Notes concerning the benchmark activities of WG2

After meeting of Belfast, reunion between WG2 leaders

Benchmark stage 2:

We have agreed that there will be 4 topic groups related to microscopic modelling, multiscale modelling, macroscopic modelling and modelling of transport parameters.

I (Agnieszka) have opened a call for participation and we have one more interested participant. However, I am convinced that there will be broader interest once the official dissemination is made via into@tu1404.eu. I will keep you informed about the interested participants.

GP2.a - Microstructural modelling (Guang Ye & Vit Smilauer)

Data based on the RRT+ for the prediction of:

- Overall degree of hydration, Degree of hydration of different minerals (C3S, C2S, C3A and C4AF)
- Heat release
- Capillary porosity, Pore size distribution, Relative humidity, Internal capillary pore pressure, Chemical shrinkage, Autogenous shrinkage
- Water permeability, Chloride diffusivity
- Elastic modulus of paste, Load-displacement curve, Cracking pattern

Agreed schedule for this stage of benchmark:

- framework for examples - by the **end of June 2017**
- examples ready - by the **end of Aug 2017**
- publication of examples and kick-off of stage 2 - Brussels meeting **Sept 2017**
- results submission deadline (preliminary) - by the **end of 2017**
- discussions, corrections and submission of final results - by the **end of March 2018**
- analysis of results by supervisors, preparation of research paper & its submission - everything ready & closed by the **end of August 2018**
- presentation of stage 2 outcome - Portugal **Oct 2018**

GP2.b - Multiscale modelling (Bernhard Pichler)

Non-aging creep of cement paste based on data not related to RRT+

Very probable that this benchmark will be joint with EDF benchmark of Vercors 2018 [note: not the same concrete is used as in COST RRT+ or previous Vercors benchmark!] (Bernhard in contact with Julien Sanahuja)

GP2.c - Macroscopic calculation (Matthieu Briffaut & Vit Smilauer)

1. **1st phase:** ring test (drying at 7 or 28 days)

- known data (from RRT+): isothermal calorimetry (on cement paste), autogenous shrinkage, drying shrinkage, Young modulus and tensile strength evolution
- unknown data can be calibrated or taken from Vercors benchmark (participants can choose if they want to use this data and make some adjustments)

2. **2nd phase:** performed with models calibrated in phase 1 of this example

- blind ring test with a different geometry
- TSTM on "Vercors" concrete - will be "confirmed" experimentally by Terje & Stephanie

Participants can perform only phase 1 (phase 2 is optional).

We would like to give you green light for finalisation of this example and preparation of materials for the benchmark.

For now, I am sending you our agreed schedule for this stage of benchmark:

- framework for examples - by the **end of June 2017**
- examples ready - by the **end of Aug 2017**
- publication of examples and kick-off of stage 2 - Brussels meeting **Sept 2017**
- results submission deadline (preliminary) - by the **end of 2017**
- discussions, corrections and submission of final results - by the **end of March 2018**
- analysis of results by supervisors, preparation of research paper & its submission - everything ready & closed by the **end of August 2018**
- presentation of stage 2 outcome - Portugal **Oct 2018**

GP2.e - Modelling of transport properties

At the beginning we would like to thank you once again for your engagement in this stage of benchmark and preparation of the proposal for simulation. We are very glad that it would be possible to use RRT+ results. To summarise this is how we see the durability example to be proceeded:

1. **phase 1:** simple example based on available RRT+ data
2. **phase 2&3:** advanced numerical exercises based on data and results from phase 1

Participants may not perform all 3 phases (phase 1 is only obligatory).

We would like to give you green light for finalisation of this example and preparation of materials for the benchmark.

For now, I am sending you our agreed schedule for this stage of benchmark:

- framework for examples - by the **end of June 2017**
- examples ready - by the **end of Aug 2017**
- publication of examples and kick-off of stage 2 - Brussels meeting **Sept 2017**
- results submission deadline (preliminary) - by the **end of 2017**

- discussions, corrections and submission of final results - by the **end of March 2018**
- analysis of results by supervisors, preparation of research paper & its submission - everything ready & closed by the **end of August 2018**
- presentation of stage 2 outcome - Portugal **Oct 2018**

Benchmark stage 3: will be purely related to macromodelling and it will be supervised by Laurie. We will try to launch it together with stage 2 and encourage participants to have the results ready by the end of Aug 2018; finalisation may possibly extend beyond the end of COST. To facilitate is we have two proposals of the structures to model:

1. **1st proposal by Laurie: Vercors 1**
   The best for the coherence of the cost action would be to do the stage 3 on Vercors mainly because the concrete is the same (or quite the same) that the one used in WG1. Therefore, the material parameters will be the same as in stage 2 (easier for the ones who want to do both).
   Temperature and strains are available in the concrete invert (massive element cast with a high sequence and in which the temperature reach around 60°C) and in the gusset (where the crack pattern was also identified).

2. **2nd proposal by Farid: Vercors 2** (joint venture with EDF)

- for COST early-age calculations must done in addition and this would differentiate COST benchmark from the EDF's; for COST the final analysis can be focused on the influence of early-age behaviour on the service life
- this will bring more participants and make finalisation by the end of COST action possible
- COST members must get a right to publish the results outside of EDF activities (for COST purposes)
- it must be discussed with Miguel first, and then with Benoit Masson (Laurie)