittal
SSP0652	Technical Review of Projects under Ujjain Smart City Ltd.	Chief Executive Officer, Ujjain Smart City Ltd., Mela Karyalay, Kothi Palace, Ujjain	A. K. Mittal
SSP0702	Development of CO ₂ sequestered engineered aggregates from fly ash and industrial wastes	M/s NTPC Ltd., EOC Noida Office, EOC, Sector-24, Noida	L. P. Singh
SSP0742	Detailed Condition Assessment of Steel &	M/S NTPC LTD BARWADIH/KERENDARI/CHATTI BARIATU, NTPC LTD., Pakri	Ajay Chourasia

	Concrete Structures at Coal Handling Plant, NTPC Sikri	Barwadih Coal Mining Project ,FLOOR NO.-2 , HAZARIBAGH	
SSP0752	Fire Performance Evaluation of UPVC Profiles	M/s DCM Shriram Ltd., Unit-Fenesta Building Systems, E1219-1222, Phase 1, RIICO Industrial Area, Ghatal, Bhiwadi	A. Aravind Kumar
SSP0852	Fire Performance Evaluation of Natural Stone (Quartzite)	M/s Serendipity Arts, Plot No. 2, Institutional Area, Vasant Kunj, Phase-II, South-West Delhi, Delhi	A. Aravind Kumar
SSP0882	Bio-efficacy and Persistence Evaluation of Isocycloseram 400 SC for Subterranean Termite Management in Buildings	M/s Syngenta India Pvt. Ltd., Amar Paradigm, Survey No. 110/11/3, Baner Road, Pune	B. S. Rawat
SSP0922	Structural Audit of residential Towers (D, E, F, G & H) of Phase-I of Group Housing Project, Chintels Paradiso, Sector-109, Gurugram, Haryana	Manager - Contracts & Planning, Chintels India Pvt. Ltd., Gurgaon	Debdutta Ghosh
SSP1062	Design and Demonstration of Mechanism for the Surya Teelak of Shri Ram Mandir at Ayodhya	Sri Ram Janmbhoomi Teerth Kshetra Trust, Ayodhya	S. K. Panigrahi
TSP0052	Fire Performance Assessment of Fire Retardant Door	M/s Shreeji Woodcraft Pvt. Ltd., B-803, Western Edge-II, Western Express Highway, Borivali (E), Mumbai	Suvir Singh
TSP0062	Fire Performance Assessment of Fire Door	M/s Sehgal Doors, B-133, Mayapuri Phase-I, New Delhi	Suvir Singh
TSP0082	Fire Performance Assessment of Fire Door	M/s Bajaj Steel industries Ltd., C-108, MIDC, Hingna Industrial Estate, Nagpur	Suvir Singh
TSP0092	Performance Evaluation of IPNet Paints to be used in painting of road over bridge between Ernakulam and Kottayam stations for Southern Railways	M/s Perumalil Granite Constructions, Arunoottimangalam P.O., Kottayam	P. C. Thapliyal
TSP0102	Evaluation of Flame Block 476 & Starbond 30-36 coating for Ignitability, Fire Propagation Index Surface spread of flame	M/s Paramount Polytreat Chemicals Pvt. Ltd., 2/10, Iind Floor, Opp. Crown Plaza Hotel, New Friends Colony, New Delhi	A. Aravind Kumar
TSP0122	Fire Performance Assessment of Wooden Fire Rated Door	M/s Navair International Ltd., Plot No. 468, HSIDC Industrial Area, Phase-I, Barhi, Sonipat	Harpal Singh
TSP0132	Fire Performance Assessment of Fire Door	M/s Shakti Horman Pvt. Ltd., 2-67/1 (Survey No. 188, 198), Gasilapur Dundigal Gandhi Maisamma Mandal, Medchal District, Hyderabad	Suvir Singh

TSP0142	Fire Performance Assessment of Fire Door	M/s Harsha Engineering Works, (Harsha Fire Door Solutions), #92, 2nd Cross, Kalika Nagar, Andrahali Main Road, Peenya 2nd Stage, Bangalore	Suvir Singh
TSP0172	Fire Performance Assessment of Fire Door	M/s Supreme Metwood, 1043, Housing Board Colony, Sector 20, Faridabad	Banti A. Gedam
TSP0182	Fire Performance Assessment of Fire Doors	Asstt. Engineer, Malda Central Division-I, CPWD, Mahesmati Hyderpur Street, PO Malda, PS English Bazar, Dist. Malda	Suvir Singh
TSP0192	Fire Performance Evaluation of Cross Linked Cross Cell Polyethylene Foam Insulation	M/s China Construction Sausum (I) Pvt. Ltd., First Floor, G-14, Sector-3, Noida, Gautambudh Nagar	A. Aravind Kumar
TSP0202	Fire Performance Assessment of Fire Door	M/s Globe Engineering, SP 124, Ambattur Industrial Estate, 3rd Main Road, Ambattur (Opp. Ford Service Centre), Chennai	Suvir Singh
TSP0242	Fire Performance Assessment of Fire Door	M/s JBSS Engineers Pvt. Ltd., Plot No. 18, Shree Shyam Chowk, Gali No. 8, Kadipur Ind. Area, Gurgaon	Suvir Singh
TSP0252	Fire Performance Assessment of Fire Door	M/s JBSS Engineers Pvt. Ltd., Plot No. 18, Shree Shyam Chowk, Gali No. 8, Kadipur Ind. Area, Gurgaon	Suvir Singh
TSP0272	Fire Performance Assessment of Fire Door	M/s Pyrotech Workspace Solutions Pvt. Ltd., Plot No. B-438, Road No. 18-A, Bhamashah Industrial Area, Kaladwas, Udaipur	Harpal Singh
TSP0282	Fire Performance Assessment of Fire Door	M/s Pyrotech Workspace Solutions Pvt. Ltd., Plot No. B-438, Road No. 18-A, Bhamashah Industrial Area, Kaladwas, Udaipur	Harpal Singh
TSP0292	Fire Performance Assessment of Fire Door	M/s Narsi & Associates, C-63, MIDC Main, TTC, Industrial Area, Turbhe MIDC, Turbhe, Navi Mumbai	Harpal Singh
TSP0302	Fire Performance Assessment of Fire Door	M/s Spartan Engg Industries Pvt. Ltd, Spartan House, 1/11, New Tejpal Industrial Estate, Andheri-Kurla Road, Sakinaka, Mumbai	Harpal Singh
TSP0312	Fire Performance Assessment of Fire Door	M/s Radiant Passive Fire Systems, A/1/17, Stutu Apartments, Behind Lalbhai Centre, Opp. Wales Avenue, Maninagar (E), Ahmedabad	Harpal Singh
TSP0332	Fire Performance Assessment of Fire Door	M/s CS Components Pvt. Ltd., 194/195/196, GIDC, Umbergaon	Harpal Singh
TSP0352	Performance Evaluation of 32 mm Diameter Rebar with Crimped Rebar Coupler under Static / Tensile Loading	Sr. Manager-Civil Const. Barrage, NTPC Ltd., Tapovan Vishugad HPP, Ravigram, Joshimath	R. Siva Chidambaram

