



भवन से आने सुरक्षा तकनीक विकसित



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Research in Progress

Development of Building Materials from H-Acid Gypsum

It is very important for the sustainable development of our industry and the protection of environment that the appropriate and economical disposal of industrial by-

products would increase every year. In recent years, the use of waste materials in the production of cement and concrete has become common place because it offers cost reduction, energy savings and arguably superior products. Fly ash and chemical gypsum are great source of industrial waste residues. In India, H-acid gypsum, a waste material is produced to the tune of 0.5 million tonnes per annum from the dye intermediate by the neutralization of free sulphuric acid with limestone. The literature survey revealed that no work has been done on the utilization of H-acid gypsum. H-acid gypsum samples were collected from the dye industry. The waste gypsum contains impurity of organic matter like nitro compounds, naphthalene etc. The removal of impurities and improvement in colour was carried out by scrubbing with water, centrifuging and drying. The beneficiated H-acid gypsum was calcined to form β -hemihydrate plaster. The plaster was tested and evaluated for engineering properties such as compressive strength, bulk density, water absorption and porosity. These properties suggest the use of beneficiated H-acid gypsum for making building and ceramic grade plasters and for casting building blocks, board and cementitious binder. Water-resistant gypsum binder has been developed by blending the calcined H-acid gypsum with fly ash and Portland cement. Data showed that cementitious binder of low water absorption (9.5 %) and adequate compressive strength (19.6 MPa at 28 days) can be produced for use as construction material. The cementitious binder show better water resistance and higher strength than H-acid gypsum plaster. DTA & SEM studies showed the formation of Ettringite, CSH and C_4AH_{13} which are

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responsible for strength development of cementitious binder.

The plaster boards (Breaking load: 450-550-N, water absorption: 18-20% thermal conductivity 0.12-0.18 Kcal/m/hr/o/c and bulk density 1000-1100 kg/m³ and blocks (compressive strength: 2.2-3.5 MPa, bulk density: 1150 Kg/m³) of improved properties complied with Indian standards were produced from the beneficiated H-acid gypsum. Some typical photographs, as shown in Fig. are of the use of waste gypsum friendly environment and sustainable development.



Gypsum Plaster Boards



Gypsum Blocks

Investigation of Distress in Rashtrapati Nivas at Shimla and Rehabilitation Measures

Rashtrapati Nivas at Shimla is an old historical building on top of a hillock at Shimla. The imposing Victorian Edifice of the Viceregal Lodge is among British India's most monumental constructions, built in a mock Elizabethan style constructed in the year 1888. The building was donated to Indian Institute of Advance studies (IIAS) by late president of India Dr S. Radhakrishnan in 1964 and since then the institute is functioning from this premises. The main building comprises ground plus two storey structure with wooden trussed roof and tiles. The kitchen block comprises two basement floors, ground and two additional floors above the ground. The preservation of the main building, a fine specimen of Colonial architecture, has been a matter of concern in the past.

The IIAS authorities requested Central Building Research Institute to investigate the causes of distress and suggest suitable remedial measures. A detailed investigation has been carried out by CBRI to find the causes of distress in lime concrete vaulted floor and stone masonry walls. The investigation report briefly covers visual observations, material characterization, finite element analysis, load transfer mechanism, identification of possible causes of distress, repair and rehabilitation measures for the masonry structure. The leakage related problems in library block of the building having flat roof has also been addressed.

From the distress survey, material investigation, structural analysis, moisture movement, crack monitoring, it is concluded that the cause of distress may be because of material degradation resulting from leakage /seepage of water and possibly also because of localized settlement of the buttresses. Keeping in view of the above facts, repair and rehabilitation scheme has been suggested.

Geological, geotechnical and geophysical investigations were also carried out to address the

issues of slope instability and ground settlement in the surrounding areas and to provide suitable remedial measures.

GPR system with 250 MHz frequency antenna was used for profiling various stretches on back side of the building consisting of kitchen block, library block and open space. The backyard of the building has network of drains at various depths and of different sizes.

Based on the results of above investigations and keeping in view the ground settlement and water seepage problems in the area, the remedial measures are suggested:

On the rear side of the building, the existing old and damaged dry stone retaining wall is to be replaced by a new stone masonry wall bonded with cement mortar of 3.0m to 4.5m height all along the slope. The retaining wall should have perforated drainage gallery. It is also suggested to reconstruct/repair the existing underground main central drain. All the drains should be properly lined and be made impermeable. The backyard of the kitchen should



be made with plain cement concrete having adequate slope to minimize the local water infiltration during rainy season. The rain and storm water of the area should be channelised through a surface drain to the main central drain.

On the front side of the building, the newly constructed existing retaining wall is to be extended up to the end because the old retaining wall is completely damaged and does not serve its purpose.

