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CSIR-CBRI Newsletter

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Research in Progress

Geochemical, Physical and Engineering Characterization of Indian Red Mud

One of the major challenges before the processing and manufacturing industries is disposal of the residual waste products. Out of the various production industries, the ore dressing and mineral processing industries are the major contributors towards disposal of toxic waste products. Of all, present emphasis has been laid on the residual products pond ash and Red Mud of aluminum industries which utilize bauxite as raw material to extract Aluminium out of it. Out of total aluminum production, India contributes only about 3% of the total world's production. The major aluminum producers in India are HINDALCO, NALCO and BALCO. Added to this, in the absence of any technology that can utilize the industrial wastes like ash and red mud, the industries have to incur heavy expenses in terms of land waste disposal, safe handling, storage etc as per the national and international environmental norms which causes drastic reduction in the profit margin . This calls for development of an effective, economic and environment friendly method to be utilized in bulk the waste produced by these industries. One of the most common and feasible way to utilize the waste ash and red mud is to go for civil construction e.g. embankments and or roads with the materials. This project work on Ash and Red Mud aims at characterization of the materials through laboratory experiments, analyzing the various aspects of their geotechnical behaviour and hence find the optimum mix of ash and red mud which can serve better for the purpose of embankment construction.

The Pond Ash and Red Mud are residual waste products of aluminum extraction industry. The present samples are obtained from ash ponds and red mud ponds from HINDALCO (U.P), BALCO (CHATTISHGRAH) and NALCO (ORISSA). Both the Ash and Red Mud are collected from Thick Slurry Disposal System. This system has the advantage over conventional thin slurry disposal system that the rate of consolidation of disposed materials in the ponds is quite faster. It takes maximum of 24 hours to

Fig. 1: Unconfined Compression Test

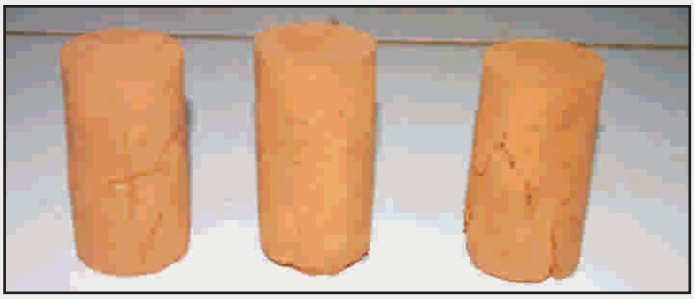

Fig. 2: Failure Pattern of Stablized Sample by UCS Test

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consolidate and the deposit hardens to the extent that it is able to walk over the surface on account of lesser water content and certain chemical treatment undergone before the disposing.

Stabilization of Red Mud with Cement

Experimental program was taken up to explore if red mud could be stabilized with cement and if so the geotechnical property of the stabilized red mud was experimentally evaluated. Experimental program was undertaken to study the effect of cement on RM with respect to the improvement in strength.

After a rest period of 7, 21, 28 and 56days the samples were taken out from the mould and tested for unconfined compressive strength (Fig 1). Failure patterns are showed in Fig 2.

The consolidation tests were carried out on stabilized RM samples in odeo-meters. The Coefficient of consolidation (Cv) and compression Index (Cc) were measured after the specified rest period of 7, 21, 28 and 56 days.

Encouraging results were obtain to use the waste for embanakment construction purposes.

