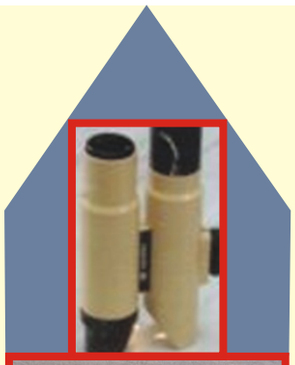


वार्षिक प्रतिवेदन
Annual Report

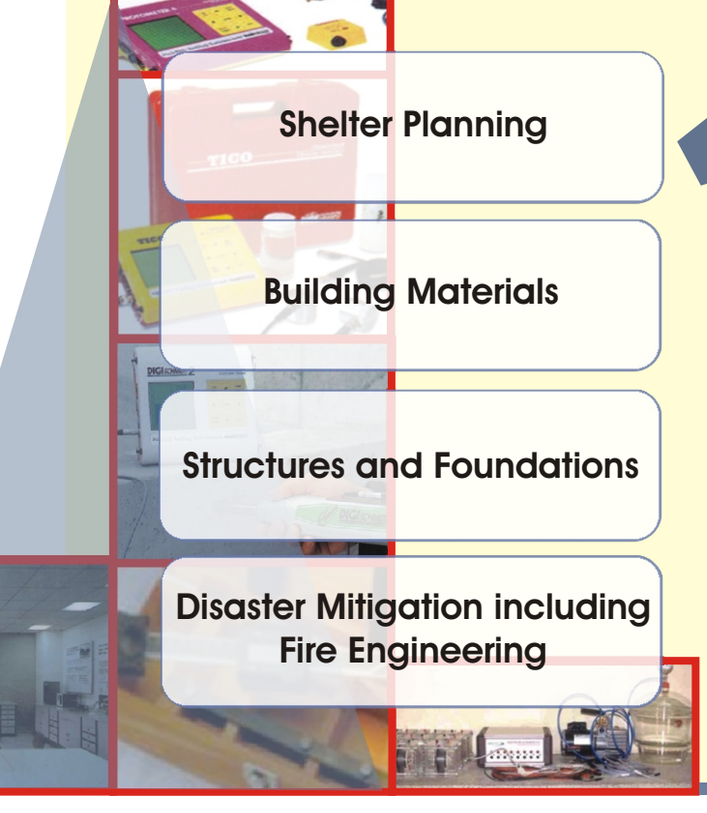
2008-2009

Serve the Nation

CBRI MISSION

"To carry out R&D on all aspects of building and housing and assist the building industry in solving problems of planning, designing, foundations, materials and construction including disaster mitigation in all kinds of building with a view to achieve economy, comfort, functional efficiency, speed, productivity in construction, environment preservation and energy conservation"

- Shelter Planning
- Building Materials
- Structures and Foundations
- Disaster Mitigation including Fire Engineering



Central Building Research Institute

(A Constituent Establishment of CSIR)

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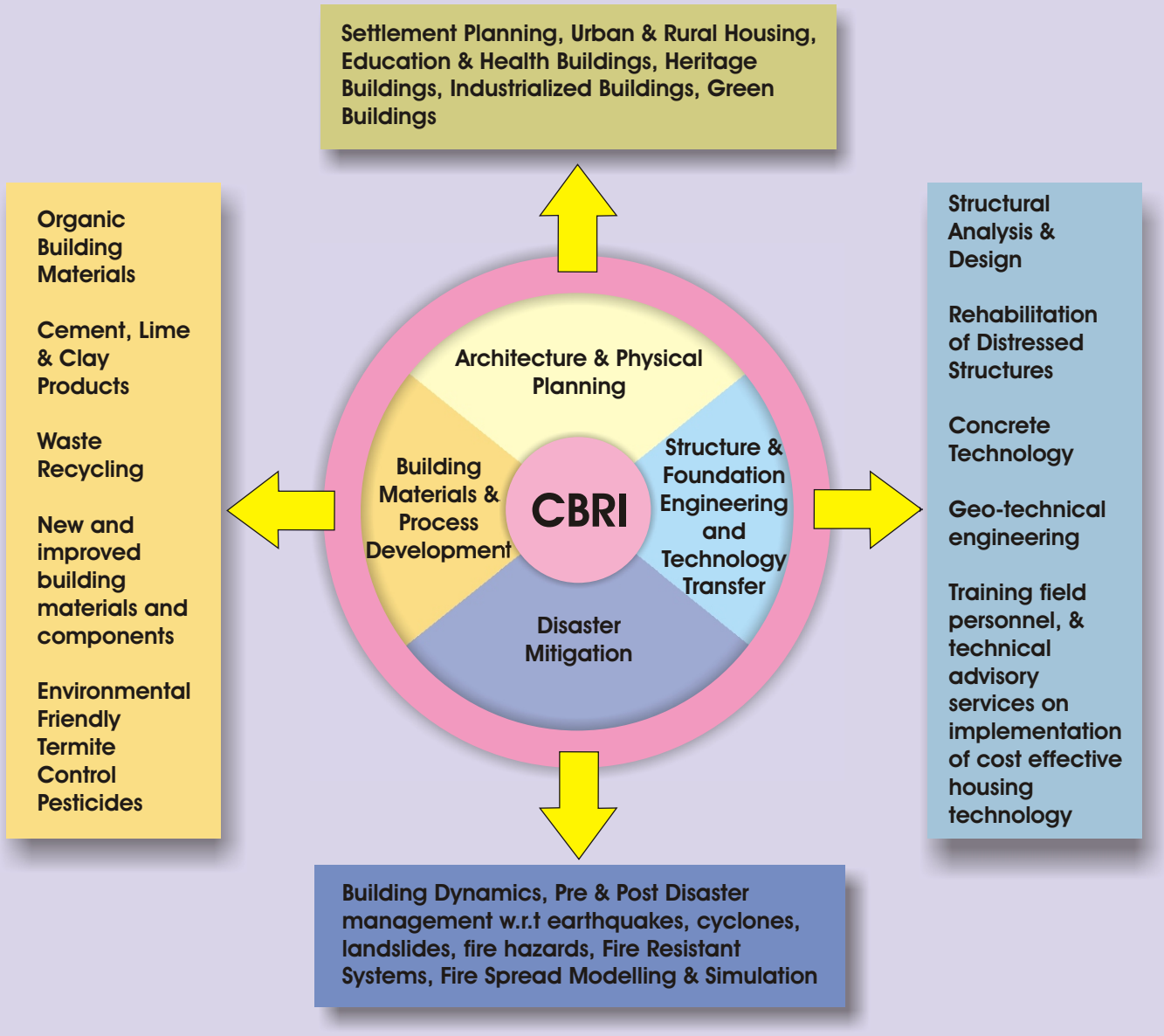
केन्द्रीय भवन अनुसंधान संस्थान, रुड़की
(वैज्ञानिक एवं औद्योगिक अनुसंधान परिषद्)

CENTRAL BUILDING RESEARCH INSTITUTE
(A Constituent Establishment of the Council of Scientific and Industrial Research)



वार्षिक प्रतिवेदन
Annual Report

2008-2009

Central Building Research Institute
(A Constituent Establishment of CSIR)
ROORKEE 247 667

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From the Director's Desk

It gives me immense pleasure to present the Annual Report of Central Building Research Institute, Roorkee. The report highlights the progress made by the Institute during the year 2008-09.

During the year notable achievements have been made in the area of Shelter Planning, New Materials, Disaster Mitigation and Structures & Foundation Engineering. A Supra Institutional Project on High Performance Materials and Construction Technologies for Sustainable Built Space was initiated. CSIR Network Projects on "Discovery and Preclinical Studies of New Bio active Molecules & Traditional Preparations", "Engineering of Structures against Natural and other disasters" and "Advancement in Metrology" were taken up.

Energy conservation continues to be a thrust area. Studies on performance evaluation of thermal insulation on Roof of Building for Extreme Climatic conditions, Assessment of Energy Efficiency in Housing, Development of methodology for eco-friendly and energy efficient buildings in National Capital Region (NCR) were also pursued.

Building Materials has been an area of strength for CBRI since its inception. Development of new building materials and technologies continues to receive high priority. The Institute has done notable work on improved pollution control technology for brick kiln. Studies of the reactivity of fly ash from different fields of an ESP and Studies on dehydrating agents and strength enhancers in making gypsum plaster for use in weather resistant binders, boards and blocks from industrial wastes, are being carried out. In the area of organic building materials, development of New Composite Materials for Building Applications using Plywood-Veneer and Vermiculite Waste, development of polymer based high performance repair materials and coating systems based on modified epoxy resins for fertilizer industries are under progress.

In the area of Structures and Foundation engineering, projects on Structural assessment & rehabilitation of Faridabad Thermal Power Station residential colonies, Architectural planning and structural design of the three models of Kasturba Gandhi Balika Vidyalayas (KGBVs) and Quality Inspection of the School Sites to be Constructed, Seismic Vulnerability Assessment and Damage Scenario of Buildings in Almora City have been taken up.

In the area of Disaster Mitigation, important studies on real life severity in fire damaged buildings, effect of wall lining materials on fire growth and spread, environment friendly fire retardant rigid polyurethane foam, CFD modelling of fire in building corridor, visibility of fire exit signs in fire smoke are pursued. Geotechnical properties of stabilized fly-ash for development of appropriate foundation, evaluation of rock

slope parameters for in-stability assessment, evaluation of seismic ground motion parameters based on site characterization in Dehradun region are continued.

The Institute has organized a number of training cum awareness programmes and other events during the period. Conference on Trends and Challenges in Structural Engineering and Construction Technologies during February 11-12, 2009 attracted a large number of delegates from academia and industries.

The Institute observed open days on the occasion of the National Science Day, CSIR Foundation Day and CBRI Foundation Day to make the students and general public conversant with the R&D programmes of the Institute. Institute celebrated Hindi week in the month of September. Various Hindi programmes and competitions were organized during the period. To make regular interaction and communication with the people of India and abroad, the Institute attended to more than 2500 inquiries related to the various problems of building and construction sector. Demonstration-cum-construction training programmes, technical exhibitions etc. contributed significantly for the creation of general awareness about the new research and technologies in the building sector. The Institute alongwith the extension center at Delhi continued to maintain liaison with Central, State, Public/Private Sectors throughout the country.

The above could not have been possible without the sincere and honest efforts made by fellow scientists, technical officers and administrative staff who worked hard in successfully completing the work assigned to them. I record my deep appreciation and best wishes to all of them. I wish to record my sincere appreciation and thanks to my predecessor Dr. M.O. Garg for his invaluable contribution to the Institute. Last but not the least it is a happy moment for me to remember the support and co-operation provided by our valued customers, sponsorers, well wishers and ex-staff members of CBRI. With the unprecedented growth in the buildings and infrastructural industry, we are looking forward to an exciting future.

Dated : November 20, 2009

(S.K. Bhattacharyya)
Director

निदेशक की कलम से

केन्द्रीय भवन अनुसंधान संस्थान रूडकी की वार्षिक रिपोर्ट प्रस्तुत करते हुए मुझे अपार प्रसन्नता हो रही है। रिपोर्ट में संस्थान द्वारा वर्ष 2008–09 के दौरान की गई प्रगति को प्रमुखता से प्रस्तुत किया गया है।

वर्ष के दौरान आश्रय नियोजन, नई निर्माण सामग्रियाँ, आपदा न्यूनीकरण तथा संरचना एवं नींव इंजीनियरी के क्षेत्र में उल्लेखनीय उपलब्धियाँ हासिल की गई। सस्टेनेबल बिल्ट स्पेस के लिए उच्च निष्पादन सामग्रियाँ तथा निर्माण प्रौद्योगिकियों पर एक सुप्रा संस्थागत परियोजना (Supra Institutional Project) का शुभारंभ किया गया। सीएसआईआर नेटवर्क परियोजना के अंतर्गत 'नई जैव सक्रिय अणुओं एवं परंपरागत तैयारियों की खोज तथा पूर्व चिकित्सकीय अध्ययन', 'प्राकृतिक तथा अन्य आपदाओं से बचने के लिए संरचना इंजीनियरी' व 'माप पद्धति में उन्नयन' पर परियोजनाएँ ली गई।

ऊर्जा संरक्षण निरंतर अति महत्वपूर्ण क्षेत्र है। राष्ट्रीय राजधानी क्षेत्र (एनसीआर) में अति प्रतिकूल जलवायु परिस्थितियों में भवनों की छत के तापीय अवरोधन के निष्पादन मूल्यांकन पर अध्ययन, आवासों में ऊर्जा दक्षता का निर्धारण, पर्यावरणानुकूल तथा ऊर्जा दक्ष भवनों की क्रिया पद्धति के विकास पर भी अध्ययन किए गए।

सीबीआरआई के प्रारंभ से ही भवन–निर्माण सामग्री इसका प्रमुख क्षेत्र रहा है। नई भवन निर्माण सामग्रियाँ एवं प्रौद्योगिकियों का विकास निरंतर ही उच्च वरीयता प्राप्त क्षेत्र हैं। संस्थान ने ईंट भट्ठों के लिए उन्नत प्रदूषण नियंत्रण प्रौद्योगिकी पर उल्लेखनीय कार्य किया है। ई एस पी के विभिन्न क्षेत्रों से उड़नराख की प्रतिक्रिया क्षमता के अध्ययन तथा निर्जलन कारकों पर अध्ययन व औद्योगिक अपशिष्टों से मौसम अवरोधक बंधकों, बोर्डों तथा ब्लाकों में उपयोग के लिए जिप्सम प्लस्तर बनाने में सामर्थ्य वर्धकों हेतु अध्ययन किए जा रहे हैं। कार्बनिक निर्माण सामग्रियों के क्षेत्र में प्लाईवुड–विनीर तथा वर्मिकुलाइट अपशिष्टों के उपयोग से निर्माण में अनुप्रयोग हेतु नई सम्मिश्रित सामग्रियों के विकास, पॉलिमर आधारित उच्च निष्पादन मरम्मत सामग्रियाँ तथा उर्वरक उद्योगों के लिए संशोधित एपाक्सी रेजिन पर आधारित लेपन पद्धति विकास प्रक्रिया में है।

संरचना तथा नींव इंजीनियरी के क्षेत्र में, फरीदाबाद थर्मल पावर की आवासीय कालोनी के संरचनात्मक मूल्यांकन तथा पुनर्वास, कस्तूरबा गांधी बालिका विद्यालय (केजीबीबी) के तीन मॉडलों का वास्तुकला नियोजन तथा संरचनात्मक अभिकल्प, बनाए जाने वाले स्कूल स्थलों का गुणवत्ता निरीक्षण तथा अलमोड़ा शहर में भवनों की भूकंपीत संवेदनशीलता मूल्यांकन तथा क्षतिग्रस्तता का परिदृश्य पर परियोजनाओं का कार्य लिया गया।

आपदा न्यूनीकरण के क्षेत्र में, अग्नि से क्षतिग्रस्त वास्तविक भवनों में वास्तविक जीवन की गंभीरता पर महत्वपूर्ण अध्ययन, अग्नि की वृद्धि तथा फैलाव पर वाल–लाइनिंग सामग्री का प्रभाव, पर्यावरणानुकूल अग्नि अवरोधक ठोस पॉलियूरिथेन फोम, भवन कोरिडोर में अग्नि का सी एफ डी मॉडलिंग, अग्नि के धुँए में बाहर जाने वाले अग्नि चिन्हों का दिखाई देना विषयों पर अध्ययन किया गया। समुचित नींव के विकास के लिए स्थायीकृत उड़नराख के भूतकनीकी गुणों, अस्थिरता निर्धारण के लिए चट्टान ढाल पैरामीटरों का मूल्यांकन, देहरादून क्षेत्र में स्थल गुणों पर आधारित भूकंपीय भौमगति पैरामीटरों के मूल्यांकन जारी है।

संस्थान ने इस दौरान बहुत से प्रशिक्षण–सह–जागरूकता कार्यक्रम तथा अन्य समारोहों का आयोजन किया है, 11–12 फरवरी, 2009 को 'संरचना इंजीनियरी तथा निर्माण प्रौद्योगिकियों में प्रवृत्तियाँ तथा चुनौतियाँ' विषय पर एक सम्मेलन का आयोजन किया गया जिसमें बड़ी संख्या में शिक्षा तथा उद्योग जगत के प्रतिनिधियों ने हिस्सा लिया।

संस्थान ने राष्ट्रीय विज्ञान दिवस, सीएसआईआर स्थापना दिवस तथा सीबीआरआई स्थापना दिवस को, संस्थान के अनुसंधान एवं विकास कार्यक्रमों के बारे में आम जनता तथा छात्रों को जानकारी देकर, 'ओपन डे' के रूप में मनाया। संस्थान ने सितंबर के महीने में हिन्दी सप्ताह का आयोजन किया। इस अवधि के दौरान विभिन्न हिन्दी कार्यक्रम तथा प्रतियोगिताओं का आयोजन किया गया। देश–विदेश से नियमित संपर्क बनाए रखने के लिए भवनों की विभिन्न समस्याओं तथा संरचना क्षेत्र के 2500 से अधिक पूछताछ संबंधी उत्तर दिए गए। निदेशन–सह–प्रशिक्षण कार्यक्रमों, तकनीकी प्रदर्शिनियों के द्वारा भवन–निर्माण क्षेत्र में नए अनुसंधान तथा प्रौद्योगिकियों के बारे में जागरूकता पैदा करने में महत्वपूर्ण योगदान दिया है। संस्थान अपने दिल्ली स्थित प्रसार केन्द्र के साथ केन्द्रीय, राज्य, सार्वजनिक/निजी क्षेत्रों के माध्यम के साथ देश भर में निरंतर संपर्क में रहा है।

संस्थान के वैज्ञानिकों, तकनीकी अधिकारियों तथा प्रशासनिक सहकर्मियों के निष्ठापूर्ण तथा ईमानदार प्रयासों के बिना उपर्युक्त कार्यों को पूर्ण नहीं किया जा सकता था, जिन्होनें कठिन परिश्रम करके सौंपे गए कार्यों को सफलतापूर्वक पूरा किया। मैं दिल की गहराइयों से उन सभी की प्रशंसा करता हूँ तथा शुभकामनाएँ देता हूँ। मैं संस्थान के पूर्व निदेशक डा. मधुकर ओंकार नाथ गर्ग के बहुमूल्य योगदान की प्रशंसा करता हूँ तथा उनको धन्यवाद देता हूँ। अंत में अपने मूल्यवान ग्राहकों, प्रायोजकों, शुभचिंतकों तथा सीबीआरआई के सेवानिवृत्त स्टाफ सदस्यों द्वारा दिए गए सहयोग तथा सहायता का स्मरण करना मेरे लिए कुछ कम महत्वपूर्ण तथा प्रसन्नतादायक नहीं है। भवन–निर्माण तथा अवसंरचनात्मक उद्योग में अभूतपूर्व वृद्धि के साथ, हम अपना भविष्य उत्साहवर्धक देख रहे हैं।

एस.के भट्टाचार्य

दिनांक : 20 नवम्बर, 2009

(श्रीमान कुमार भट्टाचार्य)
निदेशक

R&D Programme

Shelter Planning

Development of Thermo-Acoustically Efficient Combined Materials For Conducive Environment In Building. *Project No.*

R.K. Srivastava & Team

Suitable single materials were identified and combined materials were fabricated based on design standard and thermo-acoustic efficiency for achieving comfort in buildings.

Target Achieved/ Research Output

Various single materials like plastic board, particle board, wood wool board, coir board, non-asbestos board, cement bonded particle board, plastic hollow board, gypsum board, polyurethane foam etc were selected and analyzed for their thermal and acoustical behavior. Based on basic and insulating data of single material, number of combination has been prepared and fabricated in the institute. The analysis of these combined materials are being studied for thermo-acoustical properties for achieving increasing efficiency of these materials

The measurement of Sound Transmission Loss (STL) of single homogenous materials of partition wall was conducted in a reverberation chamber.

Consisting of two parts i.e. the source room and the receiving room as shown in Fig. (1), the sample of partition wall was fixed in the space provided between two rooms. The sound was generated in the source room and picked up the level at each 1/3-octave band frequencies in both the room. The difference in 2 levels gave the sound transmission loss of the material with some correction factor. The values of STL are given in Table 1.These type of materials can be used as indoor partition wall for achieving acceptable sound insulation of other side of the partition.

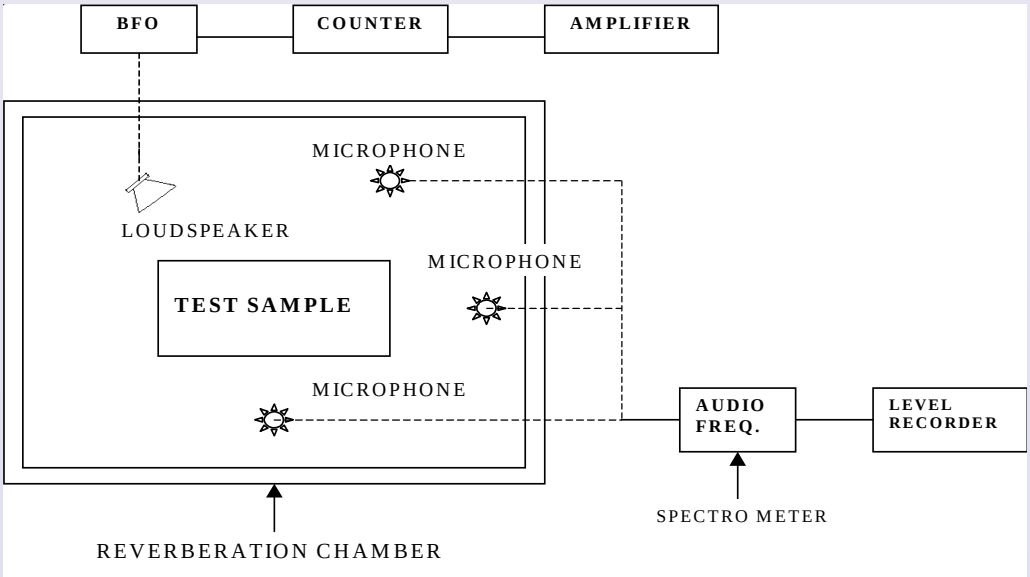


Fig.1-Reverberation Chamber

Table No.1

S.No	Name of the material	ThicknessMass (mm)	Density (Kg/m^2)	STL (dB)
1.	Cement bonded particle board	16	10.8	35.46
2.	Wood wool board	20	7.8	25.83
3.	Plastic board	15	8.12	26.18
4.	Particle board	17	10.5	28.42
5.	Plastic hollow board	50	6.84	22.84
6.	Plastic hollow board	20	4.733	21.48
7.	Gypsum board	10	8.38	26.46
8.	Kurlon	12	8.236	26.30
9.	Non Asbestos	12	6.64	24.4

Evaluation of Thermal Conductivity of Perlite Block and Expanded Perlite *(SSP 4517)*

B.M. Suman & *Team*

KELTECH Energies Limited, perlite Division, Bangalore, has sponsored a project with the objectives for evaluation of thermal conductivity of perlite concrete at room temperature for different densities. The effect of different ratio of perlite aggregate and concrete aggregates on evaluation of thermal conductivity and effect of mean temperature on thermal conductivity of expanded perlite of the same density was studied.

Different type of samples of perlite block and expanded perlite were received for evaluation from the sponsoring agency.

Thermal conductivity of all the perlite blocks were determined with the help of Automatic Guarded Hot Plate (AGHP) apparatus. The size of the specimen was kept 300x300x50mm. A temperature difference of 40°C between hot plate and cold plate was maintained. The temperature of cold plate was maintained by circulating fluid (mixture of methyl alcohol and water) in the cold plates. The temperature of hot plate was maintained with temperature controller and power supply. The effect of perlite ratio on thermal behavior of perlite concrete was studied and it was found that as the ratio of loose perlite increases, their thermal insulation value also improves up to a certain extent. It was found that after exceeding the ratio of loose perlite with cement concrete of 1:3, the rate of improvement of insulation value is very low.

The measurement of K-value of expanded perlite was determined with a difference that the two specimens replaced by the two identical frame (internal size 300x300x50 mm). These two frames were filled with expanded loose perlite. In the base of the frame blotting paper was used. The observation of voltage (V) and current (I) were made when it reached steady state condition. Thermal conductivity was computed by recorded value of V and I of the apparatus.

It has been observed that the thermal conductivity of expanded perlite is rising, by rise of the mean temperature keeping the density same.

Performance Evaluation of Resin Bonded Rockwool Mattresses for Thermal Conductivity *(SSP 4527)*

B.M. Suman & Shree Kumar

The thermal behavior of Rockwool was studied in the laboratory by increasing the mean temperature for a given density. This study has been made by using the Automatic Guarded Hot Plate Apparatus for measuring thermal conductivity for high temperature having five plates, one central hot plate, two auxiliary plates and two cold plates. A temperature difference of 100^0c was maintained between hot plates and auxiliary plates in the apparatus for high temperature. The observation of thermal conductivity has been depicted in the graphical form in Fig.2. It was observed that thermal conductivity increases simultaneously with rising mean temperature.

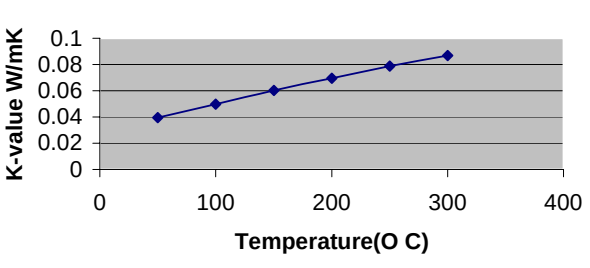


Fig.2-Effect of Temperature on Thermal Conductivity on Rock Wool

Design and Development of Standardized Housing Units with Prefabricated Components for Low-rise Housing *(OLP 322)*

R.D. Singh & Team

The objectives of the project are i) Development of Standard building components like doors, windows, walling and roofing units, ii) Design of 1-2 bedroom housing units in order to standardize them. Literature review and state of the art report has been prepared related to prefabricated building components and construction technologies. The project is an attempt to provide an easy to erect, portable and cost effective standardized prefabricated housing components/units. Quality, speed of construction and savings in labour and material cost are main features in the proposed housing system.

Based upon the literature available and the Indian social & economic system, it was decided to adopt a technology which is simple in adoption and labour oriented also and which does not require sophisticated machine to use and easy to understand by the normal construction workers. Thus a small hollow wall panel system with in situ construction of posts at junctions have been developed and unit can be called **small hollow wall panel unit,** as it will act as a wall panel and will be used as a block in construction. Unit will also be easy to handle by two persons on site. As per normal construction, the units can be placed as wall with the help of small columns on the junctions. Accordingly the standard housing unit can be designed for the (EWS) and (LIG) people of the nation particularly in Northern plains of the country where cements and concrete is easily available.

Small hollow panel units of dimension 15 x 45 x 30 cm have been conceived with 3.5 - 6 cm concrete sections in the shape having two rectangular holes with larger size on one side, to ease in the production process. It will help to remove the mould to create hollow portions in the panel unit. It is designed on one side as male and other side as female part to give proper connectivity. Similarly, a half unit has been conceived of size 15 x 22 x 30 cm having single rectangular hole and same size of male and female parts to be used in the construction of wall to avoid the vertical joints and provide a proper construction system. The moulds designed for the unit to prefabricate are shown in the photo plates A & B. Using the above modular dimensional unit two type of houses have been conceived, one with two room as LIG unit and an other one with one room as EWS units.

Moulds

Development of Methodology for Eco-friendly and Energy Efficient Buildings in National Capital Region (NCR) *(OLP 323)*

R.K. Garg & Team

Traditional Architecture and Construction Practices

Traditional buildings were having a close relationship between man and nature. The built-form and space organization was according to the climatic considerations. For example, traditional buildings from hot arid regions have been compact, stacked and attached with small courtyards to reduce heat gains. In hot humid zone houses (bungalows) were extrovert with verandah like living spaces on the periphery for the inflow of breeze. In hills, ground floor space was used for storage and cattle and the upper floors for living purpose, utilizing the heat generated by the lower floor.

The construction materials used in buildings were predominantly locally available and construction techniques were developed over a period of time, based on the habits, life style and climatic conditions in the region. Earthquake resistant construction techniques using stones and wood, without mortar have been adopted in the construction of typical multi storied structures 'Sumera, constructed centuries ago in Uttarakhand. These structures were built and have stood a number of earthquakes. Similarly, a number of temples were constructed in different parts of the country and have demonstrated that the conventional construction technologies need to be revisited in the present period to learn lessons from the past.

Green Building Movement in India – Present Scenario

The Green Building movement in India is a step to minimize the negative impact of construction activity on the environment. At present in India, there are two systems for environmental performance evaluation ate in practice namely LEEDS and TERI-GRIHA.

Leadership in Energy and Environmental Design (LEED) Rating System evaluates environmental performance from a whole building perspective over a building's life cycle, providing a definitive standard for what constitutes a green building. It is a measurement system designed for rating new and existing commercial, institutional and high-rise residential buildings. This system is the most versatile and widely adopted rating system in the

world. Around 15 to 20 countries, the world over have adopted this rating system. Green buildings registered in India include corporate office complexes, IT parks, hospitals, Govt. offices, educational institutions, airports, hotels etc.

TERI-GRIHA (TERI-Green Rating for Integrated Habitat Assessment) is a tool for measuring and rating a building's environmental performance in the context of India's varied climate and building practices, evaluates a building's compatibility with environmental priorities.

Green Buildings & its Benefits

Sustainable design or building "green" is an opportunity not only to use our resources more efficiently while creating healthier commercial or industrial buildings, it also applies to residential construction and renovation. Residential green building practices include:

- Energy efficient designing and constructing homes
- Efficient use of materials, and water efficiently
- Reuse of waste materials
- Eco-friendly construction technologies

Design parameters for Energy Efficient and Green Buildings

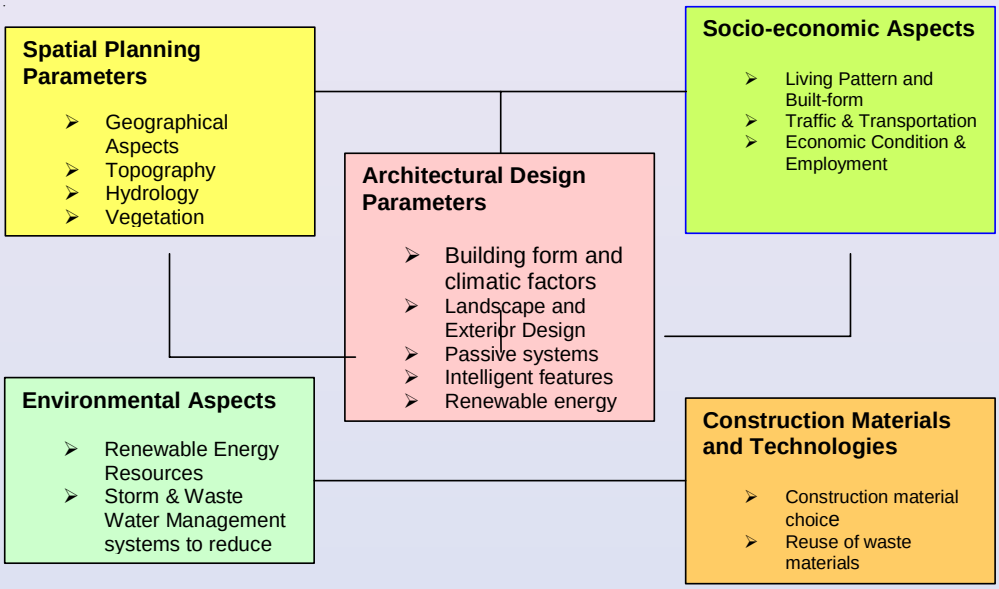
Building form and climatic factors should be incorporated in the building design. Landscape and exterior design plays an important role in micro climate and therefore it should be incorporated in the design process. Also, passive systems and intelligent features should be incorporated. The following parameters need to be a part of the design process:

Spatial Planning Parameters

- Geographical Aspects
- Topography
- Hydrology
- Vegetation

Socio-economic Aspects

- Living Pattern and Built-form
- Traffic & Transportation
- Economic Condition & Employment



Design Parameters for Energy Efficient and Green Buildings

Construction Materials and Technologies

- Construction material choice
- Reuse of waste materials
- New construction technologies
- Construction management

Environmental Aspects

- Renewable Energy Resources
- Storm & Waste Water Management systems to reduce energy demand

Review and upgradation of space norms for inclusive education & energy efficient Educational Buildings up to Secondary level

(OLP -0296)

Neeta Mittal & Team

The objective of the project is to review and upgrade the existing space norms upto secondary level education for inclusive education for the disabled & normal children for school designs.

Inclusive education means schools should accommodate all children regardless of their physical, Intellectual, emotional, social linguistic or other conditions as per UNESCO. Between 35 and 80 million of India's 200 million school age children do not attend school. In addition, fewer than 5 per cent of children who have a disability are in school. India is committed to fulfilling the goal of education for all and 'inclusive education' is now a feature of various government documents and plans.

Inclusion of handicapped children with normal children means:

- Educating children with disabilities in the schools they would attend if they did not have disabilities.
- Providing services and support that parents and children with disabilities need in order to be in normal settings.
- Supporting regular education teachers and administrators.
- Having children with disabilities follow the same schedule as other children.
- Encouraging friendships between children with disabilities and their classmates/peers without disabilities.
- Teachers and administrators taking these concerns seriously.
- Teaching ALL children to understand and accept differences.