Utilization of Red Mud and Ash as Resource Geomaterial for Embankment Construction

Large amount of red mud is left when bauxite is used as a raw material in the manufacturing of Aluminum. Unfortunately red mud in this country does not find any use and is dumped as waste material. Globally also this waste material does not find its use and in many countries this waste is dumped in the sea. Use of ash and red mud as resource material for embankment construction not only reduces environmental pollution, it is also helpful in promoting sustainable development by avoiding unnecessary use of natural soil. This is a step forward towards waste to wealth.

For laboratory evaluation of engineering parameters both major industrial wastes i.e. red mud

and ash were collected from a large aluminum manufacturing industry. The samples were tested after mixing homogeneously different percentage of ash and red mud in the laboratory.

EXPERIMENTAL PROGRAM

An experimental program was carried out to find the optimum mix of red mud and ash so as utilize the same for the construction of embankment. Geotechnical tests were carried out in the laboratory using red mud and ash in the ratios of Ash : Red mud 50% : 50%, 70% : 30%, 30% : 70%, 60% : 40% and 40% : 60%. The results are summarised in the following tables:

Table -1: Particle Size, Compaction Parameters & Specific Gravity of Ash and Red Mud

Type of Material	Grain Size Analysis			Proctor Density		Specific Gravity
	Sand%	Silt%	Clay%	OMC%	Dry Density (gm/cc)	
Ash	62	38	-	32	1.22	2.36
Red Mud	22	64	14	29	2.04	3.15

Table -2: Direct Shear, Consolidation and Permeability Properties of Ash and Red Mud

Type of Material	Direct Shear Test				Consolidation Properties		Permeability (Cm/sec)
	Unsaturated		Saturated		Cv	Cc	
	Cohesion kg/sq.cm	Angle of Friction (degree)	Cohesion kg/sq.cm	Angle of Friction (degree)	Sq.cm/sec		
Ash	0.07	40	0.05	38	1.29×10^{-3}	0.076	0.38×10^{-4}
Red Mud	0.26	33	0.06	30	0.85×10^{-3}	0.23	0.43×10^{-5}

Table -3: Particle size, compaction parameters & specific gravity of mix composition

Mix Composition (Mud + Ash)	Grain Size Analysis			Proctor Density		Specific Gravity
	Sand %	Silt%	Clay%	OMC%	Dry Density (gm/cc)	
50%+50%	65	28	7	28	1.49	2.74
70%+30%	50	40	10	28	1.56	2.91
30%+70%	70	28	2	29	1.41	2.44
60% + 40%	58	35	7	27	1.54	2.64
40% + 60%	63	32	5	28	1.52	2.68



Table -4: Direct shear, consolidation and permeability properties of mix composition

Mix Composition (Mud +Ash)	Direct Shear Test				Consolidation Properties		Permeability cm/sec x10 ⁻⁴
	Unsaturated		Saturated		Cv	Cc	
	Cohesion kg/cm ²	Angle of Friction (deg.)	Cohesion kg/cm ²	Angle of Friction (deg.)	Cm ² /sec x10 ⁻³		
50%+50%	0.38	38	0.17	36	1.05	0.059	0.14
70%+30%	0.19	37	0.10	35	0.95	0.086	1.25
30%+70%	0.12	39	0.05	38	1.14	0.082	0.42
60% + 40%	0.20	36	0.08	34	1.02	0.078	0.95
40% + 60%	0.17	37	0.06	36	1.08	0.075	0.87

EMBANKMENT DESIGN

14meter high embankment design was carried out utilising the above data for capacity augmentation of a red mud storage pond. Limit equilibrium and seismic stability analysis were carried out to check the stability of the embankment.

REMARKS

Huge quantity of red mud and ash (nearly 1.9 million cu.m.) could be gainfully utilised. Time and money for


Construction of red mud pond utilizing Red Mud and Ash

transporting good quality of soil and or rock fragments from the borrow pit area other wise required for raising the embankment height could be saved.

Vigilance Awareness Week

The Institute celebrated Vigilance Awareness Week during 3 to 6 November, 2009. Different programmes which includes special lectures, poster competition for school children of staff wards, debate competition for staff members etc. have been organized during the week. The valedictory functions was organized in the Institute's auditorium on 6th Nov. 2009. Shri S.G. Dave, Scientist 'G' presided over the function. Shri Pradeep



Batra, Chairman, Municipal Board was the chief guest and gave away the prizes to the winners of different competitions. Dr S.K. Saini, Scientist 'F', 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 S.C.Tyagi, Vigilance Officer and Controller of Administration.



