

## Minutes of the Fifth Meeting of RILEM TC 246-TDC at TU Delft, April 28 and 29, 2014

<b>Schedule</b>	Monday, April 28 <sup>th</sup> , 2014, 09:00 – 12:00 and 13:30 – 17:30, Tuesday, April 29 <sup>th</sup> , 2014, 09:00 – 11:00
<b>Venue</b>	Building of Civil Engineering & Geosciences (Building 23), TU Delft
<b>Main Subjects</b>	1) Opening of the meeting; 2) Brief report on progress of ongoing work of TC 246-TDC during 2013; 3) Final discussion on the annotated bibliography; 4) Summary on “zero” test series and discussion on details of the first comparative test series; 5) Next steps and next meeting; 6) Closure of the meeting.
<b>Participants</b>	All together 11 TC members attended the meeting: Dr. Balqis MD Yunus, Prof. Nele De Belie, Dr. Eguezu Hugo, Prof. Christoph Gehlen, Dr. Li Juan, Prof. Erik Schlangen, Prof. Max J. Setzer, Prof. Gideon Van Zijl, Prof. Wang Ling, Dr. Wang Zhendi, Prof. F. H. Wittmann.
<b>Moderator</b>	Dr. Li Juan

### 1. Opening of the meeting

On behalf of the chairlady, Prof. Yao Yan, who unfortunately was unable to attend this meeting because of other urgent commitments, Dr. Li Juan acted as moderator of the meeting. She extended Prof. Yao’s warm welcome to all participants and special thanks to Prof. Erik Schlangen from TU Delft for the careful preparation of the meeting. Then all participants briefly introduced themselves and presented their specific research fields and interests.

Minutes of the fourth meeting of TC 246-TDC (Paris Meeting) were accepted unanimously.

### 2. Brief overview on the progress of RILEM TC-246 TDC during 2013

The progress of ongoing work of TC 246-TDC during the year 2013 was briefly reviewed. In 2013, two new members, Prof. Li Weihong from Dalian University, China, and Prof. Wu Changlong from Dalian Architectural Science Research & Design Institute, China, joined our TC and they showed great interest in the comparative test series. Two meetings, i.e. Qingdao Meeting and Paris Meeting, were successfully held in May and September, 2013. During these two meetings the annotated bibliography was discussed in depth and stepwise completed. The final version of the annotated bibliography was printed by CBMA (with ISBN and DOI). An electronic version of the annotated bibliography will be available for all RILEM members via the RILEM homepage: [www.rilem.org](http://www.rilem.org). Preliminary “zero” test series were carried out in several labs.

### 3. Final discussion on the annotated bibliography

Copies of the published annotated bibliography were distributed at the beginning of the Delft meeting to all participants. A short and final discussion of the published annotated bibliography took place. Prof. Nele de Belie referred to the Guidelines of RILEM TC Publications. It was decided that hardcopies of the final version of the annotated bibliography shall be distributed among all TC members by the secretariat. It is hoped that the annotated bibliography will facilitate access to

published papers on durability and service life under combined actions and in this way accelerate further progress in research in this important field.

#### 4. Summary on preliminary “zero” test series and discussion of details of the first test series

Dr. Wang Zhendi introduced the test results of the “zero” test series at CBMA and at Dalian University. Dr. Eguezu Hugo presented the test results obtained at Ghent University. And Dr. Balqis MD Yunus introduced the zero test results obtained at TU Delft. All participants discussed then details of the test rigs and test parameters. Specific experiences and different opinions of a number of members were presented and discussed. After a detailed discussion, the following decisions were taken:

1) CBMA is prepared to provide a prototype of test rigs to those laboratories where they are needed. All members of RILEM TC-246 TDC will be asked by email, which will be distributed by the Secretary of the TC, if they are prepared to participate in the first test series and if they need a copy of the prototype of test rigs, as developed during discussions among TC members. It should be taken into account that the shipping of test rigs to overseas will last at least two months.

2) After discussion it was decided that specimens for determination of the ultimate compressive strength must be prisms and not cubes, i.e. the same geometry as the specimens under sustained load.