- A. Ghosh, S.K. Jain, Dalip Kumar and Zamir Ahmad

First order Seismic Microzonation of Jammu City using Strong Motion Data

First order Seismic Microzonation of Jammu City using Strong Motion Data

Himalayan region is one of the most active seismic zone of the world. As such Jammu city lies in Zone IV on Seismic zoning map of India. Jammu the winter capital of Jammu & Kashmir state, a city of temples, symbol of ancient values and has a distinct image due to its heritage, location and linkages. Situated on a sub hilly area between $32^0 44'$N and $74^0 55'$E at an altitude of 400m above MSL. It has been rocked by 25 earthquakes in between 1828 to 2005 of magnitude 6.0 or more. After Muzaffarabad Earthquake of 8th October 2005 (magnitude 7.6) Jammu City and the adjoining area has suffered major damage to the Buildings. The city's sprawl is on both the banks of the river Tawi, which is a tributary of river Chenab. The old city is confined to the right bank; whereas the later expansions of the city have largely taken place on the left bank. Jammu is very important city of the State and northern India. It is a fast growing city. Large scale urbanization and industrialization has been observed in last two decades have given rise to what is called now Greater Jammu.

Seismicity of the Area

The state of Jammu & Kashmir is the western most extension of the Himalayan mountain range in India. Here it comprises of the Pir Panjal, Zaskar, Karakoram and Ladakh ranges. The boundary of the Punjab plain and the mountains forms the Himalayan Frontal Thrust (HFF), which in this area is the Murree Thrust. The Main Boundary Thrust (MBT) underlies the Pir Panjal Range and is known as the Pir Panjal Thrust in the region. The Zaskar range which are part of the Great Himalayan range are underlain by the Zaskar Thrust. The Kashmir Valley lies between the Pir Panjal and the Zaskar thrusts, making it very vulnerable to earthquakes. Other northern parts of Jammu & Kashmir are heavily faulted. Along the Zaskar and the Ladakh ranges runs a NW-SE trending strike-slip fault, the longest in the Jammu & Kashmir area. However, it must be stated that proximity to faults does not necessarily translate into a higher hazard as compared to areas located further away, as damage from earthquakes depends on numerous factors such as subsurface geology as well as adherence to the building codes.

The seismicity map of Jammu region from 1973 to 2011 is shown in figure 1. During the project duration only five earthquakes were triggered and all were more than 100 km away from the Jammu city.

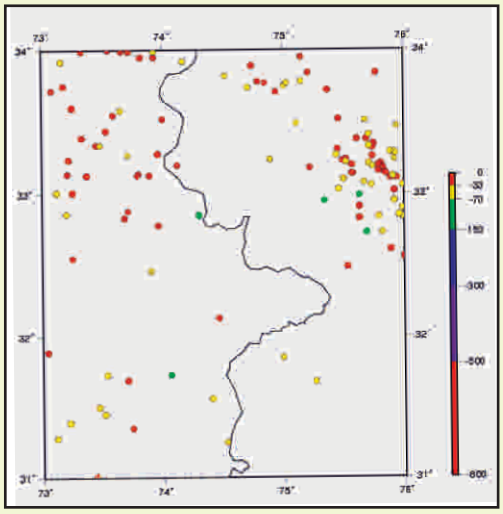

Fig. 1. Seismicity of Jammu region (1973-2011) Number of Earthquakes: 122

Latitude: 31^0N to 34^0N, Longitude: 73^0E to 76^0E. Magnitude: 3.5 to 8 , Depth: 1 to 100,

SMA Network for Jammu

CSIR-CBRI has established a four station network in Jammu city. The selection of sites were based upon the geological features, geographical criterion and the damages occurred during Muzaffarabad earthquake. During Muzaffarabad earthquake Mubarak Mandi area of Jammu city suffered severely.

Keeping all the factors in mind a four station network was established in Jammu city. The four SMAs were installed in the premises of following locations:

1. Division of Agronomy, SUKAST
2. Department of Geology, Jammu University
3. Mubarak Mandi Complex
4. Sainik School. Nagrota

Before the commencement of the project, no Strong Motion Network was present in the Jammu city.