In the present scenario the construction for convenience of physically challenged children is not given priority in the school buildings and need to be modified as a part of the inclusive education system. Access to the handicapped children should be improved in schools and to various activities.

Studied the need of physically handicapped children to integrate them in normal schools. Schools designed for the Physically Handicapped are studied and various problems and requirements required for creating the accessible environment for physically handicapped children are identified. Studied the activities to be included in schools for the convenience of physically handicapped.

Group activity of Physically Handicapped Children

Studied the need of visually handicapped children to integrate them in normal schools.

Visited the school for blinds, located in National Institute for the Visually Handicapped and Sharp school for the visually handicapped, both in Dehradun. Also, interacted with the teachers to know the problems and requirement of blind and Low vision children. During the visit, studied the class arrangement and furniture design in these schools. Some of the observations in these schools are:

- The use of bright colors like red and yellow is helpful for the children with low vision.
- Low vision children are placed near windows in these schools for the convenience of children.
- Railing provided in the corridor is helpful for the independent movement.
- Tactile flooring is useful for the direction of movement.

Interaction is being done with the teachers of normal schools, also to know their views on inclusive education and to bring awareness among the society.

New Materials

Studies on Dehydrating Agents and Strength Enhancers in making Gypsum Plasters for Use in Weather resistant Binders, Boards & Blocks *(OLP-0299)*

Mridul Garg & Neeraj Jain

Effect of Admixtures on the Properties of gypsum plasters

Effect of various organic and inorganic admixtures on the physical properties and water resistance of gypsum plaster have been studied and results are given in Tables 1 and 2 respectively.

The data show that in the presence of these admixtures significant enhancement in strength and improvement in water resistance and porosity of β-hemihydrate plaster were achieved. It was also observed that organic admixtures gave comparatively higher strength, setting time and lower water absorption and porosity. The hydration of hardened plaster is being assessed by DTA and SEM studies.

Effect of Dehydrating Agents in Production of Gypsum Plaster

Effect of chemical agents like $CaCl_2.2H_2O$, NH_4NO_3 and NaCl were studied on dehydration and performance of hemihydrate and anhydrite plasters. It was found that on using 0.1% $CaCl_2.2H_2O$, the gypsum powder (Selenite or phosphogypsum) (passing 150 micron) can be converted into

Table-1: Effect of Inorganic and organic admixtures on Compressive strength and Bulk density of Gypsum Plasters

S.N.	Admixtures (%)	Selenite Plaster		Phosphogypsum Plaster	
		Compressive strength (MPa)	Bulk density (kg/m^3)	Compressive strength (MPa)	Bulk density (g/cc)
	As Such	11.2	1.30	10.0	1.22
A.	**Inorganic Admixtures**				
1.	K_2SO_4 (1%)	17.3	1. 24	16.6	1.25
2.	$Al_2(SO_4)_3$ (1%)	14.0	1.17	14.7	1.35
3.	$CaCl_2$ (0.5%)	16.2	1.32	15.1	1.35
4.	NaCl (0.5%)	15.5	1.35	16.0	1.35
5.	Na_2SO_4 (1.0%)	15.3	1.25	15.8	1.28
B.	**Organic Admixtures**				
1.	Sugar (1%)	18.5	1.35	17.2	1.35
2.	Starch (0.25%)	16.0	1.37	14.5	1.32
3.	Sodium Tartarate (0.25%)	18.5	1.39	14.5	1.32

Table-2: Effect of inorganic and organic admixtures on the water absorption and porosity of β-hemihydrate plaster

S.N.	Admixtures (%)	Immersion Period					
		Water Absorption, %			Porosity		
		2hrs.	8hrs.	24 hrs.	2hrs.	8hrs.	24 hrs.
1.	As such	28.7	29.0	29.8	35.0	35.4	36.4
2.	K_2SO_4 (1%)	22.7	22.8	23.5	30.0	30.2	30.9
3.	$Al_2(SO_4)_3$(1%)	24.2	24.6	25.2	31.8	32.0	33.1
4.	$CaCl_2$ (0.5%)	23.9	24.3	24.8	31.6	32.2	32.8
5.	NaCl (0.5%)	23.8	24.0	24.6	31.3	31.7	32.5
6.	Sugar (1%)	19.9	20.1	20.7	28.5	28.8	29.0
7.	Starch (0.25%)	21.8	22.0	22.7	29.0	29.7	30.0
8.	Sod. Tartrate (1.0 %)	21.3	21.9	22.2	28.7	29.5	29.9

β-hemihydrate plaster at faster rate than the plaster made in kettle or rotary kiln. In later techniques, gypsum is converted into plaster in 4-6 hours. At 0.05 – 0.15% concn. of $CaCl_2.2H_2O$, plaster gave 11.8, 13.8 and 10.8 MPa compressive strength values at 1h, 2h and 3h periods. The setting time of the plaster was 10-16 minutes. Whereas plaster made without $CaCl_2.2H_2O$ showed strength and setting values as 9.0-10 MPa and 6.0-8.0 minutes respectively. With NH_4NO_3 and at concentrations 0.05-0.1% compressive strength in the range of 13.0-15.0 MPa was achieved. However, with NaCl, comparatively lesser strength values are obtained with faster setting times. The hydration of hardened plaster is being assessed by DTA and XRD studies. Effect of more additives on dehydration of gypsum is in progress.

Studies on Building Fungi and their Control with Selected Phytochemicals *(OLP-303)*

Rajesh K. Verma & Leena Chaurasia

The growth and development of fungi, causing microbial biodeterioration of building materials is attributed to change in the built environment and has lead to an increased incidence of health problems. Building Fungi can attack building timbers, stored goods, clothing, animals and even their own bodies, through allergy and diseases. They also attack objects, specimens, books and paintings. They decay wood cells by de-polymerizing insoluble nutrients such as cellulose, lignin and protein resulting wood loss in weight and strength. They also affects the health of occupants such as fatigue, nausea, headache, dizziness, irritability, concentration and memory loss, irritated eyes, nose and throat mucosa, skin reddening, asthma like symptoms, breathlessness and cough attacks.

The Pentachlorophenol (PCP), Tributyltin oxide (TBTO), Zinc carboxlate and Boron esters of fungicides that have been widely used for treatment of decay in building has now been restricted for their uses. Hence, there is a need to search for the new environment friendly alternatives of these active ingredients.

Air and surface sampling were carried out from hospitals, offices and residential buildings. The

samples are cultured, sub-cultured and pure cultured in laboratory followed by their identification on the basis of their macroscopic and microscopic features. It was observed from the present study that the fungi *Alternaria* spp., *Aspergillus* spp., *Penicillium* spp., *Rhizopus* spp. and *Trichoderma* spp. were found to be present in the walls of hospital/office/residential buildings. However, *Aspergillus* spp, *Geotrichum* spp., *Mucor* spp., *Penicillium* spp. and *Rhizopus* spp. were found in the indoor environments. It was further concluded that three fungi namely, *Aspergillus* spp., *Penicillium* spp. and *Rhizopus* spp. were the common inhabitants of the walls as well as in the indoor environments of the buildings. The permanent slides were prepared for identified fungi to best view of the fungi. The microscopic structures of identified building fungi are shown in Figs 1(a-d) and 2(a-c).

Deuteromycetes

Moniliales

Dematiaceae

Alternaria

Fig. 1(a) - Alternaria

Deuteromycetes

Moniliales

Moniliaceae

Aspergillus

Fig. 1(b) - Aspergillus

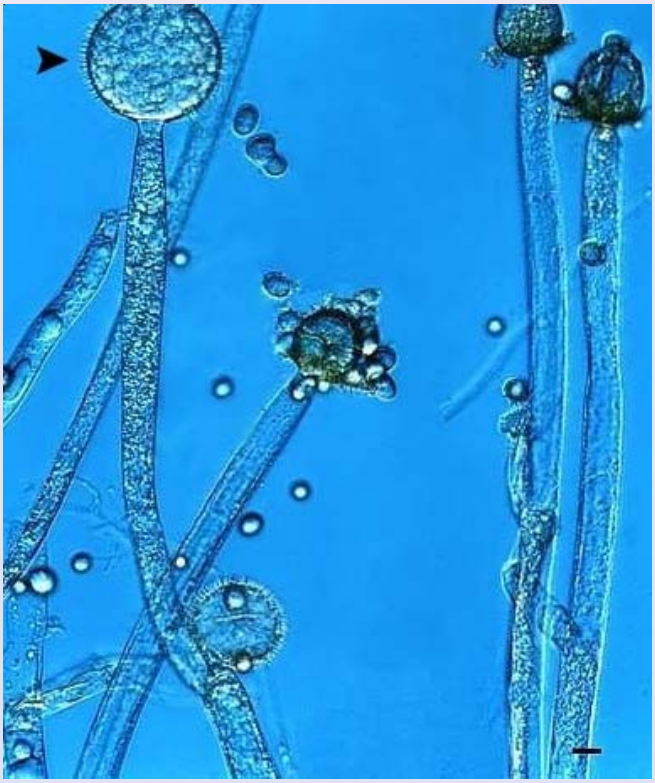
Ascomycetes

Endomycetales

Endomycetaceae

Geotrichum

Fig. 1(c) - Geotrichum



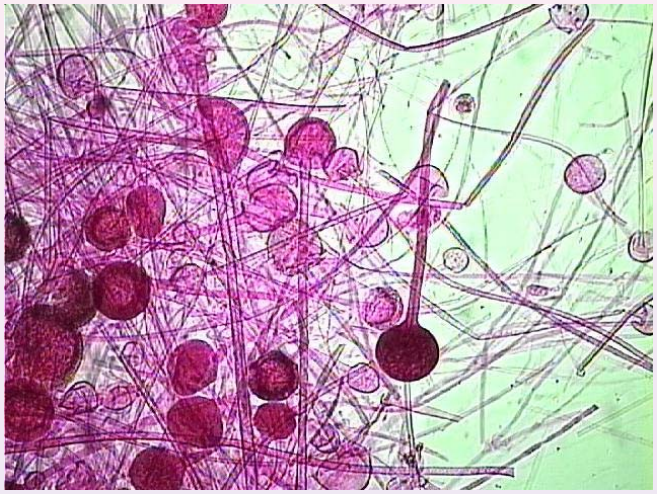
Zygomycetes

Mucorales

Mucoraceae

Mucor

Fig. 1(d) - Mucor



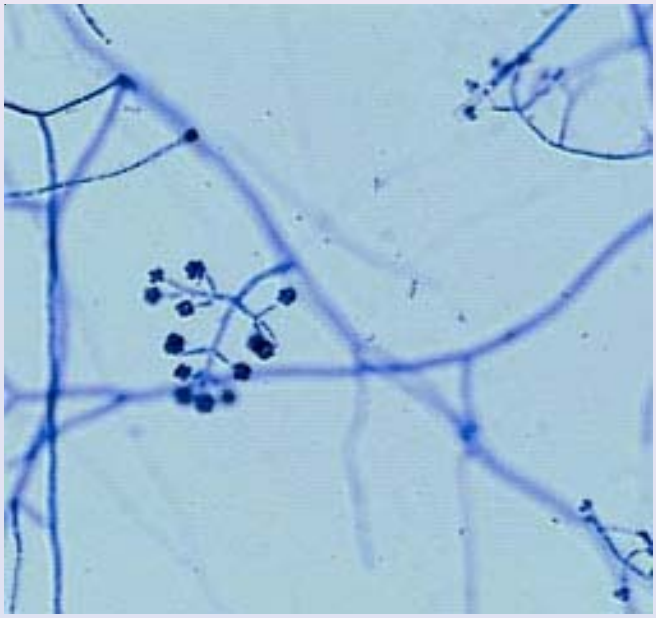
Zygomycetes

Mucorales

Mucoraceae

Rhizopus

Fig. 2(a) - Rhizopus



Deuteromycetes

Moniliales

Moniliaceae

Trichoderma

Fig. 2(b) - Trichoderma

Deuteromycetes

Moniliales

Moniliaceae

Penicillium

Fig. 2(c) - Penicillium

The plant materials of *Eucalyptus globulus* and *Tagetes patula* were de-oiled with petroleum ether followed by extracted with cold methanol, water and methanol: water (90:10) by pouring materials and pure solvents in conical flask or soxhlet extractor. The crude extracts were fractionated according to nature of compounds with hexane, chloroform and saturated mixture of n-butanol: water. The soluble were concentrated on Rotary Vacuum Evaporator (Buchi Type) to get their crude extractives. The evaluations of all obtained extracts are in progress.

Development of New Composite Materials for Building Applications using Plywood-Veneer and Vermiculite Waste *(OLP-0324)*

S.P. Agarwal & Rajni Lakhani

The charm of synthetic polymers and their products used in diverse applications is fading because these products are not biodegradable and they pollute the environment. In contrast, natural polymers are generally biodegradable but they do not possess desirable thermal and mechanical properties. In this work it has been kept in mind that mechanical properties of the developed composite should be comparable with the properties of composites with synthetic resins and it must be capable of processed by the established methods.

The starting raw material i.e. wood waste from veneer & plywood industries (Fig.3) is selected because its present price is very low (Rs. 1.25 per kg containing higher lignin content up to 35% by wt.) while its availability is very large. The generated waste is around 10% of the total wood processed in the plants. The other proposed starting material is bagasse whose availability is also very substantial. Its cost is around Rs. 1.00 per kg while lignin content is substantially low (up to 25% by wt.) and the fiber strength is also comparably low. Efforts will be made to convert lignin of wood waste of plywood/veneer industries into an adhesive for making composites of

Fig.3-Plywood-Veneer Waste

Fig.4-Different Exfoliated Vermiculite Flake Wastes

a new class of composites replacing synthetic resins mostly derived from petroleum.

The exfoliation of vermiculite generates powdered by product (waste shown in Fig.4), which is seldomly used for converting into a value added product for building applications. This by-product can be easily converted into roofing tiles for thermal insulation along with polymer modified cementitious binder. Substantial amount of exfoliated vermiculite is available (around 400 MT/year) in India. Exploratory experiments have already strengthened the objective and lead to conceive a project for the development of roofing tile for thermal insulation (a composite).

The envisaged impact of the outcome of the R&D work is to provide better alternative building materials using low value down stream products of agro-industries through value addition.

Development of Polymer Based High Performance Repair Materials *(OLP-0326)*

S.R. Karade & P.C. Thapliyal

The polymeric mortars have emerged as an important class of repair materials in civil engineering applications. Polymers are known to degrade at elevated temperatures but cement does not loose strength below 100 °C. Higher temperature conditions prevail in several industrial buildings and structures such as coke handling plants, thermal power plants, prilling towers, chimneys, furnaces, heat treatment plants etc. This study is devoted to understand the influence of temperature and chemicals on the performance of polymeric modified mortars and to formulate suitable composition for such higher temperature exposure conditions. Figure shows the bond testing of one typical formulation of repair material under slant shear test in UTM (Fig.5).

Studies are being carried out on the developed repair materials to assess the effect of thermal cycles, fire, acidic environment on the mortar samples. Influence of thermal cycles on bond characteristics is studied by using slant shear test specimens and on flexural behaviour for 60 and 120 cycles. To understand the influence of exposure to acidic environment, the specimens were submerged in a sulphuric acid solution (5%) and the changes in weight, shape, colour and compressive strength are recorded at various intervals of exposure time. The effect of thermal cycles on compressive strength of various repair mortars is shown in Fig.6. The results of change in compressive strength of the repair mortar specimens tested at 85±2 °C (Fig.6) in comparison to those tested at RT are shown in Fig.7. The changes in properties of different mortar specimens dipped in an acidic solution for 180 days is shown in Fig.8. Fire behaviour of the above mentioned mortars is in progress.

Fig.5-Polymer Modified Repair Material under Test

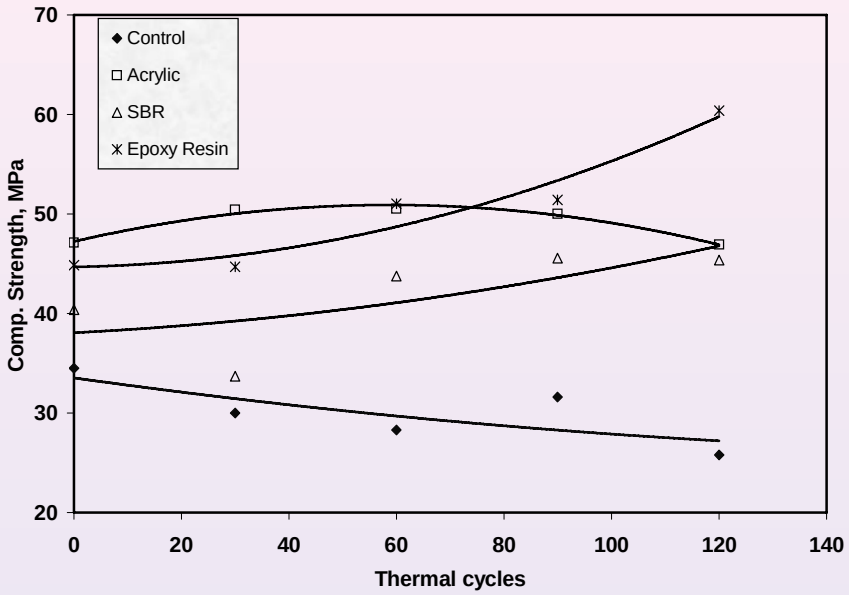


Fig.6-Effect of number of thermal cycles on compressive strength of repair mortars

(a) **(b)**

Fig.7-Testing of repair mortars at higher temperature (a) Thermostatic chamber (b) Compression test specimen inside the thermostatic chamber

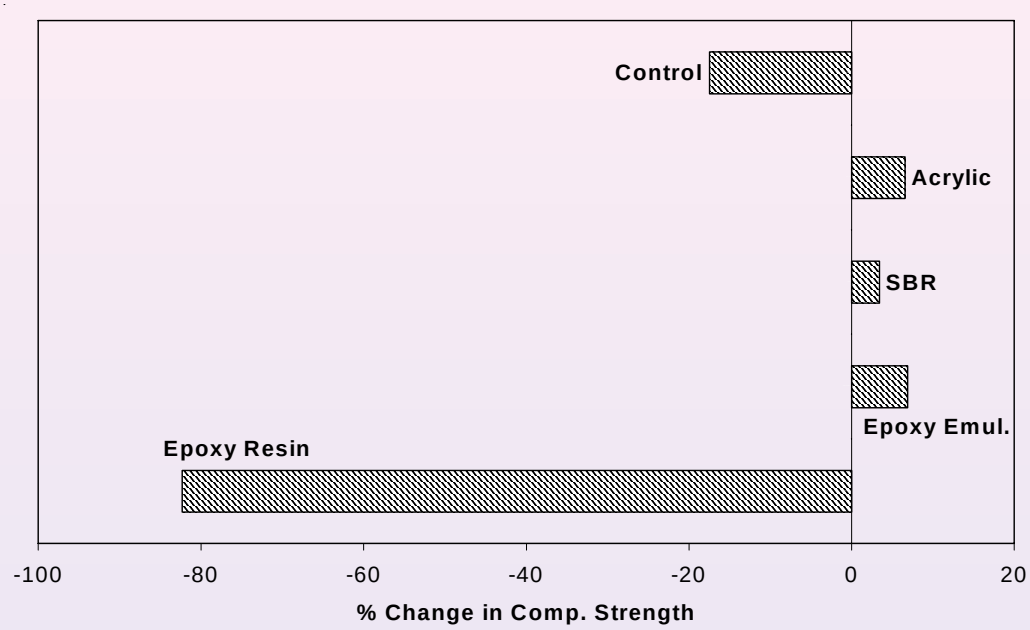


Fig.8-Change in compressive strength of repair mortars tested at higher temperature (85 °C) in comparison to those tested at RT

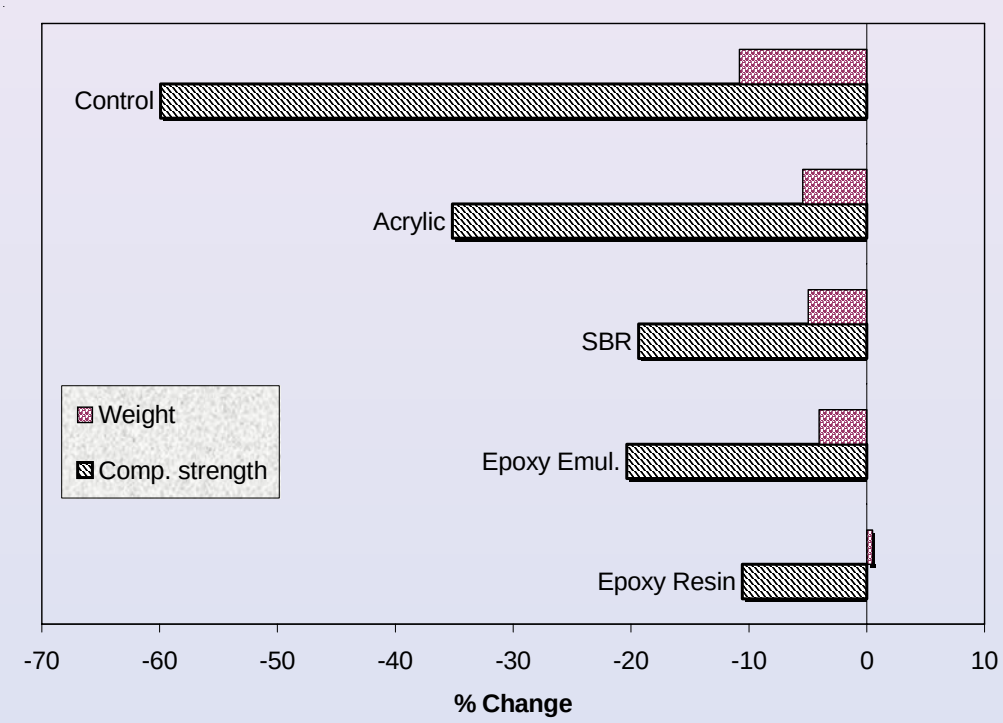


Fig.9-Change in compressive strength and weight of repair mortars after 180 days exposure to acidic solution

Development of Coating Systems based on Modified Epoxy Resins for Fertilizer Industries *(OLP-0325)*

P.C. Thapliyal & S.R. Karade

The demand for coatings for the protection of structures exposed to chemicals and higher temperature is enormous. The coatings in the fertilizer plants, chemical industries, power plants etc. especially in the chimneys, prilling towers, etc. are exposed to higher temperatures in the range of 50-70 °C and very limited coatings are commercially available for protecting the structures. The coatings based on modified epoxy resin, developed, earlier in the Institute, showed very good performance when exposed to a variety of exposure environments. This has been undertaken as the basic starting material for developing a new class of coating which would be useful for protecting the steel and concrete structures.

Studies of Polypropylene Random Copolymer as a Piping Material *(SSP-2706)*

Manorama Gupta & Team

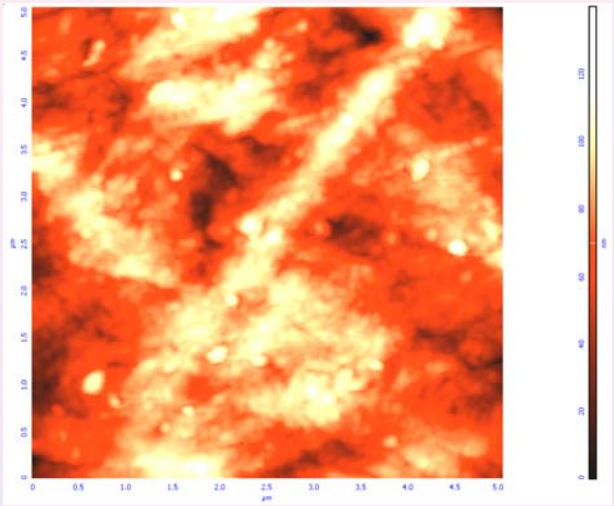
The use of polymers for pressure pipe systems has been a significant area of industrial research in recent years. In plumbing application, selection of polymers depends on an understanding of deformation and failure processes that operated over a wide range of temperatures and environment conditions. In the present study, carried out at Central Building Research Institute, Roorkee, Polypropylene random copolymer (PPR) was selected for hot and cold water distribution systems because of its low temperature impact response and high softening point. The internal morphology of PPR granules seems to be soft and fluffy. Under AFM, a clear difference between the phases of PPR is observed showing their surface roughness of ~ 28.81 nm. The melt flow index of granules is ~ 0.42g /10 min when tested at 190^0 C

Fig.10-Coated panels with developed formulations under test.

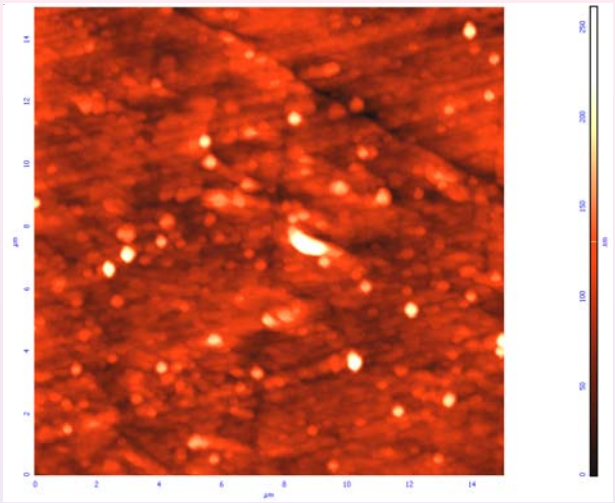
and 5 Kg load which is below the specified limit mentioned in European Standard pr EN 12202-2. The tensile properties of injection moulded sheets were examined as a function of strain rate. The improvement in tensile yield and breaking strength is ~18.23% and ~13.68% respectively when speed was increased from 5mm/min to 50 mm / min. The toughness is increased in the order of ~ 47.75%. During charpy impact, the un-notched samples do not break whereas, the notched samples exhibited impact energy to a level of ~164 KJ/m^2. Under DMA scanning, cross-over points between storage modulus and the loss modulus were noticed at 45 ^{0}C in the glassy region and ~ 110 ^{0}C in the terminal zone were noticed showing adequate visco-elasticity in PPR. The high value of storage modulus (3400 MPa) and low Tan delta (0.12) indicate that PPR has sufficient stiffness to maintain its rigidity under use condition (Table 3) .

The effect of chlorine disinfection, chemicals, weathering and leaching of additives on the properties of PPR was studied (Fig.11). Under chlorine exposure test (320 ppm), ~ 16% reduction in burst strength was noticed. Tensile modulus of exposed samples was increased by 56% over the unexposed ones. On surface examination, the difference in the fresh and exposed samples was noticed in terms of haziness. The chemicals exposure on PPR samples were carried out at RT and 60^{0}C for 30 days. The selection of chemicals and their concentration was taken from the list mentioned in IS: 13360 (part 8). The weight gain in the samples at 60^{0}C is more than the weight gain at RT. After 30 days, the weight loss observed in the samples exposed to NaOH and sodium hypochlorite was maximum (0.12%). Under 12 months natural weathering exposure, the increase in yield strength of exposed samples was ~ 12% while elongation at break decreases to a level of ~ 30% over the control samples. The exposed surface shows more exposition of particles than the control samples. The increased number of grains is an indicative of eroded soft resinous layer from the surface. The overall migration of leachable additives from PPR was also studied as a function of temperature and storage durations using water as a simulating solvent (Fig.12). It is observed that increasing temperature of extraction increases the amount of leachable additives from 3.81 mg/l at 40^0 C to 13 mg/l at 90^0 C. After 10 days extraction duration and 90^0 C, the total leachants from the PPR is ~ 18 mg/l, which is well below the permissible limit mentioned in IS: 10910. The water extract of PPR was also examined for biological growth by plate and multiple tube method. Under plate method, colony counts appeared in the extract is equivalent to the colony count appeared in the control tap water sample, whereas the extract imparted the Most Probable Numbers to a level of 6. This indicates that PPR do not support any kind of biological growth in contact with water.

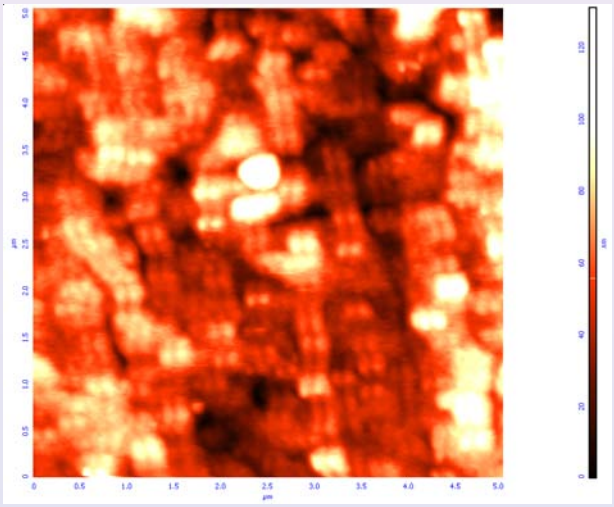
On the basis of materials performance, PPR pipes were extruded and characterized for use in hot and cold water supply. Under reversion test, the change in length of pipes at 135^0 C is ~ 0.4 % only. During impact at 0^0 C and 27^0 C, the pipe was intact and free from cracks/ splitting in the wall. The creep strength of pipes was tested at room temperature, 20^0 C and 95^0 C for various periods. At 20^0 C, there is no sign of localized swelling or leakage when 16 MPa proof stress is applied for 1 hour. The sample was further subjected to 95^0 C for 22 hours under hydrostatic stress of 4.2 MPa. At the end of test, sample is dimensionally stable and there is no localized swelling or leakage. The sample was further subjected for 1000 hours testing at 90^0 C under hydraulic stress of 3.5 MPa. The sample is intact and no defect is noticed after completion of test. Based on these results, it is found that the PPR pipe sample meets the requirements specified in DIN 8078.



Control



Chlorine exposed



Outdoor exposed PP random copolymer in rack as per ASTM D

Weathering exposed

Fig.11- Atomic Force Micrographs of Fresh and exposed PP random **copolymer**

Table-3: Physico- mechanical properties of PP random copolymer moulding and pipes

Property	Value
Density (g/cm^3)	0.902
Water absorption (%), 24 hrs	0.0038
Melt Flow Rate of pipe (gm/ 10min) (190^0 C/ 5kg)	0.48
Overall migration (mg/l) 24 h/ 40^0	3.81
Softening point (^{0}C) (DMA method)	131.69
Co- efficient of thermal expansion (/^{0}C) – DMA method	1.54 x 10^{-4}
Tensile yield strength (MPa)	
Fresh	21.73
Exposed to chlorine (240 hrs)	25.10
Exposed to natural weathering (12 months)	24.43
Storage modulus (MPa) (Dual cantilever)	3400
Loss modulus (MPa) (Dual Cantilever)	225
Heat reversion of pipes (%)	0.41
Creep Strength of pipes	
Burst pressure (MPa)	9.80
Sustained pressure (MPa)	
20^0 C (16MPa) for 1 hr	No burst/ leak during stressing
95^{0}C (4.2MPa) for 22 hr	No burst/ leak during stressing
Impact strength	
0^0 C	No shattering / crack/ split
27^0 C	(No fracture through wall thickness)

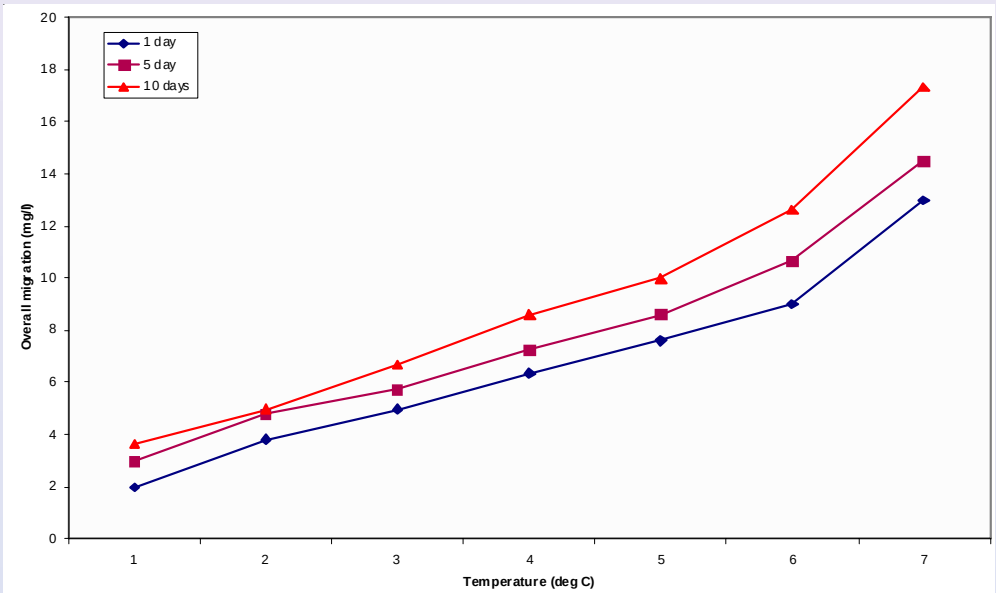


Fig.12-Overall migration of leachable additives of PP random copolymer as a function of temperatures and storage durations

Structures and Foundation Engineering

Structural Assessment & Rehabilitation of Faridabad Thermal Power Station Residential Colonies *(SSP-6347)*

Rajesh Deoliya & Team

The Institute is involved in Residual Life Assessment (RLA) of three residential colonies of Faridabad Thermal Power Station (FTPS) at Faridabad, namely Old Power House Colony, Sector 22 colony and Sector 23 colony. The main objectives are as follows:

- Detailed field investigations to assess the condition of houses and other structures,
- Visual inspection of all affected houses and structures followed by Non-destructive Testing and lab investigation of samples to finalize the conclusions and recommendation.
- Laboratory investigations of concrete cores, reinforcement and other construction material to confirm the findings of NDT result and calibrate the decision taken during visual inspection and field investigation based on findings of results of investigations.
- Investigation of causes of degradation of these structures and
- Remedial measures to repair and retrofit the buildings and other structures.