Republic Day

The Republic Day of the Nation was celebrated with a deep sense of patriotism combined with gaiety on January 26, 2010 in CBRI Main lawns of the Institute. Prof S.K. Bhattacharyya, Director, CBRI, unfurled the Tricolour and took the salute at the March Past performed by the security Guards.



CBRI Foundation Day

The institute celebrated its 64th Foundation Day on 10th February 2010. Three eminent professionals and VIP's namely Prof. S.C. Saxena, Director, IIT, Roorkee, Prof. P.B. Sharma, Vice Chancellor, Delhi Technological University, Delhi and Dr. M.O. Garg, Director, IIP, Dehradun were the Chief Guest, Guest of Honor and Special Guest respectively graced the occasion, while Prof. S.K. Bhattacharyya, Director, CBRI, Roorkee, presided over the function. Shri S.G. Dave, Scientist 'G' while welcoming the guests briefed on the history of the institute, highlighting its main R&D achievements and professional & societal contribution of CBRI in resolving and overcoming the problems of durable, safe and economical housing for the people of the country. He also introduced the guests to the audience.



Prof. S.K. Bhattacharyya, Director highlighted a new vision and the thrust of the forthcoming R&D programmes, of the Institute. He informed about initiation of a PG programme at CBRI and collaboration & MOU with IIT and other academic or housing institutions of the country for planning of appropriate HRD programmes and focused R&D work.

Prof S.C. Saxena, Director, IIT, Roorkee, the Chief Guest, stressed on the need of immediate R&D on energy efficient, cleaner processes and cost effective building materials required for mass construction activities. He appreciated the efforts of CBRI in this direction and advised scientists to engage actively in newer frontier areas like green housing, intelligent buildings, sustainable & affordable housing, nano technology etc. Prof. S.C. Saxena, Director IIT, Roorkee subsequently delivered a special Foundation Day lecture on "Green and Intelligent Buildings". He stressed on the need of taking R&D initiatives by CBRI highlighting its necessity, importance and relevance in the global scenario.

Prof. P.B. Sharma, founder Vice Chancellor of Delhi Technological University, Delhi, and the Guest of Honour of the function in his address highlighted importance of



need of taking lab research to the ultimate user at appropriate time. He said that it is a joint effort and equated extension responsibility like a Panchamrit i.e. involvement of R&D Institutions, Academic Institution, Industries, Society and Government for the overall integrated development of the country.

He also informed on his vision of Building Technology Park, which he intends to establish first at Delhi Technological University and subsequently in each state. These technology parks may serve a useful platform for creating green future by arranging mass awareness and generating technical understanding among the professionals & enthusiasm among general public.

Dr. M.O. Garg, Director, IIP, Dehradun, special guest on the occasion shared his experiences while heading both the institutes IIP and CBRI simultaneously and mentioned about the enormous potential and unique position that the CBRI has because of its availability of multidisciplinary diversified expertise in all areas related to housing spectrum.

On this occasion, Diamond Jubilee Director's award specially instituted for development of best technology/innovation/know-how having maximum societal impact for the year 2009-10 was given jointly to Dr. B. Singh and Dr. Manorama Gupta, Scientists for their work on "Development of manufacturing know-how on





Rice Husk Plastic Wood”.

The award comprises of a citation and cash award of Rs. 5000/-. The technology know how was recently transferred to the industrialist who intends to set up a manufacturing plant at Gwalior, Madhya Pradesh.

A view of Release of
CBRI Annual Report



Prof. S.C. Saxena,
Director, IIT, Roorkee
delivering Foundation
Day lecture

The foundation day function was also marked with the release of the CBRI Annual Report 2008-09, Logo of CBRI and New Website of the institute (www.cbri.res.in) at the hands of the chief guest and other guests.

National Science Day

The Institute celebrated National Science Day on 28th February, 2010 to commemorate Raman Effect of the Nobel Laureate Sir C.V. Raman. The day celebration offered an opportunity to bring issues of science in the centre stage and provide awareness to the public of immediate concern. This results into purposeful interaction between the science fraternity and the common people for mutual benefit.

Prof. S.K. Bhattacharyya, Director, CBRI narrated the contribution of Sir C.V. Raman in the field of Spectroscopy for a wide range of scientific investigations and industrial applications. He stressed the role of National Science Day's objectives in transforming our society under the theme of “Gender equality for prosperity and peace”. CBRI is pursuing faculty training and motivation for School and College faculty and students – A programme of CSIR to create interest, excitement and excellence in science education at the school and

undergraduate level to raise the standard of science education and capabilities. He felt that it is an opportunity to take stock on the status of science in India. Such introspection is necessary as science and technology have become the most important drivers of the economy of the country.



