

# ReBuild

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A Quarterly Newsletter

**TRAINING AND EDUCATION  
IN CONSTRUCTION INDUSTRY**

**Dr. Fixit Institute**  
of Structural Protection & Rehabilitation

A Not-for-Profit Knowledge Centre

The construction industry in India has contributed an estimated 3,84,282 crore to the national GDP in 2010-11 (a share of around 8%). The industry is fragmented, labor-intensive and providing employment to more than 35 million people including indirect jobs. Better construction management is required for optimising the resources and maximising the productivity and efficiency. Training the manpower with materials, system and mechanization is a key factor for achieving those objectives. It is generally a misconception that training activities are only meant for new recruits and inexperienced employees thus overlooking the older and experienced ones. Education and training are never ending processes. Steven Spielberg, the famous Hollywood filmmaker, earned a Bachelor's degree in film and electronics arts from California State University at the age of 56 years, indicating that there is no age bar where education and training is concerned. Training has become more essential with our present education system. Considering this lack of training and related problems, this issue of our ReBuild is devoted primarily to the need of manpower training and education for achieving durable and concrete structures.

Though there are significant changes in materials and mechanization for producing durable concrete structures, we are still following the old-age traditional practices. The need of training is to familiarize with the concept, material, workmanship, modernization and inspection. In construction industries the majority of the work force is unskilled. Hence, upgrading their skills and providing them training at regular interval is a bigger challenge. As envisaged by the Planning Commission of India, the construction industry will require highly skilled workers and professional manpower by FY 2017. Of course, there are various Government, public and private organizations that are conducting various skill development programmes in different parts of the country, but it's not sufficient since the percentage of unskilled workers in India is 79% which is quite high as compared to any other developing countries. But after acquiring certain skills by the virtue of years of experience along with training and education, the same skill of an individual needs to be assessed for certification which will enable him to move up in the profession in the hierarchical order.

Construction chemicals play a vital role for durability of the concrete structures. In our country majority of the builders and contractors are still following the terrace waterproofing with brickbat koba and China mosaic. Fixing the tiles with cement instead of tile adhesives is a common practice. The use of admixture is limited to large projects only. Cement is being used as crack repair

material. We have a huge stock of ageing buildings and infrastructure facilities spreading all over the country. Maintaining these structures is major issue and at the same time, more difficult than building them. The structural audit and health assessment of existing buildings and structures for determining vulnerability / risk levels could establish rational approach towards repair and retrofitting. There is a wide gap in the knowledge of the professionals in the field of repair, restoration and renewal engineering (3R's). Identification of the gaps in different areas and their planned implementation thereafter will be a step forward for ensuring durability of those structures. There is lack of awareness and training on products and systems of construction chemicals.

The Corporate sector could be incentivised to engage trainees from the training institutes on projects to provide industry exposure. This could lead to a closer bonding between industry and academia and at the same time providing training to the freshers. The methodology of evaluation of training by corporate houses and other enterprises should be goal driven in order to derive benefits from expenditure incurred on training. The return on investment of training in the construction industry is not immediate but it gives dividends in due course of time by optimizing the losses and improving the productivity, quality and durability of the structures.

The undergraduates and post graduates passing out from the universities have limited exposure to the practical field. The concrete technology is often a neglected subject in our civil engineering curriculum. Our course curriculum in civil engineering syllabus in concrete technology needs to be updated with latest materials of construction chemicals. Also, introduction of specific courses such as condition assessment, repair and advanced repair technology of structures and conducting tailor made training programmes for engineers will overcome those hindrances. One of the fastest and easiest ways of knowledge dissemination is distance education besides online education. Civil engineers in the practical field can enhance their knowledge base in 3R's with distance education for their benefit of career growth as well as for their employers in terms of asset management.

We believe that this issue of our ReBuild will refresh our readers, the importance of training and education which is a continuous process for enhancing and upgrading the skill and knowledge of the people resulting into improved quality and sustainable structures.

## Skill Development of Construction Workers

[S. C. Pattanaik, Dr. Fixit Institute of Structural Protection and Rehabilitation, Mumbai]

### 1.0 Introduction

Construction industry in India is growing in excess of 16% p.a. and is likely to reach 500000 crore billion by the end of the XIIth Five Year Plan period. In this industry, skills and knowledge are the driving forces of economic growth and social development. The economy becomes more productive, innovative and competitive through the development of more skilled human capital. There is always a difference between knowing and performing, and the gap is explained by inadequacy of skill. Skill development, therefore, means: all the efforts that allow somebody to learn to do something better than before, or do something new that the person has not done before, and which results in concrete change in their livelihoods.

### 2.0 Skill Development in Construction Sector

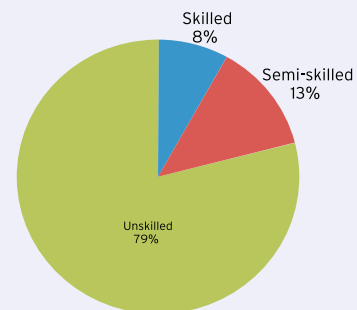
The construction industry (barring real estate developers) does not really sell a tangible product; it sells a service. The service that it may provide is determined by its clients and is performed at a time and place specified by them. Contractors neither have control on the demand for construction services nor can they stimulate it. But the vast majority of contracting firms operate in a product market where they have no control over demands, technology, materials, workplace, finance and labour supply.

The existing institutional framework for skill formation in various construction trades is inadequate. The Directorate General of Employment and Training (DGE&T) in the Ministry of Labour is responsible for vocational training in the country. It runs through state governments and private organisations ITIs all over the country. ITIs impart training in 43 engineering and 24 non-engineering trades. The engineering trades include carpentry, plumbing, masonry and plastering, which though not construction specific, may be relevant to it. As a rule, the training is oriented to the manufacturing and service sectors. Courses are of one to two year's duration and admissions are restricted to high school passouts. Very few construction workers have high school level education to qualify for admission or resources to maintain themselves over the long training period.

The other major programme for skill training is the Apprenticeship Training Scheme under the Apprentices Act, 1961. The trades in which apprentices may receive training, only 3 are construction specific (plumber, brick-layer and fitter) out of total number of trades. The National Network of Building Centres also trains construction workers.

In the absence of any institutional mechanism for skill formation, construction workers continue to be trained by the traditional master craftsmen. Apart from its inadequacy in quantitative terms, the traditional system neither utilises new technologies and work methods, nor does it absorb the benefits of research and development. Also, women workers are not trained in any trade and they remain head load carriers or helpers, all their working life.

It may be mentioned that authoritative serial data on the size of construction workforce and its distribution by skill, are not available. It is estimated that about 310 lakh workers are working in the construction sector, of which 79% are unskilled. Out of this, 210 lakh workers are seasonal construction workers, and the balance are regular construction workers. Women constitute 23%-27% of the construction workforce. The classification of workers based on their skills is given in the Fig. 1.



Classification of Construction workers

Fig. 1: Source: Report of the working group on Skill Development & Training

### 3.0 Skill Development Initiatives by Government Organisations

Among the Government Organizations CIDC has established itself as the leading organisation in the country for conducting skill development programmes and providing training to the construction workers in a very short span. Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Swarnjayanti Gram Swarozgar Yojana (SGSY), Swarna Jayanti Shahari Rozgar Yojana (SJSRY) are some of the Government sponsored skilled development programmes for both urban and rural areas.