Data Collection

In this study the whole Jammu city was divided into 48 smaller grids. The grid size was chosen as 0.5' X 0.5' (Approx. 500mX500m). Out of 48 grids only 39 grids were those where the habitats are present. The micro-tremor data

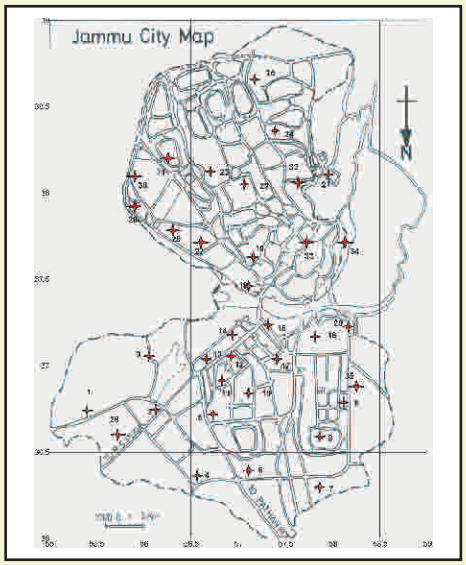

Fig. 2: Location of Micro-tremor data points

has been collected from 38 different locations distributed over entire city. For collection of the micro-tremor data the Strong Motion Accelerograph was kept at the site with minimum threshold value. The locations of the microtremor data points are shown in figure 2.

Data Analysis

In assessing the seismic Hazard of any urban centre, ambient noise measurements have been quite a popular method in estimating the amplification and the dominant frequencies for the horizontal motion during earthquakes. For the estimation of site response Nakamura technique has been widely used and the resonance frequency is obtained by evaluating the horizontal to vertical spectral ration (Nakamura 1989). The predominant frequency and amplification values were calculated for the Jammu city.

River Tawi divides the Jammu city in two parts. Thick accumulation of sediments is observed in the southern part of the city. Thick sediments cover underlying Jammu city can potentially amplify the earthquake shaking. However, the central part of the city has thinner sedimentary cover may less amplify the earthquake shaking.

On the basis of Natural Ground Frequency Jammu City is divided in to four zones, Less Hazardous, Hazardous, More Hazardous, and Most Hazardous. The Central Part of the Jammu City is less Hazardous. The outskirt regions of Jammu City are most Hazardous as compared to other part of the city. The findings are in good match with the damages occurred during Muzaffarabad Earthquake of 2005.

-P.K.S. Chauhan. Y. Pandey, Abha Mital & Gayatri

Vigilance Awareness Week

The Institute celebrated Vigilance Awareness Week during 29 October to 2 November, 2012. Different programmes which includes special lectures, slogan writing competition, essay competition, poster competition for school children of staff wards, extempore speech competition for staff members etc. have been organized during the week. The valedictory functions was organized in the Rabindra Nath Tagore Auditorium on 2nd Nov. 2012. Prof S K Bhattacharyya, Director, CSIR-CBRI presided over the function. Shri Ashok Kumar Gupta, General Manager (Incharge), BHEL, Haridwar was the chief guest and gave away the prizes to the winners of different competitions. Dr Suvir Singh, Sr. Principal Scientist, Chairman, Organizing Committee presented a brief of the programme organized during the week and the function was concluded by a vote of thanks presented by Shri R K Garg, Chief Scientist.

Conference on Emerging Trends of Energy Conservation in Buildings

A National Conference on Emerging Trends of Energy Conservation in Buildings, (EECB 2012) was organized during November 01-03, 2012 at CSIR-CBRI Roorkee. The Conference provided a platform for building energy professionals, researchers, architects, industrialists, academicians and students to interact and deliberate on various issues related to energy conservation in buildings. The Conference was attended by more than seventy delegates from industries like UP Twiga, Bayer Materials, BASF, Berger Paints, Lloyed Insulation Ltd, Keltech Energies, Supreme Petrochem Ltd, BG Shirke Construction Technologies, Indian Oil Corporation; IITs and Universities like Center for Energy Studies IIT Delhi, IIT Kharagpur, IIT Roorkee, IIT Guwahati, IIT-Madras, MNIT Allahabad, TERI University, Guru Nanak Dev University, Ansal University, BITS Mesra, Aayojan School of Architecture, Amity School of Architecture and Planning, GGS Indraprastha University,Manipal University, Engineers India Ltd.; Institute like TERI, SERC-Chennai and the host CSIR-Central Building Research Institute, Roorkee.