Prof. S. K. Bhattacharyya and Prof. I. S. Tyagi
interacting with college students at display
of project work



Prof. S.K. Bhattacharyya, Director, addressing
on National Science Day

On this occasion, Prof. I.S. Tyagi, Department of Physics, IIT, Roorkee has delivered National Science Day lecture on **"Fascinating World of Quantum Physics and Nanotechnology"**. His lecture contents such as Basics of Raman Effect, Essentials of Quantum Mechanics, Carbon Nanotubes, High-Tech Superconductors and Structure of Semiconductors have been widely appreciated by the scientists and college students. He has interacted with college students along with Prof. S.K. Bhattacharyya on the models and charts prepared by them at CBRI during training.



Know How Transferred

The Central Building Research Institute, Roorkee has developed a technology know-how for manufacturing of plastic composites used as a replacement of natural wood in buildings. This development has been made under Supra Institutional Project of the Council of Scientific & Industrial Research, New Delhi under Eleventh Five Year Plan. In this work, Rice husk is used as an alternative to wood fibres in melt blend processing because many users of wood fibres / residues often face local shortage due to environmental issues and Government Policies. Rice husk is a low cost renewable resource material and locally available in a huge quantity.



A view of Technology transfer meeting



Prof. S.K. Bhattacharyya, Director, CBRI handed over Know-how Document and Product to Mr. Bhupesh Khanna, Director of M/s Shivaye Namah Manufacturing Company Pvt. Ltd., New Delhi

Prof. S.K. Bhattacharyya, Director, CBRI informed that this product has been developed with rice husk and plastics under a specific condition of compounding / extrusion process to obtain composite profiles as

comparatively similar to natural wood in surface appearance and carpenter friendly properties in the PPC Division of the laboratory under the leadership of Dr. B. Singh and Dr. Manorama Gupta. The composite profiles have been thoroughly evaluated as per market specification for various properties such as strength, dimensional stability, screw holding and nailing properties, termite attacks and fire. These products are designed having long term durability in mind. The composite profiles meet the requirements of National Building Code, 2005, Section 3 Timber when tested as per IS: 1708. Patent on the product has also been filed.

For commercialization of research output, the Institute has transferred the technology know-how to Mr. Bhupesh Khanna, Director of M/s Shivaye Namah Manufacturing Company Pvt. Ltd., New Delhi (Works: Malanpur Industrial Area, Gwalior, Bhind) for setting of a commercial production unit. The manufactured profiles will be used for door and window profiles and frames, fencing, decking, furniture, structural support members and other industrial applications.

MoU Signed

With M/s Meta Dynamics, South Africa

An MoU was signed between Central Building Research Institute (CBRI) Roorkee and M/s Meta Dynamics, South Africa on 15th March 2010 to formulate the super sulphated cement from their raw materials using fluoro gypsum and slag as per Indian Standards. Fluoro gypsum, a waste of hydrofluoric acid industry contains the impurities of fluoride and free acidity which adversely affect the setting and strength development of plaster and its products. For mass utilization of fluoro gypsum, it is necessary to remove and inactivate these impurities as far as possible. The $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ content of fluoro gypsum varies between 95 to 97 percent.

Granulated blast furnace slag is a glassy materials

having latent hydraulic properties. Extensive work has been carried out at CBRI, Roorkee to make Portland slag cement and super sulphated cement (SSC). The SSC can be produced by activation of slag with 10-20 % gypsum anhydrite / fluorogypsum anhydrite in presence of 2.5-6% of cement clinker/lime. The SSC conformed to the requirements of IS: 6909, 1990. Some of the advantages of SSC over Portland cement are its low cost with saving in energy, increase resistant to sulphate and lower heat of hydration. It is eminently suitable for marine and mass concrete construction.

Research work has been carried out in the EST Division of CBRI to beneficiate and use of fluorogypsum for making high strength plaster, water resistant binder,





Prof. S.K. Bhattacharyya, Director, CBRI and Mr. Gavin Coulson, Managing Director, Meta Dynamics, South Africa exchanging MoU documents

flooring tiles, bricks and blocks and super sulphated cement.

The super sulphated cement market in South Africa is approximating 250,000 TPA. This is for the concrete and sewerage pipe industry. The pipe industry presently uses a specialized cement made up of admixtures and activators which is rather expensive. Therefore, a collaborative project has been undertaken with M/s Meta Dynamics, South Africa on sponsored basis for the production of super sulphated cement using fluorogypsum, a waste product. This study would be helpful in marine works, reinforced

concrete pipes in ground water, concrete construction in sulphate bearing soils and for concrete sewers carrying industrial effluents.

For commercial exploitation, an Memorandum of Understanding (MOU) has been signed between Shri Gavin Coulson, Managing Director, Meta Dynamics, South Africa and Prof. S. K. Bhattacharyya, Director, CBRI, Roorkee. The Scientist Co-ordinator of all the disciplines also graced the occasion.