TSP0362	Fire Performance Assessment of Fire Door	M/s Bhawani Fire Protection Pvt. Ltd., Plot No. S-17, S-18, UPSIDC Industrial Estate, Loni, Ghaziabad	Harpal Singh
TSP0382	Fire Performance Evaluation of Water and Solvent Based Intumescent Coating	M/s Akzo Nobel India Ltd., 62P, 62B, 62A, 43E, Hoskote Industrial Area, Bangalore	A. Aravind Kumar
TSP0392	Fire Performance Assessment of Fire Stop	M/s Promat Fire & Insulation Pvt. Ltd., Ansal Imperial Tower, UGF-5, C-Block, Community Center, Naraina Vihar, South West, Delhi	Suvir Singh
TSP0402	Fire Performance Assessment of Double Leaf Fire Door	M/s Iclean Hollow Metal Systems Pvt. Ltd., Survey No. 21/3 & 26/3, Garikapadu Village, Anumanchipalli Panchayat, Jaggaiahpetta Madal, Krishna Dist.	Harpal Singh
TSP0412	Fire Performance Assessment of WT/GT Fire Class A-60 Fire Door	M/s SGS Marine Habitability Pvt. Ltd., #28-11-28/1, Suryabagh, Visakhapatnam	Harpal Singh
TSP0442	Fire Performance Assessment of Fire Door	M/s Arishtha Safety Products India Pvt. Ltd., No. 36, VGP Selva Nagar First Main Road, Velachery, Chennai	Harpal Singh
TSP0452	Performance Evaluation of IPNet paints to be used by Southern Railways	M/s SSA Techno Construction Pvt. Ltd., 3,A-2, , SHANKA NIDHI APTS RAJENDRA COLONY, SALIGRAMAM CHENNAI, Chennai	P. C. Thapliyal
TSP0462	Fire Performance Assessment of Fire Doors	M/s Larsen & Toubro Ltd., CAPFIMS Project, Maidan Garhi, New Delhi	Banti A. Gedam
TSP0472	Fire Performance Assessment of Fire Door	M/s Dhanraj Industries, L-1107/9, III Phase, GIDC, VAPI, Tal: Vapi, Dist Valsad	Harpal Singh
TSP0482	Fire Performance Evaluation of Fire Resistance Bamboo Poles	M/s Bhavya Srishti Udyog Pvt. Ltd., Near Prerana Vidyalaya Campus, Kiritpur Road, Village Kathiya, Bemetara	A. Aravind Kumar
TSP0492	Fire Performance Assessment of USG Boral Ceiling Systems	M/s Knauf India Pvt. Ltd., 610-611, 6th Floor, Gurgaon	Banti Gedam
TSP0502	Fire Performance Assessment of A-60 Bulk Head and A-60 Steel Deck Head	M/s Bells Electrotech Pvt. Ltd., P-36 India Exchange Place, Room No. 27, Ground Floor, Kolkata	Harpal Singh
TSP0532	Fire Performance Assessment of Fire Door	M/s GMP Technical Solutions Pvt. Ltd., Village Kuranwala, P.O. Mandhala, Via. Barotiala, Tehsil Baddi, Dist. Solan	Harpal Singh
TSP0542	Fire Performance Assessment of Fire Door	M/s Doorwin Engineering, 156, Sahitya Industrial Hub, Village Bakrol, Ahmedabad	Harpal Singh
TSP0562	Fire Performance Assessment of Fire Door	M/s Cosmos Construction Machineries and Equipment Pvt. Ltd., Plot No. E/307/5, Gate No. 307, Nanekarwadi, Chakan, Dist. Pune	Harpal Singh

TSP0582	Fire Performance Assessment of Fire Door	M/s Basic Doors, 240, Bhawani Peth, New Timber Market Road, Near Ramoshi Gate Police Chowky, Pune	Harpal Singh
TSP0602	Fire Performance Assessment of Fire Doors	M/s MPP Technologies Pvt. Ltd., A-153 & A-154, 3rd Cross, 1st Stage, Peenya Industrial Estate, Bengaluru	Harpal Singh
TSP0612	Fire Performance Assessment of Dry Wall Partition System	M/s Everest Industries Ltd., Khasra No. 158 & 159, Village Lakesari, Pargana, Tehsil Roorkee, Bhagwanpur	Harpal Singh
TSP0622	Fire Performance Assessment of Fire Door	M/s Rock Miller Alltech India, #24/15, Gajanana Nagara, Behind KTG College, Hegganahalli, Bengaluru	Harpal Singh
TSP0632	Fire Performance Assessment of Fire Doors	N/s Navair International Pvt. Ltd., Plot No. 468, HSIDC Industrial Area Phase-1, Barhi, Sonipat	Harpal Singh
TSP0642	Physio-chemical Characterization of OPC (43G) and PPC Cement	M/s Mangalam Cement Ltd., 3rd N-23, 1st Floor, Ambedkar Road, Nehru Nagar, Ghaziabad	Neeraj Jain
TSP0662	Fire Performance Evaluation of Fire Retardant Fiber Board	M/s Greenpanel Industries Ltd., Plot No. 2, Sector 9, IIE, SIDCUL, Rudrapur, Uddham Singh Nagar	A. Aravind Kumar
TSP0672	Fire Performance Assessment of Horizontal Duct A and Duct B	M/s Murugappa Morgan Thermal Ceramics Ltd., Plot No. 26 & 27, SIPCOT, Ranipet	Harpal Singh
TSP0682	Tensile Behaviour of 32 mm Diameter Crimped Rebar Coupler	M/s RM Engineers, #659, Sector 69, IMT Faridabad	R. Siva Chidambaram
TSP0692	Fire Performance Assessment of Fire Door	M/s Mangal Industries Ltd., Tenepalli Village, Rangampet Cross Road, Puthalapattu Mandal, Chittoor District	Harpal Singh
TSP0712	Fire Performance Assessment of Mineral Fire Barrier and Fire Door	M/s CTR Manufacturing Industries Pvt. Ltd., Nagar Road, Viman Nagar Road, Pune	Harpal Singh
TSP0722	Fire Performance Assessment of Coated Cable	M/s CTR Manufacturing Industries Pvt. Ltd., Nagar Road, Viman Nagar Road, Pune	Harpal Singh
TSP0732	Fire Performance Evaluation of Altic 060 on Steel Specimen	M/s Ugam Technology, 406-407, Orchid Plaza, Behind McDonalds, Sama Salvi Road, Vadodara	A. Aravind Kumar
TSP0762	Performance Evaluation of IPNet Paints to be used in bridge of Rishikesh-Karanprayag rail line	M/s Rahee Infratech Ltd., Camp Office, Br-08, Lachmoli, Srinagar	P. C. Thapliyal
TSP0772	Fire Performance Assessment of Fire Doors	M/s Windoors International Ltd., 115, New Tejpal Estate, Sakinaka, Andheri (E), Mumbai	Harpal Singh
TSP0782	Fire Performance Assessment of Fire Door	M/s DEC Industries Pvt. Ltd., Dabla Sadan, 2-1-434/1, Street Number 4, Nallakunta, Hyderabad	Harpal Singh
TSP0792	Fire Performance Assessment of Fire Door	M/s Iclean Hollow Metal Systems Pvt. Ltd., Survey No. 21/3 & 26/3, Garikapadu Village, Anumanchipalli Panchayat, Jaggaiahpetta Madal, Krishna Dist.	Harpal Singh

TSP0822	Fire Performance Evaluation of Ameetuff Class 'O' Coating on Steel Plate GI Duct and Pipe with 500-micron Layer Thickness	M/s Ameetuff Technical Paint Industries, I.8 DLF Industrial Estate No. 1, Faridabad	A. Aravind Kumar
TSP0832	Fire Performance Assessment of Fire Door	M/s JBSS Engineers Pvt. Ltd., Plot No. 18, Shree Shyam Chowk, Gali No. 8, Kadipur Ind. Area, Gurgaon	Harpal Singh
TSP0842	Fire Performance Assessment of Double Leaf Fire Door	M/s Iclean Hollow Metal Systems Pvt. Ltd., Survey No. 21/3 & 26/3, Garikapadu Village, Anumanchipalli Panchayat, Jaggaiahpetta Madal, Krishna Dist.	Harpal Singh
TSP0862	Fire Performance Assessment of Fire Door	M/s Seerat Enterprises, Near Hero Service Centre, LG 371-1/7, Narayan Nagar, Hill No. 2, NSS Road, Ghatkopar (W), Mumbai	Harpal Singh
TSP0902	Fire Performance Assessment of Fire Door	M/s KEC International Ltd., RRTS Project - NCRTC, Khasra No. 601, Village Bhikkanpur, Duhai, Dist. Ghaziabad,	Harpal Singh
TSP0932	Fire Performance Assessment of Fire Door	M/s Doorwin Technologies Pvt. Ltd., Plot No. 6/2, Gandhinagar, Balanagar, Hyderabad	Harpal Singh
TSP0942	Ignitability and Flammability Evaluation of Ameetuff Class O Coating on Steel Metal GI Duct	M/s Ameetuff Technical Paint Industries, I.8 DLF Industrial Estate No. 1, Faridabad	A. Aravind Kumar
TSP0992	Fire Performance Assessment of Protected I-Beam	M/s Ameetuff Technical Paint Industries, I.8 DLF Industrial Estate No. 1, Faridabad	Harpal Singh
TSP1012	Fire Performance Assessment of Fire Door	M/s Vardhaman Corp., A-11, Kakade Angan, Opp. Talera Hospital, Tanaji Nagar, Chinchwad, Pune	Harpal Singh
TSP1022	Fire Performance Assessment of Fire Door	M/s Robust Enterprises, Shop No. 37, Western Avenue, Near Jaguar Showroom, Off Mumbai Banalore Highway, Waked, Pune	Harpal Singh
TSP1032	Performance Evaluation of IPNet paints to be used in painting of PSC girder and slab between Elimala and Payyannur Stations for Southern Railways	M/s Perumalil Granite Constructions, Arunoottimangalam P.O., Kottayam	P. C. Thapliyal
TSP1042	Fire Performance Assessment of Fire Door	M/s Sehgal Doors, B-133, Mayapuri Phase-I, New Delhi	Harpal Singh
TSP1052	Fire Performance Assessment of Fire Doors	M/s Shakti Horman Pvt. Ltd., 2-67/1 (Survey No. 188, 198), Gasilapur Dundigal Gandhi Maisamma Mandal, Medchal District, Hyderabad	Harpal Singh