There were eight technical sessions in the Conference

covering the following themes:

- Building insulation materials,
- Energy conservation in production of building materials,
- Energy conservation measures, strategies and case studies,
- Renewable energy technologies,
- Energy efficient lighting,
- Integration of energy efficient passive technologies in building design,
- Low energy building design for different climatic zones of India and
- Modelling techniques.

The conference was sponsored by several industries in addition to CSIR, New Delhi and UCOST, Dehradun. As energy efficiency is necessary in every field and the topic of the conference was so relevant that number of participants from industries was very high. Out of forty nine received papers, forty papers were presented in various technical sessions of the conference.

The inaugural function of the conference was held on 1st Nov 2012. Prof. Pradipta Banerji, Director IIT Roorkee as Chief Guest inaugurated the conference. Prof. K. Ganesh Babu, IIT Chennai and former Director CBRI Roorkee graced as Guest of Honour and Prof. S.K. Bhattacharyya, Director, CSIR-CBRI Roorkee presided over the function.

Dr. P.K. Bhargava, Chief Scientist and Convener of the conference briefed the delegates and guests about the conference and Prof. S.K.Bhattacharyya delivered his Presenditial address. Prof. K. Ganesh Babu Ex- Director, CSIR- CBRI, Roorkee also addressed the audience as Guest of Honour of the function. Prof. Pradipta Banerji, Director IIT Roorkee delivered the inaugural address. Dr. Vinod Gupta, Architect and Space Design Consultants, New Delhi spoke about the latest techniques to be used in building for energy efficiency. Prof. S. K. Bhattacharyya, Director CSIR-CBRI Roorkee also delivered a key note address on Energy conservation measures, strategies and case studies. Prof. B.V.V. Reddy, IISc Bangalore gave a plenary talk on Construction Materials and Sustainability - An Overview.

Prof. H. P. Garg, Ex Prof. & Head, CES, IIT Delhi and chief guest addressed the gathering in Valedictory function and also delivered keynote address. Recommendations were finalized in valedictory function in consultation with the Chairman of different sessions viz., Prof. B.V.V. Reddy, Dr. B. K. Saxena, Prof. S.K. Bhattacharyya, Dr. Ishwar Chand and the delegates.

National Workshop on Engineering Geophysics for Civil Engineering & Geo-hazards

CSIR-CBRI has organized a National Workshop on Engineering Geophysics for Civil Engineering & Geo-hazards (EGCEG-2012) during November 22-23, 2012, at CBRI Roorkee. The Workshop was inaugurated by Prof. V.K. Gaur, Honorary Professor, Indian Institute of Astrophysics, Bangalore and Former Secretary, Govt. of India on 22nd November 2012. Prof. S. K. Bhattacharyya, Patron of the workshop highlighted the importance of Engineering Geophysics in the area of Civil Engineering and Geo-hazards. He emphasized upon the use of geophysical tools in the areas of heritage buildings and mega civil engineering projects. The organizing secretary Dr. P.K.S. Chauhan, formally welcomed the delegates and the Chief Guest. Dr. Shantanu Sarkar, Chairman of the Workshop briefed the gathering about the workshop and its importance in the present scenario. Prof V.K. Gaur delivered his inaugural lecture on "Safe Seismic Design of

Critical Structures". During his talk he pointed out the future challenges in the area of Earth-sciences. The function was presided over by Prof. S.K. Bhattacharyya, Director, CSIR-CBRI, Roorkee and the Patron of the Workshop.

