

Introduction

The submerged floating tunnel (SFT) project is a global collaborative research project commissioned by the Chinese engineering and construction company China Communications Construction Co., Ltd. (CCCC). The Dutch tunnel and hydraulic experts from TEC and TU Delft have been invited to join force with the Chinese to tackle this global technical challenge. The consortium consists of 7 parties. Besides TEC and TU Delft, 5 parties from China including TIWTE from Tianjing are involved as core partners.

Consortium

The consortium consists of:

- China:
 - **CCCCHZMB**: Hongkong-Zhuhai-Macau Island and Tunnel Project General Management Office under CCCC JV China (project lead partner)
 - **TIWTE**: Tianjin Research Institute for Water Transport Engineering, M.O.T
 - **HPDI**: CCCC Highway Consultants Co., Ltd
 - **THEC**: CCCC Third Harbor Engineering Co., Ltd
 - **FHDI**: CCCC FHDI Engineering Co., Ltd
- Netherlands:
 - **TEC**: Tunnel Engineering Consultants
 - **TU Delft**: Delft University of Technology



Website

- TU Delft: <http://www.tudelft.nl/citg/SubmergedFloatingTunnel>
- CCCC: <http://cccsftjt.com/>

TU Delft

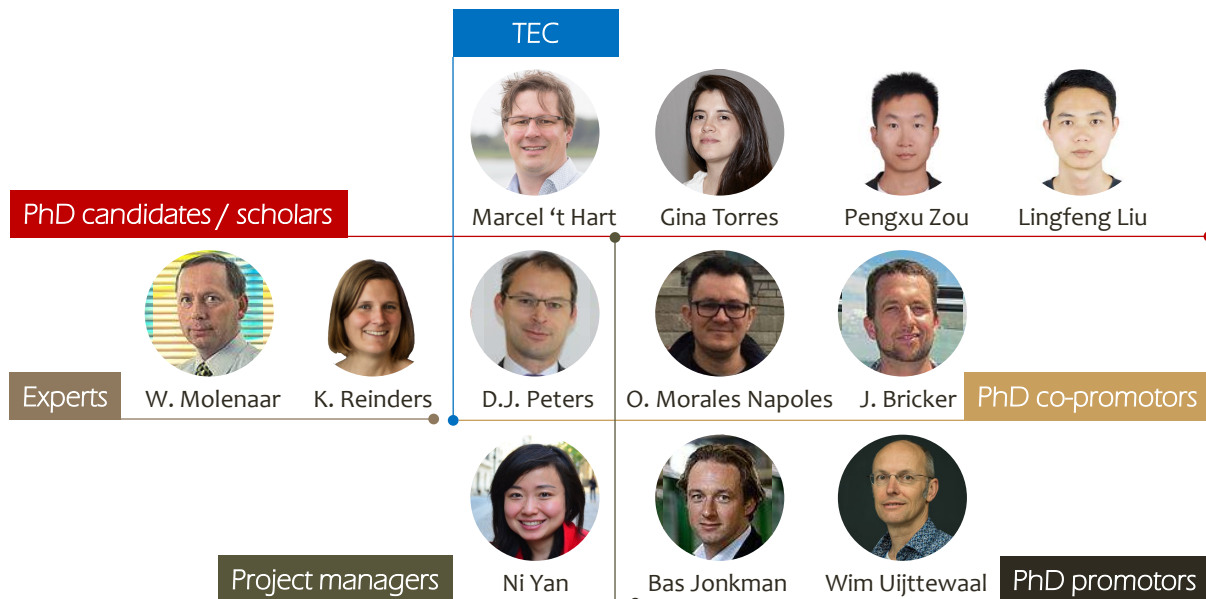
At TU Delft, the following staff members are involved:

- Prof. Bas Jonkman (Section head Hydraulic Structures & Flood Risk)
- Prof. Wim Uijtewaal (Department head Hydraulic Engineering)
- Dr. Dirk Jan Peters (Scientific coordinator, PhD supervisor / co-promotor)
- Dr. Jeremy Bricker (PhD supervisor / co-promotor)
- Dr. Oswaldo Morales Napoles (PhD supervisor/ co-promotor)
- Dr. Ni Yan (Project coordinator/manager)
- Kristina Reinders (MSc project coordinator)
- Wilfred Molenaar (Senior engineer)

Next to staff members, 4 PhDs and several visiting scholars will also be working on the project at TU Delft. Many MSc and BSc students are also carrying out their final projects in various (sub)subjects of the SFT research.

The following PhDs have started:

- Marcel 't Hart, PhD Candidate Risk Assessment, Senior Engineer TEC (started Jan 2019)
- Gina Torres, PhD Candidate Risk Assessment (started Feb 2019)
- Pengxu Zou, PhD Candidate Hydrodynamics (started Mar 2019)



Up to now 3 MSc students and 5 BSc students have completed SFT related graduation projects at TU Delft.

TEC

TEC coordinates the communication between the Chinese and the Dutch parties. At TEC, senior engineers and a post doc are involved.