M/s Meta Dynamics, South Africa has further shown interest in collaborating with CBRI on various technologies which includes Water resistant gypsum binders, Gypsum blocks and tiles from fluorogypsum and Anhydrite cement.

With IIT, Roorkee

An MoU has been executed between CBRI and IIT, Roorkee on 17th February 2010 in order to steer the R&D activities and common goals of both the organizations in the area of Building Science & Technology. The MoU covers the modalities and general conditions regarding availability of highly qualified manpower in the area of Civil Engineering, Building Science & Technology, Engineering Geology and Architecture & Planning and other areas of Engineering. The MoU also covers exchange of personnel through deputation for limited period on mutually agreed terms and conditions, organization of joint conferences and seminars, training of IIT students at CBRI, admission of CBRI Scientists/Technical Officers to the Postgraduate programmes at IIT, Roorkee.

Participation in Workshop cum Exhibition

The Institute made a significant effort in a far flung area of West Bengal by way of participation in "Krishi Shilp & Baniya Mela" organized by 'Agrayami Handicapped Sammity', West Bengal at a small town Bajkul, Dist. Purba Medinipur, West Bengal during 9th to 16th December 2009.

Coloured photographic charts, models, samples and special exhibits, related to technologies/processes on cost effective housing and building materials developed by the Institute appropriate for the region displayed by CBRI, were witnessed by thousands of local people and from nearby villages.



The technologies exhibited included Pollution control measures for brick kilns, Clay fly-ash bricks, floors and roofing tiles; Foundation in expansive soils, C-Brick making machine; Rural fire protection; Improved rural house; Low cost sanitary rural latrine; Frameless floor/windows shutters; Waste water disposal system; Cost effective prefab brick panels and RC planks, joists, flooring/roofing systems; Precast thin lintel and lintel-cum-chajja; Termite control measures, Pyramidal roof for cyclone prone areas; Roof surface evaporative cooling system etc.

The visitors showed interest in CBRI technologies, specially on non-erodable mud plaster, clay fly-ash bricks, rural sanitation, termite control, C-brick and those for production of pre-cast building components on small scale.

A lecture on 'Cost Effective Improved Housing & Entrepreneurship development' was also delivered by Shri K.L. Chhabra, Technical Officer.

Several government departments, Industries and NGOs including National Institute for the Mentally Handicapped (Ministry of Social Justice & Empower-

ment, Govt. of India), Petroleum Conservation Research Association (Ministry of Petroleum & Natural Gas, Govt. of India). Ministry of New Renewable Energy, Govt. of India, All India Coordinated Research Project on Post Harvest Technology, sponsored by ICAR, New Delhi,

represented by Agricultural and Rural Engineering. Dept., Indian Institute of Technology, Kharagpur. Agricultural and Animal Husbandry Departments, Government of West Bengal made their presence along with CBRI in this important event.

Workshop on Extension Strategy for Innovative Housing Technologies

On the occasion of the 64th CBRI Foundation Day Conference on **"EXTENSION STRATEGY FOR INNOVATIVE HOUSING TECHNOLOGIES"** was organized on **9th Feb 2010** at **CBRI Roorkee**. Keeping the objectives of CSIR 800 mission programme the main focus of the conference was to deliberate, discuss and evolve a consensus strategy for extension of innovative housing technologies leading to improvement in the construction practices, habits and standards for better quality, speed, economy, safety, durability and hygienic housing to extend economical, environmental and societal benefits to the people of the country. Housing R&D and extension experts from all over the country were invited to participate and contribute in evolving effective and consensus extension strategy.

Prof. SK Bhattacharyya, Director, CBRI Roorkee with a team of 17 senior scientists and 13 outside experts associated with housing promotional activities and representing various nodal organizations including BMTPC Delhi, State Councils of Science and Technologies Uttarakhand and Himachal Pradesh, District Urban Development Agency, NITTTR Bhopal, Innovative practitioners, Architects/Builders, Scientists and non-governmental organizations participated in the workshop.

Prof. Bhattacharyya, Director, CBRI, Chaired the workshop and stressed on need based R&D and effective mechanism for quick transfer and field implementation of suitable technologies for the ultimate benefit of masses.

Shri S.G. Dave, Scientist 'G', workshop coordinator, highlighted various CBRI technologies that have been well received and absorbed by the building industry and stressed on need of evolving a consensus strategy by integrating the efforts of all promotional agencies, for



commercial exploitation and mass acceptance of newer R&D and technologies.

