**Minutes of the 6th meeting of RILEM TC-CCC WG4**

9th Nov. 2022, Online

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| **Time** | 9th Nov. 2022, 16:00-18:00 (Beijing Time)  [9:00-11:00 (UTC+1)] |
| **Venue** | Microsoft Teams Online Meeting Room |
| **Main Subjects** | 1. Comments on the summary report of WG4; 2. Comments on the recommendation of WG4. |
| **Participants** | Altogether 17 participants attended the meeting:  Yan YAO, Ling WANG, Juan LI, Xinyu SHI, Cheng ZHANG, Zhendi WANG, Bin LI (China Building Materials Academy)  Nele DE BELIE, Zhiyuan LIU (Ghent University)  Siham KAMALI-BERNARD, Elodie PIOLET (INSA Rennes)  Tushar BANSAL (Sharda University )  Jinzhou Lu, Wenyu HAN (Yantai University)  Kokawole Olonade (University of Lagos)  Muhammed BASHEER (University of Leeds)  Quoc Tri PHUNG (Belgian Nuclear Research Centre) |
| **Moderator** | Juan LI |

At the beginning of the meeting, Prof. Yan YAO, the chair of RILEM TC 281 WG4, welcomed all the participants and made an opening speech. Then, she expressed her gratitude to all WG4 members for their cooperation and contribution in the past four years, gave sincere thanks to the members who have revised the final report and the recommendation draft prepared by CBMA and given valuable comments, and finally, she hoped all members would work together tightly to get the two documents published soon.

Prof. Juan LI introduced the 6th WG4 meeting agenda and briefly reviewed the minutes of the last WG4 meeting. Then she summarised all comments on the final report from eleven WG4 members and comments on the recommendation from two WG4 members. Regarding some important suggestions, the participants discussed them fully in this meeting. The following conclusions were drawn based on all members' comments.

# 1. The final report of TC 281-CCC WG4

## 1.1 The title

The new title was determined as:

"Effect of loading on the carbonation performance of SCM-based binders: An interlaboratory comparison of different test methods and related observations".

To replace the original one, "Results of comparative testing for determining carbonation depth of loaded concrete: technical report of RILEM TC 281-CCC".

## 1.2 Authors list

(1) According to the Guidelines and rules for preparing publications for Materials and Structures by RILEM Technical Committees (RILEM TC) (TAC-N109REV3, 14th Apr. 2020) and the suggestion from WG4 members, coauthors of the final report should be limited in members who have participated in the comparative test. The author list is suggested as the following:

Yan YAOa, Ling WANGa, Juan LIa, Nele DE BELIEb, Xinyu SHIa, Philip VAN DEN HEEDEb, Cheng ZHANGa, Zhiyuan LIUb, Visalakshi TALAKOKULAc, Zuquan JINd, Chuansheng XIONGd, Jingzhou LUe, Tushar BANSALf, Bin LIa, Zhendi WANGa, Yu HUANGe

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6. Department of Civil Engineering, Sharda University, Noida, India

All authors must be official RILEM and TC members upon submission. Prof. Nele De Belie will handle the authorship issues of five members (Zuquan JIN, Chuansheng XIONG, Jingzhou LU, Bin LI, and Yu HUANG).

(2) For members who have done important contributions (excluding authorship) by joining several WG4 meetings and giving valuable suggestions during discussions in a very significant way will be listed in the Acknowledgements section.

We would like to thank Siham KAMALI-BERNARD, Elodie PIOLET, Ivan IGNJATOVIC, Quoc Tri PHUNG, Susan A. BERNAL, Muhammed BASHEER, Kolawole Adisa OLONADE, and Antonis KANELLOPOULOS for giving valuable suggestions on the test method and this final report.

## 1.3 Revised contents

(1) Some feedbacks thought the carbonation of mortar test results under bending finished by INSA-Rennes does not fit well in the draft of the final report since they deal with mortar and not concrete. They think that the work on bending is really valuable, but perhaps it could be considered to report these results in a separate short communication (e.g., submitting it to RILEM Technical Letters) so it is possible to analyse those results in more detail.

After obtaining the consent of Prof. Siham KAMALI-BERNARD from INSA-Rennes, the sections on bending tests will be moved from this manuscript submitted for publication in M &S. Prof. Siham KAMALI-BERNARD, and Dr. Elodie PIOLET expressed that they will consolidate some results and complete another separated report.

(2) Based on all members' comments, the content of the manuscript is revised as the following:

Abstract

**1 Introduction**

**2 Preparation of specimen**

2.1 Raw materials

2.2 Mix proportion

2.3 Molding specimen

2.4 Curing procedure

**3 Combination of carbonation and loading**

3.1 Loading setups

3.2 Carbonation of the loaded specimens

3.3 Measurement of carbonation depth

**4 Results and discussion**

4.1 Mechanical Strength

4.2 Carbonation depth under compressive load

4.3 Carbonation depth under tensile load

**5 Conclusions**

Acknowledgements

References

Appendix

The main modifications are listed in the following table and compared with the original version.