#### 3.1 Skill Development Initiative Scheme (SDIS) by Ministry of Labour and Employment

The SDIS was launched by the Ministry of Labour and Employment in 2007-08 with the objective of meeting the growing requirement of skilled manpower in the industry through short-term courses. In less than three years, 1,108 Modular Employable Skills (MES) course modules have been developed covering 48 sectors of the economy. The duration of these courses ranges from 60

hours to 960 hours and they are modular in nature so that a person can acquire skills, get employed, come back to the institute, and acquire another skill according to his or her liking and the market requirement. The scheme has been very well received by the industry and youth.

### 3.2 The Construction Industry Development Council (CIDC)

CIDC under Planning Commission of India has developed Construction Workers Training Programme and Employee Development Programme to enhance the proficiencies of various trades working at execution of Construction Workers level and supervisory level duties respectively. All these programmes are running at various locations across the nation. Persons engaged in Construction Industry such as workers & supervisors having qualification from Vth to XIIth Standard can enroll for short term courses from 1 month to 6 months.

At present, apart from the Union Government, four State Governments (Rajasthan, Bihar, Haryana & M. P.), one National University (Indira Gandhi National Open University), Four State Universities, and almost 79 major Construction Companies, apart from three Industry Associations are working together with CIDC to nurture this programme, which is primarily self financing. Association with National Institute of Open Studies and the DGET, Ministry of Labour, Govt. of India, are on anvil, to enable this initiative to expand further.

#### 3.2.1 Workers Training and Certification

The largest manpower segment of Construction Industry is the Construction Workers segment where the skill development and certification requirements are substantial. To cater these requirements, a program under the auspices of Ministry of Labour in 55 different construction trades has been launched for the first time in India.

The list of these trades is as follows:

Mason, Rubble Mason, Carpenter, Shuttering Carpenter, Bar-bender/Steel Fixer, Plasterer, Tiler, Painter, Plumber, Surveyor, Roof Sheet Layer, Foreman, Stone Cutter and Dresser, Plasters, Drillers, Excavator, General Works Supervisor Welder, Electrical Fitter, Electrical Wireman, Mate Spray Man, Electrician, Fitter, Auto Electrician, Black Smith, Block Maker, Fabricator, Turner, Dozer Operators, Floor Grinding Operator, Concrete Vibrator Operator, Concrete Mixer Operator, Hot Mix Plant Operator, OMC Technician, Vibratory Road Roller Operator, Riggers, Tar Boiler Operator, Mechanic - Earth Moving Equipment, Mechanic - Auto / Heavy vehicles, Hydraulic Excavator Operator, Motorized Grader Operator Wheeled Loader Operator, Crawler Dozer Operator, Crane Operator, Road Roller Operators, Batching Plant Operator, Machine Operator, Stone Crusher Operators, Store Keeper, Dumper

Operators, Public Health Related trades (Testing of Water & Sewerage etc.), Tower Crane Erection and Operations (Concreting Operations) and Laboratory Technicians (Concreting operations).

#### 3.2.2 Vocational Training for Secondary Level Students in various supervisory level occupations

After consultation with various agencies concerned, CIDC has decided to set up this Construction Industry Vocational Training Council as the apex national agency concerned with the aspects of Human Resource Development of the Secondary segment of Construction Industry. After workers the next level in construction industry is the supervisory workmen segment. To cater to this need of workers training for this segment, Vocational Training for Secondary Level Students for different vocations is being conducted. A person either having the secondary level education or having workers certification can be educated through these courses.

In order to improve the work performance of construction industry and to generate value added employment opportunities, Construction Industry Development Council (CIDC) as the apex organization representing the Government and the construction Industry, had initiated a country wide Human Resource Development initiative focused on developing a formidable work force to fructify various Infrastructure Development Projects in the Nation and also abroad.

- Over the last 13 years CIDC has made substantial achievements in the area of HRD especially for construction workers, Artisans and Supervisory cadre personnel. The programme is now spread over 19 states and supported extensively by various State Governments.
- The support from the State Government has come by way of provision of physical infrastructure, 29 ITIs, nomination of learners under various central and state schemes such as NREGS, Chattisgarh Raj Mistry Yojana, Vocational Training for candidates belonging to SC/ST categories and training of Jail inmates.
- Over 250,000 personnel trained, tested and certified by CIDC for their skills. Almost 100% have found value added appropriate employment with leading industry organizations.

All CIDC training centers are equipped with course material, training kits and well trained staff to cater to the express needs of the students and often the teaching material is developed in vernacular to make the message well understood.

### 3.3 HUDCO (Housing and Urban Development Corporation)

HUDCO and others under Ministry of Urban Development and Planning Commission of India have established 640 Building Centres and Company run schools (NBCC HCC, L&T, ECC etc.) & association for skill development programmes.

### 3.4 Khadi & Village Industries Corporation (KVIC)

KVIC have 51 Training Centres and also running 35 types of programmes for Unemployed rural youths, Injob and Artisans/Supervisors working in KVI institutions, prospective Entrepreneurs, beneficiaries of different Govt. Schemes desirous of undertaking KVI activities for duration from 2 months to 12 months.

### 3.5 MSME (Micro, Small & Medium Enterprises)

MSME under Small Industries Development Organisation (SIDO) conducts Entrepreneurship Development Programme, Skill Development Programme (SDP), Management Development Programme in their 72 institutes/ bodies through out the country for unemployed educated youth for both short term and long term programmes.

### 4.0 Skill Development Initiatives by Public Private Participation (PPP) mode

There has been a paradigm shift in the national policy on skill development with the private sector playing a lead role instead of the government, as they are the job providers. The government's roles have changed from being a vocational training provider to a partner and facilitator.

### 4.1 National Skill Development Corporation (NSDC)

The National Skill Development Corporation India (NSDC) is a one of its kind, Public Private Partnership in India. It aims to promote skill development by catalyzing creation of large, quality, for-profit vocational institutions. It provides funding to build scalable, for-profit vocational training initiatives. Its mandate is also to enable support systems such as quality assurance, information systems and train the trainer academies either directly or through partnerships.

The objective is to contribute significantly (about 30 per cent) to the overall target of skilling / upskilling 500 million people in India by 2022, mainly by fostering private sector initiatives in skill development programmes and providing funding.

### 4.2 State Missions on Skill Development

State Governments have also been advised to set up State level missions under the chairmanship of Chief Ministers of respective States to guide and review the Skill Development activities at State level. As a

follow-up, many States have set up State Level Skill Development Mission.

### 4.3 Kaushal Vikas Yojana

In compliance with the announcement made by Hon'ble Prime Minister, DGE&T, Ministry of Labour & Employment has taken up a project titled Kaushal Vikas Yojana to set up 1500 new Industrial Training Institutes (ITIs) & 1000 Skill Development Centres (SDCs) in PPP by involving three partners:-

- Private Training Provider playing the lead role
- State Governments are expected to extend all the possible logistical support, land & provide basic infrastructural facilities free of cost and
- Central Government providing Viability Gap Funding (VGF)

### 4.4 Federation of Indian Chambers of Commerce & Industry (FICCI)

FICCI acts as a "skills development aggregator" to complement Government of India's ambition of training 500 million people by 2022. FICCI offers support and facilitation services through Policy Advocacy, Industry Intervention and International Collaboration so that the youth can acquire skills to meaningfully participate in and contribute to the economy.