The Workshop was attended by the delegates from all over

the country. In total 35 papers were received from IIT Guwahati; ISM Dhanbad; CIMFR, Dhanbad; NIT Bilaspur; CWPRS Pune; NEERI, Nagpur; NGRI, Hyderabad; RITES, New Delhi; CMMACS, Banglore; NGF, Dehradun; JNV University Jodhpur, Allahabad University, WIHG, Dehradun and IIT Roorkee. Five Keynote lectures were delivered in five technical sessions.

Key Note Lectures

GPS geodesy for seismic vulnerability of Indian subcontinent - ***Dr. Sridevi Jade***

The art of data inversion – ***Prof. P.K. Gupta***

Integrated geophysical approach for site investigation - ***Dr Sanjay Rana***

Electrical Imaging for landslide studies – ***Prof. R. G. S. Sastry***

Geophysical investigations for civil engineering and urban risk reduction – ***Prof. D.K. Paul***

The following themes were covered under the workshop

Themes

1. GPS & Geo-informatics for Geo-hazards
2. Seismic Methods for Site Investigation
3. GPR for Ground & Building Investigation
4. Electrical Methods for Sub-surface Evaluation
5. Advanced Geophysical Techniques for Geo-hazards

During the workshop, five papers were also presented by CSIR-CBRI Scientists.

The two days workshop ended with the valedictory function held on 23rd November 2012. Shri K.K. Razdan, Chief Engineer, Project Siwalik, Border Road Organisation graced as Chief Guest. He emphasized the need of detailed studies for the geo-hazards in the hilly region of Uttarakhand especially for the pilgrimage routes.

Annual Convention of the Indian National Academy of Engineering

The Indian National Academy of Engineering (INAE), founded in 1987, comprises India's most distinguished engineers, engineer-scientists and technologists covering the entire spectrum of engineering disciplines. INAE is an autonomous institution supported partly through grant-in-aid by Department of Science & Technology, Government of India. As the only engineering Academy of the country, INAE represents India at the International Council of Academies of Engineering and Technological Sciences (CAETS).

The Annual Convention of the Indian National Academy of Engineering (INAE) was held during December 6-7, 2012 at Rabindranath Tagore Auditorium, CSIR-CBRI, Roorkee jointly organized by CSIR-Central Building Research Institute and IIT Roorkee under the Presidentship of Dr. Baldev Raj, President of the Academy and President-Research, PSG Institutions, Coimbatore. Prof S K Bhattacharyya, Director CSIR-CBRI Roorkee, President of INAE Local Chapter Roorkee briefed about the major scientific and engineering highlights of the Convention.

Technical presentations by ten eminent new Fellows of the Academy who were admitted to the Fellowship during Induction Ceremony includes "An Extended Principle of Pseudo-Stochastic Filtering for Structural Optimization and Control" by Prof. Debasish Roy; "Mega Hydro Structures – Bold, Innovative and Impressive Solutions for a Large Dam with engineering challenges : Tehri Dam" by Mr. M Gopalakrishnan; "Power Converters with Improved Performance" by Dr. H.M. Suryawanshi; "A Computational Perspective on the Regulatory Network of TFs, microRNAs and genes" by Prof. S. Bandopadhyay; "Self Reliance in Manufacturing and Service of Nuclear Power Plant Equipment" by Mr. Anil V. Parab; "Order Reduction in Some Dynamic Systems" by Prof. Anindya Chatterjee; "Design of Efficient Catalysts for Auto Exhaust Purification and other Applications" by Dr. BM Reddy; "Advanced Electromagnetic and Coupled Field Computations For Improving Performance and Reliability of Power Transformers" by Prof. SV Kulkarni; "Compiling for Heterogeneous Accelerator-Based Multicore Architectures"

by Prof. Govindarajan Ramaswamy; and by Dr. S.V. Joshi.

