

# Material quality first

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Engineer M.A. Wahed, Senior Research Engineer, Structural Engineering & Construction Division, Housing & Building Research Institute (HBRI) talked about quality of construction materials, especially cement, steel rod, bricks etc.

Actually, cement quality depends on after production. There was no cement factory in our country about 33 years back. At that time cement was imported from abroad. A lot of time (nearly 3 months) used to be wasted in getting it in the country. As a result, cement used to lose its quality. Again cement loses its quality when it comes in contact with water. But now-a-days very good quality cement is available in our country. Of course, cement is considered important ingredient of concrete. The raw material used in cement is limestone. In addition, all cement factories in our country import clinker from abroad. As this is very costly, companies mix some fly ash with cement just for the business purpose.

The full power of cement is not essential for all activities. Notably, the strength of cement which is needed to build a 24 storied building is not needed for a 2 storied building.

**TDS: Is there any steel rod that can protect buildings from earthquake?**

Engr. M.A. Wahed: Whenever a steel rod contains ductility, it shows steel strength. This rod is made with such raw materials that can easily be bent/ curved. And this rod is very conducive to protecting buildings from earthquake. It generally becomes as flexible as wire because when a high rise building is hit by earthquake, the building just shakes because of this flexibility. Apart from these, it will take time to fall. But if the rod has no ductility it becomes brittle and results in a great disaster. Many engineers think earthquake resilience buildings are very costly to build. Approximately, it costs five taka per square feet. Moreover, if a building is earthquake resilient, it may fail during earthquake but it takes about one and a half hour. That way, people can save their lives. Yet the belief of saving buildings in the event of earthquake is quite impossible in our country.

**TDS: How can people identify no 1 bricks?**

Engr. M.A. Wahed: Four issues are considered in identifying number 1 bricks. First is brick shape (lengths- 9.5 inch, widths- 4.5 inch, height- 2.75 inch). Then size should be plain not rough. Third is strength: above 2500 PSI (pound per square) is considered no 1 brick. Fourth factor is raw material with which it is made. Sand should not be mixed in the raw materials. If sand is mixed, it will not be strong after being burnt. Its strength depends on its burning. Another way of identifying number -1 brick is the water absorption capacity. In case of no 1 brick, If it is kept in water for 24 hours, its weight will increase to 1:6 or 1:4.

Engineer Md. Arifujjaman

Research Engineer Structural Engineering & Construction Division Housing & Building Research Institute (HBRI) talked about activities at HBRI and contribution to the construction sector.

We have four Divisions here: Structural Engineering & Construction Division, Soil Mechanics & Foundation Engineering Division, Material Division and Housing Division. Structural Division works with earthquake. Besides, Material Division is working with material development which also helps to design the earthquake resilience buildings. We are trying to use flexible bricks so that the whole building will be flexible. Structural Division also works with lateral load (load of air, earth quake etc.) in the event of earthquake. It researches with bricks by which we are making our buildings. We also research with the behavior of the buildings made with normal bricks. We have completed first phase in 2012. We hope we can reach our totally developing technology to the common people. Actually we are a research based institution. So implementation part will come later. Only HBRI is making Ferro-cement in which micro reinforcement (wire -mesh) is used. As a result, we can build very thin wall whose crack is very narrow. There are a few cracks in the Ferro-cement. We are making floating house with this Ferro-cement especially in the flood-driven areas. We are making water tank with Ferro-cement which was very popular in the 90s. And water kept in it remains very cold and hygienic. We also make pre -stressing precast piles which fulfill the demands of the people. We are going to formulize the standard of building construction materials. It is under processing. We have also made Ikra Wall which has a wall of bamboo with plastering.

**T.D.S: Do you think that construction material manufacturers are making quality steel rod, cement, bricks etc.?**

Engr. Md. Arifujjaman: Yes, there are some good companies which try to uphold their quality. But some are below standard. So people should go to the experts to take advices from them.