### 4.5 Confederation of Indian Industries (CII)

CII has turned the limelight on skills development across the country to align industry manpower needs with the skilling initiatives underway and improve the employability of the working population including school drop-outs, semi-skilled and un-skilled workers. Due efforts are underway to create a new wave of entrepreneurship in the country that will result in further employment generation. CII has launched its own Skills Development Initiative, which is aligned, to the National Skills Development Agenda to skill 500 million people by 2022. In this endeavour, CII has set up its first skills centre at Chhindwara, MP, to train people in bar bending, grinding, pipe fitting, welding, etc. CII along with HPCL launched the 'Swavalamban' project to train 2,200 youth in multiple trades. The programmes have high local relevancy, in-built flexibility and are modular in form. Five sectoral studies have been released on skills requirements in the constructions, auto, retail, healthcare and banking & financial services sectors. Skills development projects are running across the length & breadth of the country with 20 projects already being successfully completed. Projects cover both rural & urban areas. Currently the projects are running in the rural areas in Maharashtra, Andhra Pradesh, Rajasthan, Haryana, Tamil Nadu and Punjab.

CII is also conducting “Skills Gap” studies across the country through credible partners. These studies have been successfully completed in Tamil Nadu and Maharashtra, while those in Jammu & Kashmir and Punjab are nearing completion. The study projects the skills needs and gaps of the state by 2015. Such an analysis helps understand the dimensions of the problem and opportunity within. Based on the findings CII works to create mechanisms to fill these gaps and address the needs of both the organised and the unorganised sector.

#### 4.6 Delhi University-CII Professional Skills Project

CII has identified the need to bridge the employability skills gap among the youth by training them in skills as required and defined by the industry through open sessions and interaction between University and Industry to develop learned, successful and efficient manpower; to understand and explore the available resources in the University and open up avenues based on the existing learning; to assimilate the needs of industry and initiate suitable customization of the Universities’ learning.

#### 4.7 Government of India- L & T (ECC Division) Training Programmes.

Ministry of Rural Development, Govt. of India, with a view to provide much needed training, testing and certification for construction workmen has taken initiative Jointly with L&T in three different trades such as (i) Bar Bending & Steel Fixing ,(ii) Masonry and (iii) Formwork & Shuttering Carpentry.

Structured Training period is for 3 months where 80% hands-on practical training and 20% Classroom teaching to be conducted at L&T Construction Skills Training Institutes / Centres in different locations across the country and one month on-the-job training at construction site. The objectives of these training programmes would be;

- To train unskilled BPL (Below Poverty Line) candidates and also upgrade the skill level of existing construction workers engaged in the Industry.
- To provide opportunities of employment and raise the economic level of the workers.
- To develop a pool of professionally qualified / proficient micro entrepreneurs for overall economic growth & development of the state.

The modus operandi of training programme as follows: State Governments on behalf of Central Govt. to select academically challenged youth preferably 10th & 12th class fail (but 5th class pass may also be recommended) in the age group between 18 years & 30 years from various Districts of five States namely Uttar Pradesh, Bihar, Madhya Pradesh, Jharkhand & Chhattisgarh, in India. Selected youth to be sent to L&T’s Construction Skills Training Institute / Construction Skills Training Centres across the country for training as per the requirement and vacancies mutually agreed upon from

time to time. After three months of training at CSTI / CSTC and one month on-the-job training, these trainees to be referred for engagement with the sub-contractors working at L&T Project sites. In one of the training programme trainees are exposed to Formwork & Shuttering as shown in Fig. 2.



Fig. 2: Hands on training on Formwork and Shuttering in L&T (ECC) programme

#### 4.8 CPWD Regional Training Institutes

Workers Training Centres also work as part of Regional Training Institutes at four Metros. They impart skill improvement training to workers and Group D staff. The skill development courses for workers are conducted in associated with “Construction Industry Development Council”. After completion of the training, certification of the workers is also done through “IGNOU”.

#### 4.9 Australian Vocational Training and Employment Group (AVTEG)

Australian Vocational Training and Employment Group (AVTEG) is an education consultancy that provides world class Vocational and Corporate training to ensure career development and skills training of the Indian workforce. AVTEG designs educational curriculum for targeted jobs and also provides “on the job training” that yields local job opportunities, certification from vocational training institutes and polytechnics in Australia and jobs in Australia. AVTEG certified workforce is locally employable, nationally valuable and globally acceptable.

AVTEG is a performance based vocational education and training organisation that promotes and supports sustainable skill development as a strategic tool for organic growth with competency Skills Training programs designed for specific Skill Development Sectors.

#### 4.10 Artisan-friendly CSR (Corporate Social Responsibility) and educational interventions

- A “School of Construction Artisans” has been established recently in Coimbatore, Tamil Nadu, for imparting free residential training in concreting,

- carpentry and masonry as part of a CSR drive.
- Coimbatore Chapter of Builders Association of India (BAI) is cooperating with Shri Ramakrishna Mission Vidyalaya, Coimbatore to establish the country's first school for artisans. The trainees will be inducted into the member construction companies of BAI (Builders Association of India) in Coimbatore.
- In Madhya Pradesh, Rewa ITI has been selected in the first phase of Centre of Excellence in the sector of Construction and Woodworking Industry.
- The Kerala government has started a 'Kerala Construction Academy' which imparts short-term training to unskilled workers in the construction industry and 'Kerala Skills Development Corporation' to train up to 20,000 Twelfth standard students every year in different engineering streams based on the educational system in Singapore under the guidance from the Singapore Cooperation Enterprise.

## 5.0 Conclusion

The nature of skill mix in building trades is of significance. The skills required to perform building trades vary considerably. A 'mazdoor' could easily be used to assist a mason, concreter, painter or a carpenter. But the skill requirements begin to increase as one moves up the technological ladder. Skills required to become a formwork and centring carpenter, are different from those required in a furniture making carpenter. Similar is the case in masonry, plumbing, concreting etc. Each of these trades is semi-dependent, though a part of the construction process. Entry in the building job market is easy and quick at the bottom-end of the skill; the exit at this end is also easy though not as rapid. Unskilled workers keep moving in and out of the industry. But as the level of acquired skill grows, the opportunity for movement out of the industry declines. This is inevitable, as there is no demand for building skills in any other industry. They may change jobs from a contractor to an independent entrepreneur. But this does not happen to most of the workers. A female worker carrying loads on her head does the same job through out her life. One has to climb on technological ladder after acquiring certain skills and training but without any education there is no further growth. But to overcome those hindrances, Indira Gandhi National Open University (IGNOU) has announced a scheme for "Assessment and Certification of Prior Learning", which will enable skill assessment among the workforce and accordingly certify their skills. By their long work experience, people would have acquired knowledge, but would not have a degree. IGNOU will assess the skills of artisans, carpenters, office assistants and others in related fields, and give them suitable certification. The initiative will give them opportunities for vertical mobility and it will also lead to sustainable skill development.

## Training Requirements in 3 R's highlight the Gaps in Knowledge of Professional Engineers

[Seema Sugare, Dr. Fixit Institute of Structural Protection and Rehabilitation, Mumbai]

### 1.0 Introduction

The construction industry of the subcontinent, as it stands today, deals with multiple kinds of civil structures such as masonry units, RCC buildings, bridges, dams, industrial hubs, monumental structures and so on. Contrary to growing new infrastructures meeting the needs of the burgeoning population of the country, a significant number of India's built up structures also erode with age, neglect, misuse, pollution and varying climatic conditions prevailing in the country. Professionals in the field of construction are therefore face the challenges of leading the future development as well as ensuring structural renewal and durability of the structures through Repair, Restoration and Renewal engineering (3R's) methods. But reliable statistics of arresting such structural damages are not readily available though the distresses are visible in all parts of the country. Hence, knowledge on renewal engineering, in general is turning out to be a critical issue for the construction professionals encompassing residential, commercial, industrial and infrastructural segments.

### 2.0 Need of Repair, Restoration and Renewal Engineering (3R's)

Let us first understand the meaning of 3R's-

Repair mean restoring a structure to a good or sound condition after its decay or damage. Restoration means the act of restoring or returning to a normal or healthy condition of concrete structure as before. Renewal Engineering means renovation or restoration of a structure with the creative application of scientific principles engineering practices to design or develop the structures.