Dr. S.K. Agarwal, Executive Director, BMTPC presented the efforts made by BMTPC for extension and promotion of need based low cost housing technologies and sought the association of CBRI in successful implementation of various housing schemes of MoUD & MoRD like Rajiv Awas Yojana, Indira Awas Yojana, Building Centers, and a scheme on shelter for all. He was of the opinion that joint efforts may encourage industrial production of energy efficient, substantially cheaper, high quality and faster building systems and technologies utilizing locally available materials and agro-industrial wastes. The presentation on successful implementation of many housing projects using CBRI technologies in several thousand houses in Delhi and other parts of country by Shri Pramod Adlakha, an innovative practitioner and architect-builder was appreciated by all.

Dr. R. Dobhal, Director, Uttarakhand Council of Science and Technology, Dehradun and Dr.S.S. Randhawa Scientific Officer Himachal Pradesh Council of Science, Technology and Environment, desired to plan joint strategy for organization of series of training programmes to generate trained artisans in the implementation of newer technologies.

Dr. A K Jain, Director, National Institute of Technical Teachers' Training and Research (NITTTR), Bhopal highlighted the important role in of community polytechnics in training, dissemination and technical support right up to panchayats and users and expressed that joint programmes can cover a vast population. Dr. Narendra Rai, Ashok Sansthan, Bihar Shri S.K.Tiwari Rajiv Smriti Sewa Sansthan, Muzaffarpur, Shri Rishi Jaiswal, a management professional turned NGO and



other NGOs narrated their experiences on implementation of CBRI rural housing technologies and earnestly sought technical guidance from CBRI for mass extension and dissemination activities in their respective areas.

Almost all participants had good experience of field implementation of CBRI technologies like improved mud and thatch construction, low cost sanitation, prefabricated building components etc and opined that there is great potential in these technologies but improvements are needed to incorporate semi-mechanization for faster construction and quality assurance. They were also of the opinion that resources available with different agencies can be pooled to make an appreciable dent by all round impact.

The day long deliberations and discussions concluded into following suggestions that could help in developing an effective strategy for Extension of cost-effective housing technologies:

- ❖ To meet the huge housing shortage of the lower and lower middle income group, affordable housing technologies need to be widely promoted.
- ❖ Appropriate level of Mechanization has to be introduced in Indian construction system to significantly increase the pace of construction and to ensure quality and durability.
- ❖ Industrialization of the production of building materials using low energy pollution free processes is the need of the hour.
- ❖ Regular and Systematic training and certification system for skilled construction workers of different building trades is an essential requirement for better quality of construction and maintenance
- ❖ Development of Regional demonstration centers and parks highlighting innovative housing technologies appropriate to the region and to provide technical backup to the interested users.



- ❖ There is a need to develop database and documentation of region-wise specifications and technology packages highlighting advantages over traditional construction systems. Engineering institutions may be associated to collect and generate local resource database.
- ❖ CBRI may develop a technology museum with working small machines and infrastructure which may be seen and used by interested willing users to try and make products using their local raw materials so as to gain confidence prior to setting up of plant by entrepreneurs.
- ❖ Model housing projects incorporating newer sustainable and affordable technologies may be explored on Public- Private Partnership (PPP) mode with technical back up from R&D institute and financial and field implementation support from private builders/promoters.
- ❖ CBRI may have collaborations with different organizations and other stake holders for planned extension and promotional activities in different parts of country.
- ❖ CBRI may provide technical back up for regular trainings, demonstrations and technical guidance for field implementation of newer technologies and establishment of production centers/ entrepreneurs using latest IT facilities.

Papers Presented/ Published

Title : Design of a Global Frame Based on Wind Forces from a Few International Wind Codes.

Conference : The 7th Asian-Pacific Conference on Wind Engineering, 08-12 Nov. 2009 at TAIPEI-TAIWAN.

Authors : Achal Kumar Mittal, Nikhil Agarwal and V.K. Gupta

Title : Modification of Cement Mortar using Polymer Blend

Symposium : 6th Asian Symposium in Polymers in Concrete, 29-30 October, 2009 at Shanghai, China, 539-545

Authors : Anupam Singh Shiwach and Rajni Lakhani

Title : Performance Studies of Coating Systems based on Cardanol Modified Epoxy for Concrete Structures

Conference : World CORCON 2009, 29 Sept.-2 Oct.2009, at Bombay, 1-4

Authors : P.C. Thapliyal and S.R. Karade

Title : Prediction of Indoor Surface Temperature using Mathematical Model of Periodic Heat Flow through Building

Conference : 4th USSTC Promotion and Adoption of Rural Technologies in the State, 10-12 Nov. 2009 at Pantnagar, 262

Author : B.M. Suman



Title : Lateral Response of 2x2 Pile group under Combined Axial and Lateral Loading.