**T.D.S: Why should they go to the experts? What is the process?**

Engr. Md. Arifujjaman: I think one should go first to a good architect who will make a good architectural design for him. Then he/she will take the help of a good structural engineer. Besides, implementation and construction should be well-planned. An experienced engineer who has a lot of experience in the field work should be deployed for supervision. An experienced diploma engineer should be kept for all time supervision. He who will design for the construction should be set for top supervision.



# Fire safety in construction work

ENGR. KALIMUR RAHMAN

**"F**IRE due to short circuit" is a common cause that we read about, whenever there is a fire incident, be it in high rise buildings, apartments or even smaller dwellings not forgetting the industrial set ups, which have figured prominently in fire incidents of recent years.

For the present day trend of multistoried apartment buildings, highrises with offices, shopping malls etc., and even smaller buildings where the requirement for electricity involves multiple appliances (washing machines, dryers, heaters, microwave ovens etc) the electrical design aspect for buildings has assumed all the more importance simply for safety purposes.

The problem of fire due to short circuit gets even more acute due to lack of proper training of contractors, mindset of customers and developers to save cost and get the electrical work done at the cheapest possible way and electrical design in most cases is an afterthought once the entire establishment is already completed, whereas, it should have been thought of at the very early stage of design. Also at times there are elaborate designs but are not followed by the contractors, later when there is any problem no one can go by the plan that's on a piece of paper.

In layman terms, a short circuit is the coming together of wires carrying dissimilar types of "current" (as we say). Some others would say that the hot wire coming in contact with the cold wire is the cause of short circuits. That is not the strict or complete definition in technical terms yet is good enough for a basic understanding for "beginners".

To put it in a better and one that is comprehensive perspective, whenever we use an electrical appliance (light, fan, aircon, refrigerator, etc), we allow "current" to flow through the wires into the appliance which converts the electrical energy into our required form (e.g. mechanical motion for fan, light energy for lighting etc). This current flows through wires and therefore the wires have to be of the appropriate size/capacity to bear the "load" that it serves. For example, the wire that conducts current to an aircon has to be of greater capacity than one which may be used for an energy saver light. Of course, it goes without saying that the wire used for an aircon can be used for an energy saver light without short circuit worries, but not vice versa.

The simple reason is that when the current passes through the wires, heat is generated, and the wires must be designed to safely withstand that heat. If that is not done then overheating of the wires may cause the protective covering (insulation) on them to melt and short circuit may occur due to the "hot" and "cold" wires without the protective covering, to come together. Further, the melted insulation may fall on combustible material below (wood, clothes etc) and start a fire. The wires themselves may catch fire that will spread along the wire.

The above is a very simplistic description of a short circuit, that we often hear or read about. In real life it involves multiple wires with "current" in different phases, which interact very much like the "hot" and "cold" wire concept, outlined above. It also involves the selection of the right type of switchgear (switches, plugs, circuit breakers etc) which are used to distribute the "current".

Many of our contractors/workmen do not have the requisite qualifications for such designs and they work based on past experience or thumb rules that they have picked up along their way. The designing aspect should be undertaken by professionals in the field which require interaction with other disciplines during the design phase. The design would take into consideration the requirement, the type of equipment that will be used in the building, the use pattern at different times of day, month and year, the safety factor, the aesthetics desired by the customer which may sometimes lead to an unforeseen hazard and would have to be resolved in a safe manner and a host of other considerations. All these require not only someone with a degree or a licence but also with adequate design experience. The certified "as built" drawings of the designs should be available to investigate the causes, if there is an accident/incident at any later date.

Over the years, many of our local consulting firms have successfully grown with adequate capability and experience to undertake complex designs. For simple buildings (2-4 storied housing etc), many would argue if it is prudent enough to go to them and spend a substantial amount of money, for their services. For more complex buildings, industrial and manufacturing setups, it would certainly pay rich dividends in the long run as it would save the entrepreneur from heavy losses due to fire, lost lives and multiple hassles resulting from such occurrences.