Construction of a structure also deals with numerous activities and engineering practices. Now, any project involves various entities like the client, the architect, structural Engineers, contractor, sub-contractor and suppliers, involving varying workmanship and skills of construction workers.

Since independence, the construction activity has been increasing but there is hardly any increase in availability of matching inputs, in terms of materials and skilled workmen. This gap contributed to the damages and distresses in buildings right from construction stage concealed under the external

plaster and paint. Apart from these, the factors that also affect the structures and lead to damages are poor design, inferior construction materials, wrong construction practices, and damages due to indiscriminate additions or alterations, natural calamities, overloading and external factors like environmental stresses, industrial wastes, pollution, and high humidity.

The above factors stimulated by conventional construction practices lead to formation of cracks, leakages, seepages, corrosion of steel, spalling of concrete, etc, ultimately affecting the durability of the structures. Then, to protect the structures, Repair, Restoration and Renewal engineering (3R's) methods are adopted in different periods of its life cycle depending on the extent of concrete deterioration. But such methods under 3R involve a substantial amount of money in a periodic way and failure of repairs multiply the costs in higher folds, affecting the economy of the nation in a broader sense.

In India, due to unorganized nature of the construction and repair industry and outdated methods of execution, the performance of repair can be vaguely shown as under.

This performance will further get affected depending on the aggressive conditions varying from region to region in India. More recently, the widespread deterioration of our infrastructure and the high cost of replacement give us no option but to repair and rehabilitate.

### **3.0 Gaps in Construction and Knowledge of Professional Engineers**

New construction and repair works differ from each other in several important aspects including project scale, technology management and financing. The approved and adopted repair strategy will not yield any good result unless the major source of deterioration is not addressed in the planning. The knowledge of practicing engineers in this field has gaps in conventional and new technologies about which, how, what, where these technologies to be used. Following are the gaps such as:

- Lack of advanced diagnostic techniques
- Availability of code of practices on waterproofing, repairs and maintenance of concrete structures.
- Specifications requirements
- Knowledge of repair materials
- Application methodologies

#### **3.1 Lack of Advanced Diagnostic Techniques**

As any disease requires a proper clinical investigation before its treatment, similarly, structural diagnosis implies to diagnose the root cause of defects in the concrete structure by adopting right diagnostic methods. When the structure (old or new) lacks to

perform, it immediately affects its structural and aesthetic view, weakening of structural members (columns, beams, slabs etc.), penetration of water showing patches of dampness and leakage, cracks on external and internal walls, spalling of concrete, etc. For diagnostic interpretation of these problems, engineers mostly follow conventional methods and routine nondestructive tests using only Rebound Hammer, Ultrasonic Pulse Velocity test, and Half Cell Potential test resulting in inadequate data and improper diagnosis. The effective repair should involve advanced diagnostic methods such as Liquid Leakage Detector, Infrared Thermography, and Petrography, Corrosion Analyzer, etc, to find out the root cause and extent of leakages and damage along with after NDT methods. Professional engineers are not aware of these diagnostic methods which lead to diagnostic gap in this repair field.

#### **3.2 Availability of Code of Practices**

Till date, Indian code of Practice is limited to bitumen based material for waterproofing and unfortunately, no code of practice for concrete repairs and maintenance of concrete structures are available under BIS. Most of our specifications and material applications then have to follow the standards like British Standards (BS), ASTM, DIN, European (EN), and Australian standards. As professional engineers, designers, contractors and owners are not acquainted with these international standards, repair works suffers at the project site.

#### **3.3 Specifications Requirements:**

Repair works should follow a detailed specification given by the engineers as per codes and standards. These specifications deal with work procedure, application of materials handling, manpower etc. The industry normally follows the manufacturer's specifications on materials and methodology following the British and European codes where performance evaluation is based upon their climatic conditions. We do not go into the depth to find out whether these standard tests are representative of field conditions in India, and hence they are mistakenly used to determine durability criteria for field use. Moreover, the development of performance standards is not at par with the development of materials, primarily because of lack of supporting scientific and field data. All these ultimately lead to a high failure rate with new technologies and materials in our country.

#### **3.4 Knowledge of Repair Materials**

Today, though a plethora of materials are available for repair of structures; the common practice among engineers is to go ahead with the age-old conventional methods. This is attributed to ignorance in knowledge on material science and their applicability areas. A



list of polymeric materials which are available in the industry is given below:

- Polymeric cementitious materials
- Ready to use repair materials
- Pre packed mortars
- Protective coatings
- Waterproof coatings
- Bonding agents, etc.

Concrete repair requires materials with different physical and chemical properties depending on extent of damage and the compatibility with the original construction material. Moreover, the repair material should meet durability requirements of concrete structures. The correct choice and proper use of repair materials is therefore, critical to the achievement of long service life for repaired structures.

### 3.5 Application Methodologies

Repair, restoration and renewal engineering (3R) should be carried out with engineered repair materials, standard procedures and skilled applications. The use of proper procedures in repair, restoration is critical to success; but unfortunately these procedures are not well defined by codes and standards as those for new construction. The different application techniques are followed such as:

- Guniting
- Shotcreting
- Patch repairs
- Injection grouting
- Jacketing or encasement
- Structural strengthening by fiber reinforced wrapping
- Ready mix mortar repair
- Integral crystalline repairs, etc.

Added to these are advanced techniques which are sometimes innovated to carry out repair works at normal and inaccessible areas. As a result, engineers at the site carry out repair works with conventional methods which are not adequate for durable repairs. Eventually, high incidences of repair failure occur at the site and often the repairs have to be re-done within a short period which is an enormously costly exercise.

### 3.6 Other issues

Engineers responsible for selection will be expected to exercise social responsibility by considering not only engineering properties and cost, but also ecological friendliness.

#### 3.6.1 Health & Safety

The growing importance of health and safety issues requires upgrading of the structure in such a way that it meets current fire codes and air quality requirements. This will entail the use of materials with good fire-

retardant characteristics and innocuous materials free of toxic emissions.

#### 3.6.2 Laboratory testing

The use of performance specifications will encourage innovation and will facilitate the linking of laboratory and field data with field performance. However, this will require a better understanding of the relationship between material composition, microstructure and physical performance. Concrete durability is becoming the single most important design criterion in new codes in places such as Japan, Australia and Europe.

#### 3.6.3 Lack of knowledge of maintenance

Maintenance of structures is one of the very important and key parameters to maintain the structure in a good condition. For betterment, everybody maintains their health with their living lifestyles. Similarly, for a good and a healthy structure, it should be maintained with different maintenance schedules and patterns.

### 4.0 Personnel Training for 3 R's

Repair, Restoration and Renewal engineering works requires skilled, semi-skilled and expertise manpower. To carry out extremely sensitive and important operations in repair works, training should be given to the personnel for successful repair works.

Various improvements that need to be included should result in reducing -

- Repair mistakes
- Miscalculations
- Poor performance of materials
- Poor workmanship
- Finding better repair method- that reduces costs while improving quality.

Goal oriented training helps the industry, comprising of Government and private organizations, research institutes and educational facilities, to accelerate qualitative progress in the repair industry such as

- Usage of performance-based guide specifications for specific and generic repair designs to improve specifications.
- Improved repair material design and performance to eliminate cracking, to carry structural loads and to have set and cure properties established by the construction process.
- Usage of environmentally and worker- friendly repair methods, equipment, and materials that will greatly reduce the adverse effects on workers, the public and the earth's ecosystem.
- Developing selection processes, contractual agreements, procurement methods and relationship arrangements (partnering) that will greatly reduce

conflicts, rework, and claims, lawsuits resulting from disagreements among contractors, general contractors, engineers and owners.