Exhaustive efforts have been made to covers each individual house to plan and handle the project in totality. An effort has been made to identify and categorize the damages in the various housing

Photos showing damages in slabs, roof slabs, columns, lintels, mumties, parapet walls etc.

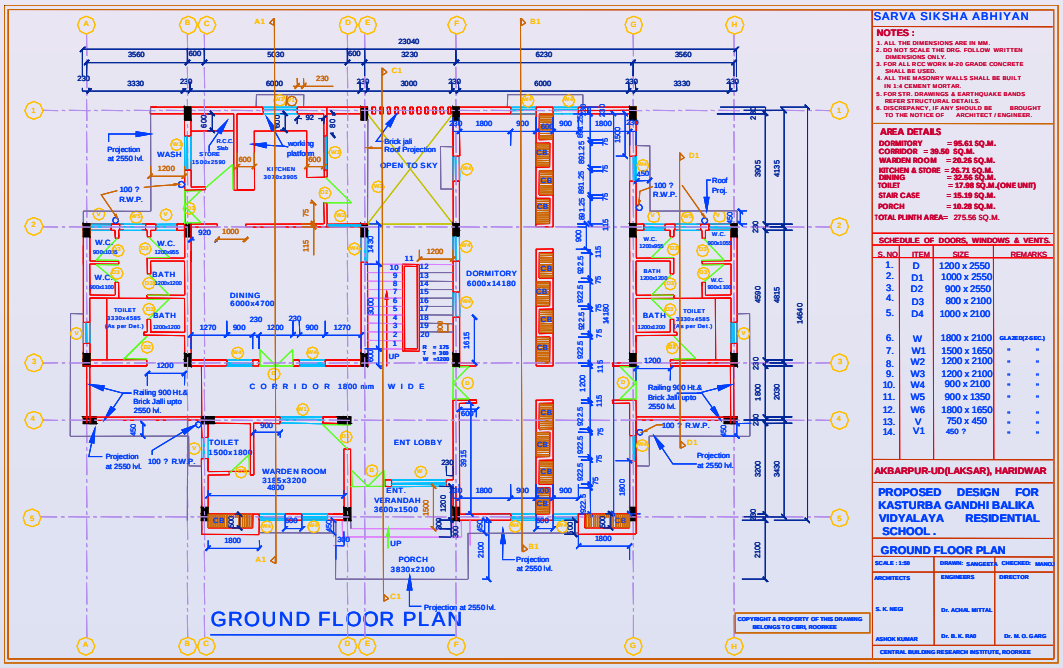
categories and other structures. A detailed report of investigation has been prepared during the year. About 800 residential units have been covered in the report. Non residential buildings covered in report are (i) Main Guest house Building (ii) Field Guest House (iii) Hospital Building (iv) Shopping Complex building (v) Primary school buildings and (vii) Guest house for supporting Staff. Water leakages through damaged water proofing, carbonation of RC components, improper maintenance of the buildings are the main causes of damages. Building damages have been categorized in five levels ie., Damage category 1 to Damage category 5, based on the damage suffered by the building components varying from negligible damage to heavy damage respectively. Component wise damages, causes of damages are described in the report to focus on the components individually. Remedial measures are also suggested component wise. Alternate methods are given to repair the structures based on the level of damage and expertise available with the implementation agency. Repair and Retrofitting measures are suggested to repair (i) masonry walls (ii) parapet walls (iii) damaged roof water proofing layer (iv) RC chhajjas, lintels, beams, staircase, slabs, balconies, shunken floors etc. Some typical component damages are shown in the photographs.

Architectural Planning and Structural Design of the three Models of KGBVs and Quality Inspection of the above School Sites to be Constructed *(SSP-6407)*

A. K. Mittal & Team

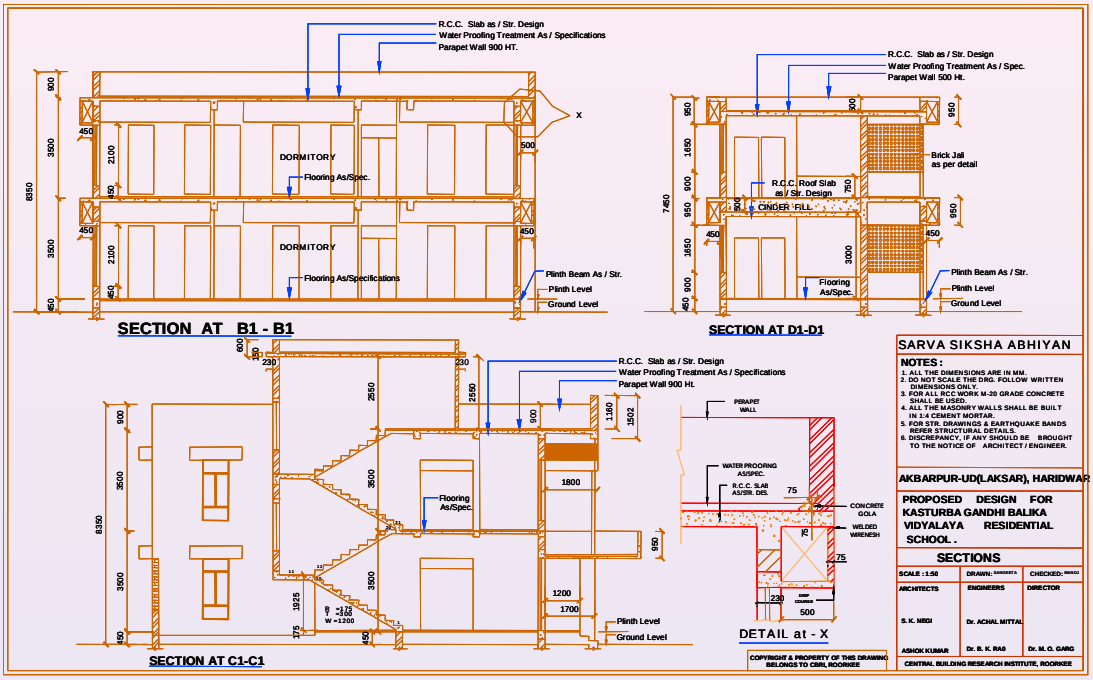
Kasturba Gandhi Balika Vidyalayas (KGBVs) are being constructed at 25 different sites of Uttarakhand. CBRI as a consultant is rendering the following services to the client:

i. CBRI is advising for good quality of construction system with earthquake resistance design. It is our duty to give advice & guide the Consultant for efficient construction so that the work is executed as per the quality norms laid by them.



Architectural Plan for KGBV

Structures and Foundation Engineering



Sectional Elevation of KGBV

3-D Rendered view of KGBV

ii. Architectural planning and design of the three models of KGBVs has been prepared, keeping in view site conditions.

iii. Earthquake Resistant Structural Design has been prepared for the above KGBVs.

iv. Quality Inspection of the above school sites is in progress.

v. Non destructive and Material testing at site/ Laboratory is also under progress.

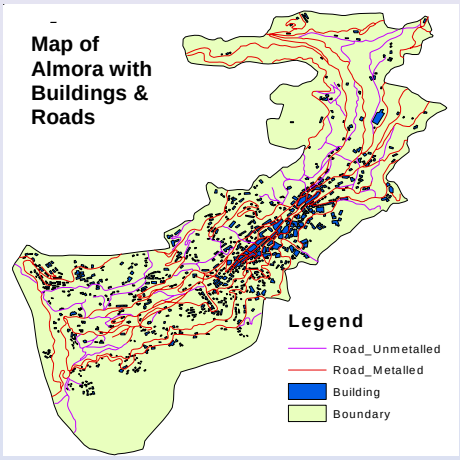
Seismic Vulnerability Assessment and Damage Scenario of Buildings in Almora City *(GAP-6574)*

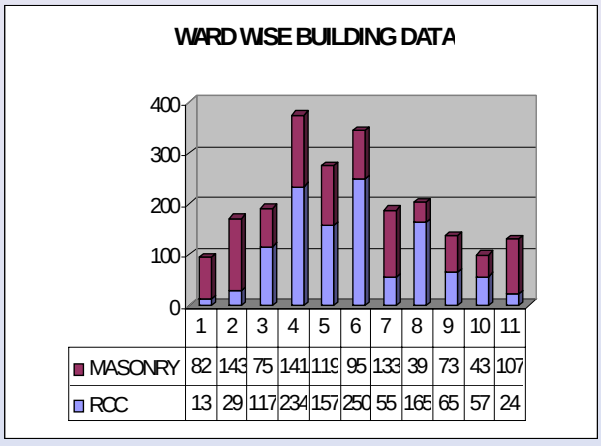
A. K. Mittal and Team

Project sponsored by DST, New Delhi for a comprehensive approach towards the disaster mitigation, the estimation of seismic vulnerability of buildings is perhaps the most important component where earthquake engineers need to focus. Evaluation of the seismic safety of all-important buildings is required so that the weaker ones could be strengthened to resist future earthquakes. In a developing country this task is further difficult as both engineered and non-engineered buildings exist. Buildings in the Himalayan regions of India are susceptible to large earthquake forces and so need to be evaluated. There is no well-defined standard procedure available to evaluate the seismic safety of such structures. However, different researchers throughout the world have tried to develop their evaluation philosophies. Some of these methods have already been implemented in cities of developed countries.

An effort has been made to evolve a quick and suitable approach for vulnerability assessment of buildings in the hilly towns of northern India. The paper contains the information on building inventory developed especially for the hilly regions of India. The building survey data of all the 11 municipal wards of Almora city has been collected and the analysis of the same is presented. Microtremor study for finding the predominant natural ground frequency has also been studied for the different locations (7 wards) of the town.

- ❖ Preparation of exhaustive building inventories of Almora town.
- ❖ Study of the seismicity of the region and estimation of PGA values.
- ❖ Field survey and data collection for existing buildings in different wards.
- ❖ Preparation of sub surface map of the Almora town.
- ❖ Study of predominant period at various locations using micro tremor.
- ❖ Estimation of seismic vulnerability of existing buildings.
- ❖ Preparation of seismic risk map and damage scenario map of Almora town.





VULNERABILITY ASSESSMENT:

Vulnerability is the degree of loss to a given element at risk resulting from the occurrence of a specified earthquake. For loss assessment over a population of buildings we need –

- A means of specifying the earthquake hazard.
- A classification of the buildings or other facilities into distinct types whose performance in earthquakes is likely to be similar both in nature and degree.
- A method of defining loss so that the extent of loss to a particular building or population of buildings can be quantified.
- A means of estimating the distribution of losses to each building type for each discrete level of ground shaking or as a function of ground shaking.

Vulnerability analysis may be carried out in three or more steps such as (a) inventory creation of the building and related infrastructure (b) relationship between the category of structure and its possible damage due to the seismic hazard (c) loss computation. Many classifications for buildings have been tried all over the world. The issues, which are important for the seismic resistance of the building, should be identified with the aim that these could be incorporated into the inventory of the buildings. These are listed as here under:

- Structural form-shape of plan, shape in elevation, number of stories, stiffness, percentage of openings, location of openings, foundations (depth, adequacy), design faults, type of roof.
- Site planning-pounding effect, slope effects, mutual stiffening effects, local ground failure.
- Construction quality-quality of building material, quality of workmanship, neglect of design specifications.
- History-age, pre-existing damage weakening structure, repair and maintenance of structure, modification to structure.

GEOLOGY OF ALMORA REGION:

The Almora city is located in the NW Himalayan belt bound by Himalayan territory towards its north. The Himalayan territory to its north comprises of diverse rock formations varying from igneous through metamorphic to the sedimentary rock formations. These rocks are cut across by numerous thrusts and faults at different scales. The major geological units comprising the Higher Himalaya, Lesser Himalaya and the Outer Himalaya are separated by major thrust faults. These thrust faults are regional in scale and traverse the entire Himalayan territory approximately parallel to the strike. All these major thrust faults are reportedly active and are potential zone for future earthquakes.

SEISMICITY OF THE REGION:

On account of northward movement of the Indian plate, strains are accumulating in several parts of the Himalaya as well as in the Indian Peninsula. There are several areas in the Indian Peninsula along which strains are accumulating and being released in the form of earthquakes. The occurrence of earthquakes in Latur, Jabalpur and Bhuj are the glaring examples. Thus, during the International Decade of Natural Disaster and Reduction (IDNDR) and after, our country has experienced earthquakes of moderate to high intensities. The Uttaranchal region has experienced twenty moderate size earthquakes in the last 200 years and is still seismically active.

The Almora region has a seismic history, being affected by the Himalayan earthquakes. The seismicity in this region is due to movements along several faults, thrusts as well as lineaments. The Himalayan earthquakes have their epicenters very close to any of the terrain bounding thrusts i.e. Main Central Thrust (MCT), Main Boundary Thrust (MBT) or Himalayan Frontal Thrust (HFT).

SEISMIC HAZARD ASSESSMENT OF ALMORA:

The PGA in and around Almora region are computed

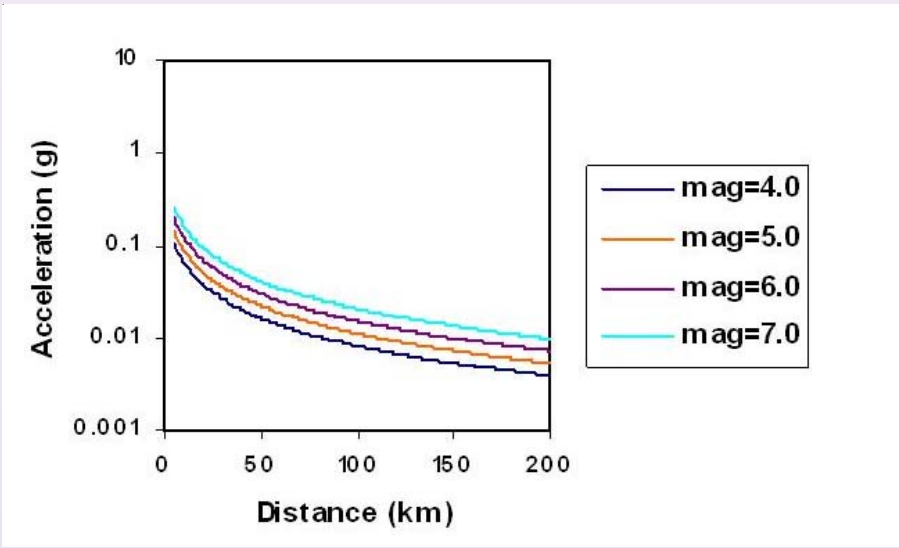
by assuming the seismic history of the region, a maximum expected earthquake of magnitude 7.5 and a 20 km depth. The attenuation relations which are developed for Himalayan region are used to compute the attenuation with distance. The PGA value may be of the order of 0.21 g within or around Almora region.

SEISMIC SURVEY:

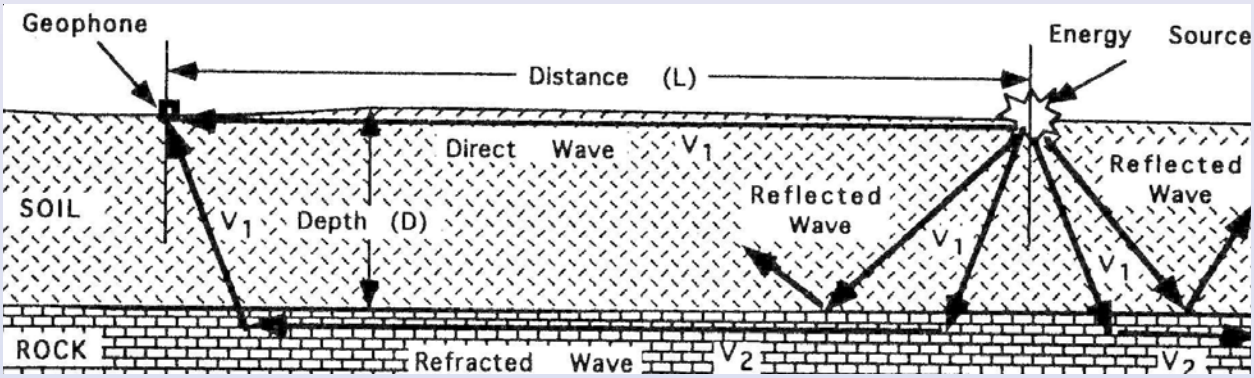
Elastic waves generated on the ground surface travel downwards into the various layers and are refracted back to the surface from the junctions of the various layers. The waves are picked up at various points on the ground and arrival times are recorded. Subsequently the velocity of propagation and depth of the layers are computed. The principle is schematically shown in the Fig below:

SEISMIC PROFILING:

Seismic refraction tests were carried out along two sections – one at the stadium and the other along a road side. 12 vertical geophones of 6 Hz frequency



Effect of PGA due to earthquake in Higher Himalayas



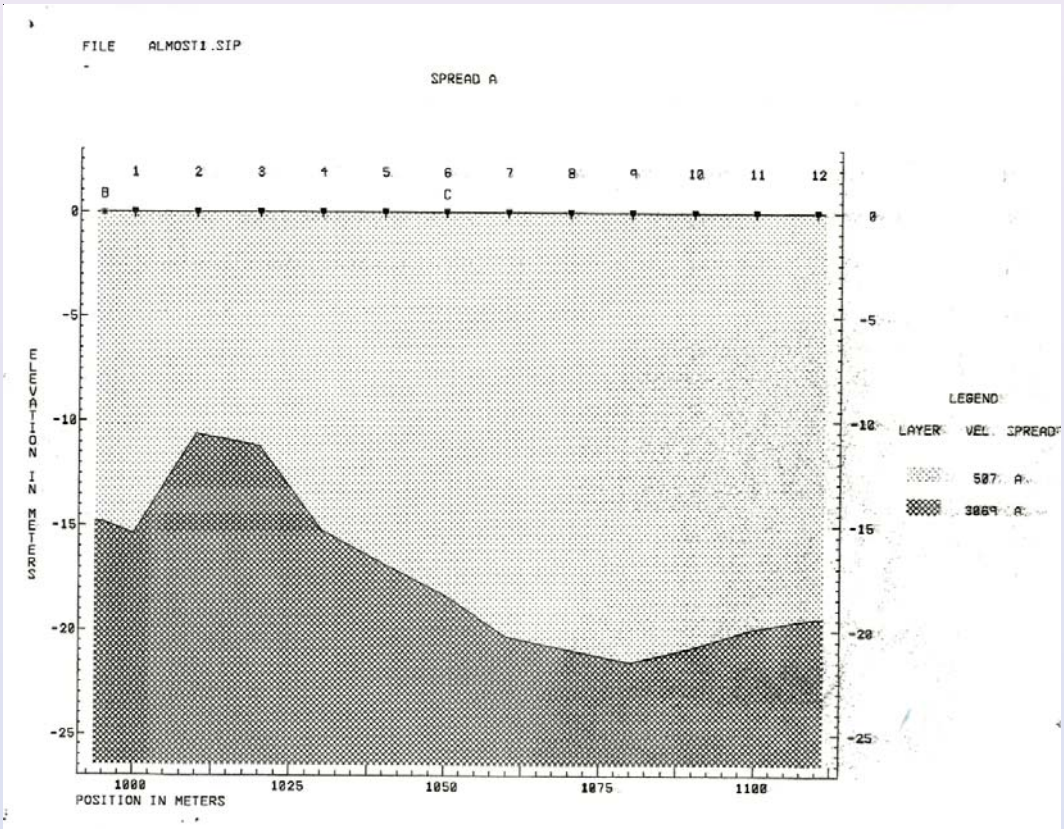
Principle of Seismic Survey

range were placed over a stretch of 100m to detect the refracted signals from the subsurface layers. Hammer blows were used as the source of energy. Multiple hammer strokes were used and data were stacked one above the other. Five shot locations were used two at both the ends and the one at the middle of the spread.

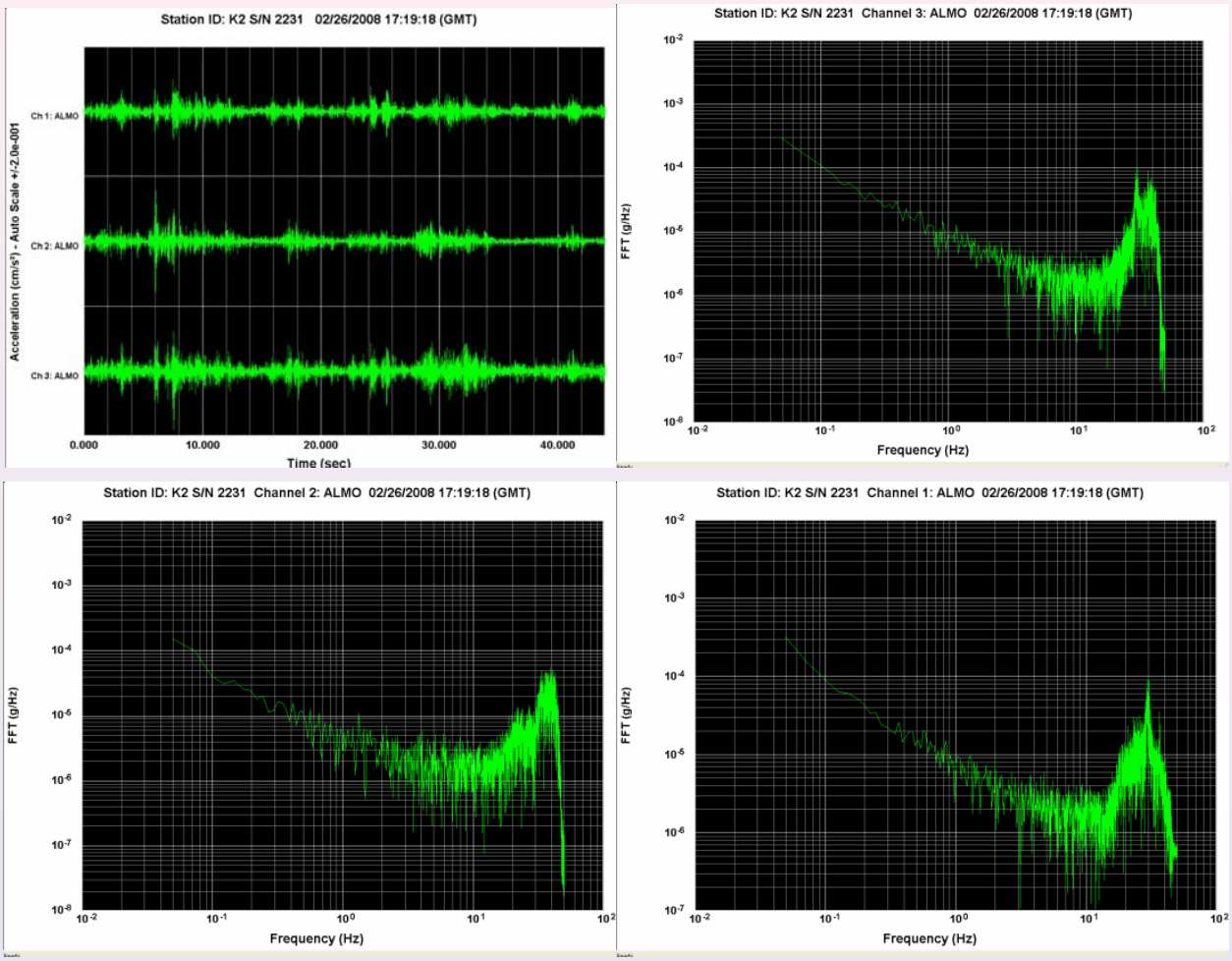
It is observed that the top soil is composed of highly fragmented rocks mixed with soil. The layer is loose. At the stadium site the flat ground has been made by cut and fill. Since the water table is neither near the surface nor within the depth of the fill possibility of liquefaction is also low under seismic event. Below the top filled up layer the base rock is detected. Average depth of the top loose layer varies between 20 – 25 meters.

AMBIENT VIBRATION STUDIES:

Ambient vibration data is collected using either seismograph or accelerograph. In the present case Digital Triaxial Strong Motion Accelerograph (SMA) is used to collect ambient vibration data. A digital triaxial Strong Motion Accelerograph (Altus K2, Kinemetrics, USA) is kept at various places for some time. The SMA was kept in trigger threshold mode for recording acceleration time histories of ground motion in digital form. The threshold was set very low to get the even cultural noise generated inside the ground. SMAs have full-scale range of 2.0 g with sampling rate of 100 samples per second (sps). Preliminary results of the study for some locations are shown in Table given below. It was observed that the natural frequencies of the structure undertaken in the study are between 0.85 to 1.5 Hz.



Road Side Profile – Top Layer Thickness (10-20m)



Predominant Natural Frequency – 0.85 ~ 1.5 Hz

EXCERPT OF BUILDING INVENTORY FOR RCC BUILDINGS:

Sr. No	Parameter	Details		
1	No. of Stories	1–2	3–5	> 5
2	Soft Storey	No		Yes
3	Basement	Yes		No
4	Provision for Lateral load	Shear Walls	Infill Walls	Nil/Any Other
5	Shape (Elevation)	Square	Rectangular	Any Other
6	Shape (Plan)	Square	Rectangular	Any Other
7	Water Tank at Roof	No/ Synthetic	Yes Type: RCC/Other	
8	Extended Portions (Including Balconies)	< 10%	10-20%	> 20%
9	Non structural Architectural Features	Nil	Few	More
10	Presently Observed distresses Corrosion Cracks in Beam/Column/Slab Cracks in Walls	 No sign No No	 Just Started Non Str. Non Str.	 Spall. of Conc. Structural Structural
11	Overall Integrity of Structure	Very Good	Fairly Good	Poor
12	Ratio Column Height/Least Lateral Dimension	10	10-15	> 15
13	Average Rebound Number	> 35	25-35	< 25
14	Positions of Partition Walls	At Appropriate Positions		Any Where
15	Ratio of Stiffness of Column and Beams	> 1		< 1
16	Type of Foundation	Raft	Isolated	Other
17	Type of Soil	Hard	Sandy	Soft
18	Depth of water Table	Low		High
19	Maintenance	Regular	When Reqd.	Never
20	Mumty	Not Provided		Provided
21	Location of stair case	At Appropriate Positions		Any Where
22	% of openings (in terms of linear length of wall)	< 15	15-25	> 25
23	Age of Building (Year of Construction)	< 20	21-35	> 35

EXCERPT OF BUILDING INVENTORY FOR MASONRY BUILDINGS:

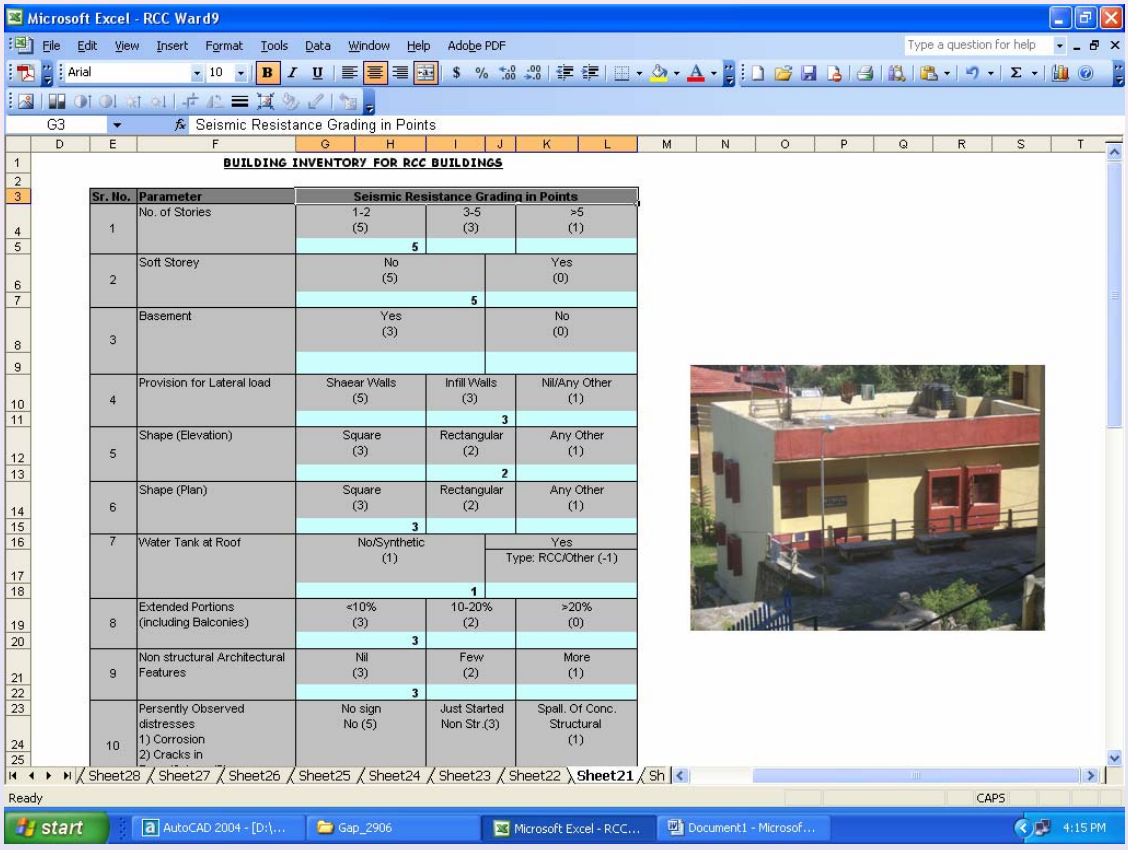
Sr. No.	Inventory Type	Details		
1.	No. of stories	1	2	3-4
2.	Shape (in Elevation)	Sq./Rect.with no offset/shift	Sq./Rect.With small Offset/Shift	Sq./Rect. With High Offset/shift
3.	Shape (in Plan)	Square (Upto1:1.2)	Rectangular (Upto 1:2.5) with small projections	Unsymmet./Long/Rect. (>1:2.5)/with projections
4.	% of opening (in terms of linear length of wall)	<15	15-25	>25
5.	Location of opening	Centre	Any other Location	End
6.	Type of Construction	Brick in C/L-Sand mortar	Stone Coursed Masonary/Hollow blocks	R/R masonary in mud/Solid Blocks
7.	Quality of construction	Excellent	Good	Poor
8.	Earthquake provisions provided	All	Partly	None

BUILDING INVENTORY DATA BASE:

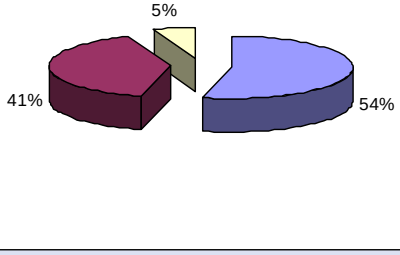
The data of the buildings is collected and entered along with photographs in the Ms Excel. Data is compiled ward wise and masonry /RCC building wise. A view of the data sheet is shown below:

Conclusion:

- More than 50% buildings in Almora Town are identified as 'Poor'. (Need detailed investigations)
- Only 5% Buildings are qualifying as 'Good'.
- 10.5% of RCC Buildings qualify as 'Good', whereas 27.7% as 'Poor'.
- 82% of Masonry Buildings are identified as 'Poor'. (Need detailed investigations)



Sr. No.	Parameter	Seismic Resistance Grading in Points		
1	No. of Stories	1-2 (5)	3-5 (3)	>5 (1)
		5		
2	Soft Storey	No (5)		Yes (0)
		5		
3	Basement	Yes (3)		No (0)
4	Provision for Lateral load	Shaear Walls (5)	Infill Walls (3)	Nil/Any Other (1)
			3	
5	Shape (Elevation)	Square (3)	Rectangular (2)	Any Other (1)
			2	
6	Shape (Plan)	Square (3)	Rectangular (2)	Any Other (1)
		3		
7	Water Tank at Roof	No/Synthetic (1)		Yes Type: RCC/Other (-1)
		1		
8	Extended Portions (including Balconies)	<10% (3)	10-20% (2)	>20% (0)
		3		
9	Non structural Architectural Features	Nil (3)	Few (2)	More (1)
		3		
10	Persently Observed distresses 1) Corrosion 2) Cracks in	No sign No (5)	Just Started Non Str.(3)	Spall. Of Conc. Structural (1)



Disaster Mitigation

Studies on Environment-friendly Fire Retardant Rigid Polyurethane Foam *(OLP-310)*

Harpal Singh

Rigid polyurethane foams (RPUF) is the most important and versatile material due to its superior thermal insulation properties than rest of the materials. The worldwide demand of polyurethane foams is estimated to be about 5% of total world consumption of plastics. The cell geometry of rigid polyurethane foam is closed cell. The closed cell foams are generally rigid in nature and are most suitable for thermal insulation due to their low thermal conductivity, low density, high strength-to-weight ratio and low moisture permeability. Some typical engineering applications of RPUFs are in the field of transportation, refrigeration technology and appliances, building construction industry, automotive industry, packaging, carpet underlay and sporting goods. A typical RPUF structure may contain in addition to the urethane linkages, aliphatic and aromatic hydrocarbons, esters, amides, disubstituted urea, biuret, allophanate, isocyanurate, uretidione and carbodiimide groups. RPUFs, being highly cellular polymers are easily ignitable and highly flammable. On burning RPUFs undergo decomposition and produce highly toxic gases such as hydrogen cyanide, carbon monoxide etc. The flammability and toxic decomposition products of RPUFs make them undesirable for use in many applications such as packaging, building and construction industries with typical applications in insulation boards, light weight concrete blocks, wall blocks with integrated insulation, curtain wall construction, preformed rigid panels and spray applied wall construction and many other industrial applications. Thus, altogether there appears to be an urgent need to use environment friendly fire retardant additives at the formulation stage to render RPUF fire retardant. As a result, the fire retardant RPUF will ultimately help in minimizing loss of life and property due to the rigid polyurethane foam fires, are desirable.

