

# TRM PILING SYSTEMS FACTSHEET

Structural engineering



## Madinat Salman housing project Manama, Bahrain

- + 5,500 ductile iron piles with a total length of 43,000 meters
- + Pile type TRM 118/7.5
- + Foundation depths of up to 10 m
- + Soil type: sand, gravel, siltstone and limestone
- + Construction of a 22-story residential building
- + Construction time: 10 months
- + Implementation in 2024

**Fast. Simple. Safe.**

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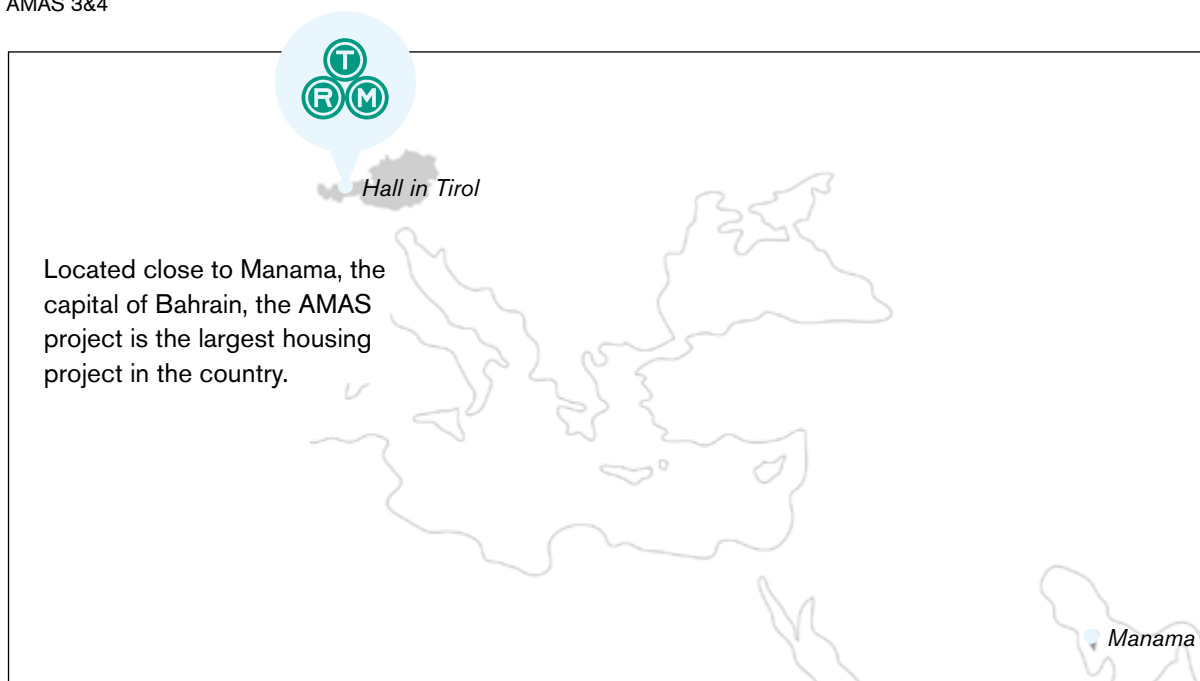
## The Initial Situation

**Bahrain**, an enclave of 750 km<sup>2</sup> and 1.8 million inhabitants, is one of the richest countries in the world and is an **international financial center**. King Hamad bin Isa Al Khalifa promotes the provision of housing, which is why the MoH (Ministry of Housing) is developing the artificial island „Madinat Salman“ with 22 building plots. Construction work started in 2021 with AMAS 3&4 (400 residential units).

A **22-storey building** is being built **on an innovative CPP** (combined pile-raft foundation), the first and largest of its kind in the world. Gulf House Engineering together with our partner Strongforce MGC implemented this innovative foundation. The decisive factor in the choice of the system was the framework that the existing freshwater aquifer cannot be penetrated under any circumstances from ~14.0 m below GOK.



AMAS 3&4





## Deep foundation

During the construction of the King Fahd Causeway, the connection between Bahrain and KSA (construction period: 1981 - 1986), the freshwater flow was damaged, rendering ~10% of Bahrain's freshwater permanently unusable. In order not to make this mistake again, a CPP with a TRM pile system was chosen for this project.

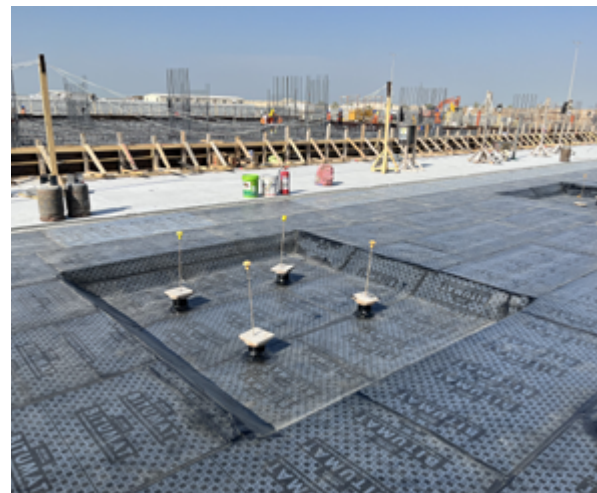
The TRM piles act as load transfer as well as a stiffening element of the slab. Before construction began, extensive test loading was carried out in order to be able to define the settlement behaviour under load and the group effect of the piles. The decision was made to use grouted ductile piles TRM 118/7.5 with  $D = 270$  mm.



Reinforcement of the CPP



Installation with multiple units



Sealing of the foundation slab

**Do you have any questions?** Our experts will be happy to advise you.