Timeline

- 2017 – Literature review
TU Delft has been involved since 2017, when literature review of submerged floating tunnel (SFT) was carried out.
- 2018 – Consortium set up + first experiments
 - May-June:
 - BSc student group, Wave and current scale model tests completed
 - COMEM MSc group, Risk inventory completed
 - Chris Heuberger, MSc thesis work completed, Floating bridge – response model of pontoon supported structure in frequency domain
 - July: CCCC SFT consortium was set up. Chinese delegation visited the Netherlands partners. Collaboration and research contracts were signed in July 2018.
 - Summer: First model experiments were carried out, both at TU Delft Water Lab and at TIWTE.
 - September: Dutch delegation visited China. Besides TEC and TU Delft, experts from Marin Research Institute and Trelleborg were also invited to the meeting in Zhongshan for the knowledge exchange. During this visit, TEC and TU Delft visited the SFT 2D small-scale experiment and the large-scale wave and current flume test site in TIWTE, Tianjing. TEC, TU Delft and TIWTE compared each other's small-scale physical model test results and discussed the medium and large-scale model test plan.
 - October-November: The SFT team visited Norway Technology Days and joined workshops with SFT-related international experts.
- 2019 – PhDs starting
 - January:
 - Marcel 't Hart (senior engineer TEC) started at TU Delft as a part-time PhD on SFT risk assessment.
 - Lianne Drost, MSc thesis work completed, Comparison of wave and current model test results with Morison equation, including parameter calibration
 - February: Gina Torres started at TU Delft as a full-time PhD on SFT risk assessment.
 - March:
 - Pengxu Zou started at TU Delft as a full-time PhD on hydrodynamics.
 - Lingfeng Liu started at TU Delft as a visiting scholar on structure & design.
 - Laura Bakker, MSc thesis work completed, Design criteria for flexible shore connection

Publications

To be added.

Planning

Summary of ongoing MSc work

- Davide de Zara, Dynamic model of SFT with moving train/traffic loads (with Prof. A. Metrikine)
- Weiyi Zhang, Dynamic longitudinal model of SFT to be used of prediction of effect of irregular and oblique wave loads (with Prof. A. Metrikine)
- Mart-Jan Hemel, Evaluation of wave and current model tests with numerical 2D model

Focus for TU Delft 2019

- Experiments in China > longitudinal model / deep flume model
- Additional BSc project with experiments in the TU Delft Waterlab, May/June 2019
- Numerical work / Open Foam
- Risk modelling work

Projects

TU Delft theses can be downloaded at <https://repository.tudelft.nl/>

- MSc theses:
 - 2018-06-05, Chris Heuberger, Assessment of the dynamic response of a floating pontoon bridge with a fiber reinforced polymer superstructure
 - 2019-01-17, Lisanne Drost, The Submerged Floating Tunnel: An experimental study on the hydrodynamics and kinematics of a submerged rectangular cylinder in a wave-current environment
 - 2019-03-07, Laura Bakker, Submerged Floating Tunnels: The Design of the End Joint

Contact

Dr. Dirk Jan Peters – scientific coordinator D.J.Peters@tudelft.nl

Dr. Ni Yan – project coordinator N.Yan@tudelft.nl

Prof. Bas Jonkman – Professor of Hydraulic Engineering & Flood Risk S.N.Jonkman@tudelft.nl

Team

Name	Affiliation	Period	Roles and Responsibilities
Prof. Bas Jonkman	TU Delft	2017-	Section Head Hydraulic Structures & Flood Risk
Prof. Wim Uijtewaal		2018-	Department Head Hydraulic Engineering
Dr. Dirk Jan Peters		2018-	Scientific Coordinator, PhD Co-promotor
Dr. Jeremy Bricker		2018-	PhD Supervisor / Co-promotor
Dr. Oswaldo Morales Napoles		2019-	PhD supervisor / Co-promotor
Dr. Ni Yan		2018-	Project Coordinator/Manager
Kristina Reinders		2017-	MSc Project Coordinator
Wilfred Molenaar		2018-	Senior Engineer
Chris Heuberger		2018	MSc Thesis
Lisanne Drost		2018	MSc Thesis
Laura Bakker		2018	MSc Thesis
Sebastian Aalbers		2018	BSc Thesis
Tom Bosma		2018	BSc Thesis, Student Assistant Experiments
Rosanne Breedveld		2018	BSc Thesis, Student Assistant Experiments
Hidde Vader		2018	BSc Thesis, Student Assistant Experiments
Ruben Speelman		2018	BSc Thesis
Daan Gorse		2018	Student Assistant Experiments
Mart-Jan Hemel		2019	MSc Thesis
Marcel 't Hart		2019-	PhD Candidate Risk Assessment, Senior Engineer
Gina Torres		2019-	PhD Candidate Risk Assessment
Pengxu Zou		2019-	PhD Candidate Hydrodynamics
Lingfeng Liu		2019-	Visiting Scholar Structure & Design
Davide de Zara		2019	MSc Thesis
Weiyi Zhang		2019	MSc Thesis
Mart-Jan Hemel		2019	MSc Thesis