- Developing facility owner education that will promote awareness of the effects of deterioration and the means to reduce the risks while protecting their investments.
- Developing improved means and methods for accurate and thorough condition assessment.
- Usage of specific repair system for expanded use, efficiency, and failure reductions.

## 5.0 Professional Courses:

To overcome all over these gaps in the knowledge of professional engineers in this field and training needs in 3 R's, there are only some institutes conducting various courses in this field in India such as

- Dr. Fixit Institute of Structural Protection and Rehabilitation (DFI-SPR) conducts various training programmes on "Construction chemicals applications", "Waterproofing Materials, Systems and Technologies", "Corrosion and Protective Coatings", "Structural Diagnosis and Condition Assessment of RC Structures" etc., and a certificate course on "Entrepreneurship in Waterproofing, Structural Protection and Repair of Concrete Structures" for civil engineers, contractors, builders, site engineers etc. Special lecture on "Waterproofing and Repairs of Concrete Structures" for civil engineering students.
- National Institute of Construction Management and Research, (NICMAR) Pune, conducts distance education programme for six months and one year post graduate programme on "Concrete Technology Waterproofing and Repair Management".
- Mumbai University, Maharashtra in Civil Engineering. Undergraduate courses offers elective subjects in seventh and eighth semester on "Reinforced Concrete Repairs and Maintenance" and "Advanced Repair and Rehabilitation of Structures" respectively.
- Annamalai University, Tamilnadu offers a distance education programme for one year diploma course in "Damage Assessment, Repair and Rehabilitation of Structures."
- Indira Gandhi National Open University (IGNOU), New Delhi offers a distance education programme for one year diploma course in "Construction Supervision and Building maintenance."
- Yashwantrao Chavan Maharashtra Open University (YCMOU), Nashik- offers a distance education programme as a certificate programme in "Fire and Safety Engineering and Management".
- Central Building Research Institute (CBRI), Institution of Engineers India, (IEI), Indian Institute of Technology (IIT)'s, Construction Industry

Development Council (CIDC), Building Materials and Technology Promotion Council (BMTPC) conduct special lectures, seminars and conferences and training programmes on Repair, Restoration and Rehabilitation of concrete structures.

- International Concrete Repair Institute (ICRI), American Concrete Institute (ACI), publishes concrete repair guidelines and research papers.

## 6.0 Conclusion:

- A repair project is more specialized, and good site management and construction practices have to be followed. The construction industry must make every effort to solve the problems that are inherent in the use of current materials and technologies.
- The assessment, design and implementation of repairs to existing structures are more complex than newly constructing them. Therefore, the gaps in construction and repair work practices should be bridged with new materials and advanced techniques, effectively through training on 3R's for professional engineers.
- The Repair industry has several beneficiaries like engineers, architects, equipment suppliers, material manufacturers, researchers, educators, testing companies, contractors, and lawyers. As a matter of fact, all these beneficiaries, along with owners, become stake holders and are thus obliged to put up their best foot forward and their expertise and be in ready to accept the other person's expertise for a common interest.
- With the right focus on the causes, evaluation and selection of correct repair materials; the resultant repairs would be long lasting and we would be able to avoid expensive repetitions of repairs in the future.
- The future prospects of the repair industry are based on an understanding of current trends in looking both opportunities and problems. Creative technology-based responses to the infrastructure problems would ideally take the form of improvements in the productivity of repair and rehabilitation activities, durability, and predictability and less expensive repairs.

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## Evaluation of Training by Corporate Houses

[T. P. Banerjee, Dr. Fixit Institute of Structural Protection & Rehabilitation, Mumbai]

### 1.0 Objective

Any training programme conducted by the corporate organization needs to be followed by an evaluation process. The reason for evaluating is not only to determine the effectiveness of a training programme, but also to determine the value for money spent on training. When the evaluation is done, one can hope that the results are positive and gratifying, both for those responsible for the programme and also for upper-level managers who will make decisions based on their evaluation of the programme. Therefore much thought and planning need to be given to any programme to make sure the effectiveness of the manpower and man hours spent are effective for the overall growth of the company.

### 2.0 Need for Evaluation

J. P. Huller of Hobart Corporation in his introductory speech on "Evaluation in Training Programme" said, "All managers, not just those of us in training, are concerned with their own and their department's credibility. I want to be accepted by my own company. I want to be trusted by my company. I want to be respected by my company. I want my company and my fellow managers to say 'We need you', but just how do we become accepted, trusted, respected and needed? We do so by evaluating and reporting on the worth of our training.

This states, in general terms, why we need to evaluate training. There are three specific reasons:

- To justify the existence and budget of the training department by showing how it contributes to the organizational objectives and goals.
- To decide whether to continue or discontinue training programmes
- To gain information on how to improve future training programmes

In some organizations, top management is of an opinion that training is an optional perspective and, as a result, its value to the organization depends on the top executives' views of its effectiveness.

The second reason for evaluating is to determine whether the training programme should continue or not. It may happen that the content of some programme may not be relevant to the present scenario and become obsolete. Hence such programmes should be evaluated to determine whether they should be continued. Even if the cost outweighs the benefits, the programmes should be discontinued or modified.

The most common reason for evaluation is to determine the effectiveness of a programme and the ways in which it can be improved. In looking for the answer to this question, you should consider each and every aspect of planning and implementation of a training programme.

### 3.0 Planning and Implementing

Each of the following factors should be carefully considered when planning and implementing an effective training programme:

- Determining needs
- Setting objectives
- Determining subject content
- Selecting participants
- Determining the best schedule
- Selecting appropriate facilities
- Selecting appropriate instructors
- Evaluating participants

#### 3.1 Determining Needs

Any programme can be effective if it satisfies the needs of its participants or the overall needs of the organization. The coordinator should ask the participants, bosses and SBU heads by means of a survey.

After tabulating their responses, the next step is to weight the sums to get a weighted score for each topic which should then be used to arrive at a rank order for individual needs. The rank order provides training professionals with data on which to determine the priorities.

A similar form can be used to determine the needs seen by the bosses of the supervisors. The bosses should indicate the subjects which would be of greatest benefit to supervisors to help improve their performance.

In order to make the final decision on the priority of the subjects offered, an advisory committee of managers can be formed and, based on the survey results, the training professional should make the final decision.

#### 3.2 Setting Objectives

Once the needs have been determined, it is necessary to set objectives for the following aspects:

- What results are we trying to accomplish? These results can be stated in terms of quality, sales, profits, return on investment (ROI), etc.
- What knowledge, skills and attitudes are necessary to achieve the results?

The training programme curriculum should then be designed to accomplish the last point. It may happen that in some programmes only upgrading knowledge

is needed, while in others new or improved skills are necessary. Sometimes, the management should also be keen to change the attitude of its employees / supervisors to get the maximum out of the trained manpower. Hence, diversity in training objectives is of utmost important to achieve the desired results.

### 3.3 Determining the Subject Content

The needs and objectives are prime factors when determining subject content. The question that should come up include what topics should be presented to meet the needs and accomplish the objectives. The replies will be the base and then some modifications may be necessary depending on the qualifications of the trainers and the training budget. The department head will take a call and finalize in consultation with the trainers of the programme.

### 3.4 Selecting Participants

While selecting participants for the programme, the decisions should be taken on the following aspects:

- Who can benefit from the training?
- Should the participants be segregated by levels in the organization or should two or more levels be included in the same class?