RPUF samples were prepared through one-shot method. Except Crude 4,4′-diphenylmethane diisocyanate (CMDI), all the raw chemicals such as amine catalyst, silicone surfactant, chain extender, water and auxiliary blowing agent were first manually well blended with polyether polyol in a stainless steel beaker. Then CMDI was added into the blended polyol and mixed for certain time under overhead electric stirrer. The stirrer speed was set at 3000 rpm throughout the mixing. After mixing, the reactants were discharged into an open mould (200 x 200 x 250 mm) lined with paper to produce free-rise foam. As the reactants mixture was poured into the mould, formation of many very small bubbles was observed which were dispersed into the reaction mixture. These tiny gas bubbles formed the nuclei into which the blowing gas diffused as the reaction proceeded. Number, size and distribution of the nuclei determine the final foam structure. The foam cake was then cured for 48 hours at room temperature. Alumina tri hydrate (ATH) was incorporated into the conventional RPUF composition at the formulation stage and the samples were prepared through same method. ATH quantity of 5–60% of total weight of foam ingredients was incorporated into the foam formulation with an increment of 5%. The chemical composition of ATH incorporated RPUF samples (RPUF-ATH) is shown in Table 1. In the table codes ATH, AC, CE, SS, W and ABA denote the amount of alumina tri hydrate, amine catalyst, chain extender, silicone surfactant, water and auxiliary blowing agent used respectively. ATH incorporated RPUF samples are shown in Figure 1 (a).

The morphology of RPUF and RPUF-ATH samples was observed with LEO (438 VP, UK) scanning electron microscopy (SEM). The samples were cryogenically fractured and gold coated to make them

conductive and scanned at 15kv accelerating voltage to observe the shape and size of the cells. The SEM was used to observe the ATH dispersion and deposition on the foam skeleton (cell walls and surfaces) and the difference in the shape and size of the cells between RPUF and RPUF-ATH samples. To define the cell size, measured cell sizes were averaged except the sizes for the largest and smallest cells. Fire performance of RPUF and RPUF-ATH samples was evaluated according to BS: 4735. Samples were weighed before placing horizontally on support gauge inside the non-combustible chamber. The farthest end away from gauge mark of the specimen was exposed for 60s to 10 mm diameter wing top fitted LPG burner of 38 mm non-luminous flame height. After complete fire exposure extent burnt, burning rate, percent mass loss (PML) and extinction time of three specimens per sample were measured and averaged for analysis. RPUF-ATH samples after flammability test are shown in Figure 1 (b).

Table-1: Chemical Composition of ATH additive incorporated RPUF (RPUF-ATH)

Sample code	ATH, (%)	Polyol	CMDI	AC	CE	SS	W	ABA
RPUF-0.0	0	100	S^c+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	5	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	10	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	15	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	20	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	25	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	30	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	35	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	40	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	45	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	50	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	55	100	S+5%	0.6	10	1.0	3.0	5.0
RPUF-ATH	60	100	S+5%	0.6	10	1.0	3.0	5.0

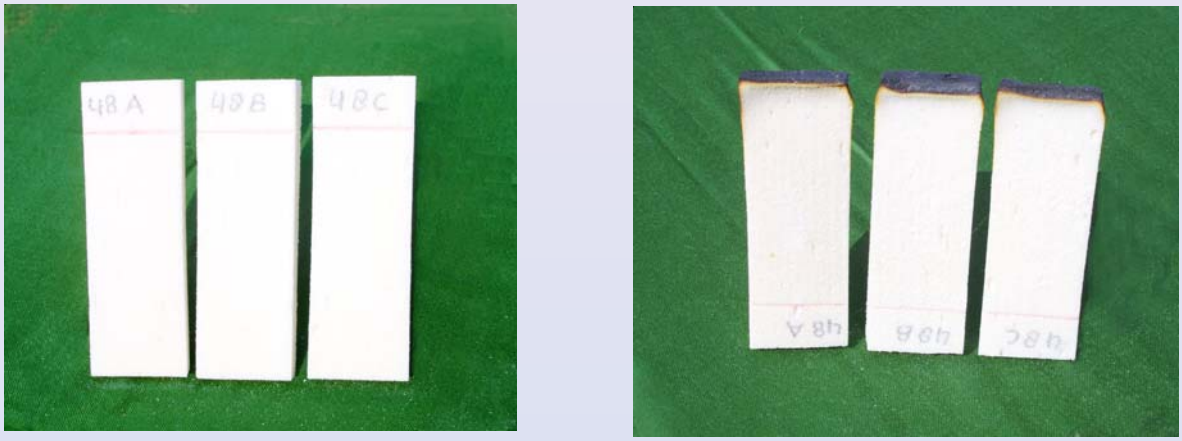


Fig.1-Photographs of RPUF samples incorporated with ATH: (a) before flammability test and (b) after flammability test

Every ingredient of RPUF composition plays an important and specific role in its formation. CMDI and polyether polyol are the important ingredients of RPUF. RPUF formation proceeds through the gelling and foaming reactions. Urethane groups are formed by the gelling reaction, whereas, foaming reaction is responsible for the foam formation by liberation of carbon dioxide. ATH is unique among the fire retardant additives due to its high proportion of chemically combined water. This 'water of hydration' is stable and unreactive at the processing temperature of polyurethane foam and also unreactive to the chemistry involved in the curing of polyurethane foam. When heated above 230^{0}C, the hydrate decomposes endothermically by liberating 34.6% chemically combined water and anhydrous alumina with the absorption of a considerable amount of heat. The fire retardant effectiveness of ATH in polyurethane foam is due to the absorption of enough heat (470 calories/g) by the decomposing hydrate resulted into release of water in the form of steam. ATH additive was primarily dispersed in the blended polyol to carry to the final RPUF formulation due to its low reactivity and toxicity than diisocyanate at the ambient conditions.

$$2\,Al(OH)_3 + Heat \longrightarrow Al_2O_3 + 3\,H_2O$$

In order to understand how the ATH particles dispersed and affect the foam cellular structure, the cross-sectional surfaces of RPUF and RPUF-ATH samples were observed under same magnification using SEM. Micrographs of RPUF and RPUF-ATH samples are shown in Figure 2 (a, b). The cell structures are nearly spherical and polyhedral shapes and mostly the cells are closed. ATH particles can be observed as white particles dispersed everywhere in the foam skeleton. These white particles are nothing but only the ATH particles which can be confirmed by the fact that polyurethane phase is optically transparent and the refractive indexes of Polyurethane (PU) and ATH phases are different. With an increase in ATH contents, the cellular polyurethane foam structure remains unchanged.

The flammability properties of RPUF-ATH and their comparison with RPUF samples were evaluated by means of horizontal burning. The parameters which were obtained through burning test were extent burnt, burning rate, percent mass loss (PML) and extinction time. The extent burnt, burning rate and PML were decreased with an increase in ATH additive contents. 5% ATH did not produce any effect on extent burnt and PML but burning rate reduces from 2.23 to 1.02 mm/s. 10% ATH reduces the extent burnt, burning rate and PML from 125, 2.23 and 100 to 101 mm,

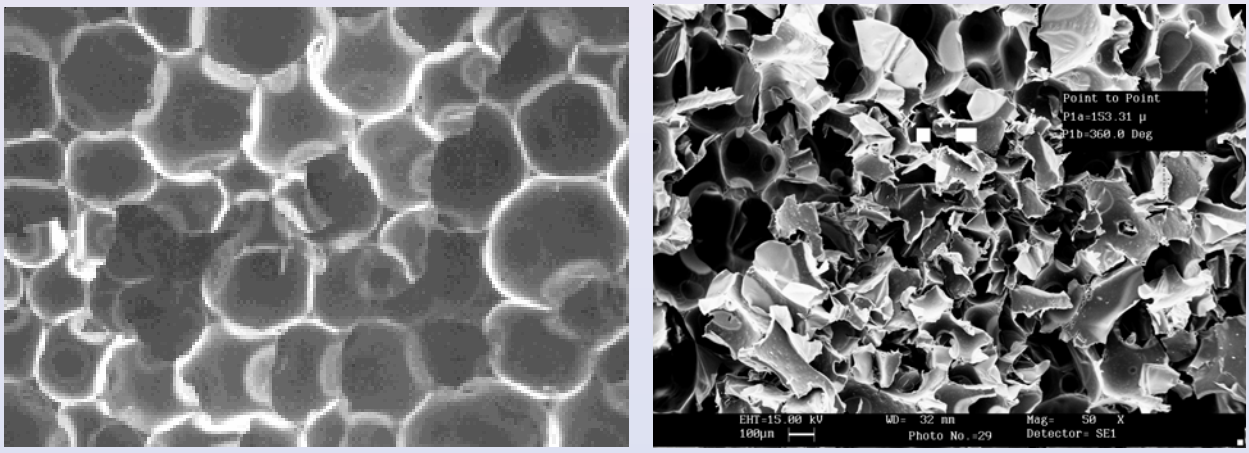


Fig.2-Scanning electron micrographs of RPUF and RPUF-ATH samples: (a) conventional RPUF and (b) ATH incorporated RPUF

0.84 mm/s and 27.86% respectively. As ATH content increases to 60%, extent burnt, burning rate and PML were further reduced to 24 mm, 0.30 mm/s and 5.91% respectively. RPUF samples in flammability test were consumed up to gauge mark (125 mm) in 56s. For comparison, 56s was considered as extinction time of RPUF. RPUF-ATH samples containing 5% ATH show 124s extinction time which further reduces to 80s as ATH contents were increased to 60%. When ATH was subjected to temperature in excess of 250^{0}C in fire, it decomposes endothermically to give off steam which quenches the flame immediately. This action probably reduces the extinction time with an increase in ATH content.

Thus, it can be concluded that RPUF samples were prepared with CMDI, polyether polyol, amine catalyst, silicone surfactant, chain extender with water and auxiliary blowing agent. ATH was considered as appropriate fire retardant additive for RPUF due to its unreactivity at the processing temperature of RPUF and endothermic decomposition at the most favourable temperature during burning of foam. Less heat is now available for decomposing RPUF to the low molecular weight gaseous fuel elements needed to sustain combustion. The micrograph of RPUF-ATH samples shows the ATH as white particles dispersed everywhere in the RPUF skeleton. These white particles were recognized as ATH particles because RPUF phase is transparent and refractive indexes of RPUF and ATH are different. On exposure to fire, RPUF was quickly consumed in fire with maximum extent burnt, burning rate and weight loss. However, RPUF incorporated with ATH exhibits great decrease in extent burnt, burning rate and PML. As the ATH percentage was increased, the flammability (extent burnt, burning rate and PML) of the RPUF samples was decreased.

Engineering of Structures against Natural and Other Disasters-CSIR Network Project

Sub Theme: Vulnerability Assessment of Buildings & Structures due to Natural Disaster in Hilly Regions *(NWP-0039)*

A. Ghosh & Team

The Rishikesh-Uttarkashi-Gangotri National Highway has many unstable slopes and landslides. These landslides always threat human lives and properties, which include buildings, bridges, power transmission line etc. One such unstable slope near Agrakhal on way to Uttarkashi is causing road subsidence and damage to several houses situated on down hill slopes (Fig. 3). The slope has many houses which have shown distress. The building of Garhwal Mandal Vikas Nigam Guest house has been considerably damaged (Fig. 4). This unstable slope has been selected for detailed geological and geotechnical study.

Topographic survey of the slope was carried out and a contour map was prepared on 1:1,000 scale with 2 meter contour interval (Fig. 5). From the contour map Digital Elevation Model (DEM) was generated in GIS (Fig. 6). A slope map of the slope was also derived from the DEM.

The geological data were collected to prepare the geological map of the area (Fig. 7). Rocks present in

Fig.3-Study area

Fig.4-Road subsidence and damaged houses

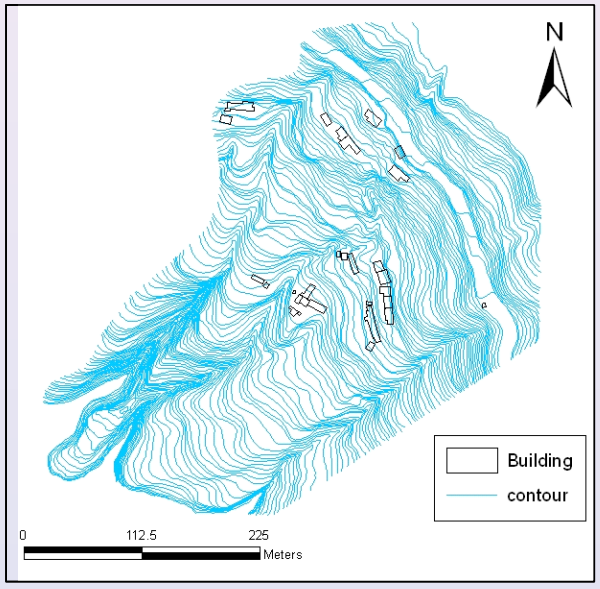


Fig.5-Contour map

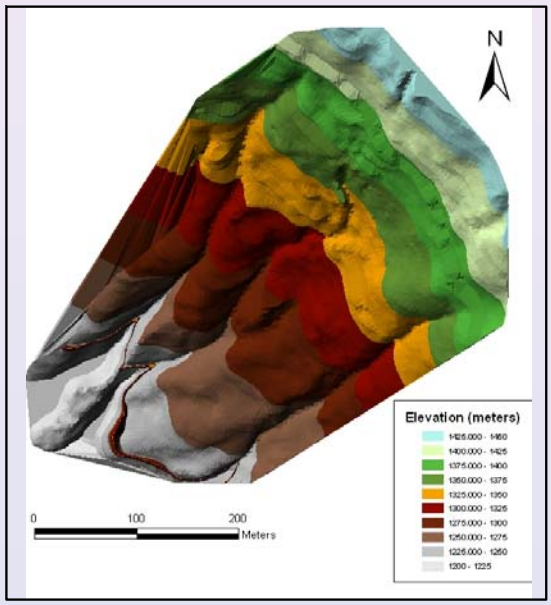


Fig.6-Digital elevation model

the area are shale and Phyllites, which are highly weathered, fractured and thinly bedded. The rock beds dip 50° towards NW and there are two major joint sets, out of which one joint dipping towards NE is outward dipping favouring slope instability (Fig.8). The soil cover on the slope is about 2-5 m thick. There are three major drains on the slope. The houses situated on either side of the central drain have shown sign of distress. From the field investigation it is inferred that continuous water flow in the central drain is contributing slope instability in the area.

Soil samples were collected from different horizons. These samples were tested in the laboratory for their geotechnical engineering properties such as grain size, proctor density, direct shear etc. The soil comprises

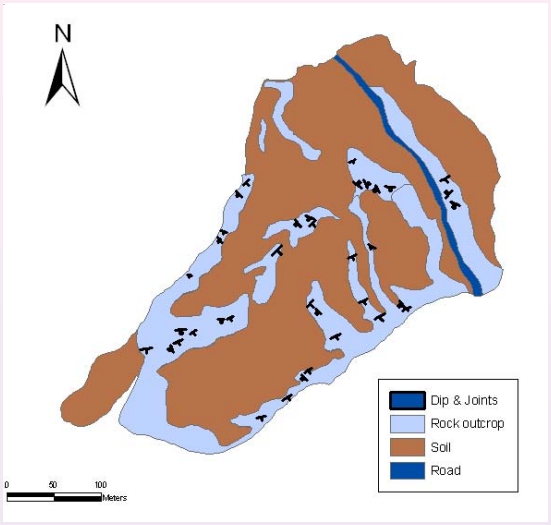


Fig.7-Geological map

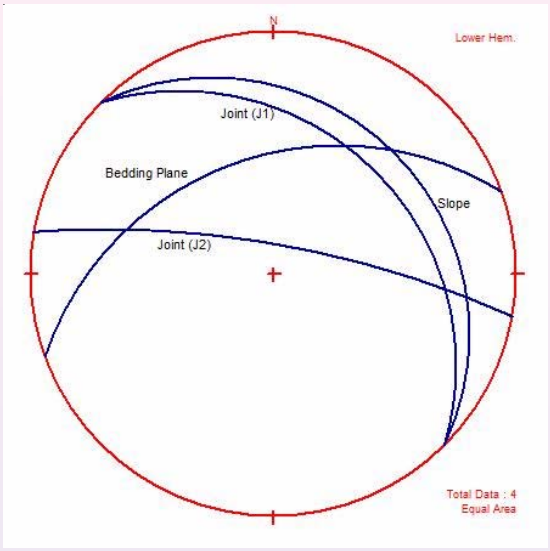
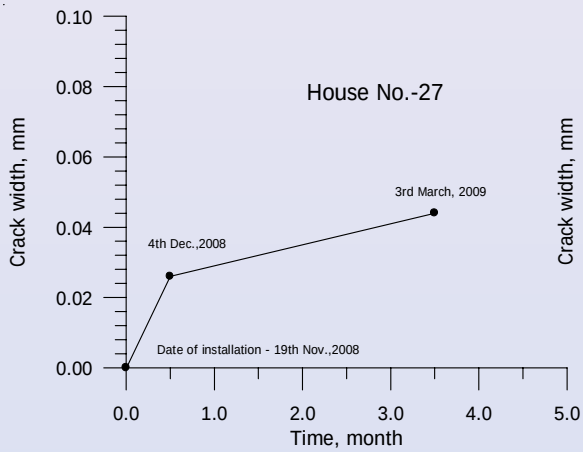


Fig.8-Stereo plot of structural data



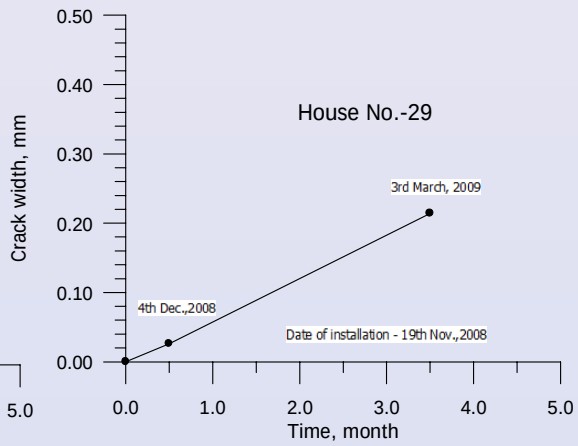


Fig.9-Monitoring of cracks in buildings situated on the slope

of gravel 34%, sand 35%, silt 29% and clay 2%. It is a less cohesive soil with cohesion ranging from 0.02 -0.11 Kg/cm^2 and friction angle 40^0- 46^0.

There are numerous cracks in several houses. Some of the cracks are being monitored through simple devices (Fig. 9). For this two studs fixed at both side of the crack and an extensometer having the accuracy of 0.002 mm is used.

The study so far has shown that the slope is still in unstable state and to quantify it, stability analysis is being carried out. The instability in the slope is mainly due to water seepage through jointed and fractured shale beds. Rock joint analysis shows an outwardly dipping joint in relation to slope which is also favouring slope instability. Adequate remedial measures will be suggested after completion of the study.

Assessment & Monitoring of Distress and Remedial Measures for Ancient Temples in Uttarakhand *(SSP-1027)*

Y. Pandey & Team

Historical and recent earthquakes created large scale destruction of buildings in Uttarakhand Himalaya. It is reported in literature that ancient temples were also severely damaged during the earthquakes, but unfortunately they could not get sufficient attention due to obvious reasons and the rehabilitation strategies adopted by the administration centred on mass housing leaving the ancient monumental structures in distress state. On request of ASI, Dehradun, CBRI has undertaken the study on the present status of two famous ancient temples Sun temple located at Katarmal (Almora) and Gopinath Temple at Gopeshwar to know the distress and instability to arrive at possible remedies.

The main objective of the study is to assess the present status of the Sun Temple of Almora and Gopinath Temple of Gopeshwar with respect to seismicity and slope instability through instrumental monitoring study along with geological and geotechnical investigations and suggesting possible remedies to minimize the deterioration process.

Sun Temple, Almora

The Sun temple popularly known as Baraditya is one of the biggest and oldest temple of Kumaun Himalaya. The temple (Fig.10) is located at Kosi-Katarmal area, which is about 15 km from the Almora town. It was probably built in 13th century by the Katarmal Raja, the Medieval king of Katyuri dynasty who ruled the Central Himalayan region. There are 45 miniature shrines clustering around the main shrine which seems to be constructed in different periods. The region known to be prone for earthquakes, is

Fig.10-Main Temple

situated in the seismo-tectonically active zone. From the various sources of information, it is observed that the region has been affected by several earthquakes ranging between 4.5-6.8 magnitudes on Richter scale.

A field survey was carried out to collect first hand information about the temple. The visual inspection of the Sun temple of Kosi-Katarmal indicates that settlement and tilting around the main temple has taken place in the past. There are indications of seepage on the walls of the main temple. There are weak joints at several locations in the temple through which rain water seeps inside the temple. The sign of distress was very prominent in few of the miniature temples (Fig.11a). The inclination data of all the temples were measured. It was observed that the majority of the temples inclined in North direction. The maximum inclination of a temple was found to be 13° degree. About 12 inches displacement (Fig. 11b) of one of the shikhars of the miniature temple was also observed.

Fig.11a- Northward tilt in miniature Temple

Fig.11b - Displaced shikhras of the miniature temples

Gopinath Temple, Gopeshwar

The Shiva temple known as Gopinath temple (Fig.12) is one of the biggest temples of Garhwal Himalaya situated at Gopeshwar on the ancient route of Badrinath and Kedarnath shrine. The temple is located centrally in the compound with a shikhar. The Gopeshwar town in the Chamoli region known to be earthquake prone is situated in the seismo-tectonically active zone with a close proximity to Main Central Thrust (MCT).

A field survey was carried out to observe the present state of the temple. From the various sources of information, it is observed that the region has been affected by several earthquakes ranging between 4.5-6.8 magnitudes on Richter scale. Evidences of severe damage during 1803 event in Gopeswar temple has been reported and many parts of the temple have been reconstructed. The temple suffered only minor vertical cracks during chamoli earthquake 1999 in spite of it being located in meizo-seismal area. This indicates that the intensity of 1803 earthquake experienced at Gopeshwar have been much larger. During Chamoli earthquake nearest Strong Motion instrument was located in Gopeswar and the peak ground acceleration (PGA) recorded was 0.359 g at a distance of 10 km from the epicenter.

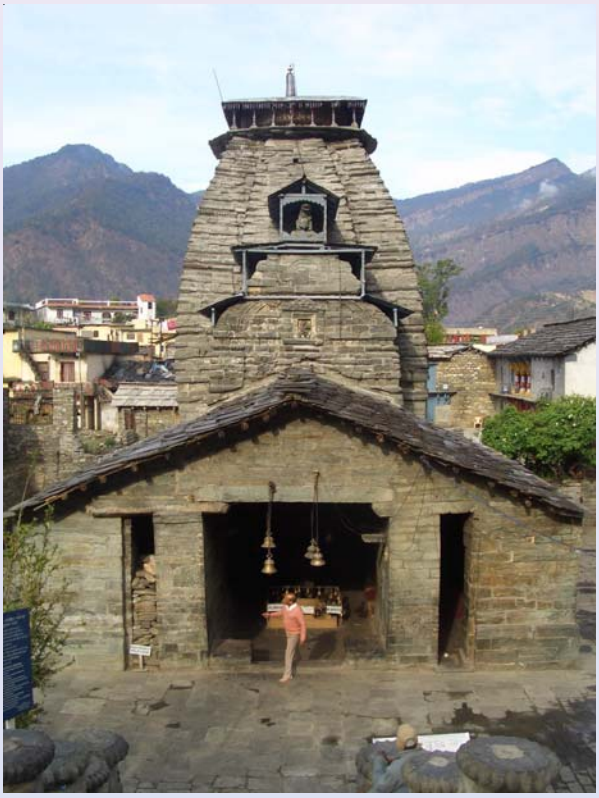


Fig.12-Gopinath Temple, Gopeshwar

In the Gopeshwar temple it was observed that water leakage was the main problem (Fig.13). There are weak joints and cracks at several locations in the temple through which rain water seeps inside the temple. The crown of the temple is also in very bad shape, allowing sufficient inlets for water to enter. Further, problem of settlement and tilting were also observed in the temple structure (Fig.14).

Fig.13-Indication of Water Seepage

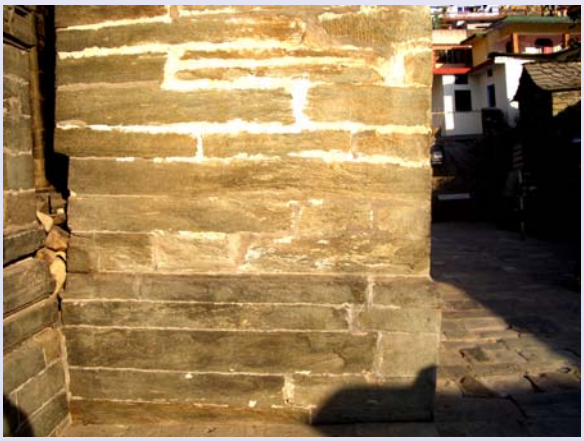


Fig.14-Indication of settlement and Tilting

Geological, geophysical, geotechnical and structural investigations are being carried out for possible causes of distress. Data pertaining to monitoring of inclinations and settlement of the temples are being analysed to know the present status of the temples. The structural integrity of the temple will be assessed and possible remedies will be suggested.

CFD Modeling of Fire in Building Corridor *(OLP-308)*

Shorab Jain

This work was initiated on account of development of major infrastructure in the country in this decade in the form of Malls, Underground car parks, Metro corridor etc. Therefore efforts were made to study fire safety inside these large aspect ratio enclosures using Computational Fluid Dynamics (CFD) as a tool. A particular case of transport tunnels (Metro) was chosen in view of its importance in the form of coming of Delhi Metro.

The study of various safety components shows that ventilation system is one of very important safety measures inside tunnels used for controlling and extracting smoke in case of fire emergency. In long tunnels, where ventilation is provided by mechanical means, two types of ventilation layouts exist - longitudinal and transverse. The longitudinal ventilation is provided through jet fans located axially below the ceiling or through jet injection system where the fans are located in a fan room and air is supplied through ventilation shafts. In longitudinally ventilated tunnel fires, smoke and hot gases form a layer below the ceiling and flow in the direction opposite to the ventilation stream. This phenomenon is called back layering. (Fig 15)

The ventilation velocity just sufficient to prevent back layering of smoke over the stalled vehicles is the minimum velocity needed for smoke control and is known as the critical velocity (Fig 16). The ability of the longitudinal ventilation system to prevent back layering is the current industry standard to measure the adequacy of the system for smoke control. The ventilation velocity depends on number of parameters such as heat release rate (HRR), tunnel geometry, slope etc. This implies that ventilation system has to be designed for each individual tunnel. The ventilation system can though be designed and evaluated through experimental studies of each tunnel, but that is impractical and expensive. Alternative method is to use mathematical modeling which when coupled with flow visualization techniques provides an excellent means to study the environment inside a tunnel. This should help in designing appropriate ventilation system effectively without the need to conduct experiments.

Therefore CFD model has been used to evaluate ventilation strategies in a transport tunnel in case of fire emergency. The aim is to study the smoke movement inside tunnels, and determination of critical ventilation velocity for smoke control in longitudinally

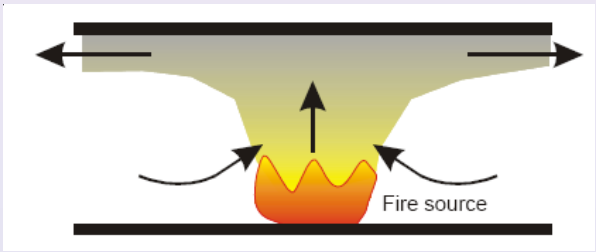


Fig.15-Smoke Progress in a naturally ventilated tunnel

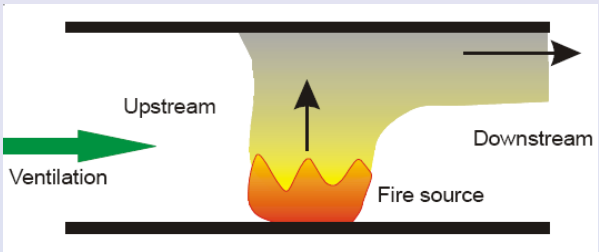


Fig.16-Influence of Longitudinal air velocity on smoke progress in the fire zone (Ventilation velocity = critical velocity)

ventilated tunnels which are similar to tunnel sections of Delhi Metro Rail corridor, India. The tunnel sections considered have jet injection type ventilation system. The CFD program, CFX is used to study the effectiveness of smoke ventilation system to control smoke spread in the event of fire inside the tunnel.

The section of tunnel considered is 400 m long, 5.5m wide and 6 m high (Fig 17). The analysis has been carried out by assuming a variable fire source with a peak heat release rate (HRR) of 16MW, located at the center of the tunnel. Ventilation ducts are located in the ceiling near the tunnel portals and inclined at 10^{o} to the plane of the ceiling through which fans discharge air. The influence of the fire HRR curve slope on the smoke flow dynamics in this realistic tunnel model fitted with inclined fans is investigated. In case of fire two scenarios are studied: (i) fans activated immediately and achieve its full speed after detection of fire. (ii) fans activated at delayed times to take into account the response time of the fans to achieve its maximum speed. The velocity of supply and exhaust fans necessary to remove smoke in 30 sec from the upstream direction is determined.

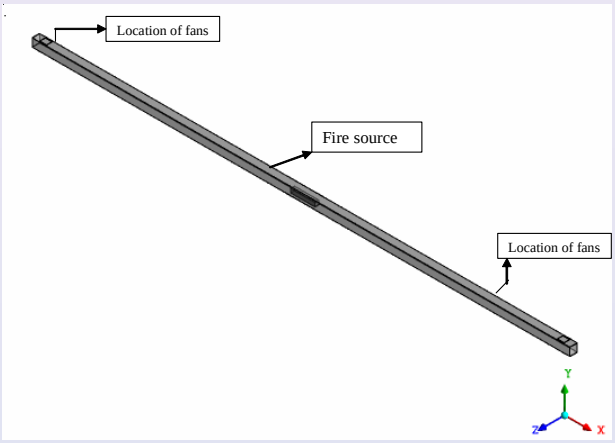


Fig.17-Tunnel Section

It is found that under natural ventilation conditions inside a tunnel, the smoke moves symmetrically along the crown in both directions, and cool entrained air from bottom of tunnel portals move towards the fire source. The smoke reaches tunnel portals in about 3 min (Fig 18). It is also found that for this type of tunnel configuration higher supply and exhaust velocities are required to produce the desired critical velocity (Fig 19) than predicted by empirical formulas available in literature. The velocities of fan required to produce different desired axial velocity inside the tunnel is determined. The exhaust fans do not influence the velocity in upstream area but are necessary for smoke removal in the downstream direction. It is also necessary that fans are activated to full speed within three minutes of starting of fire in order for the ventilation system to be effective for desired smoke removal.

Fig.18-Temperature distribution on the vertical central plane through the fire source and tunnel portals under natural ventilation condition at t = 180 s (only one half of tunnel portion is shown in figure)

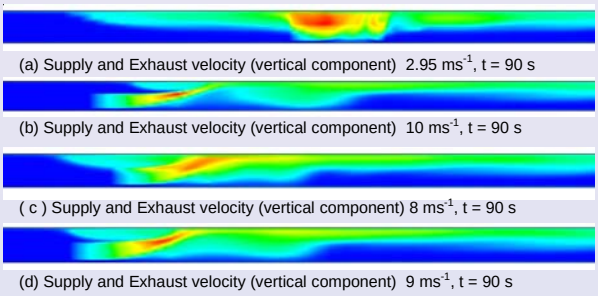


Fig.19-Thermal environments inside tunnel for different flow rates

Supra Institutional Project

Experimental and theoretical study of Masonry Walls subjected to Non-nuclear Blast Loading. *(SIP-029)*

A.K.Pandey

Masonry walls are the weakest link in a framed structure in resisting the forces during a blast event. Current codal provisions take care of only flying splinters for blast resistant design of masonry walls. Comprehensive design procedures / guidelines are required for masonry walls in a framed structure depending upon the vulnerability of the structure. Some experimental and theoretical investigations are reported in international literature however more experimental and theoretical investigations are required to evolve a comprehensive design procedure for a blast resistant design. Algorithm and software for calculation of blast pressures on walls has been completed further linear finite element analysis of masonry walls subjected to different amount of blast charges has been made. Some results are presented here.

