Minutes of the 2nd meeting of RILEM TC-CCC WG4

September 17, 2019, Prague,

Time	17:30-19:00, Sep. 17th, 2019
Venue	Club D at the Prague Convention Center, Prague, Czech Republic (17:30-18:00) Lobby of the Holiday Inn PCC (18:00-19:00)
Main Subjects	1. Discussion on the annotated bibliography 2. Discussion on loading device setup 3. Inter-laboratory comparative test 4. Next steps
Participants	Altogether 12 persons attended the meeting: Nele De Belie, Philip Van den Heede, Ivan Ignjatovic, Siham Kamali-Bernard, Charlotte Thiel, Didier Snoeck, Ling Wang, Juan Li, Zhendi Wang, Hao Wu, Yin Cao, Zengfeng Zhao
Moderator	Juan Li

At the beginning of the meeting, Professor Juan Li from China Building Materials Academy (CBMA), introduced and warmly welcomed all participants. After detailed discussion on the recent tasks and the next steps of WG 4 of RILEM TC-281 CCC, the following agreements were reached:

1. The annotated bibliography

Prof. Juan Li introduced the status of the annotated bibliography: *Publications on Durability of Concrete under Combined Mechanical loads and Carbonation.* Till now, 34 related papers have been collected, 12 of which are about gas permeability of concrete under mechanical load and the other 22 are about carbonation of concrete under mechanical load. All the 34 publications have been well compiled and the English abstracts were added for the 13 papers written in Chinese. Prof. Folker H. Wittmann wrote a forward to each Chapter, comments to the related researches.

The annotated bibliography has been sent to the WG4 members by email on Sep.

15, and comments are welcome. All the WG4 members are asked to provide any missing publications. It was planned to publish the annotated bibliography before December 2019. Please send your comments and publications to the secretary of WG4, Dr. Yin CAO via caoyinzi@163.com, before **Oct. 20, 2019**.

2. The loading device setup

It is better to reduce the dimension of the specimen so that the carbonation chamber can contain the loading device with specimen. CBMA will calculate the minimum height of the specimen and then inform all the members to prepare the loading device accordingly **before Oct. 10**.

3. The first round of comparative test

It was decided that the work of WG4 starts from the combination of carbonation and compressive load. The aim of the first round of comparative test is to validate the accuracy and stability of established test setup and to get a general idea of the influence of compressive load on carbonation. After discussion, the following details were confirmed,

(1) Concrete mix. Only one mix shall be considered in the first round of comparative test. CEM I type cement will be used to shorten the curing time to 28 days. The slump of 12 cm is recommended. CBMA will provide a mix proportion based on some pre-testing to avoid segregation **before Oct. 10**.

(2) Concrete specimens. 3 cubic specimens are needed to test the 28 d compressive strength f_{cc}. 9 prism specimens are needed, 3 of which are used to test the compressive strength f_{cp}, 3 for the carbonation test with load and 3 without. If available, more specimens can be made for additional test.

(3) Curing. Immersion the specimens in saturated $Ca(OH)_2$ solution at a temperature of 20°C till 7 days first, and preconditioning in a chamber at a RH of 60% ± 5% and a temperature of 20 °C ± 2 °C till 28 days.

(4) Load condition. The pre-defined compressive stress ratio for this first round of comparative testing is 0.45. A comparison will be made with the unloaded condition (compressive strength ratio = 0.00). This is just one of the compressive

strength ratios that will be considered within the framework of the WG4 activities. For a next round of comparative testing other compressive strength ratios to consider are 0.30 and 0.60. Compressive strength ratios higher than 0.60 will not be considered in WG4 further on since they seldom occur in practice. However, if applicable one can add some more stress ratio for their own experimental study, e.g. stress ratio of 0.8.

(5) CO_2 concentration: 2%.

(6) Carbonation duration: 28 days.

(7) Parameter: carbonation depth. More parameters can be obtained if possible.

(8) 4 laboratories confirmed to carry out the comparative test. More participants are welcome. If any other labs are willing to join in the comparative test, please send an email to inform Dr. Yin CAO (caoyinzi@163.com).

