

The Daily Star

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Roundtable On
**Durability of Concrete Structures:
 A Key Concern for Sustainable Construction**

Azimur Rahman Conference Hall
 June 30, 2018



Akij Cement Company Ltd and The Daily Star organised a roundtable titled "Durability of concrete structures: A key concern for sustainable construction" on June 30, 2018. Here we publish a summary of the discussion.

Sajjadur Rahman, Editor, Star Business, The Daily Star & Moderator of the session

The use of under-quality construction materials is a big concern for consumers in Bangladesh. Poor construction practices further aggravate this concern. Bangladesh is a country of high temperature and high

humidity but no one seems to be serious about this climatic condition that affects strength of concretes. We also hardly consider the impact of construction on our environment.

Poor regulations and monitoring by the concerned authorities make the situation more critical for the people. No one is here to make the contractors accountable. It is high time that the government took action to form a regulatory body to oversee the construction activities for everyone's sake. Otherwise, the next generations will be at risk and they will have no one but us to blame for this.

Dr Md Tarek Uddin, Professor and Head, Department of Civil and Environmental Engineering, Islamic University of Technology

Concrete is the second most consumed material after water. Worldwide consumption of concrete is estimated at 21 billion tonnes annually—that means every person in the world is consuming three tonnes

of concrete every year. To make concrete, we are extracting huge amounts of natural resources. Cement industries account for 10 percent of global CO₂ emissions. If we continue extraction of natural resources in this way, our future generations will face difficulties to obtain natural ingredients for making concrete and it will also have serious effects on our environment. We need to find effective ways to tackle this challenge.

Durability-based design of construction can be a good solution to this problem. It can significantly reduce use of concrete. It is essential for sustainable construction as well as sustainability of construction materials.

In every project, cost of construction covers the major part of budget. We generally emphasise on the safety aspect of construction. Unfortunately, we rarely consider durability and lifecycle of these structures. We do not allocate adequate budget for maintenance. As a result, after few years these structures get damaged. For example, during 1990s, a large number of cyclone shelters were built around the country. Within 15 years almost all of them became totally damaged and the country lost a huge amount of national revenue. As the government is now making huge investments in building mega infrastructures, it is high time that we thought about durability of these structures. This must be reflected in the planning and designing of a construction project.

There are various guidelines regarding durability of concrete structures. We

should learn from these codes of practices and develop a national guideline taking into consideration our local conditions. High humidity, temperature and salinity are the key environmental factors that need to be seriously addressed in this guideline.

All the developed countries have concrete institutions which work on durability of concrete structures. We need to establish such an institution in Bangladesh.

Dr Md Mahmudur Rahman, Professor, Ahsanullah University of Science and Technology

Proper compaction of concrete is crucial for ensuring strength and durability of concrete. It expels entrapped air from freshly placed concrete and packs the aggregate particles together so as to increase the density of the concrete. Similarly, we should maintain concrete cover properly. It protects reinforcement from environmental effects such as corrosion and provides thermal insulation.

Quality concrete materials can't alone ensure quality construction. To achieve it we must follow quality construction practice. Durability-based design is an integral part of this practice.

Md Abu Sadeque, Former Director, Housing and Building Research Institute

The present building code is obsolete because it was formulated following ACI 1989. Since the latest ACI 2016 is available now, why would one use the archaic one? The government should immediately pass the Bangladesh National Building Code 2017 and formulate codes of practices based on this guideline. BNBC 2017 also directs establishment of a building regulatory authority which is a long-felt need.

In our context lack of knowledge is far more dangerous than corrupt construction practice. For example, we use unnecessary brick walls for partition in buildings which significantly increase building mass. It makes our structures vulnerable as earthquake force is directly proportional to building mass. We can easily avoid this risk by adopting light-weight partition walls. Our professionals should be made aware of these alternative technologies.

The government should also come forward in promoting environment friendly construction materials. In the Seventh Five Year Plan the government clearly mentioned that by 2020 use of clay brick as coarse aggregate will be stopped as it can cause major environmental damage. But we do not see any initiative to realise this goal. HBRI has developed some alternatives to clay brick which can be produced without baking in kilns reducing pollution and destruction of arable land. Adoption of these alternative technologies will make our construction projects eco-friendly.

agriculture-friendly and cost-effective. BSTI has set standards for twenty construction materials. But there is no mobile court or monitoring body to enforce these standards.

For ensuring quality of cement we need to develop an efficient marketing channel because after production, as time passes, quality and strength of cement falter gradually. There should be a specialised godown on site to preserve the quality of cement.

Dr Md Abdullah Al Mamun, Director, Bangladesh Road Research Laboratory, Roads & Highways Department

Cement is an industrial product. It has a huge carbon footprint. If we want to achieve sustainability we have to reduce use of concrete. Quality concrete can ensure durability and strength of structure and at the same time reduce use of concrete.

In Bangladesh the major causes of premature failure of constructions are high humidity and temperature and prolonged rainy season. Durability-based design must address these factors.

When we plan a structure we generally do not consider the long-term performance of the structure. After construction we forget about its regular maintenance which is crucial for durability of a structure.

We need to form an infrastructure regulatory commission.

