



**Position:** Post-Doctorate position 18 months (Toulouse-France)

**Title:** 3D printing of cement-based materials

**Institution:** Laboratoire Matériaux et Durabilité des Constructions (LMDC) / Université Paul Sabatier-Toulouse / INSA Toulouse

**Starting date:** Beginning of 2018

### **Project**

The application of digital fabrication, commonly called 3D printing, to construction raises a large interest among the construction industry. Indeed this method allows for technological improvements (fabrication of identical products in different places theoretically without any manufacturing defects), for saving (reduction of construction cost), for ecological gain (optimized use of materials and energy) as well as for more architectural freedom.

As part of the 3-year teaching and research Chair entitled “Innovation and Construction” signed between INSA Toulouse and the French company GA Smart Building, the research program aims at moving the knowledge of 3D printing of cement-based materials forward.

### **Mission**

The mission of the post-doctorate focuses on the numerical modelling of 3D printing by extrusion of cement-based materials. Based on finite-element method, the numerical approach aims at modelling the flow of the material during the layer by layer construction, from the extrusion to the deposit of the material, so that the simulations could be considered to a certain extent as an alternative to expensive experimental printing tests. This global approach will include especially the determination of the constitutive parameters. A special attention will be paid to the modified behaviour of the material during the extrusion and to its ability to be built up layer by layer. The numerical model will be validated using experimental results available in literature. Some additional tests on the printed material as well as on the printing process may be necessary and could be carried out by the post-doctorate.

### **Profile of candidates**

PhD in Civil engineering or in Fluids mechanics

An experience in numerical methods for rheological problems will be appreciated. A good knowledge of English and/or French would be a precious asset.

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