Though the training can be effective for any engineer in the organization, the organizer should focus on specific interests rather than in a general sense. For example, when training is focused in the areas of repair and rehabilitation on existing structures, then engineers working in new construction sites can be eliminated but maintenance engineers can be included for the benefit of the organization.

The categorization of levels before the training depends on the topic and the extent of coverage of the programme. The organizer should build up a batch depending on similar levels of acceptance, experience and knowledge criteria and accordingly the depth of the training should be decided. The mixing of levels can be possible if the training focuses on general areas of interest without going in depth beyond the understanding of junior staff. But again, this depends on the climate and on the rapport existing among different levels of management within the organization. The basic question is whether the subordinates will speak freely in a training class if their bosses are present. If the answer is yes, then it is a good idea to have different levels, even if in the same programme. They all get the same training at the same time. But if the answer is no, then bosses should not be included in the programme for junior engineers or supervisors. In such a case, perhaps it will be better to organize a similar programme for upper-level managers first, followed by junior staff.

### 3.5 Determining the Best Schedule

The scheduling should consider three things - the trainees, their bosses and the best conditions for learning. Many times, it is seen that the training professionals of the corporate organization consider only their own preferences and schedules. This may not be the right approach because another important scheduling decision lies in whether to offer the programme on a concentrated basis or to spread it out over days, weeks or months. Preferably or more expectedly, department heads should take the decision when their engineers or staff can be sent for training, after analyzing the work load or prevailing requirements.

Ultimately, the schedule should be set and communicated well in advance. The day of the programme and the specific time should be established to meet the needs and desires of both the trainees and their bosses.

### 3.6 Selecting Appropriate Facilities

The selection of facilities is another important decision. Facilities should be both comfortable and convenient. Negative factors like very small rooms, uncomfortable furniture, noise or other distractions, inconvenience, long distances to the training area, uncomfortable temperature conditions are to be avoided, even if a related consideration has to be given with refreshments and breaks provided within the training schedule. Failing these factors causes negative attitudes among the employees, and these attitudes affect their motivation to learn as well as their feelings toward the organization.

### 3.7 Selecting Appropriate Instructors/ Training Organizations

The selection of trainers or faculty in a training programme is critical to the success of a programme. The qualifications of the trainers should include knowledge of the subject or topic in particular, a desire to teach, the ability to communicate and the skill at getting people to participate. They should also be "learner-oriented" - have a strong desire to meet the learner needs.

The budget sometimes limits the possibilities of getting the right trainers for the right topics. Hence, the selection of the training instructors requires proper care. Many organizations feel that they have been burnt as the selected outside instructors did a poor job. Hence, in order to be sure that a potential instructor will be effective, the best approach is to observe his or her performance in a similar situation or to rely on the recommendations of other training professionals about the same instructor. Such a process not only illustrates, but also emphasizes the importance of orienting an outside leader to the needs and desires of the specific

organization. Otherwise, the industry specific training organization would be the best choice to be consulted for choosing the right faculty.

### 3.8 Evaluating Participants

The evaluation of participants immediately after the training programme can be executed in different ways:

- Allowing group discussions among the participants in an issue taught in the programme
- Conducting a written examination on specific aspects
- Organizing question and answer sessions followed by technical presentations
- Providing ratings on how the technical inputs are applied to ensure effective results

Such activities keep the participants alert in the training programme and its applications with regard to day-to-day aspects.

In most organizations, whether large and small, there is very little pressure from the top management to prove that the benefits of training outweigh the cost. Generally, most managers at high levels are too busy worrying about profits, return on investment, stock prices and other matters of concern to the board of directors, stockholders and customers. They pay little or no attention to training unless bad news reaches them about the programme. Such attitudes of the top management should be addressed to get the best benefit from any training programme. There should be an immediate interaction of the top bosses with the participants of the training programme to ensure that the needs and objectives of the training are fulfilled. Even department heads should ensure that feedback is received from trainers or the training organization about the interest levels of its engineers during the programme.

Such interactions and open-ended discussions ensure the effectiveness of a training schedule or agenda and make the training to provide tangible and positive results.

### 4.0 Conclusion

Evaluation of training Programms will help to take corrective actions in training methods while selecting contents and trainers. Training should be a regular activity in construction industry of corporate houses for improving the quality and durability of the construction.

### Reference

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## Need for Distance Education in Application of Construction Chemicals, Repair and Waterproofing

[George Varghese, Dr. Fixit Institute of Structural Protection & Rehabilitation, Mumbai]

### 1.0 Introduction

Distance education, as the name implies, means imparting education from a distance. The student and the teacher need not be physically present at the same place or interact constantly. Distance education is a learning system which permits an individual to study within the four walls of his residence. In fact, it is an excellent opportunity and also the finest alternative to chase and hunt for higher learning, particularly for those who have missed a campus education for some reason or another.

Today, distance education has become much easier and simpler than in the past, with the development of computers and the internet, thereby increasing the effectiveness and efficiency of imparting and acquiring quality education in any field of knowledge or interest. Books, and other study material, are condensed in an e-book, CD or pen drive and can be emailed with lightning speed to reach the desired destination, with a high level of precision and accuracy. With the tremendous advancements made in the communication network in our country, distance education is no longer a distant dream for those who are thirsty for knowledge. Not only are learning processes simplified, but examinations have also become more convenient. Today, with the click of a computer mouse, students can appear for online examinations at most universities.

### 2.0 Benefits & Career Promotion

Distance learning has a number of advantages when compared to traditional classroom education. Distance education enables students to save time, energy and money. Students can thus focus and concentrate on the core learning aspects. Therefore distance education is becoming quite popular among all working executives and professionals who want to further their higher learning, developmental, training and career needs. Furthermore, distance education helps youngsters build self-confidence by enabling them to successfully take responsibility for their own education. A well-designed virtual learning environment has been shown to result in higher levels of retention than instructor-led teaching, and at the same time, it is more cost-effective than classroom training.

The benefits mentioned above are of utmost importance to civil engineering professionals employed in the construction industry. Today the construction industry encompasses not only normal construction activities, but also includes construction chemicals, repairs and waterproofing in buildings and infrastructure development projects.

A large number of engineers are employed on civil engineering projects located in rural, interior and distant places where it is difficult to update and enhance any development of technology and management due to logistics troubles. To add further woes, civil engineers are transferred frequently and are often subjected to challenging situations on the job which makes it difficult for them to leave the workplace early to study technical and managerial competence. Engineers are seldom granted or spared time by their employers so they can study and gain more knowledge.

### 3.0 Challenges of Competition

Market place competition becomes stiffer and tougher as larger segments of society enter employment armed with University qualifications. Knowledge and skills acquired by engineers, particularly civil engineers, become rapidly redundant due to the ever changing environment, converging technologies, global competitions and changing lifestyles. Hence the necessity for re-training and continuous learning and refreshing is a must. Civil engineers are expected to be ever proficient with the latest technologies in construction effectively and profitably. Hence to reach the goal or desired ambition or pinnacle of success in today's parlance, distance education remains to be the only solitary hope under the present circumstances.

To cater to this ray of hope for like-minded enterprising students there are only a few avenues of recognized bodies in the distance education field of civil engineering and they too focus on the basics rather than offering specialized courses. One active body in this area is the National Institute of Open Schooling (NIOS) - New Delhi, which is involved in vocational educational training. Another is the Indira Gandhi National Open University (IGNOU), which regularly conducts several courses in civil engineering education.