Abu Saleh Md Nuruzzaman, Superintending Engineer, RHD & Additional Project Director, The Kanchpur, Meghna & Gomti 2nd Bridges Constrn & Existing Bridges Rehab Project (Kanchpur)

Quality of concrete mixture can be ensured by maintaining proper ratio of water and cement. We should use high-quality admixture to make our concrete mixtures non-porous.

Generally, it is thought that corrosion in the

structures from salt takes place only in the coastal areas, but it also occurs in other areas of our country because of the salinity in the underground water and salt in the air. We should seriously consider this salt action.

Our engineers do not want to visit under-construction high-rise buildings because of a lack of onsite lifts. Engineers only go up to the sixth floor (at most) to check the quality of under-construction structures. As a result, in case of buildings higher than six-storey, owners rely only on masons which can seriously undermine quality of the construction. On-site construction lifts and safety gears must be used in every construction site.

We should prepare a handbook for general people so that they can learn about the basics of how to make a concrete structure strong and durable.

Md Shahjahan Alam, Director, DPM Consultants Ltd.

First of all, we have to prepare a national standard for concrete structures which will include specification of all concrete materials, testing method and standard acceptable limit. The government should

also set a standard for imported concrete materials such as stone, lime and admixture. Test reports of the materials must be enclosed for opening a LC. Standards of concrete materials should be clearly mentioned in all tender documents. There should be inspection teams for monitoring quality of concrete and durability of concrete structures. We always blame engineers and designers for failure of construction. But the whole construction work is done by contractors. They should also be made accountable for poor construction practices. Finally, regular inspection and routine maintenance of structure need to be ensured.

Md Saidul Islam, Deputy Director (Eng.), BSTI

BSTI has already formulated some standards for concrete materials such as cement and rod following the ISO guideline. If these guidelines are followed diligently we can ensure durability of our construction. Similarly, we can reduce consumption of concrete by following the standard mixing ratio of concrete elements. Unfortunately, this is not happening on the ground. Implementation of standard construction practices is a big challenge for us.

Engr Md Abdul Awal, Managing Director, The Structural Engineers Ltd.

Quality of water is crucial for maintaining quality of concrete. Polluted water seriously affects strength of concrete. Ideally, we should use potable water in every stage of construction including casting and curing.

Unfortunately, our engineering students do not want to be engineers. They want to be officers. There is no provision of internship or on-site learning for engineering students during their academic life. But it should be made mandatory for every engineering student. Ethical construction practices should also be a part of the engineering curriculum.

Compaction of concrete is crucial for maintaining durability. It requires some technical knowledge. In our country, labourers who have very little idea about it do the job. It needs to be monitored by professionals.

Quality of ready mixed concrete decreases with time. According to international standards ready mix should be used within two hours of its preparation. But due to our poor communication system and traffic jam, generally it takes longer to reach a site and eventually quality of the mix falters drastically. We

RECOMMENDATIONS

- Establish an infrastructure regulatory commission.
- Formulate a national guideline on use of durable concrete.
- Ensure proper water and cement ratio in concrete mixture.
- Use construction lifts for supervision during building construction.
- Reduce weight of structures by using light partition walls inside buildings.
- Use quality MS rod.
- Ensure quality of imported concrete.
- Contractors should be made liable for using substandard construction materials
- Compaction of concrete should be monitored by professionals.
- Ensure quality of ready mix by testing it on site.

should seriously consider this issue. To ensure quality of ready mix we need to test it on site.

In 2006 the government passed a law with the provision of seven years' jail or Tk 50,000 fine or both for not following the BNBC. Till today there has not been a single case filed under this law. It clearly indicates how poorly we are implementing our construction-related regulations. We should immediately form an infrastructure regulatory commission.

Dr Mohammad Al Amin Siddique, Associate Professor, Civil Engineering Department, BUET

At the production level we get quality concrete products such as cement, rod, admixtures but on-site quality of these materials falters due to maintenance and supervision failures. We need to seriously think about it. To ensure quality of coarse aggregate on-site, we should follow weight-basis specification instead of volumetric specification of aggregate elements.

Dr Md Nazrul Islam, Professor, Department of Civil Engineering, DUET

Supervision in every stage of construction is important. Good engineers and designers alone can't ensure quality construction because many other professionals are involved in a construction process. Therefore, when a construction project fails, all the professionals including contractors who work at different stages of the construction need to be made accountable. Database of professionals involved in every construction project should be maintained diligently.

High-strength concrete is not necessarily durable concrete. Durability should be measured by performance.

Payar Ahmed Tushar, DGM, Sales & Marketing, Akij Cement Company Ltd.

As a cement producer, we feel it is our duty to work for creating mass awareness about durability of concrete structure. I believe today's discussion will definitely contribute to this effort.

We need to invest more in creating skilled professionals for the construction sector. Our engineering students have very limited knowledge about durable construction practices. It needs to be incorporated in our engineering syllabus.

In Bangladesh, 40-45 percent of construction happens in rural areas. Those construction projects can hardly be called engineered construction as they are totally dependent on local masons. They don't follow any construction guideline. There should be strong inspection and monitoring system in place to ensure safety and durability of construction in rural areas.

Finally, all the stakeholders in the construction sector should work jointly to make our construction projects durable and sustainable.

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*Durability based design is to be followed and the structures are to be constructed accordingly.

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