IS-4991-1968 requires that a building may be designed for a bare charge of 100kg at distance of 40 m for residential building, 30 m for community buildings (schools, offices etc.) and 20 m for buildings housing services (hospitals, power stations). Calculations for blast pressures and positive phase duration has been made using the developed software for 100 kg blast at a distance of 20, 30 and 40m and it is found that for 40 m case reflected blast pressure is 0.658 kg/ cm^2 and positive phase duration is 20 millisecond. The transient dynamic analysis has been made and the deflection and stress plots at different points are given in Fig. 1, 2 & 3. The wall (30-cm thickness of 4m wide and 3m height) has been modeled using 20 noded isoparametric brick element and it is found that for the least pressure case at a distance of 40 m the peak flexural stress values is more than 5 MPa and with this stress level the masonry will be severly cracked and plastic hinges will be formed which will require

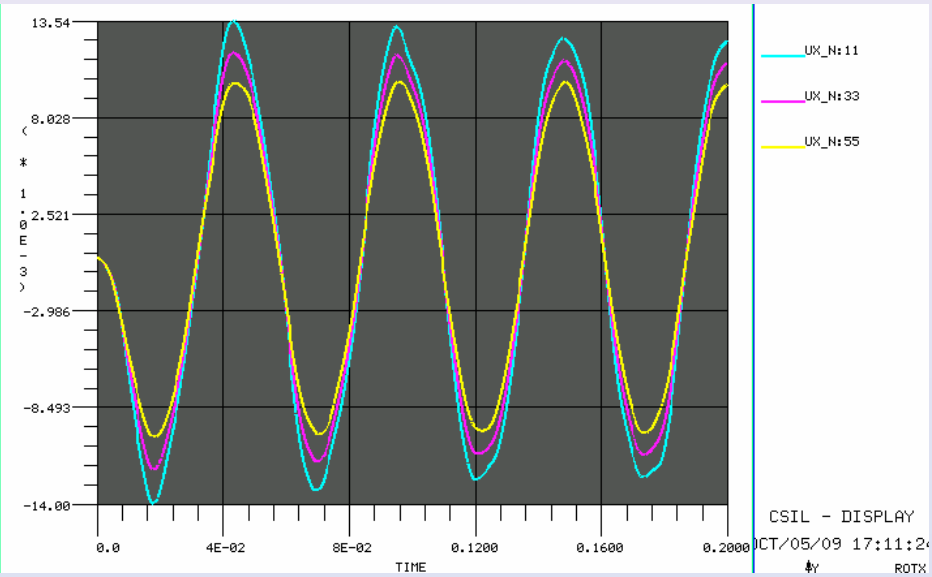


Fig. 1-Deflection of time plot of different nodes of slab

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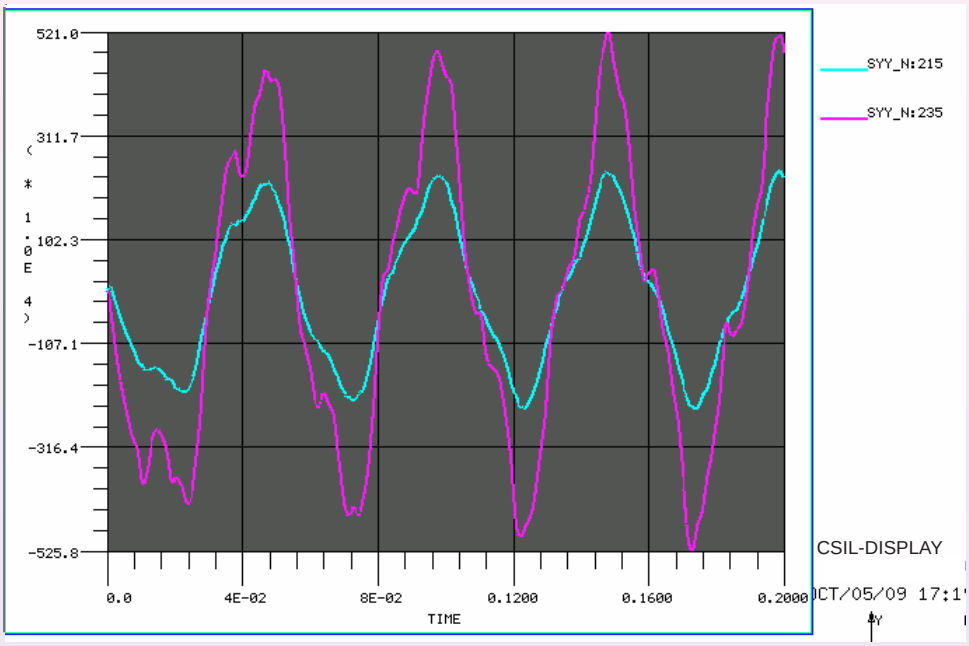

Fig. 2-Stress time plot of different nodes of slab

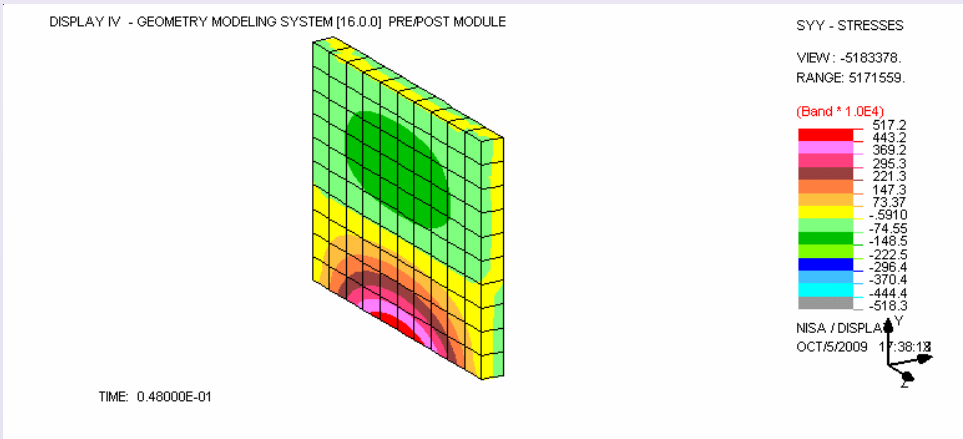

Fig. 3-Stress pattern at t=0.48e-01 for blast of 100 kg charge at 40 m distance

retrofitting.

Development of Alpha Plaster & Cementitious Binder from Non - Traditional Materials for Use in Building Bricks/Blocks and Composites *(SIP-029)*

Mridul Garg & Neeraj Jain

Gypsum is one of the important industrial mineral having multiple uses. Calcined form of gypsum popularly known as plaster of Paris occurs in two different forms namely alpha (α) and beta (β). They differ from each other in their application characteristics, heat of hydration and their method

of preparation. α-Hemihydrate plaster possesses much higher strength and durability than the α-hemihydrate plaster. Normally, α-hemihydrate is made by heating the gypsum in autoclave in lump form under steam pressure for 6-7 hours which is a long time consuming process.

To reduce calcination period and to get a product of considerable high strength, a novel method of making α - hemihydrate has been developed in which crystal modifiers were introduced during the autoclaving of gypsum. Phosphogypsum was autoclaved in slurry form (Phosphogypsum 50% + Water 50%, by wt.) in the laboratory at different steam pressures for different durations in presence of different chemical admixtures. It was found that with small quantity of chemical admixture (sodium succinate/potassium citrate/sodium sulphate), alpha plaster of high strength can be produced. The optimum pressure and duration of autoclaving was found to be as 35 psi and 2.0 hours respectively. The autoclaved gypsum was filtered and dried at 130^{0}C immediately and ground to the fineness of 300 m^2/kg (Blaine's) surface area in a ball mill. The alpha plaster was examined for properties like consistency, setting time, compressive strength and bulk density. The results show an increase in compressive strength and bulk density with all chemical admixtures. At 0.20% concentration of sodium succinate ($Na_2C_4H_4O_5.6H_2O$) alpha plaster gives maximum attainment of strength 27.0 MPa, setting time 8-10 minutes and bulk density 1.40-1.50 g/cc. The DTA (Stanton Red croft (UK)) and SEM (LEO 438 VP, UK) were performed on the alpha hemihydrate plaster produced at 35 psi steam pressure in presence of sodium succinate (0.20%).

DTA (Fig.4) studies shows appearance of a long endotherm at 180-190^{0}C due to formation of hemihydrate plaster .This endotherm is followed by formation of a small exotherm at 250-270^{0}C due to conversion of hemihydrate into soluble anhydrite. The intensity of endotherm peak increases with the increase in concentration of sodium succinate. It can be seen that at 0.20% of sodium succinate concentration, endotherm of maximum intensity is obtained confirming maximum formation of the alpha plaster in phosphogypsum. SEM studies showed most of crystals are prismatic columnar, hexagonal and tabular shaped and interspersed with . Occasionally twinned .

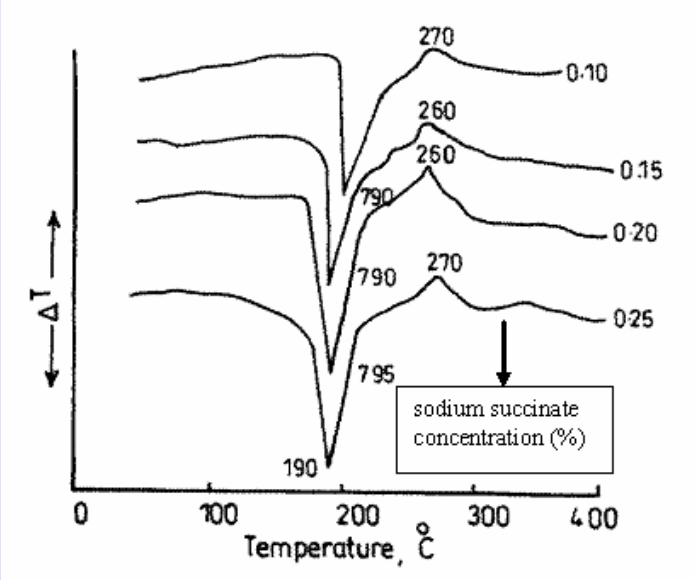

Fig.4-DTA of Alpha Plaster Produced in Presence of Different Concentration of Sodium Succinate

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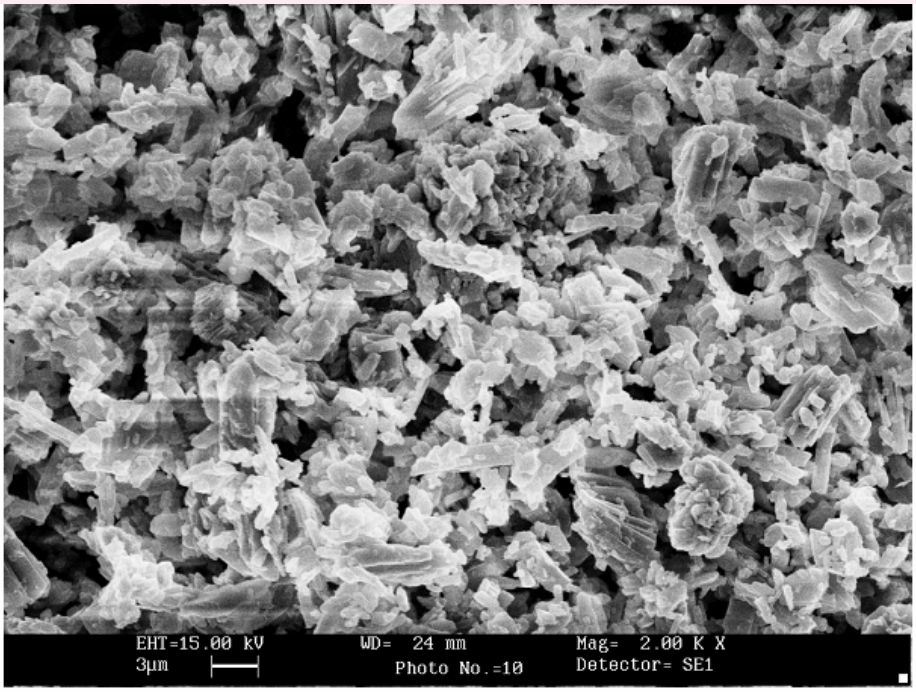

Fig.5-Microstructure of Alpha Plaster Produced in Presence of Sodium Succinate (0.20%)

Information, Extension & Project Management

International & Information Management Division

The International & Information Management Division continued to serve as the nerve center of the Institute conducting and co-ordinating multifarious activities, such as, collection, storage and dissemination of R&D information; handling scientific and technical enquiries; publicity and public relations, including liaison with Bureau of Indian standard etc. Compilation, editing and publication of Annual Report to meet the inter and intra-institutional information needs, editing and publication of CBRI Newsletter and Bhavnika periodically, publication of Building Research Notes, Project Profile, Technical and Divisional Brochures etc., preparation of other scientific/technical reports and filling up of questionnaires and performae received from various departments/organizations; write-ups for the 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 Media.

The following activities were organized in the Institute during the period :

Independence Day

The Independence Day was celebrated at the Institute on August 15, 2008. Dr. Ashok Kumar Gupta, Scientist 'G' unfurled the National Flag and addressed the members of the staff. The CBRI staff club distributed sweets on the occasion.

Sadbhavna Diwas

The Institute observed Sadbhavna Diwas on August 20, 2008 with a view to promote harmony amongst people of all religions, languages and states and goodwill towards everyone. Dr. A.K. Gupta, Scientist 'G' administered the Sadbhavna pledge to all the staff members of the Institute.

Hindi Week

The Institute celebrated Hindi week which was ended on September 19, 2008. The concluding function was presided over by Dr. Ashok Kumar Gupta, Scientist 'G' CBRI and Dr. Yogendra Nath Sharma 'Arun' a renowed Hindi Scholar, Ex-principal, BSMPG College, Roorkee, was the Chief Guest and Shri R.C. Saxena, Sr. Hindi Officer was the Organizing Secretary.

Dr. Sharma, in his speech, applauded the efforts made by the Institute for popularization of Hindi. He dwelt about the role of Hindi in the National and International sphere. He emphasized that we should not think the use of Hindi only in the inter-state level but we have to steer out efforts to make it as a pride in the international level. Dr. A.K. Gupta in his presidential address told that Hindi is symbol of our culture and, by glorifying it, we would be able to get the Hindi at its right place among masses. He emphasized that efforts should be made at the official/government level to make Hindi recognized one of the official language of UNO. Dr. A.K. Gupta apprised that CBRI is always working towards progress of Hindi and he assured that in future also there would be enough support for its upliftment. He emphasized that many interesting and useful books in English should be translated in Hindi so that every individual gets the benefit of the good literature available.

During Hindi week, several Hindi programmes and competitions were organized in which a number of Scientific/Administrative staff participated. On this occasion prizes were distributed to the winners of various competitions organized during the Hindi week.

Shri R.K. Srivastava, Scientist 'F' and Chairman of the organizing committee presented an introduction of the Chief Guest and Shri S.C. Tyagi, Controller of Administration presented a vote of thanks.

CBRI Observed Open Day on CSIR Foundation Day

CBRI observed 'Open Day' on September 26, 2008 to commemorate the Foundation Day of Council of Scientific and Industrial Research. The Institute was left open to the public and school children were invited to interact freely with the scientists of the Institute. Shri Anand Kumar, Director (R&D), Indian Oil Corporation Ltd., Faridabad graced as Chief Guest.

Shri Anand Kumar congratulated scientists and staff members of the Institute for carrying out various R&D programmes concerned with the Building Science & Technology. The R&D work of CBRI has benefited the society, particularly the rural people of the country. He told that the Nation is indeed proud to have an organization like CSIR in the Indian Sub-continent under the aegis of the Ministry of Science & Technology. Shri Anand Kumar, the Chief Guest of the ceremony draw attention on the problem of Global Warming. He also emphasized the need of environmental friendly constructions and also highlighted the importance of YOGA in our life with the living examples.

In his inaugural address, Dr. M.O. Garg, Director, of the Institute welcomed the Chief Guest and highlighted the Institute's R&D activities. He informed that CSIR has always received due importance and appreciation by its President, the Prime Minister of India and Vice President, the Hon'ble Minister of Science & Technology and all those familiar with contribution of CBRI/CSIR. He apprised that the President of CSIR, Dr. Monmohan Singh Ji, in the meeting of CSIR Society has complimented the role of CSIR in the overall development of the country and has appreciated the efforts made by CSIR.

Dr. M.O. Garg told that the Scientist of CBRI and other CSIR labs are facing a great challenge to keep pace with the development in different parts of the globe and it is indeed a matter of great satisfaction that our country is now considered as one of the greatest resources of the world market as the Scientists of this country have proved their worth. CBRI is one of those labs which is directly concerned and connected with the upliftment of common man because shelter is considered as one of the basic needs. CBRI has always played a vital role in finding appropriate solutions for providing houses and buildings to meet the aspirations of the people of this country.

On this occasion the retired persons and the employees who have served CSIR for 25 years were honoured. Two meritorious awards for obtaining more than 90% marks in more than three science subjects in secondary examination (2008) were given to Master Bharat Agarwal S/o Dr. Atul Kumar Agarwal and Ms. Surabhi Sharma D/o Shri Vijay Sharma. An essay competition on "Living with Science" was organized in three groups for CBRI wards. Master Parnav, Ms. Shubhangi Singh, Devaduti Kunungo, Master Vipin Karade & Dhruv Raj Singh Rawat were awarded in I group and Ms. Chavi Sharma, Niti Deoliya, Shreyati Chakrabarti, Manisha Mohnot, Megha Saini & Anushka Swarup were awarded in II group and Consolation prize was awarded to Master Arif Ahmed in III group.

The whole ceremony was compared by Shri Yadvendra Pandey, Scientist 'F' and the vote of thanks was presented by Controller of Administration, Shri Subhash Chand Tyagi.

Vigilance Awareness Week

The Institute celebrated Vigilance Awareness Week during 03-07 November, 2008. Different programmes which includes special lecture, poster

competition for school children of staff wards, debate competition for staff members etc. were organized during the week. The valedictory function was organized in the Institute's Auditorium on 7th November, 2008. Dr. Ashok Kumar Gupta, Scientist 'G' presided over the function. Dr. Rakam Singh, Director General, IMS, Roorkee was the Chief Guest and gave away the prizes to the winners of different competition. Dr. S.K. Saini, Scientist 'F', Chairman, Organizing Committee presented a brief note of the function and it was concluded by a vote of thanks, presented by Shri S.C. Tyagi, Vigilance Officer and Controller of Administration.

Inauguration of the Advanced Material Science Laboratory

Dr. M.O. Garg, Director, CBRI inaugurated the Advanced Material Science Laboratory of the Institute on November 20, 2008. Mrs. Anjali Tiwari, CVO, CSIR also graced the occasion alongwith other distinguished persons. The laboratory encompasses facilities for new product and process development, physico-mechanical characterization of building materials and synthesis. It will help to initiate work in a few new R&D areas of building materials viz. bio-degradable composites, and nano-coatings. These well equipped laboratory will be a great asset for achieving the goals and to cater to the needs of future R&D work.

Prof. Samir K. Brahmachari DGSIR addresses CBRI Staff

Visiting the Central Building Research Institute, Roorkee on 27 December, 2008, Prof. Samir Kumar Brahmarchari, Director General, CSIR, addressed the CBRI Staff, on the quality of leadership and importance of CBRI. He said that CBRI Scientists have potential but a good leadership is required to tap the potential. He reminded that the Institute's role is to ensure how the country can grow and develop a Low Cost Housing Model for the poor segment of the country.

Prof. Brahmachari also spoke about the mentors and leadership that he had when he started his career as a CSIR Research Fellow at Indian Institute of Science, Bangalore in mid 70s.

In 1995, he was a part of human genome project formulation funded ($ 3 billion) by United States. Today the human genome sequence is an open source document, he added. Prof. Brahmachari further said that when the human genome sequence was over, as a Director of Institute of Genomics and Integrative Biology (erstwhile CBT), he launched Indian Genome Variation Project to bring India into the world genomic map and he succeeded in his endeavour. He informed that he has created "G.N. Ramachandran Knowledge Fund" at the Institute of Genomics and Integrative Biology (IGIB), New Delhi, for providing fellowships to carry out the studies on genomics and integrative biology. Prof. Brahmachari stated that as the world is advancing very fast, CSIR will also have to change its gears in the right direction. He urged the scientists to concentrate on their missions. He lamented that people still do not know what CSIR has done for the country.

Prof. Brahmachari said that CSIR is adapting to changing needs. He pointed out that CSIR stands for Council of Scientific and Industrial Research with Corporate Social Indian Responsibility. Prof. Brahmachari assured that CSIR would render high science which will empower the farmers in future. Briefing about the new initiatives, he said that affordable health, sustainable energy, potable water and waste to energy are the prime issues on which CSIR will concentrate more by launching the CSIR –800 programme for betterment of the people in the country. He also apprised about soleckshaw – The Flagship programme of the recently launched initiative of CSIR, CSIR – 800 – Sustainable effort to utilize the fruits of cutting-edge science to improve the quality of life of 800 million Indians, who are at the bottom of the "Pyramid of quality of life". He informed that India need to spend Rs. 1000 crore to convert 8 million traditional rickshaws into petrol-

driven vehicle, it will not be sustainable. Each soleckshaw is thus capable of saving carbon-di-oxide emission to the tune of Rs.4,000/- per annum and total saving countrywide approximating Rs. 200 crore.

During discussions under the leadership of Dr. M.O. Garg, Director, CBRI, five projects from CBRI under CSIR-800 programmes i.e. Low Cost Prefabricating Housing – Dr. A.K. Pandey, Energy Efficient Building Design – Shri Ashok Kumar, New Materials for Buildings – Dr. S.R. Karade, Earthquake Disaster Mitigation of Buildings and Nuclear Reactor – Dr. Navjeev Saxena, Fire Resistant Materials and Techniques – Shri Suvir Singh were identified.

Prof. Brahmachari also had a meeting with Heads of various Divisions, Achiever's Groups and Young Scientists of the Institute.

CBRI Foundation Day

The Institute celebrated its 62nd Foundation Day, established on February 10, 1947, the CBRI is the permier institute of the country for research and development in building technology. Speaking as the Chief Guest, Shri S. Sreedhar, the Chairman and Managing Director of the National Housing Bank (NHB), said that though there had been about 40% increase in housing loans, the facility remained limited only to the upper and the middle classes and the poor segments of society were still far away from the facility provided by the housing finance companies. The scientists, specially those of the CBRI, can make an important contribution in this direction by developing very low cost techniques of building construction, remarked Shri Shreedar. Highlighting the achievements of the institute, the director of the Institute Dr. M. O. Garg said that recently two new technologies of the institute had been patented and the process of getting of more technology patented is in the pipeline. The scientist of the institute are also engaged in developing techniques of fire safe buildings and fire safe building materials. The institute has played a pioneering role in developing low cost and eco-friendly technology of building construction, with focus of the use of indigenous materials, suited to the requirements of the different geo-climatic regions of the country.

The institute has also played a key role in developing earthquakes resistant building construction techniques and also in the rehabilitation of the earthquake affected area. Our scientists are also contributing to the construction work for the Common Wealth games to be held in Delhi 2010, said Dr. M.O. Garg. On the occasion, two scientists of the institute Dr. A.K. Gupta, Ex. Scientist 'G' and Dr. A.K. Minocha, Scientist 'F' were also honoured with the diamond jubilee director award for developing gravitational settling chamber technique for pollution control in brick kilns.

Shri M.P. Singh, Scientist 'G' and Shri S.G. Dave, Scientist 'G' also spoke on the occasion. Shri S.C. Tyagi, COA proposed vote of thanks.

Conference on Trends and Challenges in Structural Engineering and Construction Technologies

The Institute organized a Conference on Trends and Challenges in Structural Engineering and Construction Technologies during 11-12 February, 2009 at Roorkee.

The objective of the conference was to bring together the scientists, researchers, field engineers, design engineers and planners, working in the field of infrastructure development and building science and technology. The conference provided a plateform for R&D organizations, academia and industrial agencies to present their latest achievements and to further explore the possibility of deriving synergies.

The conference was inaugurated by Prof. Prem Krishna, Former Professor, IIT, Roorkee and Founder President of Indian Society of Bridge Engineering. The inaugural function was presided

over by Dr. M.O. Garg, Director, CBRI, Roorkee. Dr. T.K. Datta, Professor, IIT, Delhi also graced the occasion as Guest of Honour. Shri S.G. Dave, Scientist 'G' introduced the Chief Guest to the audience. Dr. A.K. Pandey, Scientist, CBRI and Organizing Secretary of the conference welcomed the distinguished gathering and also apprised the theme of the Conference. Dr. Rajesh Deoliya, Scientist proposed the vote of thanks.

Prof. Prem Krishna in his inaugural address, spoke that South-east Asia, wherein India lies, is severely affected by mainly three kinds of natural hazards, namely wind storms, earthquakes and floods. From the point of view of Structural Engineering and Construction Technology (the theme of the conference), the first two have a different bearing on the problem of disaster mitigation, than the latter. In fact, it is interesting to see the 'commonalities and contradictions' in ensuring the safe design of structures for wind and seismic loads, whereas floods present a different nature of problem.

Earthquake engineering has been pursued quite vigorously over the last few decades in India, but surprisingly, wind engineering has taken the 'back seat', despite the increasing challenge of safety against wind for the developing infrastructure. Although India is as yet quite some distance behind the developed world in building tall and slender structures, which are wind sensitive to a great extent, the country is very much at the take off stage. Besides, a number of structures of innovative geometrical form are coming up. These present a challenging wind engineering problem.

Although the issue of safety under wind loads is important to structures in various sectors – housing industry, communication, transportation, energy – involving buildings, towers, bridges, chimneys and cooling towers – buildings present the major proportion of these.

Dr. M.O. Garg, in his presidential address, hailed the achievements of CBRI in the structural engineering and construction technologies. He apprised that structural engineers play a key role in planning and designing national infrastructure and habitat. Developments in structural mechanics in last few decades have made it possible to analyze and design complex geometrical shapes with more confidence and use optimization tools for arriving cost effective solution. With increasing population and tremendous increase in cost of land, there is further challenge for optimal utilization of space and designing tall structures which may be subjected to extremely large wind, earthquake, impact and explosive forces. Construction technologies especially prefabricated components for buildings, bridges and flyovers are the need of the day for faster construction. Civil engineering profession is going through a vital transformation phase now. There is a demand for specialist for planning and execution of different parts of the project. Structural Engineering is being diversified into wind engineering, earthquake engineering, material engineering and bridge engineering fields. CBRI contributes significantly in applied and basic research in various areas of Building Science and Technology to provide S&T backup to the problems related to Shelter Planning, Building Materials, Structure, Foundation and Disaster Mitigation. The conference is aiming to review the information related with analytical techniques, materials, design tools, construction technologies and various ongoing research programmes in the structural engineering. He also apprised the recently launched initiative of CSIR-800.

Prof. T.K. Datta, in his key note lecture presented a methodology for semi-active control of building frames using semi-active hydraulic damper (SHD) and fuzzy rule. The SHDs, installed in combination with steel bracings and the methodology developed in the MATLAB environment were presented. He also showed an illustrative example of a five storeyed steel frame selected from the literature. The control of the responses of the frame under EI-centro earthquake record is obtained for a specified set of the frame, steel bracings and the SHD properties.

Different distributions of the semi-active control force along the height of the frame are tried in order to arrive at the best distribution for obtaining the maximum control of a response quantity of interest. An extensive parametric study is conducted to investigate the effectiveness of the control scheme under the variation of the important parameters. The results of the study show that an efficient semiactive control strategy can be developed using fuzzy rule base. Further, optimum combinations of parameters for maximum control are different for different response quantities of interest.

The conference had key note lecture from Prof. D.K. Paul, IIT, Roorkee on Seismic Base isolation of Multistorey Buildings-an overview. Seismic base isolation is a technique that mitigates the effects of an earthquake by essentially isolating the structure and its contents from potentially dangerous ground motion, especially in the frequency range where the building is most affected. In recent years base isolation has become an increasingly applied structural design technique for buildings and bridges and especially for structures that must remain fully functional during a major earthquake e.g. hospitals, fire stations, and emergency command centers. Many types of structures have been built using this approach and many others are in design phase or in construction. He also explained the importance, applicability, design technique and testing method of base isolation systems.

Dr. A.K. Pandey, Organizing Secretary in his paper, 'Curvature Ductility of Reinforced Concrete Beams at High Strain Rates', explained an iterative approach for computation of curvature ductility factor for doubly reinforced concrete sections, which takes into account strain rate sensitive properties of concrete and steel. The available curvature ductility reinforced concrete rectangular sections with a range of tension and compression steel ratios has been derived at a strain rate varying from $3.3x10^{-5}$ to $1.0x10^{1}$/sec encountered during static and earthquake loading. The parametric studies have indicated that curvature ductility factor decreases at higher strain rates. The percentage decrease is more for a richer concrete mix with the similar reinforcement. Various codal provisions for providing required ductility in moment resisting frames have been discussed.

Prof. V.K. Verma, Civil Engg. Department, G.B. Pant University of Agriculture and Technology, Pant Nagar explained the effect of elevated temperature on high strength concrete. Dr. Rajesh Deoliya, Scientist CBRI explained the challenges in Life Prediction of RCC Structures. Dr. Achal Mittal Scientist presented the paper on Shear Strength and Flexual Behaviour of Reinforced Hollow Concrete Block Masonry.

In all 54 contributory papers were presented in 6 technical sessions. An exhibition was also organized to display technologies and products in the area of interest to the conference.

During the valedictory function Dr. Gopal Ranjan, DG, CoER was the Chief Guest. Shri M.P. Singh, Scientist 'G' thanked all the speakers and delegates for their active participation, the sponsorers for their support, and the organizing committee and others involved on their committed and enthusiastic efforts.

Workshop cum Training Programmes

Workshop cum Training Programmes for Village Education Committees in various Districts of Uttarakhand

Various Workshop cum Training Programmes were organized during Dec.08 to March 09 under the project **"Third party evaluation and quality inspection of school buildings construction"** of Sarva Shiksha Abhiyan at Dehradun , U.S. Nagar, Rudraprayag , Uttarkashi, Tehri Garwal, Champawat & Haridwar. Lectures were delivered by Dr. A. K. Mittal, Sh. S.K.Negi, Sh. I. A. Siddiqui, Sh. Rajeev Sharma & Sh. A. K. Sharma on the various topics viz: Achieving Quality in Construction, Concept of Earth-quake , Earth-quake Resistant Design, Non-Destructive Testing of RC Components & Quality Control Programme . A Questionnaire Pertaining to

QC Practices was also discussed with the participants.

Short Term Training Programme on AutoCAD

Building Processes Plants & Productivity Division and International & Information Management Division of the Institute organized an In-house *Short-term Training Program on AutoCAD* during 16-20 February 2009 which was attended by twelve scientists and technical officers of the Institute. Shri Sudhir Sharma organizing secretary of the programme was the course expert and main faculty. The course coverage included 2D drawings and 3D modeling for architectural, civil and mechanical engineers. Dr. S.K. Saini the course coordinator in his address mentioned that in future more courses on engineering subjects would be organized for the benefit of the S&T staff of the Institute. Shri Vinod Kumar, Event coordinator, stressed that the importance of such programmes can not be undermined and many other such programmes are in the pipeline wherein experts from other labs would also be invited to deliver lectures during the courses. Shri M.P. Singh, Scientist 'G' inaugurated the course and also gave away the Certificate of participation to the participants in valedictory session. He emphasized the need for training of the senior staff members of the Institute in Office automation, so that they may be able to handle their correspondences and e-mails independently. The hardware and software support and practice sessions at the Institute's Computer Centre were provided under the guidance of Shri P.K. Gangopadhyay, Sc., BPPP Division.

National Science Day

The Institute celebrated National Science Day on 27th February, 2009. On this occasion, a Special programme focusing screening of technical films was organized.

- **Learning Science on**
  - Understanding the Universe
  - Solar System
  - Our Own Earth, Air and Water
- **Achievements of CSIR Institution, CSIO, NAL, NEIST etc.**
- **Mechanized Brick production**

Annual Flower & Vegetable Show

42nd flower & vegetable show 2008, one day annual event organised by CBRI on March 08, 2009 proved to be a big draw. The show evoked overwhelming response and people enjoyed the colours of spring. The show was inaugurated by Dr. M.O. Garg, Director, CBRI, Roorkee. Hundred of varieties of seasonal flowers, vegetable and annual plants were displayed in the show. The other highlights of the show were different types of flower, miniature, salad & dry arrangement.

Running trophies were awarded to the winners of the show. Trophies for king of the show was awarded to Prof. S.C. Saxena, Director IIT, Roorkee, queen of the show was awarded to AGM Power Grid, Roorkee. At the end of the show Col. A.N. Thakur, Dy. Commandant, BEG&C, Roorkee, Chief Guest gave away the prizes & trophies to the winners of the show. On this occasion Dr. Garg applauded that the main objective of organizing flower show is to develop aesthic sense and create a general awareness among the people for flower and vegetables, making their dwellings and environment clean, healthy and colourful.

Library

CBRI Library is actively engaged in acquisition, technical processing and updating the collection and providing the platform for e-access of information sources to expand the horizon of information base to the scientific community.

Acquisition:

Books: The library added 56 number of books (45 through purchase + 11 on gratis basis).

Journals: The library has subscribed 119 (68 foreign + 51 Indian) journals.

211 volumes of journals were got bound.

Library Statistics: The present position of library Collection:

Books including reports; standards; conference proceedings; theses & maps	: 42866
Bound Periodicals	: 19421
Microfilms	: 56

Institutional Membership

The library continued to renew the membership of learned national/international professional societies and received their publications against the membership.