### 4.0 Studies in Waterproofing & Repairs

Coming to the core concept, we know that concrete structures are constantly under attack from environmental pollution, moisture and water ingress followed by the penetration of aggressive chemicals like chlorides and sulphates. These reactions cause damage to concrete, which is aggravated with the passage of time. These defects are manifested in concrete at the construction stage itself, mainly due to vibrations, localized settlement of sub-grades

and foundations, movements of formwork, etc. Later on, other defects creep-in due to excessive loading or from natural calamities and disasters like earthquakes, landslides and fires that affect the overall serviceability.

It is a universally accepted fact that concrete structures are hardly ever absolutely free of water leakages. A concrete structure may remain porous to various degrees and is easily vulnerable to water leakage and penetration. The dilemma of water penetration through roofs, walls, bathrooms, kitchens, basements, water tanks, etc. continues to be a serious apprehension for the construction industry the world over. Dripping roofs, damp walls and leaking tanks are perennial woes that beset structures.

It is common knowledge that water gets trapped in concrete during the construction process itself. This excess trapped water can either trickle out or evaporate in due course of time. This movement of water, and its vapour, through the body of concrete or mortar may cause disruptions by giving rise to cracks, loss of bonding between the base concrete and the finishing layers, etc. This is manifested by the gradual peeling off of paint, etc. Capillary rise of water in brickwork can bring up dissolved salts leading to "efflorescence" and further the moisture will lead to corrosion of the steel reinforcement followed by cracking and spalling of concrete.

The effect of water penetration commonly seen are in the form of rotting, staining, moulding, swelling, shrinkage, warping, decomposition of adhesives, loosening of renderings and weakening of materials, besides corrosion of reinforcements. The problems of water leakages are multifold and each needs to be handled differently. The problem of water leakages from roofs and terraces is different from bathrooms and kitchens or from basements of buildings. After having established the causes of water leakages it is important to know how to carry out the inspection, diagnosis and repair of these leakages scientifically. Thus, on the whole, a clearer understanding of water-tightness is very essential as far as modern construction practices are concerned.

### 5.0 Exploring an Evergreen Opportunity

It is found that in spite of the tremendous demand and necessity of scientific repairs needed in our country, only a limited few trained engineering professionals were actually available. In addition, the few available were not well-versed with modern construction technology and its developments in the area of using construction chemicals, which makes the scenario even worse and more complicated. Such situations often arise due to lack of exposure of our

civil engineers to modern methods of construction using specialized chemicals.

The Dr. Fixit Institute of Structural Protection & Rehabilitation aims to highlight and impart education in this niche area providing scientific and durable solutions for the prevention of water leakages and thereby revolutionizing the very concept of waterproofing technologies. The civil engineers of our generation basically need development in this specific area of the renovation and rehabilitation of structures. The Dr. Fixit Institute of Structural Protection & Rehabilitation specially caters to this specific need of civil engineers in India.

As stated earlier, the Dr. Fixit Institute of Structural Protection & Rehabilitation is fully aware of and understands the difficulties of the current generation of working executives, construction professionals and civil engineers related to upgrading their knowledge and skills. It has recently introduced a one-year part-time graduate level distance education course in concrete technology, waterproofing and repair management in collaboration with the National Institute of Construction Management and Research, Pune to equip and provide professional training in this niche area.

The detail of course modules of this programme is given below:

#### **Module 1**

Concrete Technology and Waterproofing of Concrete Structures

- Concrete Technology
- Basics of Waterproofing Technology
- Waterproofing Materials and Applications
- Waterproofing-Standards, Guidelines and Codes of Practices

#### **Module 2**

Technology and Management of Maintenance and Repair

- Building Maintenance - Concept and Perspectives
- Distress Analysis for Concrete Buildings
- Repair, Materials and Applications
- Management of Repair, Restoration and Renewal Projects

In fact, no educational institute had ventured out in the past with substantial investment. The Dr. Fixit Institute courses are specially designed keeping in mind degree and diploma holders in civil engineering engaged in the colossal mission of nation building by infrastructural projects of varying sizes. These engineers have to deal with several project authorities and government bodies involving energy, irrigation, transportation, communication, environment and ecology in the

technology, and management and financial understanding.

The special distance education programme in construction technology will appeal to engineers, quantity surveyors, architects, construction project managers, planners, contractors and property developers, as they will acquire competencies to manage the overall construction environment and be empowered to oversee the entire construction business operations. This course addresses the professional concerns and aims to provide students with a competitive edge to realize their distant dream of enhancing their academic qualifications while working or engaging in other professional activities.

#### **6.0 An Opportunity for Academicians too**

Now teachers and lecturers in engineering colleges are more occupied and engaged in routine work than professional engineers are at construction sites. They hardly have time for their own learning and development. The teachers themselves are forced to forgo the principle of continuous learning and updating their knowledge bank. The Dr. Fixit Institute of Structural Protection & Rehabilitation seeks to support the Government's aspiration and become a partner in enhancing the skills of in-service teachers in the country through C.I.D.C (Construction Industry Development Council) of the Planning Commission of India and The Indian Institute of Technology, Delhi. The Ministry wants to train more and more teachers, who in-turn could train others so as to create a big chain. The Dr. Fixit Institute wishes to be seen as a provider for this kind of distance education to teachers so that these engineering colleges can send, delegate and improvise lecturers who seek to learn more in the areas of the specializations stated above. Teachers should also look into this wonderful opportunity for a career in this field, as these courses in the Dr. Fixit Institute are now introduced in the University of Mumbai and elsewhere. These successful graduates can gain easy employment as teachers, lecturers, academics, administrators and professional educators.

#### **7.0 Conclusion**

Distance education has helped many engineering professionals to furnish and equip themselves with higher education and not to miss out on the opportunities that life throws their way.

The Dr. Fixit Institute of Structural Protection & Rehabilitation is fully confident that this distance education learning will give the participants the desired professional edge in the construction industry and help them gain all the available knowledge in the industry.

## • Open Training Programmes

### Skill Development Programme

**Topic** : Waterproofing, and Repair of Concrete Structures

**Date** : 5th - 6th January 2012

**Venue** : DFI-SPR, Andheri

**Participants** : Trainees from KVIC Borivali, Mumbai

### Certificate Programme

**Topic** : Building Maintenance, Waterproofing & General Repair

**Date** : 19th - 20th January 2012

**Venue** : DFI-SPR, Mumbai

**Participants** : HPCL, Inorbit Corporation Ltd., Adani Infra. Ltd., Kalpatru Group Reserve Bank of India etc.



**Topic** : Building Maintenance & General Repairs

**Date** : 4th February 2012

**Venue** : Institution of Engineers India, Belapur Chapter, Navi Mumbai

### Cracks in Concrete & Crack Repairs

**Date** : 16th March 2012

**Venue** : DFI-SPR, Mumbai

**Organisations** : Orbit Corporation Ltd., HPCL, Adani Infra (I) Ltd., Painter Interior India Ltd., VJTI, HPCL, R. J. Tech Services