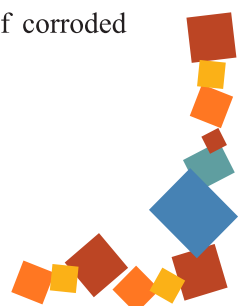
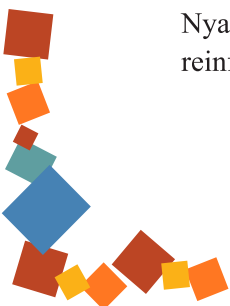


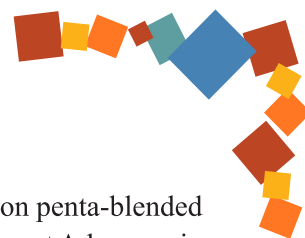
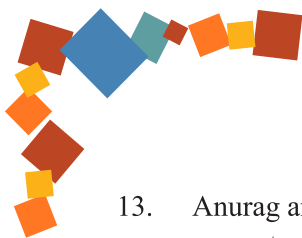
Research Papers



Publications- Journals:

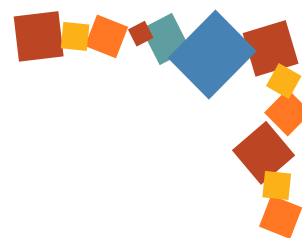
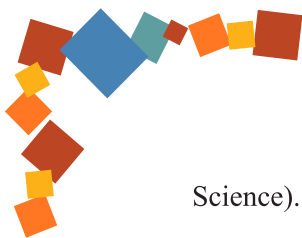
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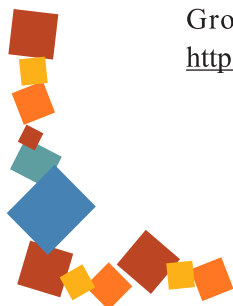
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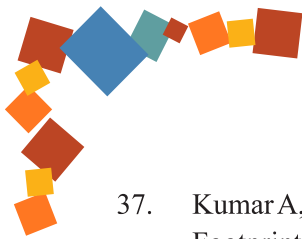




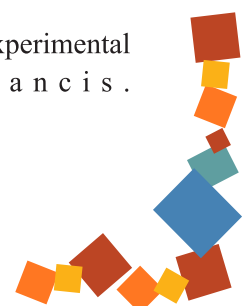
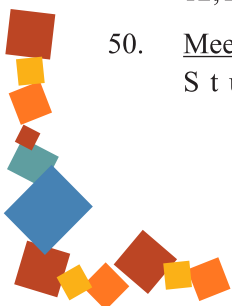
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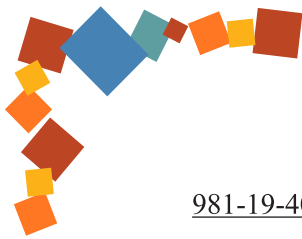


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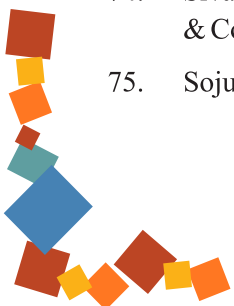
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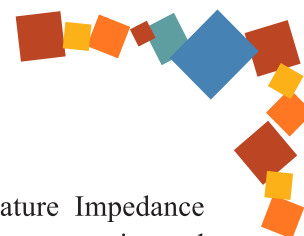
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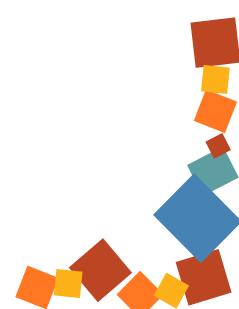
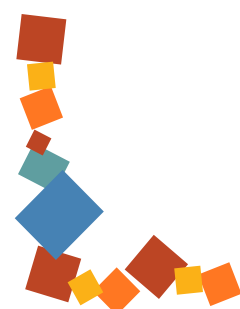
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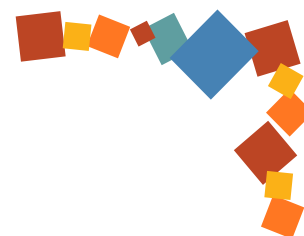
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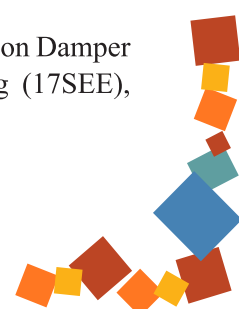
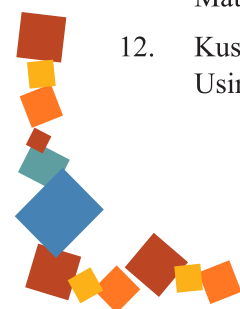
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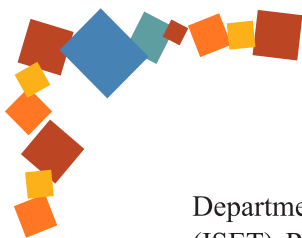




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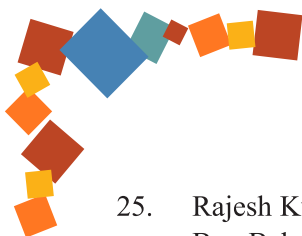
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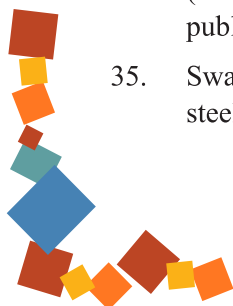