In addition to above, the following technical presentations by INAE Young Engineer Awardees 2012 were also given. "Development of MEMS based Low Temperature, Low Power Methane Sensor for Underground Coalmine Environment" by Dr. Partha Bhattacharyya; "Modelling, Analysis and Control of Electro-Pneumatic Brakes for Commercial Vehicles" by Dr. C.S. Shankar Ram; "Strategies for Long Duration Aided Inertial Navigation" by Dr. Brajnish Sitara; "Algorithms for Computational Social Science" by Dr. Animesh Mukherjee; "Improving Seismic Performance of Existing Deficient RC Frames using Aluminum Shear Yielding Devices" by Dr. Dipti Ranjan Sahoo; "Studies on Treatment of Wastewater by Physico-Chemical and Electrochemical Methods, and Desulphurization of Liquid Fuels" by Dr. VC Srivastava; "Real Parameter Optimization with Differential Evolution – New Variants and Analyses" by Dr. Swagatam Das; "Interfacial Flows: Instabilities during Adhesion, Dewetting, Film Boiling and Atomization" by Dr. Gaurav Tomar; "Novel Carbon Nanomaterials" by Dr. VVSS Srikant.

Every year, the Academy recognizes excellence in Engineering through its awards. This year, Life Time Achievement Award in Engineering was presented to Prof. P Rama Rao , Chairman, Governing Council, International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderbad; and Dr. RA Mashelkar, National Research Professor, National Chemical Laboratory, Pune; Chancellor, AcSIR & President Global Research Alliance during Award Function on December 6, 2012. Professor Jai Krishna and Professor SN Mitra Memorial Awards 2012 were presented Prof. Amitabha Ghosh, INSA Senior Scientist, Bengal Engineering and Science University, Howrah and Prof. N Viswanadham, Formerly Professor of Mechanical Engineering, National University of Singapore, Singapore and Deputy Executive Director, Logistics Institute Asia Pacific, and Former Executive Director, Center for Global Logistics respectively, delivered award lectures on Dec 6, 2012.

Ten young engineers below the age of 35 years were presented INAE Young Engineer Award for excellence in design and technology transfer, innovative development and engineering research work. Innovative Student Projects Award 2012 were also presented at B.Tech level (6), Master's level (5) and Doctoral level (5).

At the Award Function both Prof. P Rama Rao and Dr. RA Mashelkar delivered special lectures.

Dr. R.A. Mashelkar, Chancellor, AcSIR & President Global Research Alliance, National Chemical Laboratory, Pune and Ex Director-General, CSIR, New Delhi was shown important work of various Laboratories of CSIR-CBRI, Roorkee. An interactive session was also arranged with young scientists and students of M.Tech. Programme with Dr. R.A. Mashelkar. On this occasion Abhiwyakti - a magazine prepared by the students was also released.

National Conference on Wind Engineering

The two days 6th National Conference on "Wind Engineering" was jointly organized by Indian Society for Wind Engineering (ISWE) and CSIR-Central Building Research Institute, Roorkee at New Delhi during Dec. 14-15, 2012.

The conference on "Wind Engineering" was inaugurated on Dec., 14th 2012 by Prof. Yukio Tamura, President IAWE, Tokyo Polytechnic University, Japan (Chief Guest), Prof. Prem Krishna, Former President, IAWE & Chairman RC, CBRI, Roorkee and Dr. S. Gangopadhyay, Director, CSIR-Central Road Research Institute, New Delhi graced as Guests of Honour. Prof. S. K. Bhattacharyya, Director, CSIR-Central Building Research Institute, Roorkee presided over the function. Dr. A.K. Mittal, Organizing Secretary proposed a vote of thanks to the delegates. Eminent speakers as well as chief guest Prof. Yukio Tamura delivered inaugural lecture on the topic of "Extreme Winds" and the proceedings of the conference were also released during the inaugural ceremony.