## • Corporate Training Programmes

**Topic** : Building Maintenance, Waterproofing & General Repair

**Organisations** : Reliance Industries Ltd, Jamnagar

**Date** : 3rd & 4th January 2012

**Venue** : Jamnagar

**Topic** : Building Maintenance, Waterproofing & General Repair

**Organisations** : Reliance Industries Ltd, Jamnagar

**Date** : 16th & 17th March 2012

**Venue** : BMTPC, Bhopal

**Participating Organizations**: Bhopal Municipal Corporation, DTTDC, PWD etc.

## • Students' Training Programmes

### Certificate Programme

**Topic** : "Durable Construction Practices & Materials"

**Date** : 11th & 13th January 2012

**Participants** : Third year Civil- UG students

**Venue** : MGM College of Engineering, Kalamboli, Navi Mumbai

**Topic** : Waterproofing & General Repair of Building Structures

**Date** : 19th to 22nd March 2012

**Participants** : Final year building maintenance students

**Venue** : Patuck Technical College, Santacruz

**Topic** : Protection Measures Against Corrosion in RCC Structures

**Date** : 28th March 2012

**Participants** : UG- Final year civil engineering students

**Venue** : Veermata Jijabai Technological Institute (VJTI), Matunga, Mumbai

**Topic** : An Approach Towards Making Quality Concrete

**Date** : 31st March 2012

**Participants** : 2nd year civil engineering students

**Venue** : Maharashtra Institute of Technology (MIT), Pune

### Awareness sessions

**Topic** : Waterproofing and Repair

#### February, 2012

- VJTI Diploma College, Matunga, Mumbai
- Sarswati Engineering college, Kharghar, Navi Mumbai
- Sarswati Vidya Mandir, Bhandup, Mumbai
- Fr. Agnel Polytechnic, Vashi, Navi Mumbai

#### March, 2012

- MIT, Pune
- Bharti Vidyapeeth, Pune
- College of Engineering, Pune
- Parvatibai Genba Moze College of Engineering, Pune
- Savitribai Phule Polytechnic, Pune
- All India Shri Shivaji Memorial Society's (AISSMS) Polytechnic, Pune
- Abhinav Institute of Technology & Management, Thane
- Madhav Institute of Technology & Science, Gwalior, Madhya Pradesh
- University Institute of Technology RGPV Bhopal, Madhya Pradesh

## • Paper Presentation

**International Conference on Construction Chemicals at Chennai**

**Date** : 8th & 9th February 2012

**Organized by** : FICCI (Federation of Indian Chambers of Commerce and Industry), New Delhi

"Repair & Diagnostics for RCC Structures" presented by Mr. E. Gopalkrishnan



# Training Programmes and Seminars

## Forthcoming Training Programmes

DFI-SPR has scheduled the following training programmes for the upgradation of knowledge base of Practising Engineers, Waterproofing and Repair Contractors, Consultants, Architects, Faculties and Students from Engineering Colleges.

Sr. No.	Date	Venue	Topic	Fees	Details of the topic
1	6 - 7 Sept 2012	DFI - SPR, Andheri (E), Mumbai	Advancements in Materials towards Sustainable Concrete	₹ 4000	<ul style="list-style-type: none"><li>• Sustainability principles and suitability of concrete as a green material</li><li>• Performance requirements vs. sustainable construction ensuring durable structures</li><li>• Use of Mineral admixtures to minimize clinker consumption</li><li>• New developments in chemical admixtures and their effective uses</li><li>• Recycling of concrete debris for sustainable future</li><li>• Special concreting practices with natural and recycle materials</li></ul>
2	30 Nov 2012	DFI - SPR, Andheri (E), Mumbai	Specialized Waterproofing for Critical Building Sections	₹ 2000	<ul style="list-style-type: none"><li>• Waterproofing for water retaining structures - over head tanks, reservoirs and swimming pools</li><li>• Design considerations for watertight basements and material selections</li><li>• Roof Gardens - designing and protection against water leakage</li></ul>
3	17 - 18 January 2013	DFI - SPR, Andheri (E), Mumbai	Building Maintenance, Waterproofing and General Repairs	₹ 4000	<ul style="list-style-type: none"><li>• Manifestation of weathering distresses in concrete buildings</li><li>• Diagnosis and condition assessment</li><li>• Advanced Waterproofing Materials, Systems and Application Methodologies</li><li>• Understanding cracks - classifications and patterns</li><li>• General repair techniques and materials</li><li>• Strategic planning and maintenance of buildings</li></ul>

## Corporate Training Programme

In addition to the above scheduled programmes, we do organize separate corporate training programmes on specific topics as per the needs of the customer.

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## Distance Education Programme for Practising Engineers

One year Graduate Programme is being offered by DFI-SPR jointly with NICMAR, Pune for practising Engineers on following course:

- **Concrete Technology, Waterproofing and Repair Management**

**Qualification :** Diploma in any branch of Engineering OR Non-Engineering Graduate with 2 years of work experience in the construction industry.

**How to Apply :** Prospectus and Application Form can be obtained from NICMAR on payment of ₹ 1103/- by Demand Draft or downloaded from websites: [www.nicmar.ac.in](http://www.nicmar.ac.in) or [www.drfixitinstitute.com](http://www.drfixitinstitute.com) and sent along with xerox of required documents & application fee of ₹ 1103/- by Demand Draft to NICMAR. The Demand Draft shall be in favour of "NICMAR - SODE" payable at Pune.

### Contact Details:

The Dean - SODE, NICMAR, 25 / 1, Balewadi,  
N.I.A. Post Office, Pune - 411045.

Phone : (020) 2729 2671 / 2729 2512 (Extn. 202)

Fax : (020) 2729 1057

E-mail : [code@nicmar.ac.in](mailto:code@nicmar.ac.in)

## International Journal of 3R's

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For subscription of above Journal and purchase of Manual, please send your Demand Draft / Cheque in favour of "Dr. Fixit Institute of Structural Protection & Rehabilitation" in the address given on overleaf or contact our Editorial Office on Tel.: 022 28357149.

## Advanced Diagnostic Laboratory & Consultancy Services

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The institute offers advanced diagnostic services using non-destructive testing facilities for concrete structures with Ultrasonic Pulse Velocity meter, Digital Schmidt Hammer, Profometer, Core extraction, Petrography, Rapid Chloride Penetration Test, Crack detection on concrete structure by microscope, Corrosion analyzer and Infra Red Thermography etc.

Also, ADL is equipped with all concrete testing facilities along with chemical analysis for chloride and sulphate contents in the concrete.



Petrography laboratory

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- Periodical health check of buildings and structures
- Diagnosis of structural defects and recommendation for suitable repair and rehabilitation
- Service life determination of Civil Engineering structures
- Consultancy on water proofing systems
- Specific training programs on NDT for engineers and practicing specialists



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## VISION

To become a premier national knowledge and skill development centre for capacity enhancement in waterproofing and other areas of repair, restoration and renewal engineering based on sustainable and green technologies.

## MISSION

To act as a platform of national and international networking for sharing of knowledge and practices in the fields of waterproofing, repair, restoration, and renewal engineering in the context of life cycle assessment of the built environment for adoption of best practices by the country's construction industry.

### DFI - SPR : ACTIVITY CHART

#### Capacity Enhancement Services

Networking with National & International Organisations

Development of Database

Formulation of Guidelines for Standardization of Codes of Practices

Compilation of Global Best Practices in the Fields of Relevance

#### Knowledge Dissemination Services

Design of Training Courses for Different Levels and Development of Training Modules

Publications

Refresher Courses for Engineers

Tailor made Training Programmes for Corporate Bodies

Academic Courses for Educational Institutions

International Journal

Students Awareness Programmes

Seminars and Workshops

Entrepreneurial Training

Technical Newsletter

Workers Skill Development

Technology Demonstration

Distance Education Correspondence Courses

Manuals

Guide Books

#### Laboratory and Advisory Services

Non Destructive Testing

Partial Destructive Testing

Concrete Petrography

Health Assessment of Buildings

Consultancy for Repair and Restoration

Heritage Conservation

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## Reader's Feedback & Interaction Solicited

Our Newsletter is focused on good concreting practices, waterproofing, repair, rehabilitation and maintenance of concrete structures and buildings. Any reader, who wishes to contribute his or her experience or achievements in this field to our Newsletter for wider dissemination, may send the details to:

The Editor - 'Rebuild'

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