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13. Kothapalli, Naveen Kumar, R. Siva Chidambaram, and Pankaj Agarwal. "Experimental Evaluation of Steel Bracings and Metallic Yield Damper as Retrofit Techniques for Severely Damaged RC Building Frames." *Journal of Earthquake Engineering* (2022): 1-24. (SCI-Indexed)
 14. K.V. Naveen Kumar, Chidambaram, R. S and Pankaj Agarwal (2022). Cyclic Evaluation of Severely Damaged RC Frames Repaired and Strengthened through an FRP-Wrapped Coupler-Box Confinement, *ASCE Journal of Composite for Construction*. (SCI-Indexed)
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 16. Lal M, Chidambaram R.S, Karade S. R. (2023). Bond and Cracking Behaviour of Textile Reinforced Concrete (TRC) Under Uniaxial Tensile Loading, *Proc. National Conference on Recent Advances in Construction Materials and Structures (RCMS'2023)*, 2nd – 3rd February Coimbatore, India.
 17. Manjunatha H, Shekhar S. and Gaurav G. (2022). Influence of Ground Motion Characteristics on the Seismic Vulnerability of Bridges" 17th Symposium on Earthquake Engineering, IIT Roorkee.
 18. M Vinoth and Aswathy M.S. "Three Dimensional Responses of Tunnel to Adjacent Construction", *Proceedings of Indian Geotechnical Conference 2022* December 15-17, 2022, Kochi.
 19. Moka Vijay Tarun Kumar, R. Siva Chidambaram. "Experimental Investigation on Flexural Behaviour of Precast Beam-beam Connections Using Mechanical Connectors", 17th Symposium on Earthquake Engineering (17SEE), Department of Earthquake Engineering, IIT Roorkee & Indian Society of earthquake Technology (ISET), Roorkee, India (Paper ID: 497), November 2022.
 20. Moka Vijay Tarun Kumar, R. Siva Chidambaram. "Influence of Slip and Cyclic Loading on the Tensile Behaviour of Rebar Couplers", *National Conference on Recent Advances in Construction Materials and Structures (RCMS'2023)*, Coimbatore, India (Paper ID: RCMS23000050) February 2023
 21. Mohan Lal, R. Siva Chidambaram, Sukhdeo Karade. "Critical Review of the Rehabilitation Techniques of Corrosion-Damaged Reinforced Concrete (RC) Beams using Composites", 28th International Conference & Expo on Corrosion, CORCON2022, Udaipur AMPP NACE At: Udaipur, India (Paper No. RCC27), September 2022.
 22. Mohan Lal, R. Siva Chidambaram and S.R. Karade. "Bond and Cracking Behaviour of Textile Reinforced Concrete (TRC) Under Uniaxial Tensile Loading", *National Conference on Recent Advances in Construction Materials and Structures (RCMS'2023)*, Coimbatore, India (Paper ID: RCMS23000045) February 2023.
 23. Nitin Shinde, R Gobinath, R. Siva Chidambaram, Manisha Shewale. "An Experimental Investigation on Concrete Blocks using Ferrock as a Green Binding Material, *International Conference on Advanced Technologies in Chemical, Construction and Mechanical Sciences (ICATCHCOME 2023)*, Feb., 2023
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27. Rawat A, Karade S. R. and Thapliyal P. C. Green corrosion inhibition of steel reinforcement embedded in concrete using aqueous extract of AzadirachtaIndica, Corrosion in RCC Structures, Technical Session 2, Paper No. RCC22, Proc. 28th International Conference & Expo on Corrosion (CORCON-2022), NACE AMPP, Udaipur, India, 19th - 22nd September, 2022.
28. Rawat A, Karade S. R, and Thapliyal P. C. (2023), Mechanism of Inhibitors in control of corrosion of steel in concrete, Proc: National Conference on Recent Advances in Construction Materials and Structures (RCMS'2023), 2nd – 3rd February 2023, Coimbatore, India.
29. S. Alexander, P. Sumathi, and S. K. Panigrahi, “Semi-Active Control of Structures with Magneto rheological Fluid Dampers,” in 2022 IEEE Global Conference on Computing, Power and Communication Technologies (GlobConPT), pp. 1–6, Nov. 2022.
30. Samad P, Aswathy M.S and M Vinoth, “Settlement of Existing Structure Due to Construction of a Tunnel in Layered Soil”, Proceedings of Indian Geotechnical Conference 2022 December 15-17, 2022, Kochi.
31. Sarvanshdeep Singh Sahota, Harish Chandra Arora, Aman Kumar, Krishna Kumar, and Hardeep Singh Rai. ML-Based Computational Model to Estimate the Compressive Strength of Sustainable Concrete Integrating Silica fume and Steel Fibers. 5th International Conference on Information Systems and Management Science (ISMS 2022), Lecture Notes in Networks and Systems, November 24-27, 2022.
32. Siddhant Jindal, Mool Chand, Harish Chandra Arora and Aman Kumar. Seismic Evaluation and Retrofitting of RC Corroded Structures Using SAP 2000 Software in Accordance with Different Indian Guidelines. International Conference on Sustainable Solutions for Infrastructure Development, At: Kozhikode, India, 9-11 April 2023.
33. Solanki A, Sharma U, Singh L. P, Karade S. R. (2022). Mineralogical and morphological attributes of hydrated aluminate Phase incorporating silica nanoparticles, 17th NCB International Conference on Cement, Concrete and Building Materials. New Delhi, 06–09 December 2022 Paper No. FP-24.
34. Shubham Semwal, Abhilasha Prajapati, Rajesh Kumar, Sachin Kashyap, R. Siva Chidambaram, Gunjan Joshi, Rajni Lakhani. (2023). “Thermo-mechanical behaviour of lightweight precast sandwich panel incorporated with solid waste – An Experimental Investigation”, International Conference on Sustainable Infrastructure: Innovation, Opportunities and Challenges-2023 (SIIOC-2023). (Abstract ID: SIIOC-242). National Institute of Technology KARNATAKA (NITK), SURATHKAL, MANGALORE – 575 025, INDIA. April 20th & 21st, 2023 (Will be published in Scopus with doi)
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9. Nishant Raj Kapoor, Ashok Kumar, Anuj Kumar, Aman Kumar, Harish Chandra Arora. Prediction of Indoor Air Quality Using Artificial Intelligence. 1st Edition, In book: *Machine Intelligence, Big Data Analytics, and IoT in Image Processing: Practical Applications*. 2023, John Wiley & Sons.
10. Nishant Raj Kapoor, Ashok Kumar, Anuj Kumar, Aman Kumar, Harish Chandra Arora, Has hem Jahangir. Quantum Computing for Indoor Environmental Quality: A Leapfrogging Technology. 1st Edition, In book: *Handbook of Research on Quantum Computing for Smart Environments*, 2023, 191-216, IGI Global.
11. Nishant Raj Kapoor, Aman Kumar, Harish Chandra Arora, Ashok Kumar. Structural Health Monitoring of Existing Building Structures for Creating Green Smart Cities Using Deep Learning. 1st Edition, in book: *Recurrent Neural Networks*, CRC Press, May 2022.
12. P. C. Thapliyal, 'Chapter 13 – Utilization of chemical additives to enhance biodegradability of plastics' in 'Biodegradability of Conventional Plastics – Opportunities, Challenges, and Misconceptions', Elsevier Inc., 259-281, 2022.
13. Suvam Das, Shubham Chaudhary, Shantanu Sarkar, D.P. Kanungo. (2023). “Fuzzy-Based Meta-Heuristic and Bi-Variate Geo-Statistical Modelling for Spatial Prediction of Landslides”. *Advances in Scalable and Intelligent Geospatial Analytics*
14. Yumnam M, Gupta H, & Ghosh D. (2022). Imaging of Delamination in Concrete Slab Using Impact Echo. In *Advances in Non-Destructive Evaluation* (pp. 187-202). Springer, Singapore. DOI: https://doi.org/10.1007/978-981-16-9093-8_16
15. S K Panigrahi, Ajay Chourasia. (2021). A study on mode shape-based approaches for health monitoring of a reinforced concrete beam under transverse loading, *Modelling and Computation in Vibration Problems*, Volume 1, UK, 1st edition, IOP.
16. Ajay Chourasia, S K Panigrahi. (2021). Numerical analysis of QutubMinar using non-linear plastic-damage macro model for constituent masonry *Modelling and Computation in Vibration Problems*, Volume 1, UK, 1st edition, IOP.