Conference: Indian Geotechnical Conference, 16-19 December 2009 at Guntur (AP), 665-668

Author : S. Karthigeyan

Title : GIS based Spatial Prediction of Landslide Potential Zones in Parts of Darjeeling Himalaya using Certainty Factor Approach

Conference : 4th USSTC Promotion and Adoption of Rural Technologies in the State, 10-12 Nov. 2009 at Pantnagar.

Author : D P Kanungo, Shaifaly Sharma and Kumkum Mishra

Title : Batch Studies on Adsorption of As (III) from Drinking Water by Iron-Oxide Coated Sand

Conference : 97th Indian Science Congress, University of Kerala, Thiruvananthapuram, 3-7 January 2010.

Author : Neeraj Jain, Mridul Garg and A K Minocha

Title : Environmental Friendly Construction Materials from Waste Gypsum

Conference : International Seminar on Waste to Wealth, BMTPC, New Delhi, 12-13 Nov. 2009, 117-120.

Author : Mridul Garg and Neeraj Jain

Title : Eco-Friendly Building Material Using Cleaner Technologies of Production

Conference : Indo - Italian Conference on Emerging Trends in Waste Management Technologies, 3-4 December 09 at Pune

Author : S P Agarwal

Title : Building Construction on Soils Susceptible to Liquefaction and Uplift

Conference : International Conference on Advances in Materials, Mechanics & Management, 14-16 February 2010, University of Trivandrum, Vol. II, 415

Author : Pradeep Kumar & Prabhat Kumar

Title : Modeling of Fire in Enclosure with Wall Linings

Conference : International Conference on Challenges and Applications of Mathematics in Science & Technology, NIT, Rourkela, 11-13 January 2010, 912-922

Author : Rajiv Kumar and Sunil Kumar Sharma

Title : Modeling of Smoke Flow and Assessment of Smoke Management Systems in an Underground Transport Tunnel : A case study

Conference: 3rd Fire Safety and Disaster Management Conference at Lucknow, 19 February 2010.

Author : Saurabh Jain

Title : Lignin: A promising Replacement of Phenol

Conference: Analytical Science in Energy & Environment, Doon University, 6 February 2010

Author : Amita Kumari and S P Agarwal

Title : Controlling the Leaching Behavior of Calcium in Cement Hydration Using Nano materials

Conference: International Conference on Advances in Electron Microscopy and Related Techniques, BARC, Mumbai, 8-10 March 2010

Author : L.P. Singh, S K Agarwal, A K Minocha, S K Bhattacharyya and S. Ahlawat

Title : Use of Higher volume Fly Ash in Concrete for Building Sector

Journal: Journal of Civil Engineering & Construction Review, (CE & CR), October 2009, 72-90

Author : S.K. Agarwal, Deepak Juneja, I.A. Siddiqui and Avdesh Kumar

Title : Energy Simulation of a Single Zone Building Determining Indoor Air Temperature

Journal: Energy & Buildings

Author : B.M. Suman

Workshop Attended

Dr. Sunil K. Sharma, Scientist 'G' attended a workshop on "IP Protection and Management Issues" organized by HRDC/IPMD (CSIR), and United State Patent and Trademark Office, and Global Intellectual Property Academy, USA at HRDC, Ghaziabad during 22-23 March, 2010.

Staff News

Honours/Awards



Sri S.P. Agrawal, Scientist 'F' has been awarded Ph.D. degree by IIT Roorkee in Chemical Engineering on "Studies on Polymer Bagasse Fibre Composite for Application as Building Material".

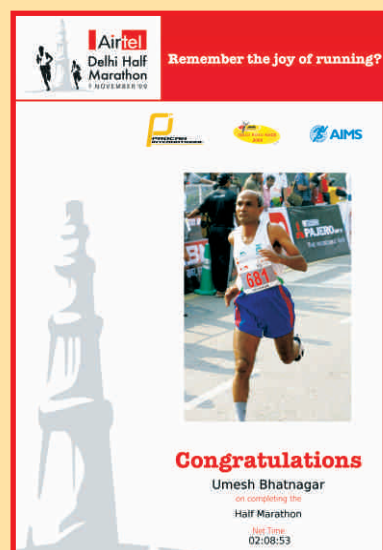


Dr. D.P. Kanungo, Scientist 'E1' has been awarded CSIR Raman Research Fellowship for the year 2010-11 to work at Research Centre on Landslides, Disaster Prevention Research Institute, Kyoto University, Japan for 4 months on a topic "Initiation and movement mechanisms of landslides during heavy rainfall."



Following Staff Members participated in 8th Uttarakhand Masters Athletic Championship-2009 held during 28-29 Nov. 2009, at Army Stadium Roorkee and won the prizes.