National (India)

Indian Building Congress (IBC), Delhi; Indian Geotechnical Society (IGS), Delhi; Institute for Steel Development and Growth (INSDAG), Kolkata.

International/Foreign

International Council for Research & Innovation in Building and Construction (CIB), Rotterdam, The Netherlands; International Union of Laboratories & Experts in Construction Materials, Systems and Structures (RILEM), Bagneux, France; International Federation for Structural Concrete (fib), Lausanne, Switzerland.

Exchange of Publications

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

CBRI library is maintaining continuously good relationship with the libraries located in Roorkee viz. Indian Institute of Technology; National Institute of Hydrology; Irrigation Research Institute; Bengal Engineering Group library and so on, providing resource sharing through inter library loan.

Besides the local network, library is maintaining the liaison with the libraries of CSIR Laboratories and other academic/research institutions.

Library Services

Library 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, library is also rendering the following services :

Documentation

Paper clipping service is continued through scanning eight no. of newspapers in English and Hindi version. The topics of the interest of the institute under eleven major heads like-Building Materials; Structure & Foundation; Disaster Management; Earthquake & Landslides; Shelter Planning & Policy; Environment Science & Technology; Fire Research; CSIR/ CBRI etc. The paper clipping are kept in classified order for providing current awareness service to users.

List of Latest Addition

Library is bringing out a quarterly list of latest arrivals of books for the general awareness of library users.

Bibliographic Service

Library is providing bibliographic service to users on demand on the subject of interest from in house data base as well as international databases.

OPAC Search

Library 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 Search

Library has subscribed International Construction Database (ICONDA). Other CD-ROMs are also available in library viz. CIB Conference Proceedings, ACI Manual, Patestate: a database of CSIR patents and heritage buildings and sites and different sections of ASTM.

In-house Database

Library is maintaining in-house created bibliographic database of books and bound volumes of journals.

Internet Facility & Access of E-Journals

Now, access to over 3000 full text of e-journals of leading S&T publishers, full text of Indian & ASTM Standards as well as science & patent databases are available online under CSIR E-journals Consortium.

Development, Construction & Extension Division

The Extension of CBRI's know-how for construction and building materials.

- Construction of cost effective and efficient buildings
- Establishment of production facilities/industry using CBRI Know-how
- Durable/Comfortable buildings.
- Savings in scarce materials, cost and time
- Efficient use of local materials and skills
- Human resource development
- Aid to building industry.
- Employment generation.
- Entrepreneurship development
- Enhancement of quality of life
- Poverty alleviation.
- All over the country; both in rural & urban sector; through various government and non-government agencies.

During the period the DCE alongwith Delhi Extension Centre continued to maintain an effective liaison with Central State and other Government Departments/Organizations practicing engineers and architects, construction agencies, building material manufacturers, entrepreneurs and NGOs.

In the XIth Five Year plan 2007-12, the division has refocused its extension activities to further take the CBRI technologies upto rural masses under a CSIR-RSWNET Programme on 'Dissemination, Demonstration and Trainings on Rural Housing Technologies/ Some of the important activities carried out during the year are listed below :

I. AWARENESS PROGRAMMES

S. No. •	Theme	Date & Venue	Organization Agency/ Department	Participation By way of	Participants/ Visitors and name of VIPs
1	Cost effective Rural Housing Technologies	7th Aug., 2008, Kolkata	CBRI	Presentation of paper & interaction	20 senior executives, Personnel from W.B.C.S.T. & NGOs
2.	3rd Indian Building Congress of Tripura region	8th & 9th Aug. 2008, Agartala	Indian Building Congress, Agartala	As an invited guest speaker on Rural Housing Constructions & chairman for concluding session	250 senior engineers, professionals and engineering students of the Tripura state.
3. •	Exhibition – 2nd Destination Uttrakhand	18-20th Oct., 2008, Dehradun	Friendly Exhibition & Promotors (P) Ltd. Delhi	Display charts, models, samples and distribution of literature	More than 1000 VIPs professionals, entrepreneurs, NGO personnel's etc.
4.	Audhyogik Vikas and Sanskritik Mela	14th to 20th Nov., 2008, Gauchar (Chamoli) U.K.	Dist. Admn., Chamoli	Display on Institute's Technologies appropriate to the Region, Lectures and Film shows	Over 2000 villagers, students, social workers etc.
5.	Construction & Building Expo (CBX-2008)	19-23 Nov., 2008, Pune	Builders Association of India	Display charts on CBRI R&D and presentation of paper	More than 1000 entrepreneurs, builders & visitors
6.	Building construction technologies & material appropriate to North East	19th & 20th Feb., 2009, Jorhat	CBRI	Display charts, Models, samples and demonstrations	Over 200 Scientists & Engineers
7.	Achievements of CBRI	10th Feb., 2009 Roorkee	CBRI	Display Charts on R&D	Guests of Foundation day
8.	Achievements of CBRI	11-12 Feb., 2009 Roorkee	CBRI	Display Charts on R&D	Delegates of Conference
9.	International workshop-cum-Exhibition on "Emerging Housing Technology"	24th & 25th Nov., 2008 Delhi	BMTPC	As delegate, interaction and participation in exhibition	Over 100, including VIPs, Secretary, Ministry of Housing & Urban Poverty Alleviation

II. LIVE DEMONSTRATIONS ORGANIZED

S. No.	CBRI techniques/processes	Date & Venue	No. & type of participants
1.	Precast roofing Components Ferrocement Products and Solid Concrete Blocks.	18th & 19th Oct., 2008 Bhopal	About 200 Jail-in-mates at Central Jail, Bhopal
2.	Precast Roofing components & solid concrete blocks	21st Oct., 2008 Vidisha (MP)	More than 200 Civil Engg. Students.
3.	Precast RC Planks and prefab brick panel roofing system Earthquake Resistant Features	Dec. 16 & 17, 2008 Village Hasnabad Dist. 24 Parganas, W.B.	About 40 Engineers & artisans.
4.	Precast Walling & Roofing components for Rural Houses appropriate to N.E. Regions	20th Feb., 2009, Jorhat	About 50 engineers, scientists & masons
5.	Stone Masonry Blocks, Solid concrete blocks, Precast Lintel and Lintel-cum-Chajas, partially Precast & Precast roofing components	5th May 2008 CBRI, Roorkee	2 Sr. Executives from Real Estate.

Training Programmes Organized:

Organized Training-cum-demonstration programmes on "Appropriate Rural Housing Technologies" under CSIR-RSWNET programme at :

(i) Central Jail, Bhopal for 190 qualified Jail-inmates during 17th to 19th Oct., 2008.

(ii) Samrat Ashok Technological Institute (SATI), Vidisha (MP) for 200 Civil Eng. P.G. Graduate and Diploma students and engineers of Rural Engineering Services, Vidisha from 20th to 21st Oct., 2008.

(iii) Village Hasnabad Dist. 24 Parganas, W.B., during Dec.15-17, 2008 for 25 Panchayatt/Block Egineers & Masons.

(iv) Jorhat on 19-20 Feb., 2009 for 42 construction engineers & masons from MES, State DRDA, contractors, Faculty of Engineering College and North East Institute of Science & Technology, Jorhat.

Summer Vocational Training:

Conducted vocational training of 4-8 weeks duration for 43 Under-graduate/ Post Graduate Science & Engineering students from BITS, Pilani, GBPUAT, Pant Nagar; NIT Kurukshetra; MNIT Jaipur; NIT Patna; NITK Surathkal; NIT Silchar; MBM Engg. College Jodhpur, GB Pant Engineering College Pauri (Garhwal); MITS Gwalior, IIET Bareilly, ABES Engineering College Ghaziabad and BBIT Dehradun.

Visits Conducted

- A group of 50 delegates, attending the course on 'Seismic Resistant Design and Rehabilitation of Structures' at Roorkee on 24.4.2008.
- Group of 15 engineering students of Environmental Studies alongwith faculty members on 12.5.2008.
- 33 Soldiers receiving training on 'Construction Masonry and Plumbing' at Gorkha Resettlement Training Unit, Raiwala, Dehradun on 26.5.2008.
- 15 delegates attending the course on 'Earthquake Risk Management for Rural Housing' at Roorkee visited the Institute on 5.6.2008.
- Madam N. Longvah, Additional Income Tax Commissioner, Haridwar and Mrs. Sadhna Panwar, Income Tax Officer, Roorkee, visited the Institute on 13.11.2008.

Documentation

- Prepared a 4 pages institutional brochure highlighting **'CBRI technologies, expertise and core competence areas for dissemination of Rural Housing Technologies'** under CSIR RSWNET programme.
- Prepared a 4 page brochure leaflet on 'CBRI R&D and Technologies' for submission to CSIR for inclusion in the CSIR publication on Labs.
- Prepared training readers in English & Hindi comprising details on Rural Housing technologies for distribution among trainees of the training programme organized under CSIR RSWNET.

Users/Beneficiaries

Several Govt/non-Govt. organizations and private individuals availed the benefits of CBRI know-how and technologies in furthering the cause of construction of cost effective, safe and comfortable buildings. Some of these are as follows :

- West Bengal Council of Science & Technology, Kolkata
- Central Jail, Bhopal
- PWD Tripura
- Samrat Ashok Technological Institute, Vidisha
- Ordinance Factory, Institute of Learning, Dehradun, Uttrakhand
- BIS, New Delhi
- BITS, Pilani (Rajasthan),
- GB Pant University of Agri & Technology, Pantnagar
- NIT Kurukshetra
- NIT's of Jaipur, Silchar, Nagpur
- Gorkha Resettlement Training Unit, Raiwala, Dehradun, Uttarakhand
- Government Polytechnic, Gauchar (Chamoli), Uttarakhand
- Many NGOs and Building Centres located all over the country.

Partners:

- Housing & Urban Development Corporation (HUDCO)
- Building Materials and Technology Promotion Council, Delhi
- National Housing Bank
- Indian Building Congress, Delhi
- Adlakha & Associates, New Delhi
- CAPART
- NEIST Jorhat (Assam)

Facilitators:

- North East Institute of Science & Technology, Jorhat,
- Civil Engg. Technology Development Centre, SATI, Vidisha

- Srujan Building Centre, Central Jail, Bhopal
- West Bengal Council of Science, Technology & Environment (WBSTE) Council, Kolkata

Any Other Features:

New facility created:

- **Display charts for Exhibitions:**
  - Designed, developed and got prepared 15 Nos. of 3'x6' size light weight and rollable display charts, highlighting more than fifty important CBRI R&D and technologies for display in national level exhibitions.
  - 10 charts on '**Rural Housing and Environment Technologies'** in Hindi with photographs and details.

Other Items of Significance:

(i) Invited Technical lectures:

- Invited guest speakers for Seminar on Building Construction and Railway Construction organized by IBC Tripura at Agartala on 8-9 Aug., 2008.
- Shri S.G. Dave, Scientist spoke on 'Ferro Cement Products & Technologies developed by CSIR Labs. arranged by Ferro Cement Society on 20th Nov., 2007 in a concurrent seminar at Pune.
- "Construction of Earthquake Resistant Houses in Hilly Areas" by Shri K.L. Chabbra, Technical Officer in a Sammelan of education Deptt. Chamoli (Uttarakhand), held at Govt. College Gauchar on 19th Nov., 2008.
- "CBRI Technologies for Cyclone, Landslide, Fire and Earthquake Resistant Houses" by Shri K.L.Chabbra at Government Polytechnic, Gauchar on 19th Nov., 2008.

(ii) CSIR RSWNET Programme (RSP-0003)

A project on **'Dissemination, Training and Demonstration of Appropriate Rural Housing Technologies'** amounting to Rs. 80 lakhs has been approved by CSIR under its rural development progamme for Rural, SC/ST, North East, Tribals (RSWNET) under XIth Five Year Plan.

The problems of shortage of adequate durable housing, unemployment, vulnerability to natural hazards and shortage of skilled manpower are the foremost challenges in the way of improving quality of life of villagers. The National Agenda for Governance has been advocating 'Housing for All' as a priority area, with particular emphasis on the needs of the vulnerable groups.

In order that the available resources may be utilized most efficiently, it is necessary to promote use of innovative building materials and construction techniques. Dissemination and extension of energy and cost effective building materials, utilization of agro-industrial byproducts/wastes as well as locally available raw materials, cheaper and time saving building construction techniques and efficient house plans at affordable cost meeting the minimum basic requirements of the users has assumed a greater significance in the present scenario.

The main objective of this project is to disseminate, promote and extend safe and healthy housing technologies which will improve housing and living conditions of the rural masses and also improve the skill of local artisans and construction workers through mass awareness programmes, training programmes, on-site demonstration and entrepreneurship development in rural society in the production of building materials and use of appropriate housing technologies by villagers, SC/ST and womenfolk.

In the year 2008-09 the institute has organized 4 training-cum-live demonstration programmes and participated in 7 exhibitions in 5 states namely, M.P., W.B., Assam, U.K. and Maharashtra.

(iii) Implementation of CBRI Construction Technologies:

CBRI construction technologies and materials including concrete blocks in masonry, precast roofing components for roofs and pile foundation in black cotton soil are repeatedly being used in construction of thousands of houses by NGOs, Central and State Government Departments and private builders at various rural and urban locations of the country. Several Building Centres and Rural Building Centres are in regular production of precasts concrete/ferrocement components engaging local artisans and labour.

During the year, some of the important constructions adopting cost effective CBRI technologies for which technical support and guidance is being provided by CBRI through its Extension Centre at Delhi are listed below :

- 1184 housing units – Type III of area 39.75 sq.m. at Bawana, Delhi using Under Reamed Pile foundation, R.C. Plank and Joist roofing scheme.
- 1982 housing units – Type III/Type I at Narela, Delhi using strip Foundation and RC Plank & Joist Roofing scheme.
- 1272 housing units – Type III/Type I of area 39.75 sq.m./31.75 sq.m. at Bhorgarh, Delhi using open trench foundation and RC plank and joist scheme.
- 5552 housing units – EWS of area 30 sq.m. at Baprola, Delhi using open trench foundation and RC Plank & Joist roofing scheme.
- 3680 Nos. EWS houses area 30 sq. m. each at Ghogha using open trench foundation and RC Plank & Joist roofing scheme.

(iv) Important Meetings

Delhi Extension Centre held meetings with:

- M/s. New Era Construction Company, for use of RCC planks system roofing on 14.05.2008.
- Mr. R.K. Gupta, Chief Engineer, Delhi Small Industrial Infrastructure Development Corporation (DSIIDC) to explore the new projects on 24.12.2008.
- Executive Director, BMTPC in connection with the upgradation of Existing Building Centres on 10.10.2008.

Extension efforts made at a nominal expenditure attracted a huge cost and effort of the user organizations in actualizing the technology transfer in the form of construction of buildings all over the country utilizing CBRI's technologies and processes. Large-scale involvement and investment of the building industry towards meeting national aims through CBRI's national extension network, has been a unique feature of the programme.

Over 500 Entrepreneurs, Building Centres, Rural Building Centres spread all over the country are regularly using CBRI know-how in regular production of building components and completing construction of buildings worth millions of Rupees.

Dr Y.N. Sharma Arun, Renowned Hindi Scholar, Chief Guest, awarding the prize on the occasion of Hindi Week

Dignitories on dias on the occasion of CSIR Foundation Day

Dr. Rakam Singh, DG, IMS, Roorkee addressing the audience on Vigilance Awareness Week

Inauguration of Advanced Material Science Laboratory by Dr. M.O. Garg, Director, CBRI alongwith Mrs. Anjali Tiwari, C.V.O., CSIR

Glimpses of Activities

Prof. S.K. Brahmachari, DG, CSIR viewing the CBRI activities

Prof. S.K. Brahmachari, DG, CSIR addressing the CBRI staff

Dr. S. Sreedhar, awarding CBRI Diamond Jubilee Director's award to Dr. A.K. Minocha, Scientist 'F' and Dr. A.K. Gupta, Scientist 'G'

Dr. S. Sreedhar, Chairman & MD, National Housing Bank, Chief Guest delivering the Foundation Day lecture

Dignitories lighting the lamp on Inaugural Function of National Seminar

Prof. T.K. Datta, IIT, Delhi, Guest of Honour, addressing the gathering on National Seminar

Prof. Prem Krishna, Founder President, Indian Society of Bridge Engineering delivering inaugural address on National Seminar

Dr. M.O. Garg, Director alongwith his wife visiting the flower show organised by CBRI

CBRI FAMILY

AS ON 31.03.2009

Name	Destination
Group-IV-Scientific Staff	
Dr. M.O. Garg	Director
Shri M.P.Singh	Scientist G
Shri S.G.Dave	Scientist G
Dr.B.Kameshwara Rao	Scientist G
Dr. (Ms.) Manju Mittal	Scientist F
Shri Vinod Kumar	Scientist F
Shri R.K.Srivastava	Scientist F
Shri R.K.Garg	Scientist F
Shri A.Ghosh	Scientist F
Shri Shree Kumar	Scientist F
Shri S.P.Agarwal	Scientist F
Shri V.K.Sharma	Scientist F
Shri R.D.Singh	Scientist F
Shri B.B.Lal	Scientist F
Dr. S.K.Saini	Scientist F
Dr.Sunil Kumar Sharma	Scientist F
Shri Y.Pandey	Scientist F
Shri P.K.Bhargava	Scientist F
Dr.(Ms.)Abha Mittal	Scientist F
Dr.A.K.Minocha	Scientist F
Shri R.L.Dhabal	Scientist F
Shri D.K.Gautam	Scientist F
Shri R.S.Chimote	Scientist F
Dr.Brajeshwar Singh	Scientist F
Shri Suvir Singh	Scientist F

Name	Destination
Shri P.K. Gangopadhyay	Scientist E-II
Dr.S.K.Agarwal	Scientist E-II
Ms. Neeta S. Mittal	Scientist E-II
Dr.A.K. Pandey	Scientist E-II
Dr.N.K.Saxena	Scientist E-II
Dr.Harpal Singh	Scientist E-II
Shri Ashok Kumar	Scientist E-II
Shri Surender Kumar Negi	Scientist E-II
Dr.Shantanu Sarkar	Scientist E-II
Dr.(Ms.) Mridul Garg	Scientist E-II
Dr.Pradeep Kumar-I	Scientist E-II
Dr.(Ms.)Manorama Gupta	Scientist E-II
Dr.Atul Kumar Agarwal	Scientist E-II
Shri A.K. Sharma-I	Scientist E-II
Shri Rajendra Kumar	Scientist E-II
Shri A.A.Ansari	Scientist E-II
Dr.Pradeep Kumar-II	Scientist E-I
Shri Nadeem Ahmad	Scientist E-I
Dr.(Ms.) Rajni Lakhani	Scientist E-I
Dr.Rajesh Deoliya	Scientist E-I
Dr.Achal Kumar Mittal	Scientist E-I
Dr.Sujit Kr.Saran	Scientist E-I
Dr.Navjeev Saxena	Scientist E-I
Shri S.K.Jain	Scientist E-I
Dr.D.P.Kanungo	Scientist E-I
Dr.S. Karthigeyan	Scientist E-I

Name	Destination
Dr.Sukhdeo Rao Karade	Scientist E-I
Dr.B.S.Rawat	Scientist E-I
Shri A.P.Chourasia	Scientist E-I
Dr.P.C. Thapliyal	Scientist E-I
Dr.Rajesh Kumar Verma	Scientist E-I
Shri Shorab Jain	Scientist E-I
Shri Soraj Kumar Panigrahi	Scientist E-I
Shri S.K. Singh	Scientist C
Shri V. Srinivasan	Scientist C
Dr.(Ms.) L.Chourasia	Scientist C
Dr.P.K.S.Chauhan	Scientist C
Shri H.C.Arora	Scientist C
Dr.Lok Pratap Singh	Scientist C
Dr.Neeraj Jain	Scientist C
Group-III-Technical Staff	
Dr. Rajiv Kumar	Mech.Engr-E-II
Shri H.K.Jain	TO E-II
Shri Ajay Singh	TO E-II
Shri A.S.Srivastava	TO E-II
Shri K.L.Chhabra	TO E-II
Shri Ramesh Chandra	TO E-II
Shri Deepak Kumar Sehgal	TO E-II
Shri N.S.Tyagi	TO E-II
Shri S.K.Srivastava	TO E-I
Shri Chandra Prakash	TO E-I
Shri Sudhir Sharma	TO E-I
Shri Ashok Kr.Sharma-II	TO E-I
Shri Suresh Kumar	TO E-I

Name	Destination
Shri R.K.Yadav	TO E-I
Shri Rajesh Kumar	TO E-I
Shri Narendra Kumar	TO E-I
Dr.B.M.Suman	TO E-I
Shri Prakash Chand	TO E-I
Shri Rajeev	TO E-I
Shri Jaswinder Singh	TO E-I
Dr.P.K.Yadav	TO E-I
Shri Dalip Kumar	TO C
Shri Bhupal Singh	TO C
Shri S.K.Senapati	Library Officer Gr.III(5)
Shri S.K.Gupta	Ex.Er.Gr.V (5)
Shri Rajeev Kumar Sharma	TO C
Shri A.K.Jain (SE)	TO B
Dr.M.K.Sinha	Medical Officer
Shri Zamir Ahmad	TO B
Shri Sushil Kumar	TO B
Shri Rakesh Kumar-II	TO B
Shri Vivek Sood	TO B
Shri Jalaj Parashar	TO B
Shri Naresh Kumar	TO B
Shri Ram Ashray Rai	TO B
Shri Bharat Bhushan	TO B
Shri Rajesh R.Ghadse	TO A
Shri B.K.Kalra	A.E.Gr.III(3)
Shri Itrat Amin	STA Gr.III(2)
Ms. Deepti Karmakar	STA Gr.III(2)
Shri Ajay Dwivedi	STA Gr.III(2)

CBRI Family

Name	Destination
Shri Amit Kush	STA Gr.III(2)
Shri B.Muralidharan	T.A. Gr.III(1)
Ms. Gayatri Devi	T.A. Gr.III(1)
Shri Sameer	T.A. Gr.III(1)
Shri Deepak Singh Dharmshaktu	T.A. Gr.III(1)
Shri A.P.Sharma	Tech.Gr.II(4)
Shri Prem Lal	Tech.Gr.II(4)
Shri Shiv Kumar	Tech.Gr.II(4)
Shri Virendra Singh	Tech.Gr.II(4)
Shri Shiv Dass (SE)	STA Gr.II(4)
Shri R.P.Gupta (SE)	Tech.Gr.II(4)
Shri Kuldeep Singh	Tech.Gr.II(4)
Shri Ami Chand	Tech.Gr.II(4)
Shri S.P.Vardhya	Tech.Gr.II(4)
Shri Rizwanul Hasan	Tracer Gr.II(4)
Shri Shreeram	Lab Asstt. Gr.II(4)
Shri Nawal Singh	Lab Asstt. Gr.II(4)
Shri C.S.Mayal	Tech. Gr.II(4)
Shri Nand Kishore (SE)	Fitter Gr.II(4)
Shri Madan Lal (SE)	Carpenter Gr.II(4)
Shri R.L.Sharma (SE)	Lab Asstt. Gr.II(4)
Shri Mam Chand II (SE)	Lab.Asstt. Gr.II(4)
Shri Budh Prakash	Mason Gr.II(4)
Shri Govind Singh	Mechanic Gr.II(4)
Shri M.K.Nazir	Tech.Gr.II(4)

Name	Destination
Shri S.L.Kaushik	Tech.Gr.II(4)
Shri Rajender Kumar	Tech.Gr.II(4)
Shri Kirpal Singh	Electrician Gr.II(4)
Shri Chottey Lal (SE)	Tech. Gr.II(4)
Shri Bishan Lal	Tech.Gr.II(3)
Shri Nankanwar Singh	Tech.Gr.II(3)
Shri Gopal Chand	Tech.Gr.II(3)
Shri Har Sagar Sharma	Tech.Gr.II(3)
Dinesh Chandra	Tech.Gr.II(3)
Shri Jagan Nath	Tech. Gr.II(3)
Shri P.K.Yadav	Tech. Gr.II(3)
Shri Ram Pal Singh	Tech. Gr.II(3)
Ms. Neelam Gupta	Tech. Gr.II(3)
Shri Prem Singh	Tech. Gr.II(3)
Shri Sheeraj Ahmed	Tech. Gr.II(3)
Ms. Saroj Rani	N/Sister-Gr.II(3)
Ms. Sangeeta Sharma	Tech.Gr.II(3)
Shri Anil Kumar Sharma	Mechanic Gr.II(3)
Shri Surendra Kumar (SE)	Tech.Gr.II(3)
Shri Rishi Pal Singh	W/Man Gr.II(3)
Shri Sushil Kumar	Tech. Gr.II(3)
Shri Himanshu Sharma	Tech. Gr.II(3)
Shri Manmeet Singh	Tech. Gr.II(3)
Shri Manoj Kumar Tyagi	Tech. Gr.II(2)
Ms. Urmila Kotnala	Pharmacist Gr.II(2)
Shri Amar Singh	Tech.Gr.II(2)
Shri D.K.Chopra	Tech. Gr.II(2)
Shri Kedar Nath	Tech. Gr.II(2)
Shri Santosh Kumar Mishra	Tech. Gr.II(2)

Name	Destination
Shri Rajeev Bansal	Tech. Gr.II(2)
Shri Pradeep Kumar Kapooria	Tech. Gr.II(2)
Shri Arvind Saini	Tech. Gr.II(2)
Shri Ashwini Kumar Mishra	Tech. Gr.II(2)
Shri Harish Kumar	Tech. Gr.II(2)
Shri Sukhbir Sharma	Tech. Gr.II(2)
Shri Arvind Kumar	Pharmacist-Gr.II(2)
Shri Sharad Kumar	Tech. Gr.II(2)
Shri Mam Chand Agarwal	Tech. Gr.II(2)
Shri Arvind Kumar Sharma	Tech. Gr.II(2)
Shri Tahir Hussain	Tech. Gr.II(2)
Shri Ghanshyam Mittal	Tech. Gr.II(2)
Shri Francis Charles	Tech. Gr.II(2)
Shri Jai Pal	Tech. Gr.II(2)
Shri Iqbal Ahmad	Tech. Gr.II(2)
Shri Jameel Hasan	Tech. Gr.II(2)
Shri Umesh Chandra Bhatnagar	Tech. Gr.II(2)
Shiv Prakash Tyagi (SE)	Tech. Gr.II(2)
Shri B.S.Bisht (SE)	Tech. Gr.II(2)
Shri Sohrab Khan (SE)	Tech. Gr.II(2)

Group-I Supporting Staff

Shri Hamir Dass	Tech.Gr.I(4)
Shri R.P.Singh	Tech.Gr.I(4)
Shri Suresh Chand	Tech.Gr.I(4)
Shri Harpal Singh	Tech.Gr.I(4)
Shri Dinesh Kumar	Tech.Gr.I(4)
Shri Hari Singh (SE)	Tech.Gr.I(4)
Shri D.P.Yadav	Tech.Gr.I(4)
Shri Janeshwar Prasad	Tech.Gr.I(4)

Name	Destination
Shri Akhtar	Tech.Gr.I(4)
Shri Sita Ram	Tech.Gr.I(4)
Shri Yakub Ali	Tech.Gr.I(4)
Ms.Attri Devi	Tech.Gr.I(4)
Shri Deepak Singh	Tech.Gr.I(4)
Shri Guru Charan Singh	Helper-Gr.I(4)
Shri Rajeshwar	Helper-Gr.I(4)
Shri Amar Singh (SE)	Tech.Gr.I(4)
Shri Vijay Kumar (SE)	Tech.Gr.I(4)
Shri Sham Lal (SE)	Tech.Gr.I(4)
Shri Shiv Kumar	Helper-Gr.I(4)
Shri Vijay Kumar	Helper-Gr.I(4)
Shri Jai Pal Singh	Helper-Gr.I(4)
Shri Rishi Pal (SE)	Helper-Gr.I(4)
Shri Shiv Kumar	Helper-Gr.I(4)
Shri Vishwas Kumar	Helper-Gr.I(4)
Shri Abhay Dass	Helper-Gr.I(4)
Shri Jagdish Pal	Helper-Gr.I(4)
Shri Deepak Kumar	Helper-Gr.I(4)
Shri Bharat Singh	Helper-Gr.I(3)
Shri Hira Lal	Helper-Gr.I(3)
Shri Subhash Chand (SE)	Helper-Gr.I(3)
Shri Shyam Bir (SE)	Helper-Gr.I(3)
Shri Rajendra Kumar Arya	Helper-Gr.I(3)
Shri Rajesh Kumar	Helper-Gr.I(3)

House-Keeping/Administrative Staff

Group-A

Shri S.C. Tyagi	C.O.A.
Shri D. Sethi	F&AO

CBRI Family

Name	Destination
Shri Brijesh Sharma	S&PO
Shri Hari Kumar	F&AO
Shri Rajesh Chandra Saxena	Sr.Hindi Adhikari
Group-B	
Shri Md.Salaudin Ansari	S.O.(S&P)
Shri J.K. Chourasia	S.O.(F&A)
Shri Babu Ram (SE)	S.O.(F&A)
Shri Anil Kumar	S.O.(G)
Shri Alok Sharma	S.O.(G)
Shri S.K. Jakhwal	S.O.(G)
Shri Y.P.Singh	S.O.(G)
Shri S.P. Kapil	P.S.
Shri A.K.Jain	P.S.
Shri B.K. Sharma	Security Officer
Shri V.P.S. Rawat	Security Officer
Shri Brij Lal	Asstt(S&P)Gr.I
Shri Sanjeev Bansal	Asstt(S&P)Gr.I
Shri Arpan Maheshwari	Asstt(S&P)Gr.I
Ms. Anju Rani Simon	Asstt(S&P)Gr.I
Shri Harish Chandra	Asstt(F&A)Gr.I
Shri Virendra Singh (SE)	Asstt(F&A)Gr.I
Shri Aman Kumar	Asstt(F&A)Gr.I
Shri Constan Kujur	Asstt(G) Gr.I(ACP)
Shri R.K.Lamba	Asstt(G)Gr.I
Shri R.K.Sharma	Asstt(G)Gr.I
Shri V.K.Sharma	Asstt(G)Gr.I
Shri H.C.Madan	Asstt(G)Gr.I
Shri R.N.Bhatt	Asstt(G)Gr.I

Name	Destination
Ms. Nisha Tyagi	Asstt(G)Gr.I
Ms. Saroj Sethi	Asstt(G)Gr.I
Ms. Sarita Khanna	Asstt(G)Gr.I
Shri Neeraj Kumar	Asstt(G)Gr.I
Shri B.B.Dimri	Asstt(G)Gr.I
Ms. Sheema Farhat	Asstt(G)Gr.I
Shri Surinder Singh	Sr.Steno(ACP)
Shri Khushpendra Arora	Sr.Steno(ACP)
Shri Suresh Giri	Sr.Steno(ACP)
Shri Naresh Yadav	Sr.Steno(ACP)
Shri Surendra Kumar (SE)	Sr.Steno(ACP)
Shri D.K.Gulshan (SE)	Sr.Steno(ACP)
Shri Satya Pal	Sr.Steno
Shri Rajinder Kumar	Sr.Steno
Ms. Archana	Sr.Steno
Shri Arvind Kumar	Sr.Steno
Shri Dalpat Singh	Sr.Steno
Shri Mehar Singh	Sr.Translator
Shri Suba Singh	Sr.Translator
Shri Ashok Kumar	Receptionist
Group-C	
Shri Kalam Singh Chauhan	Asstt(S&P)Gr.II
Shri Vishwas Tyagi	Asstt(S&P)Gr.II
Shri Suraj Pal Singh	Asstt(F&A)Gr.II
Shri Vipin Kumar Sharma (SE)	Asstt(F&A)Gr.II
Shri R.K.Johar	Asstt(G)Gr.II
Shri Yogesh Kumar	Asstt(G)Gr.II
Ms. Sunita	Asstt(G)Gr.II
Shri Dharam Pal Singh	Asstt(G)Gr.II
Ms. Arun Lata	Asstt(G)Gr.II
Shri Sudhir Kumar	Asstt(G)Gr.II

Name	Destination
Shri Shiv Kumar	Asstt(G)Gr.II
Shri Sushil Kumar	Asstt(G)Gr.II
Ms. Mamta Sharma	Asstt(G)Gr.II
Ms. Rubina Zaidi	Asstt(G)Gr.II
Shri Satyarth Prakash	Asstt(G)Gr.II
Shri Sanjay Kr.Tyagi	Asstt(G)Gr.II
Shri Ravindra Kumar	Asstt(G)Gr.II
Ms. Seema Ahuja	Asstt(G)Gr.II
Shri K.K.Murthy	Jr.Steno
Shri C.P.Tyagi	Jr.Steno
Shri Dharam Singh Negi	Jr.Steno
Shri Rajendra Singh	Driver
Shri Radhey Shyam Goswamy	Driver Gr.II(2)
Shri Sushil Kumar	Driver
Shri M.Ramakrishna	Driver
Shri Vijay Kumar I	Driver
Shri Vijay Kumar-II	Driver
Shri Naresh Chand Yadav (SE)	Daftri Cum R/Keeper
Shri Suresh Pal	Safaiwala(ACP)-Gr.B
Shri Kamalbir Singh	Sr.Sec.Guard
Shri Baljeet Singh	Counter Clerk (ACP)
Shri Satya Pal	Daftri-Cum-R.Keeper
Shri Vikram Pal	Daftari-Gr.B
Shri Sant Ram (SE)	Farrash-Gr.B
Shri Naresh (SE)	Safaiwala(ACP)
Shri Nanak Chand (SE)	Safaiwala-Gr.B