NO.	Leader	Lab	First round test
1	Yan Yao	The State Key Laboratory of Green Building Materials, CBMA, China	YES
2	Nele De Belie	Magnel Laboratory for Concrete, Ghent University, Belgium	YES
3	Ivan Ignjatovic	Laboratory of materials, University of Belgrade, Serbia	YES
4	Siham Kamali-Bernard	Laboratory of Civil and Mechanical Engineering, INSA-Rennes, France	YES

4. The second round of comparative test

In the second round of comparative test, CEM III/B (or CEM I + Fly ash) concrete will be tested. For CEM III/B(or CEM I + Fly ash) concrete, longer curing period is needed before carbonation test, i.e. 7d of optimal curing in saturated Ca(OH)2 solution (lime water) followed by 84 days of curing at at 20 (±2) ℃ and 65 (±5) % RH.

In the second round of comparative test, natural carbonation and CO_2 concentration of 20% will be also considered.

And after carbonation additional tests can be done to investigate the loading-induced damage on the micro-scale, changes in chemical composition due to

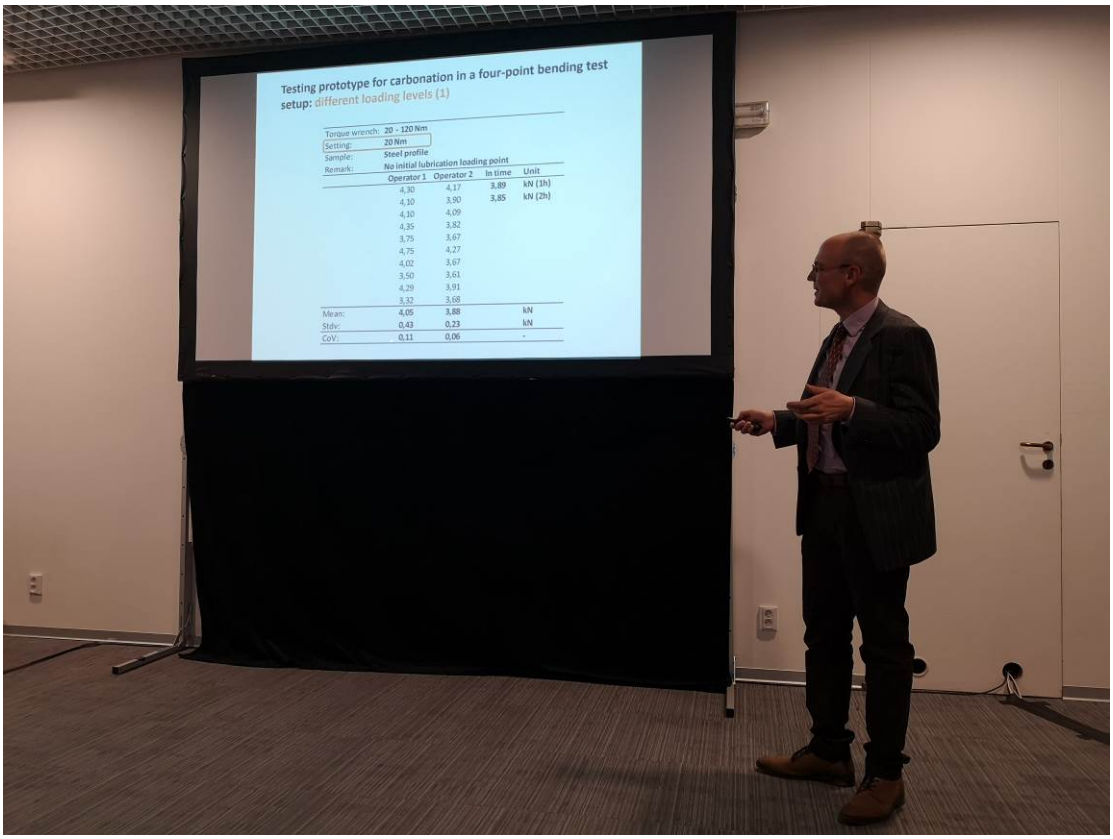
carbonation, etc.

5. Next steps

The next steps are listed in the following table.

Time	Tasks
Oct. 10, 2019	CBMA will provide a draft program of the first round of comparative test including a mix proportion of concrete and the calculated minimum height of the specimen.
Oct. 20, 2019	Send more relative publications and the comments on the *Annotated Bibliography* to Dr. Yin CAO.
Oct. 2019	Determine the comparative test plan. Start the first round of comparative test.
Dec. 2019	Publish the annotated bibliography.
Jan. 2020	Compare the test result of the first comparative test.
Feb. 2020	Start the second round of comparative test.
Aug. 2020	3rd WG4 meeting in Sheffield, UK.

Presentation by Prof. Juan Li



Presentation by Dr. Philip Van den Heede

Discussion

Group photo