D.K. Gautam	Javelin Throw	Gold Medal
(55+ Age group)	Hammer Throw	Gold Medal
	Discus Throw	Silver Medal
Umesh Bhatnagar	5,000 Meter Race	Gold Medal
(50+ Age group)	10,000 Meter Race	Gold medal
	800 Meter Race	Silver Medal



Shri Umesh Bhatnagar Tech., received a Medal & Timing Certificate in International race of 21.097 kms. organized by Airtel Delhi Half Marathan (International) on November 1, 2009 at Delhi. He also got Third prize (Cash Rs. 2100/-), memento & certificate in state Level Green Marathan Race of Veteran male organized by Uttarakhand Forest Department on the

occasion of Uttarakhand Foundation Day on November 08, 2009 at Deharadun. He also participated in 31st National Masters Athletic Championship 4-7 Feb. 2010, held at J.N. Stadium, Chennai, Tamilnadu during 4-7 February 2010.

Transfer

Joined CBRI on Transfer:

Ramesh Chand	09.11.2009
Stores & Purchase Officer	
From NISTADS, New Delhi	

Joined CBRI on promotion

R.K. Raina	25.02.2010
Finance & Accounts Officer	
From IIIM, Jammu	

Transferred to NISTADS, New Delhi

Hari Kumar	F.&A.O.	31.03.2010
Brijesh Kumar	S.&P.O.	31.03.2010

Obituary

It is placed on record the sad and untimely demise of Sri Ram Lal Sharma, Tech. on 18.12.2009 and Sri Vijay Kumar-I, Driver on 14.02.2010.

Promotions

Anil Kumar	Administrative Officer	16.03.2010
S.K. Srivastava	Tech. Officer Gr.III (7)	01.03.2008
Chandra Prakash	Tech. Officer Gr.III (7)	05.07.2008
Sudhir Sharma	Tech. Officer Gr.III (7)	01.11.2008
A.K. Sharma	Tech. Officer Gr.III (7)	01.02.2009
Suresh Kumar	Tech. Officer Gr.III (7)	01.02.2009
R.K. Yadav	Tech. Officer Gr.III (7)	01.02.2009
S.K. Senapati	Library Officer Gr.III (6)	20.05.2008
Bhupal Singh	Tech. Officer Gr.III (6)	01.10.2008
Sushil Kumar	Tech. Officer Gr.III (5)	01.09.2007
Dr. M.K. Sinha	Medical Officer Gr.III (5)	28.05.2008
R.S. Pahwa (Retd.)	Tech. Officer 'C'	21.02.1996
Itrat Amin Siddiqui	Tech. Officer Gr.III(3)	29.05.2008
Amit Kush	Tech. Officer Gr.III (3)	28.02.2009
Bishan Lal	Carpenter Gr.II(4)	18.05.2008
Surendra Kumar	Mechanic Gr.II(4)	01.08.2008
Nankanwar Singh	Mechanic Gr.II(4)	23.10.2008
Late Brahm Prakash	Mechanic Gr.II(4)	02.01.2009
Gopal Chand	Mechanic Gr.II(4)	16.01.2009
Urmila Kotnala	Pharmacist Gr.II(3)	14.03.2009
Bharat Singh	Helper Gr.I(4)	24.09.2006
Shyam Bir	Helper Gr.I(4)	01.04.2008
Hira Lal	Helper Gr.I(4)	01.04.2008
Subhash Chand	Helper Gr.I(4)	01.04.2008

Superannuations

Vinod Kumar	Sc. F	31.10.2009
R.K. Lamba	Asstt.(G)Gr.I	31.10.2009
Smt. Attri Devi	Gr.I(4)	30.11.2009
R.K. Srivastava	Sc. F	30.11.2009
Ashok Mishra	Recept.	30.11.2009
R.N. Bhatt	Asstt. (G)Gr.I	30.11.2009
Ram Pal Singh	Tech. Gr.II(3)	30.11.2009
R.D. Singh	Sc. F	31.12.2009
Brij Lal	Asstt.(G)Gr.I	31.12.2009
Raghuvir Singh	Asstt Manager	31.12.2009
Suredndra Kumar	Sr. Steno (ACP)	31.12.2009
Lokeshwar Prasad	J.S.G.Gr.B	31.01.2010
Ami Chand	Tech. Gr II (4)	31.01.2010
Mam Chand	Lab Asstt. Gr. II (3)	31.01.2010
D.K. Gautam	Sc.F	31.03.2010
R.K. Sharma	Asstt.(G) Gr.I	31.03.2010
D.K. Gulshan(SE)	Sr.Steno (ACP)	31.03.2010
Madan Lal (SE)	Carpenter Gr. II(3)	31.03.2010

Chief Editor

Dr Atul Kumar Agarwal, Scientist

For further details please contact :

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