Processes, Licensed & MoU Signed

PROCESSES LICENSED

S. No	Name of Technology	Name of Licensee	Date of License
1.	Standalone UV Air Disinfection System for Rooms and Spaces	M/s Vision Realty 79, Sector-4, MDC, Panchkula Haryana – 134 114	10.06.2022 Jointly with CSIR- CSIO, Chandigarh
2.	Epoxy-Phenolic IPN Coating based on CNSL for the protection of Concrete and Steel Reinforcement in Concrete	M/s Berger Paints India Limited, Berger House, 129 Park Street, Kolkata-700017	06.07.2022
3.	Design of High Draught Brick Kilns with zig-zag setting	M/s Ray Techno Solutions Proprietor Dr. Tuhin Ray Vill- Bhatua, P.O- Rajhat, PS- Polba, District- Hooghly – 712 123 (WB)	19.07.2022
4.	Design of High Draught Brick Kilns with zig-zag setting	M/s Team Energy Systems Near Balaji Traders Malout Bypass, Abohar Punjab – 152 116	16.08.2022
5.	Gypsum-Vermiculite-Fly Ash Light Weight Plaster	M/s Sakarni Plaster India Pvt. Ltd., D-Mall, 405, Netaji Subhash Place, Pitampura, New Delhi-110 034	03.02.2023
6.	High Volume Fly Ash-Gypsum Composite Plaster	M/s Sakarni Plaster India Pvt. Ltd., D-Mall, 405, Netaji Subhash Place, Pitampura, New Delhi-110 034	03.02.2023
7.	Manufacturing of Internal Fuels based Eco-friendly and Energy Efficient Burnt Clay Bricks with Criss-Cross bricks setting	M/s Omparakash and Sons Auto Fire Bricks Jalalabad, Ganaur Distt. Sonapat, Haryana	14.03.2023
8.	IPN Coating for the protection of Reinforced Concrete Structures	M/s Kansai Nerolac Paints Pvt. Ltd., Mumbai	16.03.2023
9.	IPN Coating for the protection of Reinforced Concrete Structures	M/s Krishna Conchem Products Pvt. Ltd., Mumbai	29.03.2023

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Patents & Copyrights

Patents Filed in India (2022-23)

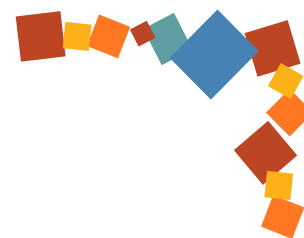
S. No	Title	Inventors	Comp. Filing Date	Application No.
1	An improved process of making cement concrete interlocking paver blocks using Kota-stone slurry	Lakhani Rajni, Kumar Rajesh	21/Oct/2022	202211060661

Patents Granted in India (2022-23)

S.No	Title	Inventors	Application No.	Grant Date	Patent No.
1	An Improved Process for The Preparation of Silica Nanoparticles for Applications in Cement Based Materials	Lok Pratap Singh, Srinivasarao Naik B, Usha Sharma, Dilshad Ali, Inderjeet Tyagi	201911019105	14/Feb/2023	421499

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Honours & Awards



Er. M. Vinoth and Dr. Anindya Pain:

- National level- Best master thesis award from Deep Foundation Institute (DFI).

Dr. R. Siva Chidambaram

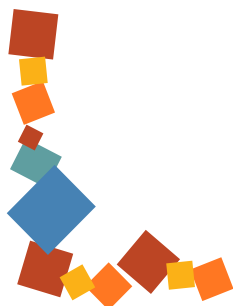
- Received Gold Award from CII for Affordable Damper 2022
- Received Silver Award from CII for PET Strengthening Masonry Wall in 2022
- PG Student Research work has received First Prize from IIT Kanpur (Mr. Kelvin Baariu, P G Scholar) Project for ML 2022
- Received Best Paper Award for the article titled “An Experimental Investigation on Concrete Blocks using Ferrock as a Green Binding Material”, at International Conference on Advanced Technologies in Chemical, Construction and Mechanical Sciences (ICATCHCOME 2023).

Dr. SR Karade

- Chaired a Technical Session on RC Structures in 28th International Conference & Expo on Corrosion (CORCON2022), NACE AMPP Udaipur, 19 -22 September 2022.
- Dr SR Karade was ‘Guest of Honour’ in the Inaugural Session of National Conference on "Recent Advances in Construction Materials and Structures" Organised by Department of Civil Engineering, PSG College of Technology (RCMS 2023), Coimbatore, February 2, 2023.
- Nominated as President (Elected), Indian Society for Construction Materials & Structures (ISCMS) for 2022-24.
- Nominated as panellist, in a “Technical Interactive Forum (TIF)’ on ‘Corrosion in Concrete Structures’ 28th International Conference & Expo on Corrosion

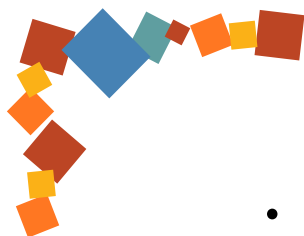
Er. Soju Alexander:

- The research paper titled “Evaluation of Embedded Dual-Piezoelectric-Based Transducer with Miniature Impedance Analyzer for Monitoring the Curing of Cement Mortar”, published in IEEE Transactions on Instrumentation and Measurement, was awarded the Diamond Jubilee Best Research Paper Award for the year 2022, by CSIR-Central Building Research Institute.

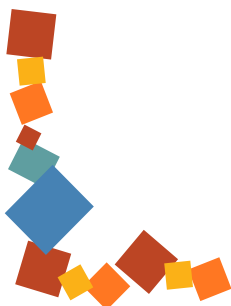


Lectures Delivered

1. Dr. P.C. Thapliyal delivered invited lecture titled ‘Insecticides and Pesticides for Pest Management’ on 10th May in ‘Skill Development Programme on Structural Pest Management (Certified Training Programme)’ held from 9-13th May 2022 at CSIR-CBRI.
2. Dr. P.K.S. Chauhan delivered the following lectures:
 - Lecture on “Crack Formation & Expansion Joints in Buildings” in CSIR-CBRI Training Programme on Structural Pest Management during 1-6 August, 2022.
 - Lecture on “Geophysical Investigations for Landslides” in CSIR-CBRI Training Programme on Landslide Risk Mitigation and Control Measures during 28-30 November, 2022.
 - Lecture on topic “Earthquake Alert System” at DLF Public School, Ghaziabad under Jigyasa Students Scientist Interaction event on 2nd December 2022.
 - Lecture on topic “Ancient Indian Science” at CJ DAV Cent Public School, Meerut under Jigyasa Students Scientist Interaction event on 22nd February 2023.
 - Lecture on the topic “Lost Indian Science” at D.P.S. Ghaziabad under Jigyasa Students Scientist Interaction event on 23rd February 2023.
 - Lecture on “Earthquake’s Why and How” at the Scientist Teacher connect workshop held in CSIR- Central Building Research Institute on 24th March 2023.
3. Dr. R. Siva Chidambaram delivered the following lectures:
 - Key Note Address in Two-day 2nd International E-Conference on “Novel Innovations and Sustainable Development in Civil Engineering” (NISDCE 2022) on March 31st, 2022 and April 01st, 2022
 - Guest Lecture in "World Quality Month" in Nov22 at NTPC at Tapovan Vishnugarh.
 - Key Note Lecture in 5 Day Faculty Development Programme (FDP) on “Role of Smart Materials and Sensing Technologies in The Construction Sector” on December 23rd, 2022, Vel Tech, Chennai
 - Key Note Address in National Conference on “Recent Advances in Construction Materials and Structures” RCMS 2023, PSG college of Technology, Coimbatore.
 - Key Note Lecture in ICT Course on "Low-Cost Housing Techniques and Practices, NITTTR Chandigarh, March 2023.
4. Dr. S.R. Karade delivered the following lectures:
 - Dr. S.R. Karade delivered "Corrosion Control in RCC Structures" in Online Short-Term Programme on Defect Free Construction, Repair and Maintenance", NITTTR Chandigarh, 25-29th April'22.
 - “Durability and Corrosion Control Measures in Steel Reinforced Concrete Structures” Good Construction Practices for Engineers/Technologists of JK Cement Ltd. at CSIR-CBRI 9th Aug. 2022
 - “Durability of Concrete in Coastal Areas & Corrosion Protection” Training Programme on Rural Housing - Appropriate Construction Techniques’ at CSIR-CBRI, 24th Aug. 2022
 - “Corrosion Control for Sustainable Infrastructure” - Key-note lecture in Workshop on ‘Innovative and Sustainable Construction Materials & Technologies (ISCMT-2023)’ January 6th, 2023 at New Delhi
 - “Alternative Building Materials for Sustainable Construction”- Key-note Lecture in a National Conference on "Recent Advances in Construction Materials and Structures" Organised by Department of Civil Engineering, PSG College of Technology (RCMS 2023), Coimbatore, February 2nd, 2023.



