

FOR EDUCATION AND RESEARCH
IN GRADUATE SCHOOL OF ENGINEERING
HIROSHIMA UNIVERSITY

EDUCATION AND RESEARCH REPORT

(COVER Page)

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Affiliation: Paris-Est University, IFSTTAR, Bridges and Structures Department, Paris

Name of Host Scientist: Prof Ryoichi SATO

Period: From June 27, 2011 to June 29, 2011

Title of class which you educated:

Advanced Structural Concrete

Date: June 29, 2011

Signature: François TOUTLEMONDE

1. Preparation

Following contacts with Professor Sato dating back CONSEC'10 conference, where we discussed the possibility to organize a joint seminar on crack control of mass concrete in Paris (France), associated to recent JCI recommendations and French works on this subject, and the subsequent visit at LCPC (now IFSTTAR) of Prof. Sato and Prof. Mizobuchi in October, 2010, I was invited by Dr Eng. Fusahito YOSHIDA, Dean of the Graduate School of Engineering at Hiroshima University, to give 7.5 hours lectures (5 units) within the course "Advanced Structural Concrete" (letter to Prof. Henri Van Damme, scientific director at LCPC, dated March 30, 2011) chaired by Prof. Sato.

The subject of the lectures had been agreed with Prof. Sato in an e-mail exchange dated December, 2010. Based on Dr Toutlemonde's research experience, the lectures were intended to give complementary open-minding information to the students on active research, innovation and concrete structures advanced design with an international point of view. Slides were sent as .pdf files some days in advance to Prof. Sato's secretariat for preparing prints to facilitate understanding of the talk for students who might be not familiar with technical lesson given in English.

The IFSTTAR reference for this activity is the "ordre de mission international" n° 103 dated May 30, 2011 following the "autorisation de cumul d'emploi et de rémunérations" validated by the IFSTTAR Direction on January 6, 2011.

2. Lectures

Monday June 27, 2011, 13:00 – 14:30

Application of VHPC (Very High Performance Concrete) in a new type of precast beams: Concept, design, justification method and experimental validation

Monday June 27, 2011, 14:45 – 17:00

Development and validation of new UHPFRC (Ultra-high Performance Fiber-reinforced Concrete) bridge decks

Tuesday June 28, 2011, 13:00 – 14:45

Chemo-mechanical couplings in AAR / DEF affected concrete structures: identification and modelling

Tuesday June 28, 2011, 15:00 – 16:00

Managing AAR and/or DEF-affected structures: State-of the art in France

Wednesday June 29, 2011, 12:50 – 14:20

Performance-based durability design of concrete structures: European standards and State-of-the-art in France



Announcement of the lectures had been done for students' information (see figures above). Fourteen students attended the lectures (see figures below).



One of them was quite active (probably with a better practice of English language) and asked relevant questions. For the other students they hardly asked questions. It seems that the connection of innovative concrete materials and their properties and design optimization is a rather new field in the students' education course. Expansive reactions within concrete also seemed to be a new topic, but students had heard about cases in Japan and even in Hiroshima and around.

3. Other scientific activities

Monday, June 27

We discussed about some research issues with Prof Sato. He gave me papers off-prints related to FRP strengthening of concrete columns, which is of interest for one of my Ph.D. Students and one of active subjects in France due to renewal of seismic actions considered in the design code. He also gave me recent papers on accounting for autogenous shrinkage effects in safely predicting strains and stresses of reinforcement, and also mitigating autogenous shrinkage effects with some porous ceramic waste aggregate substitution.

I left to Prof. Sato the special issue of “Bulletin des Laboratoires des Ponts et Chaussées” N° 278 dealing with heat generation due to thermal hydration (in complement to .pdf English versions) for future discussions in view of the joint seminar on crack control of mass concrete.

We had a visit of the civil engineering laboratories, especially with free / restrained shrinkage tests on concrete specimens, the controlled atmosphere chamber for study of corrosion due to chlorides (cycles of salty water spray / drying at 40°C), and discussed about the project of large testing machine removal for future strong floor creation.

Tuesday, June 28

In the morning I finished preparation of the lectures to be given at Hiroshima University, and I proceeded in preparation of the meeting with JCI committee to be held in Tokyo on Thursday June, 30, and the lecture to be given in Tokyo on Friday July, 1st within the JCI seminar on crack control of mass concrete.

From 16:30 to 18:30 there was a seminar with presentations of current on-going projects in the Department by Master and Ph.D. students (see photos hereafter). It was the opportunity for them to give a short presentation in English. Nine projects were presented. We could have discussions following some of them since they have common interests with current on-going projects at IFSTTAR (Bridges and Structures Department or Materials Department).

This concerned mainly:

- Corrosion of reinforcement and long-term deflection of RC beams (Ph.D. Thesis prepared by A. Phetkeyson). A fruitful joint analysis of the very interesting results and interpretation which shows additional long-term deformations due to corrosion effects after exposure to salty water spray, could be carried out with results of the French APPLET project where increased long-term RC beams deformations have been observed following accelerated corrosion by imposed electrical current. Contact will be given to directly concerned researchers.

- Leaching of heavy metals in cement hydrates, and Concrete resistance to sulfuric acid: for both projects, chemical characterization of the cement and mineral additions used in the experiments is desirable for the sake of comparison with similar results in the literature, and possible data available following IFSTTAR research on these subjects.
- Use of porous ceramic waste for improvement of concrete properties, especially reducing autogenous shrinkage in providing internal curing. The economic situation of ceramic waste may differ in France. However fundamental results of reduced autogenous shrinkage are of common high interest. It seems useful to collect data also on long-term effects and possibly increased drying shrinkage and creep due to the use of these saturated porous materials.



Wednesday, June 29

In the morning I proceeded in preparation of the lecture to be given in Tokyo on Friday July, 1st within the JCI seminar on crack control of mass concrete, and discussed with Prof. Sato about preparation of the joint organized Concrack3 Seminar in Paris, 15-16 March, 2012.

4. Impression and comments

I was warmly welcomed in Hiroshima Civil Engineering Department and met some colleagues that I had only briefly met before during previous conferences.

Following lectures in English is probably highly demanding to graduate students, however such activities using technical English will be the rule in their further professional activities, therefore it seems to be a good exercise. Maybe for voluntary students specific previous language training should be appropriate.