3) Apart from the test rigs as shown in the recommendations, other types of test rigs, based on the same principle, can also be used, for example the test rigs used in TU Delft (see Fig. 1). If anyone needs more details about the test rigs, please contact Prof. Erik Schlangen from TU Delft directly.

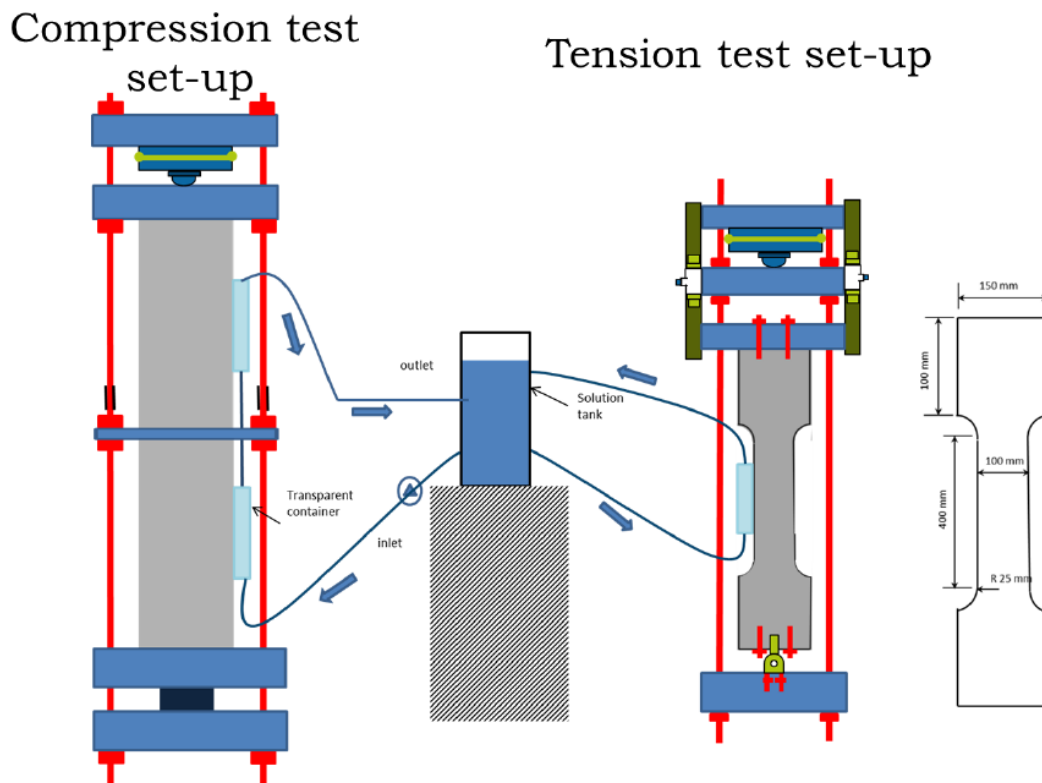


Fig. 1 Test rigs used at TU Delft

4) Prof. C. Gehlen distributed during the meeting several recommendations concerning test methods for the diffusion coefficient of chloride ions in concrete (CEN/TC 104 prEN 12390-11: 2014, and Recommendation of RILEM TC 178-TMC). Test methods as described in these documents shall be used in the following comparative test series.

5) TU Delft will continue to run traditional chemical analysis of chloride content and compare the results with LIBS (Laser-Induced Breakdown Spectroscopy). Results shall be compared and discussed critically.

6) The type of cement for the first comparative test series should be CEM I 42.5 or CEM I 52.5, but preferably CEM I 52.5.

7) The rate of circulation of the salt solution should be  $5 \pm 1 \text{ mL/s}$ . A constant flow pump is recommended to allow control of the circulation rate.

8) For the determination of the applied compressive load, four strain gauges should be fixed on the four tension bars.

9) The size of the open window shall be  $80 \times 160 \times 50 \text{ mm}$ . The back of the container fixed on the surface of the loaded concrete prisms shall be transparent (Plexiglas for instance) in order to allow permanent control of the homogenous flux of the liquid.

The inlet and the outlet for the flowing salt solution should be arranged diagonally (not just opposite).