- “Corrosion of Steel in Concrete Structures and Its Prevention” In: Scientist-Teacher Interactive Event under Jigyasa Programme on March 24th, 2023 at CSIR-CBRI, Roorkee
5. Soju Alexander delivered “Smart transducer for monitoring concrete curing” - Colloquium (Mar 17, 2022)





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CSIR-CBRI FAMILY

CSIR-CBRI Family (2021-2023)

Group-IV-Scientific Staff

S. No	Name	Designation
1.	Dr. N. Gopalakrishnan	Director (Till 25.05.2022)
2.	Dr. Anjan Ray	Director (26.05.2022 to 20.10.2022)
3.	Prof. R. Pradeep Kumar	Director (From 21.10.2022)
4.	Dr. Ashok Kumar	Outstanding Scientist
5.	Dr. Suvir Singh	Chief Scientist
6.	Ar. S.K. Negi	Chief Scientist
7.	Dr. Shantanu Sarkar	Chief Scientist
8.	Dr. Harpal Singh	Chief Scientist
9.	Dr. R. Dharma Raju	Chief Scientist
10.	Dr. Atul Kumar Agarwal	Chief Scientist
11.	Dr. Rajni Lakhani	Chief Scientist
12.	Dr. D.P. Kanungo	Chief Scientist
13.	Dr. Achal Kumar Mittal	Chief Scientist
14.	Dr. S.R. Karade	Chief Scientist
15.	Prof. S.K. Singh	Chief Scientist
16.	Dr. Rajesh Deoliya	Chief Scientist
17.	Dr. A.P. Chaurasia	Chief Scientist
18.	Sh. Nadeem Ahmed	Sr. Principal Scientist
19.	Dr. P.C. Thapliyal	Sr. Principal Scientist
20.	Dr. Navjeev Saxena	Sr. Principal Scientist
21.	Dr. B.S. Rawat	Sr. Principal Scientist
22.	Dr. L.P. Singh	Sr. Principal Scientist
23.	Dr. S.K. Panigrahi	Sr. Principal Scientist
24.	Dr. Shorab Jain	Sr. Principal Scientist
25.	Dr. Rajesh K. Verma	Sr. Principal Scientist
26.	Dr. P.K.S. Chauhan	Sr. Principal Scientist
27.	Dr. Leena Chaurasia	Sr. Principal Scientist
28.	Dr. Sujit Kumar Saran	Pr. Scientist
29.	Dr. H.C. Arora	Pr. Scientist
30.	Dr. Neeraj Jain	Pr. Scientist
31.	Er. Vineet Kumar Saini	Pr. Scientist
32.	Mr. Ravindra Singh Bisht	Pr. Scientist
33.	Mr. Nagesh Babu Balam	Pr. Scientist
34.	Mr. Manojit Samanta	Pr. Scientist
35.	Mr. Soumitra Maiti	Pr. Scientist
36.	Mr. Srinivasa Rao Naik B.	Pr. Scientist
37.	Mr. Anindya Pain	Pr. Scientist
38.	Sh. Nawal Kishore Banjara	Pr. Scientist
39.	Mr. Soju Joseph Alexander	Sr. Scientist
40.	Mr. Subash Chandra Bose Gurram	Sr. Scientist
41.	Mr. Mickey Mecon Dalbehera	Sr. Scientist
42.	Mr. Siddharth Behera	Sr. Scientist
43.	Dr. A. Aravind Kumar	Sr. Scientist
44.	Mr. Siddharth	Sr. Scientist
45.	Mr. Rajesh Kumar	Sr. Scientist

46.	Mr. Santha Kumar G.	Sr. Scientist
47.	Mr. Debdutta Ghosh	Sr. Scientist
48.	Dr. Bharat Singh Chauhan	Sr. Scientist
49.	Mr. Rakesh Paswan	Sr. Scientist
50.	Mr. Chanchal Sonkar	Sr. Scientist
51.	Mr. Mohd. Reyazur Rahman	Sr. Scientist
52.	Mr. Kaushik Pandit	Sr. Scientist
53.	Ms. Hina Gupta	Sr. Scientist
54.	Mr. S. Ganesh Kumar	Sr. Scientist
55.	Mr. Banti A Gedam	Sr. Scientist
56.	Mr. Kishore S. Kulkarni	Sr. Scientist
57.	Mr. Tabish Alam	Sr. Scientist
58.	Mr. R. Siva Chidambaram	Sr. Scientist
59.	Ms. Surya M.	Scientist
60.	Mr. Ashish Pippal	Scientist
61.	Mr. Chandan Swaroop Meena	Scientist
62.	Mr. Mohammad Jeeshan Khan	Scientist
63.	Mrs. Aswathy M.S.	Scientist
64.	Dr. Hemlata	Scientist
65.	Mr. M. Vinoth	Scientist
66.	Mr. Kanti Lal Solanki	Scientist
67.	Dr. Ms. Veena Chaudhary	Scientist
68.	Mr. Ashish Kapoor	Scientist
69.	Mr. V. Chakradhar	Scientist
70.	Dr. Govind Gaurav	Scientist
71.	Mr. Prasanta Kar	Scientist
72.	Dr. Raj Kumar	Scientist
73.	Mr. Chandrabhan Patel	Scientist
74.	Mr. Suman Kumar	Scientist
75.	Mr. Shashank Bhatnagar	Scientist
76.	Dr. Sandeep Gupta	Scientist
77.	Mrs. Humaira Athar	Scientist
78.	Mr. Anup Kumar Prasad	Scientist
79.	Mr. Naveen Nishant	Scientist
80.	Mr. Nirmal	Scientist
81.	Dr. Md. Muslim Ansari	Scientist
82.	Mr. Biswajit Pal	Scientist
83.	Ms. Ishwarya G.	Scientist
84.	Ms. Monalisa Behera	Scientist

Group III Technical Staff

85.	Dr. P.K. Yadav	Pr. T.O.
86.	Dr. S.K. Senapati	Lib Officer-EII, Pr. T.O.
87.	Sh. Rajeev Kumar Sharma	Pr. T.O.
88.	Sh. Sushil Kumar	Pr. T.O.
89.	Dr. M.K. Sinha	Med. Officer, Pr. T.O. (3)
90.	Sh. Vivek Sood	Sr. T.O. (3)
91.	Sh. Jalaj Prashar	Sr. T.O. (3)
92.	Sh. Rakesh Kumar –II	Sr. T.O. (3)
93.	Sh. Bharat Bhushan	Sr. T.O. (3)

94.	Sh. B.K. Kalra	Sr. T.O. (2)
95.	Sh. Itrat Amin	Sr. T.O. (2)
96.	Sh. Amit Kush	Sr. T.O. (2)
97.	Mrs. Gayatri Devi	Sr. T.O. (2)
98.	Mrs. Deepti Karmakar	Sr. T.O. (2)
99.	Sh. Ajay Dwivedi	Sr. T.O. (2)
100.	Sh. Sameer	Sr. T.O. (1)
101.	Sh. D.S. Dharamshaktu	Sr. T.O. (1)
102.	Mrs. Sunita Rani	Sr. T. O.(1)
103.	Sh. Sugam Kumar	T.A.
104.	Sh. Sachin Kumar	T.A.
105.	Ms. Bhawna	T.A.
106.	Sh. Dinesh Kumar	T.A.
107.	Sh. Anil Kumar	T.A.
108.	Sh. Mayank Grover	T.A.