Name	Destination
Shri Ram Samaj	J.S.G.-Gr.B
Shri Raj Kumar	J.S.G.-Gr.B
Shri Lokeshwar Prasad	J.S.G.-Gr.B
Shri Lakhmi Chand (SE)	Chowkidar-Gr.B
Shri Kailash Chand	Peon-Gr.B
Shri Inderpal	Peon-Gr.A
Shri Mukesh Kumar	Peon-Gr.A
Ms. Kusum Lata	Peon-Gr.A
Shri Desh Raj	Peon-Gr.A
Shri Rakesh Kumar	Peon-Gr.A
Shri Ramesh Kumar	Peon-Gr.A
Shri Shiv Kumar	Peon-Gr.A
Shri Santosh Kumar	Peon-Gr.A
Shri Jagdish Chand	Peon-Gr.A
Shri Rakesh Kumar-III	Peon-Gr.A
Shri Krishna Gopal Thakur	Peon-Gr.A
Shri Mani Ram	Peon-Gr.A
Shri Rohitash Kumar	Peon-Gr.A
Shri Subhash Chand (SE)	Peon-Gr.A
Shri Mohd. Naeem (SE)	Peon-Gr.A
Shri Radhey Shyam (SE)	Peon-Gr.A
Shri Sushil Kumar	Farrash-Gr.B
Shri Shyam Narain	Farrash-Gr.B
Ms. Usha	Farrash-Gr.B
Shri Devendra Kumar	Farrash-Gr.A
Ms. Prakash Kaur	Farrash-Gr.A
Ms. Anju	Farrash-Gr.A
Ms. Bala	Safaiwala-Gr.A
Shri Khalil Ahmed	Farrash-Gr.A

CBRI Family

Name	Destination
Shri Ranbir Singh	Peon-Gr.A
Shri Subhan Singh	Peon-Gr.A
Shri Anit Kumar Pal	Peon-Gr.A
Shri Maharaj Deen Khan	Peon-Gr.A
Shri Pritam Giri	Peon-Gr.A
Shri Pooranwasi	Farrash
Shri Kiran Pal	OPS Group-D(NT)

Name	Destination
Canteen Staff	
Shri Raghuvir Singh	A/Mangr. S/Keeper-ACP
Shri Rakesh	Tea Maker-ACP
Shri Arun Kumar	Bearer-ACP
Shri Ravindra Nath	Bearer-ACP
Shri Dil Bahadur	Bearer-ACP
Shri Rajender Pal	Bearer-ACP
Shri Pooran	Wash Boy-ACP
Shri Dheer Singh	Wash Boy-ACP

Retirements

Following staff members are superannuated from CBRI family during the year:

Name	Designation	Date of retirement
Shri Prakash Chand Yadav	Asstt.(G) Gr.I	30.04.2008
Shri Trilok Singh	Farrash	31.05.2008
Shri R.K. Goel	Scientist 'F'	31.07.2008
Dr. Manjit Singh	Scientist 'G'	31.10.2008
Shri Ramoo Kamle	Chowkidar Gr.A	31.10.2008
Shri Mohd. Rashid	Museum Asstt.II(3)	30.11.2008
Shri A.S. Srivastava	T.O. 'E-II'	31.12.2008
Shri N.L. Goswami	T.O. 'E-I'	31.12.2008
Dr. A.K. Gupta	Scientist 'G'	31.01.2009
Shri Budh Prakash	Mason Gr.II (3)	28.02.2009
Shri Chander Bhan	Asstt. (G) Gr.I	31.03.2009

Appendices

Appendix - I

Research Council

Chairman

Prof. S.K. Khanna
Former Chairman, AICTE & Adviser, ID
Ed. CIL, Ed. CIL House, 18 A, Sector-16 A
NOIDA – 201 301

Members

Dr. K.C. Narang
Adviser (R&D)
Dalmia Cements (Bharat) Ltd.,
11th Floor, Hansalya Building
Barakhamba Road
New Delhi – 110 001

Dr. Shailesh Kumar Agarwal
Executive Director
BMTPC
Core 5-A, First Floor,
India Habitat Centre, Lodhi Road,
New Delhi – 110 003

Dr. Nagesh R. Iyer
Scientist 'G'
Structural Engg. Research
Centre, CSIR Campus
Post Office TTTI Taramani
Chennai – 600 113

Dr. O.P. Puranmalka
Head Marketing
Aditya Birla Centre,
A.K. Ahire Marg, Worli,
Mumbai – 400 025

Dr. N. Lakshmanan
Former Director
Structural Engg. Research
Centre, CSIR Campus
Post Office TTTI Taramani
P.B. No. 8287,
Chennai – 600 113

Shri Nirmaljit Singh
Member (Technical)
National Highway
Authority of India,
G-5 & 6, Sector – 10,
Dwarka,
New Delhi – 110 075

Dr. M.O. Garg
Director
Central Building Research Institute
Roorkee – 247 667

Dr. Ramesh Kapur
Unitech Signature
Tower, GF South, City-I, NH-8
Gurgaon – 122 001

Head or his representative
R&D Planning Division
CSIR, Anusandhan Bhawan
2, Rafi Marg,
New Delhi – 110 001

Prof M.N. Viladkar
Professor
Deptt. of Civil Engg.,
Indian Institute of Tech.
Roorkee – 247 667

Shri R.K. Garg,
Secretary
Scientist 'F' & Head, H&P Div.
Central Building Research Institute
Roorkee-247 667

Appendix-I

Management Council

Chairman

Director
Central Building Research Institute
Roorkee – 247 667

Members

Dr. Ashok Kumar Dimri,
Scientist 'G'
CSIO, Chandigarh

Shri P.K. Bhargava
Scientist 'F'
CBRI, Roorkee

Shri S.K. Saini
Scientist 'F'
CBRI, Roorkee

Dr. Mridul Garg
Scientist 'E-II'
CBRI, Roorkee

Dr. Manju Mittal
Scientist 'F'
CBRI, Roorkee

F&AO
CBRI, Roorkee

Shri S.K. Negi
Scientist 'E-II'
CBRI, Roorkee

Dr. B.M. Suman
Technical Officer
CBRI, Roorkee

Secretary

CoA/AO
CBRI, Roorkee

Appendix – II

List of R&D Projects & Support Activities for the year 2008-09

S.No.	Duration	Project No.	Title	Principal Investigator
1.	10-2007 to 03-2009	OLP-292 (DC&E)	Design and Development of Tessi Phone-as CBRI Diamond Jubilee Building Materials and Technology Museum. (Kept in abeyance)	S.G. Dave
2.	01-2008 to 12-2009	OLP-293 (BPPP)	Modeling and Simulation for the Seismic Response of Connected Buildings using Artificial Intelligence.	S.Chakraborty
3.	01-2008 to 12-2009	OLP-294 (BPPP)	Development of Boring Machine for Making Horizontal Bores under the Ground-a Trenchless Technology.	D.K. Gautam
4.	01-2008 to 12-2009	OLP-296 (E&HB)	Review and upgradation of Space Norms for Inclusive Education in Educational Buildings Up to Secondary Level.	Neeta Mittal
5.	01-2008 to 12-2009	OLP-297 (EB)	Development of Solid State Lighting System for Interiors.	Shree Kumar
6.	01-2008 to 12-2009	OLP-298 (EB)	Development of Design Guidelines for Overall Comfort In MIG Type of Houses.	R.K. Srivastava
7.	01-2008 to 12-2009	OLP-299 (EST)	Studies on dehydrating Agents and Strength Enhancers in Making Gypsum Plaster for Use in Weather Resistant Binders, Boards and Blocks.	Manjit Singh
8.	01-2008 to 12-2009	OLP-300 (EST)	Improved Pollution Control Technology for Brick Kilns.	A.K. Minocha
9.	01-2008 to 12-2009	OLP-301 (EST)	Studies of the Reactivity of Fly Ash from Different Fields of an ESP.	S.K. Agarwal

Appendix-II

10.	01-2008 to 12-2009	OLP-302 (EST)	Evaluation of Plant Extractives for Termite and Pest Management in Buildings.	B.S. Rawat
11.	01-2008 to 12-2009	OLP-303 (EST)	Studies on Building Fungi and their Control with Selected Phytochemicals.	R.K. Verma
12.	01-2008 to 12-2009	OLP-304 (FIRE)	Development of Fire Retardant Formulations for Lining Materials.	Sunil Sharma
13.	01-2008 to 12-2009	OLP-305 (FIRE)	Studies on Visibility of Fire Exit Signs in Fire Smoke.	M.P. Singh
14.	01-2008 to 12-2009	OLP-306 (FIRE)	High Capacity Gypsum Calcinator for Small Scale Industries.	S.K. Saini
15.	01-2008 to 12-2009	OLP-307 (FIRE)	Determination of Real Life Severity in Fire Damage Buildings by Studying the Effect of Standard Fire Exposure on Building Elements.	Suvir Singh
16.	01-2008 to 12-2009	OLP-308 (FIRE)	CFD Modeling of Fire in Building Corridor.	Shorabh Jain
17.	01-2008 to 12-2009	OLP-309 (FIRE)	Studies on Species Concentration in Enclosure Fire.	Rajiv Kumar
18.	01-2008 to 12-2009	OLP-310 (FIRE)	Studies on Environment Friendly Fire Retardant Rigid Polyurethane Foam (RPUF)	Harpal Singh
19.	01-2008 to 12-2009	OLP-311 ((FIRE)	Studies on Water Mist Fire Extinguishing System.	R.S. Chimote
20.	01-2008 to 12-2009	OLP-312 (FIRE)	Development of Barrier for Improvement of Flame Retardancy of Wood Base Lining Materials and their Fire Behaviour Studies.	A.A. Ansari
21.	01-2008 to 12-2009	OLP-313 (GE)	Behaviour of in Filled Discontinuities with Gouge Materials.	A.K. Sharma
22.	01-2008 to 12-2009	OLP-314 (GE)	Numerical Investigation of the Lateral Response of Pile Groups under Combined Loading.	S. Karthigeyan

23.	01-2008 to 12-2009	OLP-315 (GE)	Geotechnical Properties of Stabilized Fly-ash for Development of Appropriate Foundation.	A. Ghosh
24.	01-2008 to 12-2009	OLP-316 (GE)	Evaluation of Rock Slops Parameters for in-stability Assessment.	S. Sarkar
25.	01-2008 to 12-2009	OLP-317 (GE)	Evaluation of Geotechnical Parameters for Analysis of Unstable Slops.	Pradeep Kumar
26.	01-2008 to 12-2009	OLP-318 (GE)	Seismic Studies using SMAs in Delhi.	P.K.S. Chauhan
27.	01-2008 to 12-2009	OLP-319 (GE)	Evaluation of Seismic Ground Motion Parameters Based on Site Characterization in Dehradun Region.	Abha Mittal
28.	01-2008 to 12-2009	OLP-320 (GE)	Geological Investigation, GPR and resistivity Survey for Characterization of Hill Slops Along Highway in Yamuna Valley, Uttarakhand, Himalaya for Landslide Risk Assessment Mapping and Building Construction on Hilly Regions.	Pradeep Kumar II
29.	01-2008 to 12-2009	OLP-321 (GE)	Behaviour of Shallow Foundations on Randomly Distributed Fiber Reinforced Soil.	S.K. Saran
30.	01-2008 to 12-2009	OLP-322 (H&P)	Design & Development of Standardized Housing Units with Prefabricated Components for Low rise building.	R.D. Singh
31.	01-2008 to 12-2009	OLP-323 (H&P)	Development of Methodology Eco-friendly and Energy Efficient Buildings in National Capital Regions (NCR).	R.K. Garg
32.	01-2008 to 12-2009	OLP-324 (OBM)	Development of new Composite material for Building Application Using Ply-Wood/Veneer and Vermiculite Wastes.	S.P.Agarwal

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33.	01-2008 12-2009	OLP-325 (OBM)	Development of Coating System on Modified Epoxy Resins for Fertilizer Industry.	P.C. Thapliyal
34.	01-2008 12-2009	OLP-326 (OBM)	Development of High Performance Polymer Based Repair Materials.	S.R. Karade

NETWORK PROJECTS (CBRI AS PARTICIPATING LAB)

1.	NWP-037 (EST)	Discovery and Preclinical Studies of New Bioactive Molecules (Natural & Semi-Synthetic) & Traditional Preparations.	B.S. Rawat
2.	NWP-039 (GE, SE)	Engineering of Structures Against Natural and Other Disasters.	A. Ghosh
3.	NWP-0045 (EST)	Advancement in Metrology	A.K. Minocha

CSIR RSWNET PROJECT

1.	RSP-003 (DC&E)	Dissemination, Training & Demonstration of Appropriate Rural Housing Technologies.	S.G. Dave

SUPRA INSTITUTIONAL PROJECT

1.	SIP-029 (PPCD)	High Performance Materials and Construction Technologies for Sustainable Built Space.	B. Singh

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R&D SUPPORT ACTIVITES
(DECISION UNIT 06)

1.	STS 0001	LIBRARY SERVICES LIBRARY & DOCUMENTATION	S.P. AGARWAL S.K. SENAPATI
2.	STS 0002	PLANNING MONITORING & EVALUATION	P.K. BHARGAVA
		RC AGENDA (R&D), DEPLOYMENT OF MANPOWER FOR APAR, EXPERT PANEL, RESEARCH UTILIZATION DATA, QUARTERLY & MONTHLY PROGRESS REPORTS, EXTERNALLY FUNDED PROJECTS & SERVICE TAX	R.K.YADAV
3.	STS 0003	RESEARCH PLANNING & BUSINESS DEVELOPMENT	P.K. BHARGAVA
		TECHNOLOGY TRANSFER (LICENSING, PATENTS ETC) AND TREND ASSESSMENT INCLUDING FEEDBACK, MARKETING SURVEY & OTHER INDUSTRIAL LIAISON, CUSTOMER SATISFACTION EVALUATION	P.K.YADAV
4.	STS 0004	TECHNOLOGY DISSEMINATION	S.G. DAVE
		INLAND LIAISON INCLUDING EXHIBITION, DISPLAYS, TRAINING, SPECIAL FUNCTIONS & VISITORS, TECHNICAL GUIDANCE AND FILM	H.K.JAIN
		DEMONSTRATION, CONSTRUCTIONS FEEDBACK & DOCUMENTATION	K.L. CHABBRA
5.	STS 0005	EXTENSION CENTER (DELHI)	RAJENDERA KUMAR
6.	STS 0006	PABX	VINOD KUMAR JALAJ PARASHAR
7.	STS 0007	INTERNATIONAL & INFORMATION MANAGEMENT	VINOD KUMAR
		HR TRAINING AND MANAGEMENT, LIASION WITH BIS, PRINT-PRODUCTION & IN-HOUSE PUBLICATIONS, PUBLICITY AND INFORMATION DISSMINATIONS THROUGH PRESS	ATUL KR. AGARWAL
8.	STS 0008	COMPUTER FACILITIES & SERVICES	P.K.GANGOPADHYAY
9.	STS 0009	ICT AND INTERNET SERVICES	NODAL OFFICER, ICT
		DEVELOPMENT OF ICT INFRASTRUCTURE	AMIT KUSH

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ADMINISTRATIVE SUPPORT
(DECISION UNIT 08)

	GENERAL ADMINISTRATION & HOUSE KEEPING	DIRECTOR
INFRA 0001	ADMINISTRATION	COA/AO
INFRA 0002	FINANCE & ACCOUNTS	F&AO
INFRA 0003	STORE & PURCHASE	S&PO
INFRA 0004	SECURITY	SECURITY OFFICER
INFRA 0005	DISPENSARY	MEDICAL OFFICER
INFRA 0006	ESTATE & TECHNICAL SERVICES	AJAY SINGH (SE)
	i. CIVIL WORKS, NEW CONSTRUCTION, MAINTENANCE, HORTICULTURE SERVICES, CLEANING, SANITATION AND WATER SUPPLY	
	ii. ELECTRICAL SERVICES & MAINTENANCE OF VEHICLES	

Appendix – III (2008-09)

CONSULTANCY & SPONSORED PROJECTS (APRIL 2008 – MARCH 2009)

PROJECT NO.	PROJECT LEADER	TITLE OF THE PROJECT	SPONSORING AGENCY
CNP0017	R. S. CHIMOTE	FIRE ENGG. EXPERTISE-BASED TECHNICAL INPUTS FOR IMPROVE-MENT IN EXISTING ACTIVE FIRE FIGHTING SYSTEM AT SALAR JUNG MUSEUM HYDERABAD	DR. A. NAGENDER REDDY SALAR JUNG MUSEUM HYDERABD
CNP0398	A.K SHARMA	ADVICE ON LAND STABILITY FOR MALSI PROJECTS AND PLANNERS	SHRI. A.K BANSAL, CHIEF PROJECTS
CNP3006	B. M. SUMAN	STUDY THE THERMAL BEHAVIOR AND HEAT TRANSMISSION THROUGH POLYESTER FIBER.	DUPONT INDIA PVT.LTD. GURGAON
CNP6317	A. K. PANDEY	THIRD PARTY QUALITY ASSURANCE OF CIVIL CONSTRUCTION WORK OF DOON UNIVERSITY DEHRADUN AT ITS KEDARPURAM SITE	PROJECT MANAGER, UPRNN LTD., NIRMAN UNIT, NEHRU COLONY, DEHRADUN
CNP6327	AJAY CHOURASIA	INSPECTION & QUALITY CONTROL MONITORING OF CONSTRUCTION WORKS OF HRDI AT MANDAL GOPESHWAR	DIRECTOR, HERBAL RESEARCH & DEVELOPMENT INSTITUTE, GOPESHWAR
CNP8717	S. K. SAINI	FIRE RESISTANCE & BURGLARY RESISTANCE EVALUATION OF DOOR - ONE NO. - ONE HOUR RATING	M/S STEEL SAGE ENGINEERING, PLOT NO. 3, GIDC, NH-88, GINDAL - 360 311 (GUJARAT)

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CNP8727	S. K. SAINI	FIRE RESISTANCE EVALUATION OF FIRE DOOR - ONE NO. - TWO HOUR RATING	M/S SOUTHERN TEXSPARE MANUFACTURERS, P.BOX NO. 2110, NO. 2&3, SRI VENKATESAPURAM, GANPATHY, P.O. COIMBATORE - 641 006
CNP8737	S. K. SAINI	FIRE ENDURANCE & BURGLARY RESISTANCE TEST (CLASS-B) OF STRONG ROOM DOOR - ONE- NO. - ONE HOUR RATING	M/S GUARDWELL INDUSTRIES PVT. LTD., RAJHANS INDUSTRIAL COMPLEX, CHINCHPADA GOKHIVARE, VASAI (E), MUMBAI - 401 208
CNP8747	S. K. SAINI	FIRE RESISTANCE EVALUATION OF FIRE BARRIER/CABLE PENE-TRATION SEAL - ONE NO. - THREE HOURS RATING	M/S SIGNUM FIRE PROTECTION (INDIA) PVT. LTD., 47-A, BHAGWAGHAR LAYOUT, DHARAMPETH, NAGPUR - 440 010
CNP8757	S. K. SAINI	FIRE RESISTANCE EVA-LUATION OF FIRE DOORS - TWO NOS. - TWO HOURS AND THREE HOURS RATING	M/S GODREJ & BOUCE MFG. LTD., PIROJSHANAGAR, VIKHROLI, MUMBAI-79
CNP8777	S. K. SAINI	FIRE RESISTANCE EVA-LUATION OF GODREJ SAFE AND STRONG ROOM DOOR	M/S GODREJ & BOYCE MFG CO. LTD MUMBAI
CNP8787	S. K. SAINI	FIRE RESISTANCE TEST-ING OF LLOYD PRODUCT SYSTEM	M/S LLOYD INSULATIONS (I) LTD., KALKAJI INDUSTRIAL AREA, NEW DELHI - 19
CNP8846	S. K. SAINI	FIRE RESISTANCE EVA-LUATION OF FIRE DOOR - TWO NOS. - TWO HOUR RATING	B.G. SHIRKE CONSTRUCTION TECHNOLOGY PVT. LTD., PUNE
CNP8946	S. K. SAINI	FIRE RESISTANCE EVA-LUATION OF FIRE DOOR AND PARTITION	G.M.PARTITIONS PVT. LTD., BLDG NO. 14, VIKROLI, MUMBAI

CNP9687	R.L DHABAL	DEVELOPMENT OF ACOUSTICAL CEILING TILES W.R.T. ACOUSTICAL PROPERTIES	MR. P.B. MAHESH GM, (NORTH) MINWOOL ROCK LTD., NEW DELHI
GAP0218	A.K SHARMA	GEOTECHNICAL INVESTIGATION FOR CHARACTERIZATION OF SOIL AND EVALUATION OF SOIL PARAMETERS	DIRECTOR , DEFENCE TERRAIN RESEARCH LABORATORY, METCALFE HOUSE , DELHI-51 TEL: 011-23810159; FAX: 011-23812494
GAP0518	DR.MRIDUL GARG	UTILIZATION OF INDUSTRIAL WASTE MATERIALS AS INEXPENSIVE ADSORBENTS HAVING APPLICATIONS IN BUILDING MATERIALS	THE EXECUTIVE DIRECTOR, BUILDING MATERIALS AND TECHNOLOGY PROMOTION COUNCIL (BMTPC), (MINISTRY OF HOUSING & URBAN POVERTY ALLEVIATION), CORE 5A, FIRST FLOOR , INDIA HABITAT CENTRE, LODHI ROAD, NEW DELHI-110003 PH: 01124636705; FAX: 01124642849
GAP1606	S. CHAKRABORTY	SOFT COMPUTING BASED MODELING AND SIMULATION FOR THE IDENTIFICATION AND DIAGNOSIS OF STRUCTURAL SYSTEM VIA VIBRATION RESPONSES	SEISMOLOGY DIVISON DEPARTMENT OF SCIENCE & TECHNOLOGY, NEW DELHI
GAP2906	A. K. MITTAL	SEISMIC DAMAGE SCENARIO OF BUILDINGS IN ALMORA	UTTARAKHAND STATE COUNCIL FOR SCIENCE & TECHNOLOGY, DEHRADUN
GAP3017	L. P. SINGH	SYNTHESIS AND CHARACTERIZATION OF NANO-SILICA AND ITS SUBSEQUENT USE IN CALCIUM - SILICATE HYDRATE SYSTEM	UTTARKAHAND STATE COUNCIL FOR SCIENCE & TECHNOLOGY, DEHRADUN

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GAP3522	L.P.SINGH	CAPACITY ENHANCEMENT PROGRAMME ON FLAYSH UTILISATION	ENVIRONMENTAL MANAGEMNET CAPACITY BUILDING TECHNICAL ASSISTANCE PROJECT (EMCBTA PROJECT) MINISTRY OF ENVIRON-MENT & FORESTS, NEW DELHI
GAP5027	R. LAKHANI	DEVELOPMENT OF POLY-MER MODIFIED CEMENTI-TIOUS SYSTEMS FOR REPAIR APPLICATIONS	GOVERNMENT OF INDIA, DEPARTMENT OF SCIENCE AND TECHNOLOGY, NEW DELHI
SSP0027	B. B. LAL	REACTION TO FIRE CHARACTERISTICS ON INSSULA MINERAL TILES & MINROCK RB SLABS	MINWOOL ROCK FIBRES LTD, FLAT NO.5, 1 FLOOR, HERITAGE APARTMENTS, A-6, NARAINA VIHAR, NEW DELHI
SSP0028	AJAY CHOURASIA	REPAIR/REHABILATION OF EXPANSION JOINT AT JAWAHAR BUSINESS CENTRE, TOLSTOY MARG, NEW DELHI	CHIEF GENERAL MANAGER, STATE TRADING CORPORATION OF INDIA LTD., JAWAHAR BUSINESS CENTRE, TOLSTOY MARG, NEW DELHI; FAX: 011-23359154
SSP0037	B. B. LAL	REACTION TO FIRE CHARACTERISTIC STUDIES ON PARAMOUNT FR XPE FIRE RETARDANT POLY-ETHYLENE INSULATIONS	PARAMOUNT INTER-CONTINENTAL PVT. LTD, 55-B, BLOCK-ED, MADHUBAN CHOWK, NEW DELHI
SSP0048	B. B. LAL	REACTION TO FIRE CHARACTERISTICS STUDIES ON VISAKA FIBRE CEMENT FLAT SHEETS	VISAKA INDUSTRIES LTD., 'VISAKA TOWERS', 1-8-303/69/3, S. P. ROAD, SECUNDERABAD-500003; PH: 040-27813833, FAX: 040-27813837
SSP0057	SUVIR SINGH	FIRE RESISTANCE TETSING OF FIRE DAMPER	M/S RAVISTAR INDIA PVT. LTD. A 19, SECTOR 64 NOIDA-201301

SSP0058	SUVIR SINGH	FIRE RESISTANCE EVA-LUATION OF WOODEN FIRE DOOR	M/S KUTTY FLUSH DOORS & FURNITURE CO. LTD., 1167 (OLD NO. 37), POONAMALLE HIGH RD., KOYAMBEDU, CHENNAI
SSP0067	S. K. SAINI	FIRE RESISTANCE ASSESSMENT OF FIRE DOOR	M/S SHAKTI MET-DOR LTD., PLOT NO. 4, SY NO. 22, SAI NAGAR COLONY, SECUNDERABAD - 500009
SSP0068	B. M. SUMAN	STUDY THE EFFECT OF RISING TEMPERATURE ON THERMAL TRANS-MISSION THROUGH RESIN BONDED FIBER GLASS PRODUCT	M/S U.P. TWIGA FIBER GLASS LTD., TWIGA HOUSE, 3, COMMUNITY CENTRE, EAST OF KAILASH, NEW DELHI-110 065
SSP0077	R. S. CHIMOTE	ACTIVE FIRE PROTEC-TION MEASURES FOR LUCKNOW DEVELOPMENT AUTHORITY (LDA)'S PRADHIKARAN BHAVAN	CHIEF ENGINEER LUCKNOW DEVELOPEMENT AUTHORITY ZONE 9, VIPIN KHAND, GOMTI NAGAR, LUCKNOW-226001(UP)
SSP0078	RAJESH DEOLIA	3RD PARTY QUALITY ASSURANCE OF CIVIL CONSTRUCTION WORK OF NURSES COLLEGE, MAHILA ITI AND SAINIK KALIAN DIRECTORATE BUILDINGS AT DEHRADUN	S.A.SHARMA, ADD. PROJECT MANAGER, UPRNN LTD., CAMP OFFICE, CORONATION HOSPITAL, DALAN WALA, DEHRADUN
SSP0087	R. S. CHIMOTE	FIRE ENGG. EXPERTISE BASED TECHNICAL INPUTS FOR DESIGN AND IMPROVE-MENT IN EXISTING ACTIVE FIRE FIGHTING SYSTEM OF SANJAY GANDHI POST GRADUATE INSTITUTE OF MEDICAL SCIENCES	PROF.A.K.MAHAPATRA, DIRECTOR, SANJAY GANDHI POSTGRADUATE INSTITUTE OF MEDICAL SCIENCES (SGPGIMS), RAI BARELI ROAD, LUCKNOW-226014 (UP)

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SSP0088	A. GHOSH	INVESTIGATION FOR DISTRESS AT RASHTRAPATI NIVAS AND REHABILITATION MEASURES, SHIMLA	MR KUNDAN LAL SHARMA, ESTATE SUPERVISOR, INDIAN INSTITUTE OF ADVANCED STUDIES, RASHTRAPATI NIVAS, SHIMLA-171005
SSP0098	SUVIR SINGH	FIRE RESISTANCE EVALUATION OF WOODEN FIRE DOOR	EX. ENGR., PWD BUILDING PROJECT DIVISION 232 (GNCTD), OPP. DISTRICT COURTS, SECTOR 9, DWARKA, NEW DELHI
SSP0107	SUVIR SINGH	FIRE PERFORMANCE ASSESSMENT OF STEEL FIRE DOOR	M/S TRIPTI ENGG. SERVICES PVT. LTD., 22, ASHUTOSH CHOWDHURY AVENUE, KOLKATA
SSP0108	B. B. LAL	REACTION TO FIRE CHARACTERISTICS STUDIES ON A-FLEX INSULATION	M/S ALP OVERSEAS PVT. LTD., P. G. COLLEGE, BILASPUR RD., DISTT., UDHAM SINGH NAGAR, RUDRAPUR
SSP0117	SUVIR SINGH	FIRE RESISTANCE EVALUATION OF VIJAY FIRESTOP MORTAR SEAL SYSTEM	M/S VIJAY SYSTEM ENGINEERS PVT. LTD., 35, CHANDIVALI VILLAGE, OFF. SAKIVIHAR ROAD, ANDHERI(E), MUMBAI-72
SSP0118	SUVIR SINGH	BURGLARY RESISTANCE PERFORMANCE ASSESSMENT OF GUARDWEL SAFE	M/S GUARDWEL INDUSTRIES PVT. LTD., RAJHANS INDUSTRIAL COMPLEX, CHINCHPADA GOKHIVARE, VASAI (E), MUMBAI - 401 208; PH: 0250-2455468, 2455300
SSP0127	SUVIR SINGH	FIRE PERFORMANCE EVALUATION OF FIRE DOOR	M/S DELHI METRO RAIL CORP. LTD., TRAIN DEPOT, SHASTRI PARK, EAST APPROACH RD., DELHI-53

SSP0128	SUVIR SINGH	FIRE & HORSE STREAM EVALUATION OF GUARD-WEL STRONG ROOM DOOR	M/S GUARDWEL INDUSTRIES PVT. LTD., RAJHANS INDUSTRIAL COMPLEX, CHINCHPADA GOKHIVARE, VASAI (E), MUMBAI - 401 208; PH: 0250-2455468
SSP0137	SUVIR SINGH	FIRE RESISTANCE EVA-LUATION OF GODREJ FIRE DOORS	M/S GODREJ & BOYCE MFG. CO. LTD., PLANT 17, SECURITY EQUIPMENT DIVISION, MUMBAI-79; PH: 022-27961700/1800
SSP0138	S.K SINGH	PROOF CHECKING OF STRUCTURAL DRAWINGS & THIRD PARTY QUALITY ASSURANCE OF UNIVER-SITY BUILDINGS AT SRINAGAR, CHOURAS, NEW TEHRI AND PAURI	DR. H.B THAPDIYAL, REGISTAR HEMWATI NANDAN BAHUGUNA GARHWAL UNIVERSITY (HNBGU) SRINAGAR(GARHWAL) FAX: 01346-252174
SSP0147	SUVIR SINGH	FIRE PERFORMANCE ASSESSMENT OF FIRE-STOP SYSTEM	M/S LLOYD INSULATION (I) LTD., KALKAJI INDUSTRIAL AREA, KALKAJI, NEW DELHI - 110 019
SSP0157	R. S. CHIMOTE	EXPERT OPINION FOR FIRE SAFETY DESIGN NORMS FOR SHOPPING MALL CUM MULTIPLEX HOTEL PROJECT AT SECTOR-B, KANPUR ROAD, LUCKNOW	SH. S.K. BANERJEE, GENERAL MANAGER, UPAL DEVELOPERS PVT. LTD., MAHMOODABAD ESTATE BUILDING, 15-HAZRATGANJ, LUCKNOW-226 001
SSP0158	B. K. RAO	THIRD PARTY QUALITY ASSURANCE OF CONS-TRUCTION OF RESIDEN-TIAL APARTMENTS IN COMMONWEALTH GAMES VILLAGE, NEW DELHI	THE EXECUTIVE ENGINEER, COMMON-WEALTH GAMES DIVISION-1, SEED BED PART, SCHOOL BLOCK , SHAKARPUR, DELHI-110902, PHONE:011-22481602; FAX:011-26893107

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SSP0167	SUVIR SINGH	FIRE PERFORMANCE ASSESSMENT OF SMOKE DUCT	M/S. ETA SET L.L.C, UNION SQUARE, P.O. BOX 172520, DUBAI, UNITED ARAB EMIRATES DELHI OFFICE: ETA ENGINEERING PVT. LTD., B3 SECTOR-2 NOIDA
SSP0177	R. S. CHIMOTE	FIRE SAFETY RESEARCH EXPERTISE BASED INPUTS FOR ESTABLISHING THE PROBABLE CAUSE OF FIRE IN PAPER BOARD REELS AND REMEDIAL FIRE PRO-TECTION MEASURES THEREOF AT ITC BHADRACHALAM PAPER BOARD MILL SARAPAKA (A.P.)	SH. R. S. PHATAK, DIVISIONAL EHS COORDINATOR, PAPER BOARDS AND SPECIALITY PAPER DIVISION, ITC LTD., ITC BHADRACHALAM HOUSE, 106, S.P. ROAD, HYDERABAD - 500 003 (A.P.)
SSP0178	S. R. KARADE	HEALTH ASSESSMENT OF COAL HANDLING PLANT AND DM PLANT STRUCTURES	GM (E), VAISHALI POWER GENERATING CO. LTD., MTPS, KANTI, MUZAFFARPUR
SSP0188	B. S. RAWAT	STUDIES ON MICROBIAL FORMULATION (METARI ZIUM SPPS) FOR TERMITE MANAGEMENT IN BUILDINGS	DR. D. K. MISHRA, GM-TECHNICAL, INTER-NATIONAL PANNACEA LTD., E-34, CANNAUGHT CIRCUS, NEW DELHI-110001; PH: 011-23418880
SSP0208	R. S. CHIMOTE	FIRE PERFORMANCE STUDIES OF ASKA-HNE WATER MIST CUM COM PRESSES AIR FOAM SYSTEM (CAFS) BASED FIRE FIGHTING EQUIPMENT AS PER DIN EN3 STANDARD FOR CLASS A AND CLASS B FIRES	MR. ASHOK GARG, MANAGING DIRECTOR, M/S ASAKA EQUIPMENTS LTD., 193, DEEPALI, DEEPALI CHOWK, PITAM PURA, NEW DELHI - 110 034; TEL: 011-27014416/17; FAX: 011-27014413

