Student's Voice

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New Chapter of My Life

My name is Idrees Zafar and currently, I am a PhD student in Graduate School of Engineering, Hokkaido University under the English Engineering Education Program (e3). I am grateful to the editor of the Japan Society of Civil Engineer (JSCE) Concrete Committee Newsletter to give me the opportunity to share my experience of living and studying in Japan for last four years.

The life is Japan has been a challenging but interesting experience of my life. In the beginning, I was a little worried coming to a non-English speaking country such as Japan because I did not speak any other international language except for English. But once I came here, I was surprised to find out how helping these people were, even you don't understand each other. Like, on the first day I lost myself while coming back from university to my dormitory and I asked a stranger about the address. He tried to explain for few minutes but after realizing that I was new and could not follow what he was saying he took me to the address by himself. After that day it has always felt like home to me.

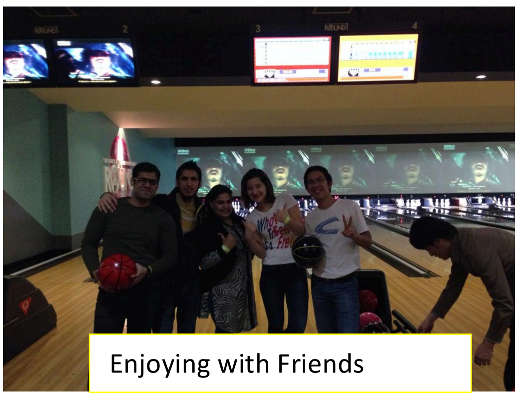
I used to live in the dormitory where there are students from all over the world. I have made many friends. It's interesting to have different perspectives on things depending on where they are from and in this way you, you come to know about lot of other cultures as well.

The lab atmosphere is really encouraging and helps a lot to increase the understanding of durability related issues of reinforced concrete. Although every individual has his own research topic but according to the theme we are divided into small research groups. We all help each other with casting of concrete when necessary. Once in a semester our laboratory also hold a joint seminar with other concrete laboratories to share the ongoing research with each other. And the questions, especially from the teachers, during the seminar inspire us to dig more into our study. Beside the hard work, we also enjoy different parties, BBQ and sport tournament as a family. In the end I will like to introduce a part of my ongoing research with an extended abstract.

During International Hour

During University Food Festival

During Lab Party



Enjoying with Friends

Study on the corrosion of rebars in fly ash concrete during moderate to high corrosion rate

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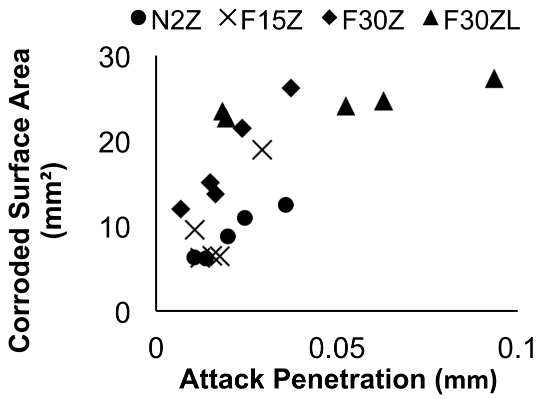
ABSTRACT

Corrosion of reinforcement has been established as one of the principal factors causing extensive premature deterioration which seriously affects the serviceability and the safety of concrete structures. In last few years, among many mitigation methods, the incorporation of Supplementary Cementitious Materials (SCM) in concrete, has been proposed as one of the effective methods to reduce the corrosion induced damage in concrete structures. Fly ash, among the rest of SCMs is the common pozzolan and used worldwide in blended cements. It is generally recognized that the intrusion of fly ash in concrete improves its resistance against chloride-induced corrosion of steel reinforcement by reducing its permeability, particularly to chloride ion transportation and increasing the resistivity of the concrete (Sugiyama 2001).

In literature various studies have been done on the durability of concrete with regard to the corrosion of steel reinforcement. In majority of these researches, an impressed current technique has been used to accelerate the corrosion process. In this method a constant current (5-100 $\mu A/cm^2$) is applied to achieve a certain degree of corrosion like corrosion stains, first visible crack or certain crack width. But in real structures the values of corrosion rates higher than 1 $\mu A/cm^2$ are seldom measured, while the values between 0.1-1.0 $\mu A/cm^2$ are most frequent. The electrochemistry of the corrosion process in real structures is also different as compared to the impressed current method. So in this regard, less data is available especially for the behavior of fly ash concrete for small current density values ranging from 0.1-1.0 $\mu A/cm^2$.

In view of the above mentioned context, an experimental methodology which has already been used for determination of chloride threshold values was applied to study the propagation stage of corrosion. Four different series of specimen (N2Z, F15Z, F30Z and F30ZL) were prepared with a constant water to binder ratio of 0.5. Fly ash concrete specimens were made by replacing 15% and 30% ordinary Portland cement with fly ash, named as F15Z and F30Z respectively. All specimen series were cured for 28 days except F30ZL series which was cured for 91 days. In this method, accelerated corrosion is achieved by an artificial environment method, using the high concentration of NaCl i.e. 10% at a temperature of 23 ± 2˚C. The corrosion performance of ordinary Portland cement and fly ash concrete were put to test under this method. A limit of 0.5-1.0 $\mu A/cm^2$ was fixed for every specimen to imitate the conditions of moderate to high risk of corrosion.



Relation between Corroded Surface Area and Attack Penetration

Results indicated that activation polarization was found to be the governing mechanism of rebar corrosion irrespective of the fly ash addition. It was perceived that the longer curing for fly ash concrete has delayed the onset of the corrosion of rebars but on the other hand it has increased the probability of pitting corrosion.

REFERENCES

Sugiyama, T. Tsuji, Y. and Bremner, T.W. 2001. Relationship between coulomb and migration coefficient of chloride ions for concrete in a steady-state chloride migration test. Magazine of Concrete Research 53(1): 13-24.