10) During the discussion it was indicated that special attention should be paid during the chemical analysis for the chloride profile. At Gent University it was observed that some components (as for instance slag, some carbonaceous limestone) might contain metal sulfides which interfere with the titration process. It is suggested that metal sulfides shall be oxidized during the chloride extraction procedure with nitric acid. 3ml of hydrogen peroxide (30 %) shall be added to the extracted solution in order to oxidize the sulfides.

11) The first test series shall start in June, and the first test results after 18 weeks of chloride penetration are expected in November.

12) The secretariat of RILEM TC 246-TDC will prepare and distribute among the TC members a draft for a test program of the first comparative test series for working groups, WG1 and WG2 (see the following Table), and then finalize them by the end of May.

13) Allocation of tasks for the following first comparative test series:

- General task (tests which are expected to be done in all participating laboratories): Chloride diffusion tests on pre-saturated concrete specimens under 0 and 30 % of the ultimate compressive load should be run.

- WG1 (Working Group 1): besides the general task, additional tests should be run by TC members of WG1. These additional tests should include chloride diffusion tests on pre-saturated concrete specimens under 60 % of ultimate compressive load and on pre-saturated concrete specimens under 0, 50 and 80 % of the ultimate tensile load.

- WG2 (Working Group 2): besides the WG1 task, additional tests should be run by members of WG2, including capillary absorption tests on non-saturated concrete specimens stored for 7 days in a moist curing at  $20^\circ \text{C}$  and 95% RH and then until 28 days in laboratory atmosphere at  $20^\circ \text{C}$  and 60% RH, under an applied compressive load of 0, 30, and 60 % of ultimate compressive load and under applied tensile load of 0, 50 and 80 % of the ultimate tensile load.

14) TC members who have agreed to participate in the first test series are listed in Table 1. All those TC members who have not participated in the Delft meeting are kindly requested to inform the TC secretary on their planned contributions. Candidates for the tasks assigned to WG2 are particularly welcome.

Table 1: RILEM TC 246-TDC members who have agreed to participate in the different tasks of Working Group 1 (WG1) and Working Group 2 (WG2)

No.	TC Member	Affiliation	WG1		WG2	
			Compr.	Tens.	Compr.	Tens.
1	Yao Yan	China Building Materials Academy (CBMA)	Yes 1	Yes 1	No	
2	Li Weihua	Institute of Oceanology, Chinese Academy of Science (I-CSA)	Yes 2	No	No	
3	Nele DE BELIE	Ghent University	Yes 3	No	No	
4	Erik SCHLANGEN	Delft Univ. of Technology (TU Delft)	Yes 4	Yes 2	No	
5	Li Weihong	Dalian University	Yes 5	No		
6	Christoph GEHLEN	Munich University of Techn. (TUM)	Yes 6	No		

## 5. Next steps and next TC meetings

During the second test series which will start from January 2015, tests on SHCC shall be included to compare the durability of SHCC under applied load with ordinary concrete. This co-operation will strengthen the link between the two committees RILEM TC 246-TDC and RILEM TC 240-FDS. Prof. Gideon Van Zijl, the chairman of RILEM TC 240-FDS, is at the same time a member of TC 246-TDC.

The following dates and places for the next three meetings have been fixed:

The 6th TC meeting is scheduled in Nov. 27-28, 2014 at TUM, Munich.

The 7th TC meeting is scheduled in Apr. 23-24, 2015 at Ghent Univ.

The 8th TC meeting is scheduled in combination with [ICCC 2015](#) on Oct. 13-16, 2015 in Beijing.

## 6. Closing remarks

To wrap-up the successful TC meeting in Delft, Dr. Li Juan summarized the main points which were discussed and the most important decisions which were taken briefly, and she expressed her sincere thanks to all the experts who were involved in the activities of this TC. She offered her sincere thanks to Prof. Erik Schlangen for hosting and supporting this meeting. The ideal conditions for this meeting provided by TU Delft helped a lot that all participants could enjoy a most efficient and successful meeting. She finally expressed her special thanks to all members, who attended the meeting for their hard work and support to achieve the aim of the RILEM TC 246-TDC.

The meeting was closed at 11:00 o'clock on Tuesday, April 29<sup>th</sup>.