Group II

109.	Mrs. Saroj Rani	N. Sister/ Sr. Tech.(3)
110.	Sh. Sheeraj Ahmad	Sr. Tech. (2)
111.	Sh. Manmeet Singh	Sr. Tech.(2)
112.	Mrs. Urmila Kotnala	Pharmacist/ Sr. Tech.(2)
113.	Sh. Sushil Kumar	Sr. Tech. (2)
114.	Sh. Himanshu Sharma	Sr. Tech. (2)
115.	Sh. Amar Singh	Sr. Tech. (2)
116.	Sh. Rajeev Bansal	Sr. Tech. (2)
117.	Sh. Arvind Saini	Sr. Tech. (2)
118.	Sh. Harish Kumar	Sr. Tech. (2)
119.	Mrs. Neelam	Sr. Tech. (2)
120.	Sh. Anil Kumar Sharma	Sr. Tech. (2)
121.	Sh. Rishi Pal Singh	Sr. Tech. (2)
122.	Sh. Sukhbir Sharma	Sr. Tech. (2)
123.	Sh. Arvind Kumar	Pharmacist/ Sr. Tech. (2)
124.	Sh. Sharad Kumar	Sr. Tech. (2)
125.	Sh. Mam Chand Agarwal	Sr. Tech. (2)
126.	Sh. Tahir Husain	Sr. Tech. (2)
127.	Sh. Ghanshyam Mittal	Sr. Tech. (2)
128.	Sh. Iqbal Ahmed	Sr. Tech. (2)
129.	Sh. Jai Pal	Sr. Tech. (2)
130.	Sh. Sohrab Khan	Sr. Tech. (2)
131.	Sh. Arvind Kumar Sharma	Sr. Tech. (1)
132.	Sh. Jameel Hasan	Sr. Tech. (1)

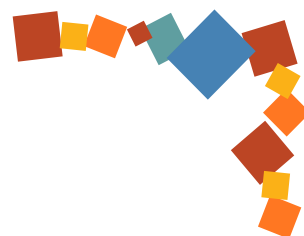
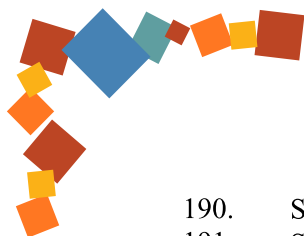
Group I Supporting Staff

133.	Sh. Rajeshwar	Lab. Asstt.
134.	Sh. Jagdish Pal	Lab. Asstt.
135.	Sh. Rajesh Kumar	Lab. Asstt.
136.	Sh. Satya Pal	Lab. Asstt.
137.	Sh. Usha (smt)	Lab. Asstt.
138.	Sh. Subhash Chand	Lab. Asstt.
139.	Sh. Desh Raj	Lab. Asstt.
140.	Sh. Rakesh Kumar	Lab. Asstt.
141.	Sh. Ramesh Kumar	Lab. Asstt.

142.	Sh. Santosh Kumar	Lab. Asstt.
143.	Sh. Rakesh Kumar	Lab. Asstt.
144.	Sh. Krishna Gopal Thakur	Lab. Asstt.
145.	Sh. Devendra Kumar	Lab. Asstt.
146.	Sh. Anit Kumar Pal	Lab. Asstt.
147.	Sh. Pooranvashi	Lab. Asstt.
148.	Sh. Kirat Pal	Lab. Asstt.
149.	Sh. Kiran Pal	Lab. Asstt.
150.	Sh. Rajesh Kr. Yadav	Lab. Asstt.
151.	Sh. Ranjeet Singh	Lab. Asstt.
152.	Sh. Satya Pal Singh	Lab. Asstt.
153.	Sh. Sunil Kumar	Lab. Asstt.
154.	Sh. Malkhan Singh	Lab. Asstt.
155.	Sh. Prakash Kaur (smt)	Lab. Asstt.
156.	Sh. Rakesh	Lab. Asstt.
157.	Sh. Arun Kumar	Lab. Asstt.
158.	Sh. Ravinder Kumar	Lab. Asstt.
159.	Sh. Rajinder Pal	Lab. Asstt.
160.	Sh. Anju (smt)	Lab. Asstt.
161.	Sh. Jai Prakash	Lab. Attd. (2)

Administrative Staff

162.	Mrs. Kumud Singh	COA
163.	Sh. Pravesh Chand	A.O
164.	Sh. Ajay Kumar Sharma	S&P.O.
165.	Sh. Maharaj Singh	F&A.O. (From 02.09.21)
166.	Sh. Avnish Kumar	F&A.O. (From 22.11.22)
167.	Sh. Lekh Raj Kaushik	S.O. (S&P) (From 29.09.17)
168.	Sh. Sanjeev Bansal	S.O (S&P)
169.	Sh. Arpan Maheshwari	S.O. (S&P) (From 16.11.22)
170.	Sh. Virendra Singh	S.O.(F&A) (From 14.12.20)
171.	Sh. Aman Kumar	S.O.(F&A) (From 17.02.22)
172.	Ms. Priya Singh	S.O.(G)
173.	Sh. Rakesh Kumar	S.O.(G)
174.	Sh. Rakesh Pant	S.O.(G)
175.	Sh. Shyam Lal	S.O.(G)
176.	Sh. Satya Pal	P.S.
177.	Ms. Archana	P.S.
178.	Sh. Dalpat Singh	P.S.
179.	Sh. Dharam Singh Negi	P.S.
180.	Sh. Arvind Kumar	Sr. Steno.
181.	Sh. V. P. S. Rawat	Sec. Officer
182.	Sh. Sheema Farhat	ASSTT(G) GR.I
183.	Sh. Sudhir Kumar	ASSTT(G) GR.I
184.	Sh. Shiv Kumar	ASSTT(G) GR.I
185.	Ms. Mamta Sharma	ASSTT(G) GR.I
186.	Ms. Savita Vishwakarma	ASSTT(G) GR.I
187.	Sh. Sushil Kumar	ASSTT(G) GR.I
188.	Sh. Sanjay Kr. Tyagi	ASSTT(G) GR.I
189.	Sh. Ravinder Kumar	ASO(G)



190.	Sh. Suraj Pal Singh	ASSTT(F&A)GR.I
191.	Sh. Satyarth Prakash	ASSTT(F&A)GR.I
192.	Ms. Rubina Zaidi	ASSTT(F&A)GR.I
193.	Sh. Kalam Singh Chauhan	ASSTT(S&P) GR.I
194.	Sh. Vishvash Tyagi	ASSTT(S&P) GR.I
195.	Sh. Mehar Singh	Hindi Officer
196.	Sh. Suba Singh	Hindi Officer

GROUP – C (Non-Technical)

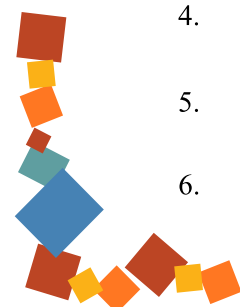
197.	Ms. Seema Ahuja	SSA
198.	Sh. Subhan Singh	SSA
199.	Sh. Mehrajdeen khan	SSA
200.	Sh. Mukesh kumar	Asstt. Gr. III
201.	Ms. Mamta	JSA
202.	Sh. Amit Kumar	MTS

New Joining

1.	Prof. R. Pradeep Kumar	Director	21.10.2022
2.	Dr. Bharat Singh Chauhan	Sr. Scientist	03/01/2022
3.	Sh. Kanti Lal Solanki	Scientist	20/12/2021
4.	Ms. (Dr.) Veena Chaudhary	Scientist	28/12/2021
5.	Sh. Ashish Kapoor	Scientist	29/12/2021
6.	Dr. Govind Gaurav	Scientist	05/01/2022
7.	Sh. Prasanta Kar	Scientist	10/01/2022
8.	Sh. Suman Kumar	Scientist	17/01/2022
9.	Sh. Chandrabhan Patel	Scientist	17/01/2022
10.	Dr. Sandeep Gupta	Scientist	21/01/2022
11.	Sh. Shashank Bhatnagar	Scientist	21/01/2022
12.	Ms. Humaira Athar	Scientist	03/02/2022
13.	Sh. Nirmal	Scientist	02/03/2022
14.	Sh. Anup Kumar Prasad	Scientist	02/07/2022
15.	Sh. Biswajit Pal	Scientist	02/08/2022
16.	Ar. Naveen Nishant	Scientist	02/08/2022
17.	Sh. V. Chakradhar	Scientist	02/08/2022
18.	Km. Mamta	JSA(G)	26/10/2022

Transfer & Posting

1.	Sh. Rakesh Pant	S.O.(G)	30.12.2021(From CSIR-IIP, Dehradun to CSIR-CBRI, Roorkee)
2.	Dr. Rajkumar	Scientist	10.01.2022(From CSIR-NIIST, Thiruvananthapuram to CSIR-CBRI, Roorkee)
3.	Dr. Mod.Muslim Ansari	Scientist	27.06.2022(From CSIR- NAL, Bangalore to CSIR-CBRI, Roorkee)
4.	Dr. Naval Kishor Banjara	Prin. Sc.	23.05.2022(From CSIR-SERC, Chennai to CSIR-CBRI, Roorkee)
5.	Smt. Sunita Rani	Sr. T.O.(1)	13.06.2022(From CSIR-CLRI, Chennai to CSIR-CBRI Roorkee)
6.	Smt. Kumud Singh	COA	12.12.2022 (From- CSIR Hqtrs. New Delhi to CSIR-CBRI, Roorkee)