More than 70 delegates from Govt. and private sectors attended the conference and presented technical papers during the conference. Engineers/Professionals from many

Inaugural Function



Valedictory Function

organizations like CSIR-CBRI, Roorkee, CSIR-SERC, Chennai, CSIR-CRRI, New Delhi, DST, Ministry of Earth Science, Jaypee Associates Ltd., RWDI Consulting Engineers, Mahagun India Pvt. Ltd., ESCOM consultants Pvt. Ltd., and HUDCO attended the conference. Faculty members from IIT Roorkee, SVNIT Surat, Thapar Institute, Patiala and research scholars also participated in this conference.

The key-note lectures were delivered during the conference by Prof. Yukio Tamura, Dr. Suresh Kumar, Prof. S. K. Bhattacharyya, Prof. Kishor C Mehta, Dr. S. Arunachalam, and Prof. Mahesh Tandon on the following topics:

- Extreme Winds
- Wind Tunnel Studies on Tall Buildings
- Health Monitoring of Structures
- Impact of Wind Storm on Urban Centre
- Issues of Wind Loading on Chimneys
- Issue of Wind in the Design of Bridges

Annual General Meeting of ISWE, India was also conducted on Dec., 15th 2012 AN. The AGM was chaired by Prof. P. D. Porey, President ISWE, India.

The valedictory function of the conference was celebrated on Dec., 15th 2012. Prof. Kishor C. Mehta, Texas Tech University, USA, graced the occasion as Chief Guest. Dr. Nagesh R. Iyer, Director, CSIR-Structural Engineering Research Centre; Chennai was the Guest of Honour. Prof. P. D. Porey, President ISWE, India presided over the function. Dr. A.K. Mittal, Organizing Secretary proposed a vote of thanks.

Papers Published/Presented

S.K. Agarwal, Vivek Sood and L.P. Singh, Chemically activated blended cements as sustainable cements, New Building Materials & Construction World, NBM&CW, 196-201, November, 2012.

S.P. Agrawal, B. M. Suman and Rajni Lakhani, Comparative Studies on Two Different Methods of Thermal Conductivity Measurements, National Conference on EmergingTrends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 04-09.

Rajni Lakhani, S. P. Agarwal and Sapna Ghai, Development of Energy Efficient Material from Vermiculite, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 10-15.

Ashok Kumar, P.S.Chani, Rajesh Deoliya, Rajni Lakhani, and Naresh Kumar, Comparative Assessment of Energy Requirements and Carbon Footprint for Different Types of Building Materials and Construction Techniques, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 63-71.

S. P. Agrawal and B. M. Suman, Value Added Insulating Materials from Wastes, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 82-87.

V. Sood, S.K. Agarwal and Ashok Kumar, Impact of Sustainable Cements on the Conservation of Energy in Buildings, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 88-95.

Amit Kush, Amod Krishna and P.K.Bhargava, Energy Efficiency through ICT Adoption for Sustainable Habitat, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp.120-125.

Neeta Mittal, Heritage Building- An Inspiration for Energy Efficient Modern Buildings, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 136-142.

S.K. Negi and V.Srinivasan, Planning and Energy Conservation Strategies in Small Settlements, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 143-148.

Nagesh B. Balam and PK Bhargava, Solar energized Liquid Desiccant Air Conditioning – A review, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 194-203.

Rajiv Kumar and Vinod Kumar, Development of Integrated Solar Photovoltaic-Thermal System, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 168-176.

Narendra Kumar, S. K. Saini and Sameer, Partial Replacement of Conventional Heat Energy by Solar Energy in the Production of

Gypsum Plaster, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 210-215

Chhavi, Solution of Integral Equation applying Finite Difference Approach for Evaluating Visible Radiation Exchange including Multiple Inter-Reflection in Building Enclosures, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 245-254.

H.K.Jain, P.K.Bhargava and Shiv Lal, Passive Cooling of Buildings, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp 264-273.