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| --- | --- | --- |
| **Contents** | **Original** | **Revised** |
| Materials and testing methods | Section 2 | Section 2 & 3 |
| Influence of different aspects on carbonation depth | Section 3.3 | Section 2 & 3 |
| Mortar bending and carbonation test | All | Deleted |
| Test carbonation depth | Section 3.2 | Section 4.2 & 4.3 |

## 1.4 Missing information on raw materials

According to the comments, labs participating in the comparative test need to provide the following information for the finalisation of the final report:

1. Properties of raw material
2. Information on the project/funding/other financial supports in Acknowledgement
3. Standard/Code for testing the mechanical strength of concrete
4. Figures/Photos of carbonation depth measurement (showing the measuring point place and numbers, the treatment for aggregate crossing, etc.)
5. Schematic illustration of the loading device

Dr. Xinyu Shi is responsible for collecting the above information before 18th Nov. and adding them to the manuscript.

## 1.5 Revise Figures & Tables

Some members pointed out that the tables and figures in the report contained duplicate information. After discussion, it was decided to retain the figures in the final report. The data in the tables will be included as support information for the paper. The main changes are listed in the following table.

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| **Contents** | **Original** | **Revised** |
| Properties of fine aggregate, coarse aggregate, chemical admixture, GGBFS, FA | missing | Add Table 3, Table 4, Table 5, Table 6, Table 7 |
| Mechanical strength  (repeated with figures) | Table 6 – Table 9 | Listed as supplementary information |
| Carbonation depth  (repeated with figures) | Table 11 – Table 13 | Listed as supplementary information |

In addition, Prof. Zhendi WANG from CBMA volunteered to redraw all the figures to improve the quality and meet the journal's requirements.

# 2. The recommendation of TC 281-CCC WG4

Establishing a recommendation on the test method of concrete carbonation combined with mechanical load is a clear goal of WG4. Based on the solid foundation and outcomes of developing the test method on chloride penetration under combined mechanical load in RILEM TC 246-TDC, and supported by WG4 members of RILEM TC 281-CCC and five international laboratories, two rounds of the comparative test have been carried out and finished. Through the tests, WG4 was clear on influencing factors on the test results and details of the experimental program. The proposed draft recommendation mainly includes test setup and procedure formulated and finalised based on the comparative test. The work in the past four years has provided enough evidence to support the creation of the recommendation. The release of this RILEM Recommendation will further improve the evaluation of the durability of concrete under different combined factors.

Two WG4 members, Prof. Kolawole Adisa OLONADE and Prof. Antonis KANELLOPOULOS, have returned their comments and suggestions. More specific suggestions are expected for finalising the recommendation through the common efforts of WG4 members. Comments on the Recommendation are still welcome until 21st Nov. 2022.

## 2.1 The title

The new title was determined as:

"Test method to determine the effects of compressive load and tensile load on concrete carbonation depth".

To replace the original one, "Recommendation of RILEM TC 281-CCC: Test methods to determine carbonation of concrete under compression and tension load."

The test method is suitable for either Portland cement concrete or concrete containing supplementary cementitious materials.

## 2.2 Modified contents

The content of the recommendation was revised as the following:

Abstract

**1. Introduction**

**2. Scope and applications**

**3. Equipment, specimens, and test procedure**

3.1 Test equipment

3.1.1 Loading device

3.1.2 Carbonation chamber

3.2 Specimens

3.3 Test procedure

3.3.1 Casting

3.3.2 Curing

3.3.3 Compressive strength & tensile strength

3.3.4 Sealing specimens

3.3.5 Loading

3.3.6 Accelerated carbonation

**4. Measurement and calculation**

4.1 Average carbonation depth of specimen

4.2 Carbonation depth under load

**5. Test report**

**6. Acknowledgements**

# 3. Next steps

All participants agreed upon the listed timetable and the deadline. The final report and recommendation need to be polished by a native English speaker before submission. Prof. Kolawole Adisa OLONADE from the University of Lagos volunteered to polish the two manuscripts.

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| **Step** | **Tasks** | **Responsible** | **Deadline** |
| 1 | Check and supplement test data | Each lab's PIC | 18th Nov. 2022 |
| 2 | Revised the draft | CBMA | 28th Nov. 2022 |
| 3 | Polish the language and grammar | Kolawole Adisa OLONADE | 12th Dec. 2022 |
| 4 | Sending to authors for confirmation | Xinyu SHI | 19th Dec. 2022 |
| 5 | Sending to all TC members | Nele DE BELIE |  |
| 6 | Sending to the cluster convener and the General Secretariat | Nele DE BELIE |  |
| 7 | Handled by the TAC Chair as Deputy Editor-in-Chief | Nele DE BELIE |  |
| 8 | Published | M & S |  |
| 9 | Report on the TC-CCC meeting |  | 23rd Mar. 2023 |

Before the end of the meeting, Dr. Juan Li thanked for the cooperation from the labs that participated in the comparative test series once again. She also thanks WG4 members for all their contributions and hopes the two manuscripts be ready by Christmas!