SSP0228	A. K. PANDEY	THIRD PARTY QUALITY ASSURANCE OF CIVIL CONSTRUCTION WORK OF VARIOUS BUILDINGS AT DEHRADUN & RISHIKESH	ER. S.A. SHARMA, ADDITIONAL PROJECT MANAGER, UPRNN LTD., CAMP OFFICE, CORONATION HOSPITAL, DALANWALA, DEHRADUN MB: 9412075796
SSP0238	SUVIR SINGH	FIRE RESISTANCE TESTING OF FIRE DOOR	M/S MPP TECHNOLOGIES PVT. LTD., 487/C, 14TH CROSS, 4TH PHASE, PEENYA INDUSTRIAL AREA, BANGALORE-560 048; PH: 080-28361567/ 28362704
SSP0248	SUVIR SINGH	FIRE RESISTANCE EVALU-ATION OF FIRE DOOR	M/S GM PARTITIONS PVT. LTD., BLDG. NO. 14, CTS NO. 82, 82 (1 TO 17), L.B.S. MARG, VIKHROLI (W), MUMBAI-400 083; PH: 022-25772283
SSP0258	SUVIR SINGH	FIRE PERFORMANCE ASSESSMENT OF FIRE DAMPERS	M/S COSMIC EQUIPMENT T (I) PVT. LTD., NO. 9-A, KALAIVANI STREET KEELKATTALAI, CHENNAI-600 017; PH: 044-22476014
SSP0288	SUVIR SINGH	POST FIRE INVESTIGA-TIONS OF DAMAGED AREA OF INDIAN OIL BHAWAN AT NOIDA AND REMEDIAL MEASURES	SHRI U.K. PAL, DY. GENERAL MANANGER (PI-CIVIL) PIPELINES DIVISION, INDIAN OIL CORPORATION LIMITED, A-1, UDYOG MARG, SECTOR-1, NOIDA-201301 PH: 0120-2448844; FAX: 0120-2448023

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SSP0328	AJAY CHOURASIA	HEALTH ASSESSMENT OF TERRACE FLOOR OF LINK AND DEPARTURE BLOCKS OF ISBT, KASMERE GATE & SUGGESTING REMEDIAL MEASURES	MR. R. K. JAIN, DY. GENERAL MANAGER-PROJECTS, DELHI INTEGRATED MULTI-MODAL TRANSIT SYSTEM LTD., 1ST FLOOR, MAHARANA PRATAP ISBT BUILDING, KASHMERE GATE, DELHI-6; FAX: 23860966
SSP0363	T. P. SHARMA	DESIGN, DEVELOPMENT AND TECHNOLOGY TRANS-FER OF WOODEN COMPO-SITE DOORS	M/S KUTTY FLUSH DOORS AND FURNITURE CO. PVT. LTD., 1167 (OLD NO. 37), POONAMALLEE, HIGH ROAD, KOYAMBEDU, CHENNAI - 600107
SSP0368	H. C. ARORA	THIRD PARTY QUALITY ASSURANCE OF CIVIL CONSTRUCTION WORKS OF UTTRAKHAND SANSKRIT ACADEMY RESIDENCES, HARDWAR	PROJECT MANAGER, UP RAJYA NIRMAN NIGAM LTD., HARDWAR
SSP0408	P.K.S CHAUHAN	SITE FEASIBILITY STUDY OF A PROPOSED REAL ESTATE AT DEHRADUN	MS ATS INFRASTRUCTURE LTD, NOIDA
SSP0428	A. GHOSH	AUGUMENTATION OF STORAGE CAPACITY OF RED MUD POND NO 9, RENUKUT	MS HINDALCO INDUSTRIES RENUKUT RENUKUT
SSP0438	S. SARKAR	INVESTIGATION AND DESIGN OF EMBANKMENT FOR RED MUD STORAGE AT RENUKUT	MS HINDALCO INDUSTRIES RENUKUT
SSP0448	B. M. SUMAN	EVALUATION OF PERLITE BLOCKS AND EXPANDED PERLITE FOR THERMAL CONDUCTIVITY	MR. V.N PANGAL, DIRECTOR (O), KELTECH ENERGIES LTD. BANGALORE-560001, FAX: 08022253857

SSP0498	B. K. RAO	HEALTH ASSESSMENT OF STRUCTURES AT CFCL GADEPAN, KOTA	MR. N. KUMAR, MANAGER(CIVIL) CHAMBAL FERTILIZER & CHEMICALS LTD., GADEPAN, DISTT. KOTA PH.NO. 0744-2782450
SSP1017	A. GHOSH	STABILITY ANALYSIS OF MAIN DAM, NEW ASH DYKE AT RENUSAGAR	MR. G. M. PANDEY, SR. VICE PRESIDENT (MAINT.), HINDALCO INDUSTRIES LTD., RENUSAGAR (UP)
SSP1027	Y. PANDEY	ASSESSMENT OF MONITORING OF DISTRESS AND REMEDIAL MEASURES FOR ANCIENT TEMPLES IN UTTRAKHAND	SUPRINTENDING ARCHAEOLOGIST., ARCHAEOLOGICAL SURVEY OF INDIA, DEHRADUN CIRCLE, DHAROHAR, TYAGI ROAD, DEHRADUN-248001
SSP3517	R. K. GOEL	FIELD DEMONSTRATION OF MANUFACTURING CLAY-FLYASH BRICKS IN THE VICINITY OF NEARBY BRICKS KILNS	DY. GENERAL MANAGER (ASH UTILIZATION CELL), NTPC, SINGRAULI SUPER THERMAL POWER STATION, SHAKTINAGAR (DIST. SONEBHADRA), UP
SSP4517	B. M. SUMAN	EVALUATION OF THERMAL CONDUCTIVITY OF PERLITE BLOCKS AND EXPANDED PERLITE	MR. V. N. PANGAL, DIRECTOR (O), KELTECH ENERGIES LTD., BANGALORE-560001; FAX: 080-22253857
SSP4527	B. M. SUMAN	PERFORMANCE EVALUATION OF RB ROCKWOOL MATRESSES FOR THERMAL CONDUCTIVITY	M/S SHREE RAM EQUITECH PVT. LTD., GANJPURA, DURG-491001, CHATTISGARH; PH: 0788-2617250; FAX: 0788-2322863
SSP5037	S. P. AGARWAL	TECHNICAL ADVICE AND SUPERVISION FOR CHIMNEY AT BTPS	SR. MANAGER (CIVIL), NTPC LTD., BADARPUR THERMAL POWER STATION, NEW DELHI

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SSP6337	A. K. MITTAL	THIRD PARTY QUALITY ASSURANCE LOAD TEST ON SLABS	DELHI DEVELOPMENT AUTHORITY, OFFICE OF THE EXECUTIVE ENGINEER, SOUTH WESTERN DIVISION NO. 6, CENTRAL NURSERY, SECTOR-5, DWARKA, NEW DELHI-75
SSP6347	RAJESH DEOLIA	STRUCTURAL ASSESSMENT AND REHABILIATION OF FARIDABAD THERMAL POWER STATION RESIDENTIAL COLONIES	CHIEF ENGR/THERMAL, CIVIL MAINTENANCE CELL, FTPS, HPGCL, FARIDABAD
SSP6357	AJAY CHOURASIA	PROOF CHECKING OF STRUCTURAL ANALYSIS, DESIGN & DRAWING FOR THE PROPOSED AIRPORT TERMINAL BUILDING AT AURANGABAD	MR. A. C. SRIVASTAVA, SR. MGR. ENGG (CIVIL), AUTHORITY OF INDIA, AURANGABAD AIRPORT, AURANGABAD
SSP6367	A. K. MITTAL	RLA STUDY OF TPS STACK AT PANIPAT REFINERY	CHIEF MAINTENANCE OFFICER (CIVIL), CIVIL MAINTENANCE DEPT., PANIPAT REFINERY, PANIPAT
SSP6377	S. K. SINGH	ASSESSMENT OF STRUCTURAL INTEGRITY & SUGGESTION FOR REHABILATION MEASURES OF OLD BUILDING OF POST-GRADUATE INSTITUTE OF MEDICAL SCIENCES (PGIMS), ROHTAK	ER. S. K . GOYAL, EXECUTIVE ENGINEER, PROVINCIAL DIVISION NO. IV, PWD B&R BR, MEDICAL CAMPUS, MEDICAL SCIENCES ROHTAK
SSP6387	S. K. SINGH	PREPERATION OF MAINTENANCE POLICY AND MANUAL FOR HEALTH CARE BUILDINGS	PROJECT DIRECTOR/SE, UTTRAKHAND HEALTH DEVELOPMENT PROJECT (UAHSDP), 107, CHANDER NAGAR, DEHRADUN-248001
SSP6397	A. K. MITTAL	ASSESSMENT OF STRUCTURAL HEALTH AND SAFETY OF ONGC RESIDENTIAL COLONY BUILDINGS	GM(E), ONGC, ES&TPP, TRIPURA ASSEST, AGARTALA

SSP6407	A. K. MITTAL	ARCHITECTURAL PLANNING AND STRUCTURAL DESIGN OF THREE MODELS OF KGBVS AND QUALITY INSPECTION OF THE ABOVE SCHOOL SITES	STATE PROJECT OFFICE, SARVA SHIKSHA ABHIYAN, DEHRADUN- TEL: 0135-2701941/2/3
SSP6417	B. K. RAO	3RD PARTY QUALITY ASSURANCE OF CIVIL CONSTRUCTION WORK AT SANSKRIT UNIVERSITY CAMPUS, HARIDWAR	SH. J. S. PRASAD, PROJECT MANAGER, UPRNN LTD., NEW DISTRICT HEADQUARTER, ROSHNABAD, HARIDWAR
SSP6427	S. K. SINGH	PERFORMANCE EVALUATION & CHECKING OF STRUCTURAL DESIGN OF PREFABRICATED CONSTRUCTION OF SUB CENTRE FOR UPHSDP, LUCKNOW	CHIEF ENGINEER, UP HEALTH SYSTEM DEVELOPMENT PROJECT, TRAINING BLOCK-2, SIHFW CAMPUS, PROJECT, BLOCK C, INDIRA NAGAR, LUCKNOW - 228 016; PH: 0522-2340541; FAX: 0522-2340538
SSP6447	AJAY CHOURASIA	EVALUATION OF STRUCTURAL INTEGRITY & STABILITY OF ADMINISTRATIVE BLOCK & GOS MESS OF ITBP, MUSSORIE AND SUGGESTING APPROPRIATE REMEDIAL MEASURES	THE SUPRINTENDING ENGINEER, CPWS, 20, SUBHASH ROAD, DEHRADUN - 248 001; PH: 0135-2653579; FAX: 0135-2650884
SSP6717	B. S. RAWAT	EVALUATION OF CHLORFLUAZURON 0.1% TERMITE BAIT (REQUIEM) FOR TERMITE MANAGEMENT IN BUILDINGS	MR. S. SURKUND, SR. V.P., PEST CONTROL (INDIA) PVT. LTD, 36 YUSUF BUILDING, M.G. ROAD, P.B. NO. 1510, MUMBAI-01; PH: 022-26865550-54
SSP8717	S. K. SAINI	FIRE RESISTANCE ASSESSMENT OF FIRE DAMPER	M/S DYNAMIC EQUIPMENTS, D-37, CHANAKYA PLACE UTTAM NAGAR, NEW DELHI - 59

Appendix-III

SSP8797	S. K. SAINI	FIRE RESISTANCE ASSESS-MENT OF FIRE DOOR	M/S SHAKTI MET-DOR LTD, PLOT NO. 4, SY NO, 22, SAI NAGAR COLONY, PICKET, SECUNDERABAD - 500009
SSP8807	S. K. SAINI	FIRE RESISTANCE ASSESS-MENT OF HILUX CALCIUM SILICATE BOARDS FALSE CEILING	M/ S RAMCO INDUSTRIES LTD., 98-A, RADHAKRISHAN ROAD, PB NO. 2949, MYLAPORE, CHENNAI - 600004
SSP9527	P. C. THAPLIYAL	PERFORMANCE EVALUATION OF MATERIALS TO BE USED IN THE REPAIRING & PAINTING OF RCC CHIMNEYS AT BTPS	M/S STANDARD BUILDERS, Y-153, BLOCK 29, NEYVELI-607807
SSP9697	S. K. SAINI	FIRE RESISTANCE ASSESS-MENT OF FIRE SAFE ENCLOSURE	M/S LLOYD INSULATIONS (I) LTD., KALKAJI INDUSTRIAL AREA, NEW DELHI - 19
SSP9717	S. K. SAINI	FIRE RESISTANCE ASSESS-MENT OF FIRE DOOR	M/S SHETH FABRICATORS PVT. LTD., R-676, TTC INDUSTRIAL AREA, MIDC, RABALE, NAVI MUMBAI - 400 701
SSP9727	S. K. SAINI	FIRE RESISTANCE ASSESS-MENT OF FIRE DOOR	M/S ASHISH ENTERPRISES, GANDEVI ROAD, PO DEVSAR, BILIMORA, GUJARAT
TSP0348	S. P. AGARWAL	EVALUATION OF INSUSHIELD - FR CLOSED CELL CHEMICALLY CROSS	M/S THE SUPREME INDUSTRIES LTD., LINKED POLYETHYLENE 22 DEEPAK BUILDING, 13 NEHRU PLACE, NEW DELHI - 110 019; PH: 011-26217454; FAX: 011-46561393; EMAIL: DELHI_PROTPKG @SUPREME.CO.IN

TSP0358	B. B. LAL	REACTION TO FIRE CHARACTERSTICS STUDIES ON FR CLOSED CELL CROSS-LINKED POLYETHYLENE	M/S THE SUPREME INDUSTRIES LTD., 22, DEEPAK BUILDING, 13, NEHRU PLACE, NEW DELHI-110019 PHONE: 011-26217454, 26413728; FAX: 011-46561393
TSP0378	B.B. LAL	REACTION TO FIRE CHARACTERISTICS STUDIES ON INSUSHIELD LAMINATED WITH AL-FOIL & GLASS CLOTH ON ONE SIDE	M/S THE SUPREME INDUSTRIES LTD. 22, DEEPAK BUILDING, 13, NEHRU PLACE, NEW DELHI-110019 PHONE: 011-26217454, 26413728 FAX: 011-46561393
TSP0388	A.A. ANSARI	REACTION TO FIRE CHARACTERISTIC STUDIES OF NEROMASTIC 400 NPK ON STEEL AND CONCRETE PANELS	M/S KANSAI NEROLAC PAINTS LIMITED, P.B NO. 16322, NEROLAC HOUSE, GANPATARO KADAM MARG, LOWER PANEL, MUMBAI-400013 PHONE: 022-24934001 FAX: 022-24973704
TST0018	SUVIR SINGH	IMPACT, WATER ABSORPTION, AGEING AND VIBRATION TEST ON VIJAY MORTAR SEAL SYSTEM	M/S VIJAY SYSTEM ENGINEERS PVT. LTD., 35, CHANDIVALLI VILLAGE, OFF. SAKIVIHAR ROAD, ANDHARI (E), MUMBAI-400072
TST0047	B. B. LAL	EVALUATION OF FORMICA HIGH PRESSURE SINGLE SIDED DECORATIVE LAMINATES WITH BARRIER PAPER FOR SURFACE SPREAD OF FLAME	M/S THE BOMBAY BURMAH TRADING CORPORATION LTD, PLOT NO. 23-26 & 46-48, SECTOR 5, IIE PANT NAGAR IND. ESTATE, RUDRAPUR (UTTRAKHAND)

Appendix-III

TST0097	B. B. LAL	EVALUATION OF GREEN FIRE RETARDANT PLY-WOOD FOR FLAMMABILITY, FLAME PENETRATION & RATE OF BURNING	M/S GREENPLY INDUSTRIES PVT., 1501-1505, NARAIN MANZIL, 23 BARAKHAMBA ROAD, NEW DELHI - 1
TST0228	B. B. LAL	EVALUATION OF ROCK-WOOL SLABS FOR NON-COMBUSTIBILITY	SH. PRADEEP GUPTA, E.E., COMMONWEALTH GAMES DIV. IV, CPWD, YAMUNA VELODROME, IG STADIUM COMPLEX, IP ESTATE, NEW DELHI-2
TST0528	A.A ANSARI	EVALUATION OF FRP PANELS FOR SURFACE SPREAD OF FLAME	M/S KEMROCK INDUSTRIES AND EXPORTS, ASOJ, HALOL-VADODRA EXPRESS WAY 1A, WAGHODIA, DISTT. VADODRA 591510, GUJRAT
TST8837	B. B. LAL	EVALUATION OF HILUX CALCIUM SILICATE BOARDS FOR NON-COMBUSTIBILITY	M/S RAMCO INDUSTRIES LTD., AURAS CORPORATE CENTRE, VI FLOOR, 98-A, DR. RADHAKRISHNAN ROAD, PO NO 2949, MYLAPORE, CHENNAI-4
TST8847	B. B. LAL	EVALUATION OF PARA-MOUNT POLYETHYLENE INSULATION LAMINATED WITH AL-FOIL ON ONE SIDE FOR FIRE PROPA-GATION INDEX	M/S PARAMOUNT INTERCONTINENTAL PVT., LTD., 55-B, BLOCK-ED, MADHUBAN CHOWK, PITAMPURA, NEW DELHI-88
TST9577	P. C. THAPLIYAL	EVALUATION OF IPNET SYSTEM FOR TENSILE STRENGTH, ELONGATION, WATER VAPOUR AND BOND STRENGTH	M/S KRISHNA CONCHEM PRODUCTS PVT. LTD., #1&2, BLDG 6, SECT. 3, MILLENNIUM BUSINESS PARK, MAHAPE, NAVI MUMBAI - 400 710
TST9737	B. M. SUMAN	TESTING OF BUILDING AND INSULATING MATERIAL FOR THERMAL CONDUCTIVITY AS PER IS: 3346	M/S CORAL INDUSTRIES, 304, EMCA HOUSE, ANSARI ROAD, 23-B, DELHI

Appendix-IV

Papers Published

S.P. Agarwal, "Alternative Building Materials", **Science Tech. Entrepreneur**, March-April, 2008, 1-7.

B.M. Suman & R.K. Srivastava, "Effect of Air Gap on Thermal Performance of Composite Wall Section", **Indian Journal of Science and Technology**, Vol.1, No.5, October, 2008, 1-4.

B.M. Suman & R.K. Srivastava, "Summer Period Analysis of Performance of Insulated Roof for Energy Saving and Thermal Comfort in Building", **Indian Journal of New Building Materials & Construction World**, New Delhi, Vol.14, Issue 4, October 2008, 256-266.

Neeraj Jain and Mridul Garg, "Effect of Cr(VI) on the Hydration Behaviour of Marble Dust Blended Cement: Solidification Leachability and XRD analysis", **Construction and Building Materials**, Vol.22, Issue 08, 2008, 1851-1856.

Rajesh K. Verma, Leena Chaurasia & Sadhana Katiyar, "Potential Antifungal Plants for Controlling Building Fungi" , **Natural Product Radiance**, 2008, 7 (4): 374-387.

M. Naveen, Rajiv Kumar & A.K. Gupta, "An Overview of Quantitative Fire Hazards Analysis", **Fire Engineer,** 33(4), Institution of Fire Engineer, New Delhi, October-December, 2008, 7-14.

B. Singh and M. Gupta, "Jute Sandwich Composite Panels for Building Applications", **Journal of Biobased Materials and Bioenergy, USA.** Special issue - 2009.

M. Gupta, Monika, Naseeba Khatoon and B. Singh , "Studies on Bio–Composites based on Pine Needle and Isocynate Adhesives", **Journal of Biobased Materials and Bioenergy,** USA, Special issue - 2009.

B.M. Suman & R.K. Srivastava, "Influence of Thermal Insulation on Conductive Heat Transfer through Roof Ceiling Construction", **Journal of Scientific and Industrial Research**, March, 2009, 248-251.

Leena Chaurasia & Rajesh K. Verma, "Fungicidal Activity of Pyrazolo Pyrimidine Derivatives; N^1-nicotinoyl-4-(sulpha / substituted phenylazo)-1, 2-diazole-4, 6 dimethyl pyrimidine-5-one", **Biozone International Journal of Life Sciences**, 1(1): 92-97, 2009.

V. Srinivasan, R.D. Singh & S.K. Negi, "Environmental Impact Assessment of Building Construction : An Overview, **Journal of Indian Building Congress (IBC)**, Vol. 16, No.1, 2009.

Harpal Singh & A. K. Jain, "Ignition, Combustion, Toxicity and Fire Retardancy of Polyurethane Foams: a Comprehensive Review" **Journal of Applied Polymer Science**, USA, Vol. 111, No. 2, 2009, 1115-1143.

Rajiv Kumar, A.K. Gupta & M. Naveen, "Compartment Fires : BFD Curve and Mathematical Model", **Journal of Applied Fire Science** (Accepted).

Appendix-V

Papers Presented in Conference/Seminar/Workshop etc.

National Seminar on Corporate Social Responsibility, College of Engineering, Roorkee, April 5, 2008

Sustainable Development towards Green Buildings
Astha Dhawan & P.C. Thapliyal

14th Annual Convention and National Seminar on Recent Trends in High Rise Buildings held organised by Indian Building Congress at Vigyan Bhawan in New Delhi during 8-10 May 2008

Design Criteria in High Rise Residential Buildings for Safety
Neeta Mittal

World Sustainable Building Conference' 2008, Melborne, Australia Sept. 21-25, 2008.

Energy Efficient Design & Planning of Small Settlements as Sustainable Building Approach
R.D. Singh & V. Srinivasan

International Conference on Advances in Polymer Technology, APT 2008, Cochin University of Science & Technology, Kerala, September 25-27, 2008.

Modification of Epoxy Polymer by Addition of Thermoplastics
Anupam Singh Shiwach & Rajni Lakhani

Polymer Blend and Alloys and its Application
Ridhi Kaushik and Rajni Lakhani

12th International Conference of International Association for Computer Methods and Advances in Geomechanics (121ACMAG), Goa, October 1-6, 2008, 3272-3282.

Influence of Combined Vertical and Lateral Loading on the Lateral Response of Piles
K. Rajagopal & S. Karthigeyan,

Probable Occurrence of Earthquakes in Chandigarh Region
Abha Mittal, R. Dharmaraju & Gayatri Devi

Liquefaction Potential of Chandigarh City – A Conventional Approach
R. Dharmaraju, VVGST Ramakrishna, S. Karthigeyan & Gayatri Devi,

International Workshop on Emerging Housing Technologies, Organized by BMTPC, Delhi, November 24-25, 2008.

Model Design for EWS Housing using Innovative Construction Technologies developed by CBRI
R.K. Garg

Renewable Energy Asia 2008, An International Conference& 4th SEE Forum meeting, December 11-13, 2008, IIT Delhi

Utilization of Solar Energy in Building Designs in Cold Climatic Regions
Neeta Mittal

Proc. Structural Engineers Congress (SEC-2008), Chennai, December 18-20, 2008, 1227-1236.

Deterioration and Repair of Concrete Structures in Thermal Power Plants
S.R. Karade, A.K. Mittal, P.C. Thapliyal & S.P. Agarwal

A Conference on Trends and Challenges in Structural Engineering and Construction Technologies 11 - 12 , February 2009, CBRI, Roorkee

New and Alternative Building Materials Developed and Evaluated at CBRI, Roorkee,
B. Singh and M. Gupta

Evaluation of Performance of Concrete Surface Treatment Systems
Rajni Lakhani, A. Singh & S.P. Agarwal

Influence of Aggregate Exposure Conditions on Performance of Repair Materials
S.R. Karade, P.C. Thapliyal & S.P. Agarwal

Fire Retardant Rigid Polyurethane Foam – A Fire Safe Insulation Building Material
Harpal Singh

Interface Modeling for Slip and Separation
Navjeev Saxena

Curvature Ductility of Reinforced Concrete Beams at High Strain Rates
A.K. Pandey

Static Soil-Structure Interaction Response of Nuclear Reactor Building
Navjeev Saxena, D.K..Paul & Ram Kumar

Seismic Soil-Structure Interaction Response of Nuclear Reactor Building
Navjeev Saxena, D.K. Paul & Ram Kumar

Damage Evaluation of a Containment Shell Subjected to Blast Loading
A K Pandey

Seismic Vulnerability Evaluation of Housing Stock- A Review
JSR Prasad, Yogendra Singh & Rajesh Deoliya

Challenges in Life Prediction of RCC Structures
Rajesh Deoliya

Quality Assurance and Reliability Analysis of Bored cast-in-situ Concrete Pile
A.K. Sharma & P. K. Yadav

Towards Minimization of Design Errors and Construction Defects in Buildings
Prabhat Kumar & Pradeep kumar

Thermal Behaviour of Fly Ash Mix Concrete
B. M. Suman, R. K. Srivastava and Rashmi Chauhan & Parulekar Shama

Concrete Mix Proportioning Considering Permeability as the Criteria for Durability
B Kameswara Rao

Wind Tunnel Studies on the Effect of Neighbouring Buildings on Wind Pressure Distribution on the Roof of a Cuboid Enclosure
V.K.Sharma , Shree Kumar & P.K.Bhargava

Appendix-V

Review of Retrofitting Techniques for Masonry Infilled RC Frame Buildings
Ratnesh Kumar, Yogendra Singh & Rajesh Deoliya

A New Approach for Damage Identification in Multi Storey Shear Structure from Sparse Modal Information
S.K.Panigrahi, S.Chakraverty & B.K.Mishra

Challenges in Evaluation and Condition Assessment of Structures Prior to Rehabilitation
Harish Chandra Arora & Rajesh Deoliya

Experimental Investigations of Earthquake Resisting & Retrofitting Measures of Full-Scale Masonry Models
Shailesh Kr. Agrawal, Ajay Chourasia,,S.K. Singh & Jalaj Parashar

New Building Materials Technologies from Agro-Industrial Wastes
Manjit Singh

Studies on Wind Pressure Distribution on Pyramidal Roof of Square Shape Buildings
P.K.Bhargava & Amit Kush

Shear Strength and Flexural Behaviour of Reinforced Hollow Concrete Block Masonry
Achal Kumar Mittal

Development of Building Blocks Utilizing Industrial and Construction Waste
D K Gautam, S K Panigrahi, Narendra Kumar & Sameer

A Case Study of Shrinkage and Other Cracks in Concrete Pavements and Repair Techniques
A K Pandey, Anurag Garg & DLN Rao

Role of Information Technology in Construction Management
Sudhir Sharma, P. K. Gangopadhyay, Ajay Dwivedi & Sameer

Optimization of Building Construction Management Process
P.K. Yadav, Rajeev Kumar Sharma & Nadeem Ahmed

Impact –Echo Test: A Tool for Detecting Internal Flaws and Quality of Construction
S. K. Singh, Ajay P. Chourasia & Anjali Ahalawat

Appendix-VI

Training Attended

Shri D.P. Kanoongo, Scientist has attended the Leadership Development Programme during April 20-May 02, 2008 organized by HRDC, Ghaziabad.

Shri R.C. Saxena & Shri Rajesh Ghadse have attended a Course on Swasthay Sanrakshan : Vaigyanik Uplabdhyan during April 23-24, 2008 organized by IGIB, New Delhi.

Dr. B.K. Rao, Shri Vinod Kumar, Shri Ashok Kumar, Shri S.K. Negi, Shri Ajay Singh, Shri S.K. Gupta, Dr. S. Sarkar, Shri V. Srinivasan, Shri H.C. Arora, Shri Rajeev, Shri Rajeev Sharma & Shri Jalaj Parasher have attended the Seminar on Seismic Resistant Design and Rehabilitation of Structures during April 22-25, 2008 jointly organized by Institute of Engineers (I) Ltd. and CBRI at Institute of Engineers (I), Roorkee.

Md. S. Ansari, S.O. (S&P) has attended a training programme on E-Procurement during April 28-30, 2008 organized by ASCI, Hyderabad.

Shri Ashok Kumar & Shri V. Srinivasan, Scientists have attended the Short term training programme on Pre Engineering Building during May 20-23, 2008 organized at IIT Roorkee by ISCMS.

Shri Sanjeev Bansal and Shri Kalam Singh Chauhan have attended a Refresher Programme on Enhancing Job Efficiency for Store & Purchase Assistants of CSIR Laboratories during May 26-30, at HRDC, Ghaziabad.

Shri Ashok Kumar, Scientist has attended the International workshop on Green Buildings : Towards Sustainable Urban Habitats during July 10-11, 2008 organized by GTZ and MoUD at Hyderabad.

Shri S.K. Negi, Scientist has attended the workshop on Draft National Rural Housing and Habitat Policy during July 24-25, 2008 organized at Ministry of Rural Development, New Delhi.

Shri R.S. Chimote, Scientist has attended the training programme on Project Management Technique and Practices during August 04-07, 2008 organized by HRDC, Ghaziabad.

Dr. Neeraj Jain, Scientist has attended the Leadership Development Programme for Junior Scientists during August 04-08, 2008 organized by LBS National Academy of Administration, Mussorie.

Ms. Gayetri Devi has attended the Seminar on Advance Electronic System – Modeling and Simulation (Verification) during August 09-10, 2008 organized by the Institution of Engineers (I), Rajasthan State Centre, Jaipur.

Dr. Rajiv Kumar, Technical Officer 'E-II' has attended certified Incident Managers Programme during August 18-22, 2008 organised by LBS National Academy of Administration, Mussorie.

Md. S Ansari, S.O. (S&P) has attended a Refresher Programme for Section Officers during August 18-22, 2008 organized by HRDC, Ghaziabad.

Dr. S.R. Karade, Scientist has attended a training programme on Theory of Inventive Problem Solving (TRIZ) during 25-27 August, 2008 organized by HRDC Ghaziabad.

Dr.(Mrs.) Rajni Lakhani has attended a training programme on Project Management, during 19-20 September, 2008 organized by Consultancy Development Centre, New Delhi

Appendix-VI

Dr. S.R. Karade has attended the Leadership Development Programme Module 2 during 7-11, December, 2008 organized by HRDC Ghaziabad.

Dr. S.R. Karade has attended Structural Engineers Convention (SEC-2008) at SERC, Chennai, December 2008.

Shri Ashok Kumar, Scientist 'E-II' has attended training on Leadership Development Programme during 1-13 February, 2009 at HRDC, Ghaziabad.

Dr. B.M. Suman, T.O. 'E-I' has attended a workshop on Mathematical Modeling during 23-27 February, 2009 at National Institute of Science Technology and Development Studies (NISTADS), New Delhi, jointly organized by Technology Information Forecasting and Assessment Council (TIFAC) New Delhi, International Institute for Applied Systems Analysis (IIASA) Austria and NISTADS, New Delhi.

Shri D.S. Negi & Rajinder Kumar have attended Professional Development workshop for Private Secretaries/ Personal Assistants during 23-27 March, 2009 at HRDC Ghaziabad.

Shri Nadeem Ahmed, Scientist 'E-I' has attended training on Leadership Development Programme during 22nd March to 3rd April, 2009 at HRDC, Ghaziabad.

Appendix-VII

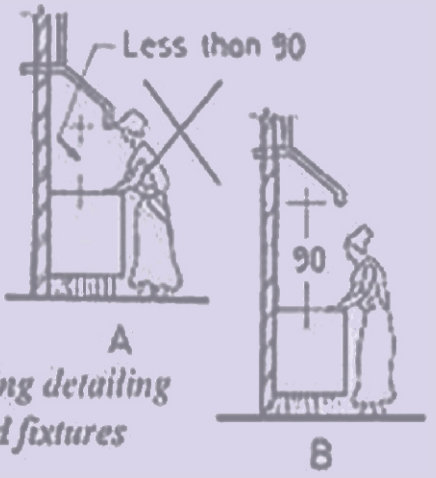
Honours & Awards

Dr. M.O. Garg, Director, CBRI, Roorkee has been elected Fellow of the Indian National Academy of Enigneering (INAE), New Delhi, India in recognition of his distinguished contributions to 'Engineering'.

Shri Harpal Singh, Scientist has been awarded Ph.D. Degree by Indian Institute of Technology, Roorkee for his thesis titled "Studies on Flame Inhibition for Imparting Flame Retardancy in Polymeric Rigid Foam" in November 2008.

Dr. S.R. Karade, Scientist has been elected as a Member of the Executive Committee of the 'Indian Society for Construction Materials and Structures' for 2008-10.

Dr. S. Karthigeyan, Scientist has received an award of the IGS – Chennai Chapter Biennial Prize for the Best Paper on 'Deep Foundation/Retaining Structures' for the year 2006-2007 during the inauguration ceremony of the Proceedings of Indian Geotechnical Conference 2008, held at IISc Bangalore during December 17-19, 2008.



Building detailing and fixtures