P.K.Bhargava, Nagesh Babu Balam and A.K.Roy, Passive Design Features for Energy Conservation in Residential Buildings, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 293-302.

K.L.Chhabra and Rajeev, A Process of Heat- Reflective Insulation for Roof, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR- CBRI, Roorkee during Nov 1-3, 2012, pp. 303-308.

B. M. Suman, Energy Simulation for Sustainable Building with Application of Roof and Wall Insulation, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 360-369.

A.K. Roy and P.K. Bhargava, CFD Modelling of Wind Flow around Buildings for Wind Energy Conversion, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 370-379.

P.K. Yadav and B.M. Suman, Prediction of Indoor Thermal Comfort Level Using Fuzzy Logic, National Conference on Emerging Trends of Energy Conservation in Buildings held at CSIR-CBRI, Roorkee during Nov 1-3, 2012, pp. 380-388.

Abha Mittal, Gayatri Devi, PK.S. Chauhan & S. Karthigeyan, Site Response Analysis based on V_{s30} for Chandigarh City, National Workshop on Engineering Geophysics for Civil Engineering & Geo-hazards (EGCEG-2012) during November 22-23, 2012 at CSIR-CBRI, Roorkee.

P.K.S. Chauhan, J. N. Vaish and Ajay Dwivedi, Ground distress investigation through GPR, National Workshop on Engineering Geophysics for Civil Engineering & Geo-hazards (EGCEG-2012) during November 22-23, 2012 at CSIR-CBRI, Roorkee.

P.K.S. Chauhan, Ajay Dwivedi and J.N. Vaish, GPR investigations at TAJ, National Workshop on Engineering Geophysics for Civil Engineering & Geo-hazards (EGCEG-2012) during November 22-23, 2012 at CSIR-CBRI, Roorkee.

A. Ghosh, P.K.S. Chauhan and Zameer Ahmed, Geophysical Investigation for Habitat Development, National Workshop on Engineering Geophysics for Civil Engineering & Geo-hazards (EGCEG-2012) during November 22-23, 2012 at CSIR-CBRI, Roorkee.

P.K.S. Chauhan, Gayatri Devi, Y.Pandey and Abha Mittal, Micro-tremors for Seismic Hazard Estimation, National Workshop on Engineering Geophysics for Civil Engineering & Geo-hazards (EGCEG-2012) during November 22-23, 2012 at CSIR-CBRI, Roorkee.

Staff News

Promotion

Dr Manorama Gupta	Sr Principal Scientist	20.06.10
Dr Harpal Singh	Sr Principal Scientist	03.07.10
Dr Atul Kr Agarwal	Sr Principal Scientist	30.03.12
Dr P C Thapliyal	Principal Scientist	23.03.11
Dr B S Rawat	Principal Scientist	01.01.12
Dr Neeraj Jain	Sr Scientist	15.11.11
Smt Mamta Sharma	Assistant (G) Gr. I	27.12.12

Congratulations!

Transfer

Satish Kumar — Group (C), Non Tech. — 21.09.12
(From CSIR-IIP Dehradun to CSIR-CBRI, Roorkee)

Dheeraj — Section Officer (F&A) — 05.11.12
(From CSIR-CRRI, New Delhi to CSIR-CBRI, Roorkee)

Maharaj Deen Khan — Peon — 31.10.12
(From CSIR-CBRI, Roorkee to CSIR-IIIM, Jammu)

Neeraj Kumar — Assistant (Gen) — 16.11.12
(From CSIR-CBRI, Roorkee to CSIR-CIMFR, Dhanbad)

Superannuation

K L Chabbra	Principal T.O.	31.10.12
Suresh Pal	Safaiwala	31.10.12
Ashok Kr Sharma II	Principal T.O.	30.11.12

We wish a peaceful & happy retired life !

Editor
Dr Atul Kumar Agarwal
Sr. Principal Scientist

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