7.	Sh. Pravesh Chand	A.O.	09.03.2022 (From CSIR-NAL, Bangalore to CSIR-CBRI, Roorkee)
8.	Sh. Avnish Kumar	F&A.	22.11.20122 (From-HRDC, to CSIR-CBRI, Roorkee)
9.	Sh. Arpan Maheshwari	S.O.(S&P)	15.11.2022(From CSIR-CSIO, Chandigarh to CSIR-CBRI, Roorkee)
10.	Sh. Shyam Lal	S.O.(G)	09.01.2023(From-CEMRI, Durgapur, West Bengal to CSIR-CBRI, Roorkee)
11.	Sh. Constan Kujur	S.O.(G)	06.04.2023(From CSIR-IHBT, Palampur to C CBRI, Roorkee)

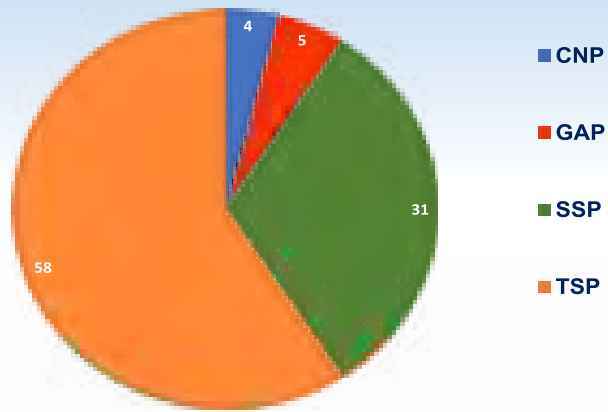
Promotion

1.	Sh. Soju J. Alexander	Principal Scientist	13-08-2022
2.	Sh. Subash Chandra Bose Gurram	Principal Scientist	16-08-2022
3.	Sh. Mohd. Jeeshan Khan	Senior Scientist	28.06.2021
4.	Sh. M. Vinoth	Senior Scientist	14-10-2022

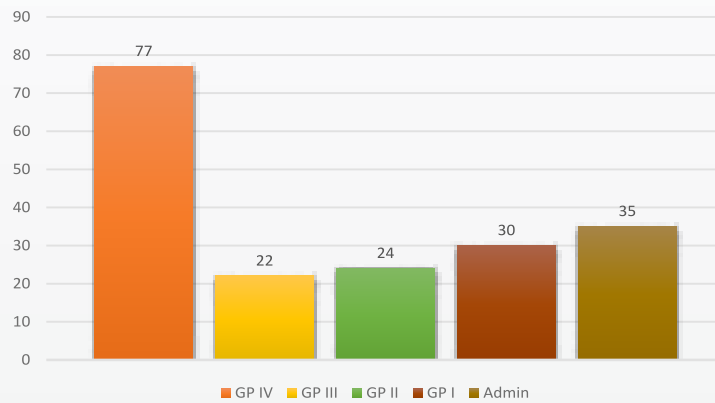
Superannuation

1.	Sh. Dhir Singh	Lab. Asstt.	30.04.2021
2.	Sh. R.S. Chimote	Chief Sc.	31.05.2021
3.	Sh. Bhagat Singh Bist	Sr. Tech.	30.06.2021
4.	Sh. Vijay Kumar	Lab. Asstt.	31.07.2021
5.	Sh. R.A. Rai	Sr. T.O.	31.08.2021
6.	Sh. Narendra Kumar	P.T.O.	31.08.2021
7.	Sh. Vipin Kumar Sharma	A.S.O.	30.09.2021
8.	Sh. Khuspender Arora	P.S.	30.09.2021
9.	Sh. Dalip Kumar	Sr.T.O.	31.10.2021
10.	Sh. Rohitash Kumar	Lab. Asstt.	30.11.2021
11.	Sh. Pradeep Kumar Kapooria	Sr. Tech.	30.11.2021
12.	Sh. Naresh Kumar	Sr.T.O.	31.12.2021
13.	Sh. Ranbir Singh	Lab. Asstt.	31.01.2022
14.	Sh. Dil Bahadur Mala	Lab. Asstt.	31.01.2022
15.	Sh. Anil Kumar	Sr. COA	28.02.2022
16.	Dr. Purnima Parida	Sr. Pr. Scientist	28.02.2022
17.	Sh. S.K. Jakhwal	A.O.	28.02.2022
18.	Sh. Anil Kr. Sharma	St. Tech.	31.03.2022
19.	Dr. N. Gopalakrishnan	Director	25.05.2022
20.	Dr. Atul Kumar Agarwal	Sr. Prin. Sc.	30.06.2022
21.	Sh. Jai Prakash	MTS	30.06.2022
22.	Smt. Neelam Gupta	Sr. Tech.	30.06.2022
23.	Sh. Arun Kumar	MTS	30.06.2022
24.	Sh. Arvind Kumar	Sr. Steno	31.07.2022
25.	Dr. Suvir Singh	Chief Sc.	30.09.2022
26.	Sh. Satya pal	MTS	31.10.2022
27.	Sh. Jagdish Pal	Lab. Attendant	30.11.2022
28.	Sh. A.A. Ansari	Sr. Pr. Scientist	30.11.2022
29.	Sh. Rishi Pal	Sr. Tech.	30.11.2022
30.	Dr. S. Sarkar	Chief Sc	31.12.2022
31.	Sh. Virendra Singh	SO(F&A)	31.01.2023
32.	Dr. Rajani Lakhani	Chief. Sc.	31.01.2023
33.	Dr. Ashok Kumar	Sc. H/outstanding Sc.	31.01.2023

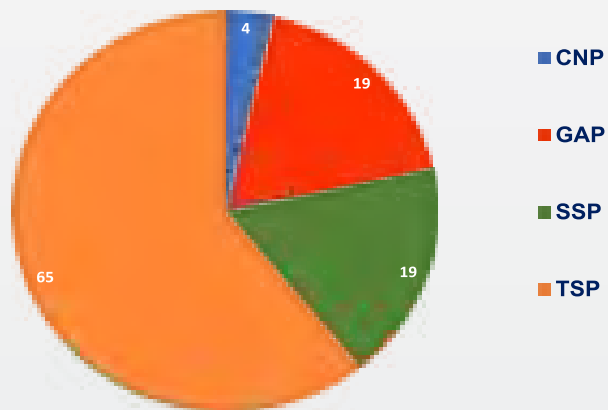
EXTERNALLY FUNDED PROJECTS 2021-2022



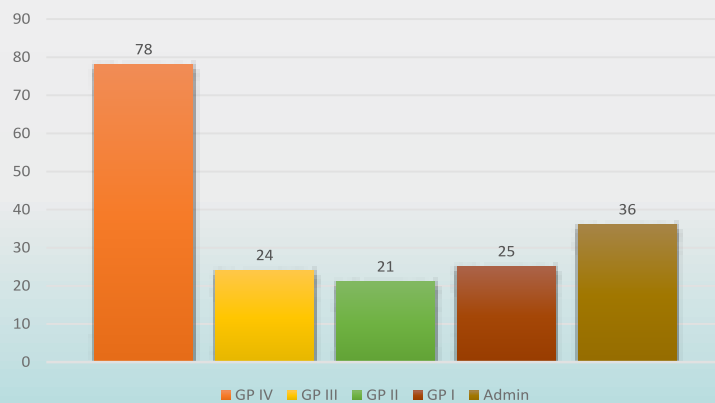
Human Resource 2021-2022



EXTERNALLY FUNDED PROJECTS 2022-2023



Human Resource 2022-2023





सीएसआईआर-केन्द्रीय भवन अनुसंधान संस्थान, रुड़की
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Designed By: Ar. Navneet Nishant