Waterproofing – for Durable and Sustainable Buildings and Infrastructure in India!

Following an initiative by Prof. Ravindra Gettu, Department of Civil Engineering - IIT Madras and Mr. Ulrich K. Weber, Senior Manager and Waterproofing expert - Sika Group (the global leader in waterproofing), IIT-Madras and Sika in partnership with Indian Concrete Institute, organized an intensive 3-day course on waterproofing of concrete structures from the 17th to 19th of January 2013. The course was fully booked and gave the 75 participants a unique opportunity to get an updated view of the modern technologies and systems used in waterproofing.

The topics covered were:

a. the basics in waterproofing  
b. treatment of joints  
c. waterproofing of basements and tunnels  
d. leak-proofing of roofs  
e. wet rooms  
f. rehabilitation of basements and roofs.

The course was a combination of detailed presentation of the products and and practical demonstrations where the participants could also get a hands-on experience. The audience included construction professionals from the Government, developers, investors, designers, contractors and suppliers.

Why Waterproofing?

Any structure must be enveloped from bottom to top preventing intrusion from nature’s elements and other pollution. Making a building or structure envelope waterproof also provides protection against vapour transmission and serves to prevent unnecessary passage of wind and air into or out of a building, assisting in the controlling of heating and cooling requirements.

Waterproofing Technologies

Life Cycle Management  
... or the trap of low initial investment versus risks.....

Investment for waterproofing system versus total investment in civil works  
Water ingress is causing 80% of damages resulting in huge maintenance and repair costs

A reliable Waterproofing System  
substantially reduces the Total Costs of Ownership (TCO) over the entire service life of a concrete structure

Most of us experience the negative impact of water ingress in our homes causing permanent and serious health hazards due to dampness and mouldiness. Long-term investigations have shown that 80% of all damages to structures are caused by the ingress of water. We expect that a house shall last for 50 or more years and infrastructure, 100 years or more. If the repair and maintenance costs incurred during the entire life of a structure, due to sub-optimal waterproofing solutions being employed, is calculated, it will be several multiples of the initial investment in adopting the most suitable waterproofing solutions. With an additional initial investment of only 1 – 2% of the basic civil construction cost, using modern technologies and waterproofing systems shall ensure water tightness of the structure and shall enhance durability.
No single product or system can be appropriate for all types of waterproofing requirements. We have to think of solutions that are suitable to each situation! For example, protection of below-grade structures can be performed using a positive (exterior) or a negative (interior) waterproofing system.

Waterproofing mortars widely used in India are rigid systems and therefore subject to high crack risks. Modern buildings have different requirements than structures built in the past. The popular crystalline products (part of admixtures or mortars) may not be an ideal solution for effective waterproofing, as crack healing properties of this system are less reliable.

Flexible systems are the choice in projects with long durability requirements and in severe environmental conditions. In addition, high quality injection technology is a must in the waterproofing solutions.

Effective Waterproofing Solutions – Overall Requirements

Long-term durability of buildings and infrastructures can be ensured only with effective systems, where every system component and the detailing are proven in their long-term behaviour. Waterproofing is all about the last minute detailing, understanding the site conditions, owner’s requirements, design, specifications, application and quality control. Areas of high risks in the waterproofing process must be adequately focused upon.

- How to detect the origin of leakage?
- How to limit the risk of leakage?
- How to fix the leakage with complete control?

Selection of the waterproofingsystem with in-built “redundancy” like a PVC membrane system with “Compartment” and back up injection will address the above mentioned concerns to provide a durable and safe waterproofing solution.

However, for existing basement or underground structures with leakages (through joints or cracks), the only solution is to adopt a professional injection system with flexible injection resin (Polyurethane, Acrylic).

Waterproofing Solutions for Basements, Open Cut Structures and Metro Stations

Waterproofing system selected in underground structures could be of the following categories:

1) Watertight Concrete with special joint treatment;
2) Pre applied fully bonded membrane;
3) Loose laid PVC/TPO membrane with compartment with integrated control and back up injection.

The major concerns for any underground structure in case of any leakage are:

Waterproofing of Tunnels

Underground structures like road tunnels and metro projects have a defined service life of more than 100 years. A waterproofing system has to protect the tunnel construction against damage resulting from moisture or the unintentional entry of water as well as the danger posed by aggressive water or soils and the effects of chemicals during the complete service life. Contrary to other application areas, a proper waterproofing system can only be installed once, during the construction, and is not accessible anymore later on – hence, it’s really a MUST to design and construct with a “Do it first time right” approach. Durable, flexible materials and designed systems are required for single- and double-shell tunnels. Special details like crossways and connections to station boxes require customized solutions.
Waterproofing Solutions for Roofs

With the enhanced demands and functional requirements from roofing applications, it is important to adopt more durable roofing solutions based on advanced material science (which can produce highly elastic products), compared to more conventional and rigid roofing systems.

Both Liquid applied elastic and pre-formed synthetic membranes can be adopted based on site conditions, roof design and functional requirements. As an example:

a. LAM system for roofs with complicated detailing or geometry;

b. PVC roofing for large flat roof;

Waterproofing Solutions for Wet Rooms

Waterproofing solutions for wet rooms need to be based on a holistic system approach and not just using a few products.

Ideally, a wet room waterproofing solution should have;

- Waterproofing layer with a special one-component, fibre-reinforced, elastic cementitious mortar
- Polymer-modified, highly flexible cementitious tile adhesive.
- Option 1 for grouting:
  - Two-component epoxy resin based tile grout
  - which is watertight
  - has high chemical and abrasion resistance

- is aesthetically pleasing and coloured
- Option 2 for grouting:
  - flexible cementitious tile grout
  - high abrasion resistance
  - water resistant
  - wide range of very stable colours
  - easy to apply and easy to clean
  - helps to prevent the proliferation of bacteria, fungi and mould
  - High performance, antifungal elastomeric sealing tape and silicone joint sealant.

The construction industry in India is increasingly aware of the importance of higher quality durable waterproofing solutions of buildings and infrastructure, both the Government and the private investors and building owners may not afford anything else in the future. The certificate of participation was issued to each of the participants at the end of the course. The high interest and success of this 3-day course in waterproofing has encouraged ICI, IIT Madras and Sika to repeat such workshops in future.