

# Non-Standard Piles

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AND COMACCHIO

Hundreds of CFA piles with a diameter of 1,200 mm in an inconsistent terrain. This is the challenge faced by a Comacchio CH 650 working in Valtellina for the construction of two railway underpasses

The Winter Olympics are not just about ski slopes or ice rinks; they also present an opportunity to improve ordinary road infrastructure and bring modernization to territories like Valtellina, which has too often (and unfairly) been left on the sidelines. As part of the projects related to Milan-Cortina 2026, RFI is proceeding with the elimination of some level crossings along the Colico-Sondrio railway line, with the subsequent construction of underpasses. In this context, we have observed a Comacchio CH 650 drilling rig equipped with a continuous flight auger at work.

## THE CONSTRUCTION SITE

On behalf of a major local company, Fondazioni Speciali is building the foundation piles for two railway underpasses a few kilometers from Sondrio. "Specifically" explains Mattia Benzi, owner of Fondazioni Speciali, "we have just completed the Forcola underpass, and we are now focusing on the one in Colorina, where we are constructing CFA pile walls with diameters ranging from 800 to 1,200 mm and depths of nearly 20 meters. In the first phase in Forcola, we built 250 piles of 1,200 mm at 19.6 m deep, 150 piles of 1,000 mm at 16.5 m,



Overview of the Colorina construction site, where Fondazioni Speciali is collaborating on the construction of the railway underpass





Mattia Benzi, owner of Fondazioni Speciali, in front of the new Comacchio CH 650

## ← The CH 650

The CH 650 is a multifunctional drilling rig with an operating weight of 70 tons. It is fully self-erecting, requiring minimal disassembly of components for transport and enabling rapid positioning on-site. The Comacchio machine used by Fondazioni Speciali features a WPD system (winch pull-down), making it particularly versatile when considering the various types of work that can be performed using simple conversion kits and Comacchio's proprietary software, which manages machine operations:

- CBP (Cased Bored Piles): cased bored piles drilled directly by the rotary head or column clamp powered by the base unit;
- BP (Bored Piles): uncased bored piles stabilized with drilling fluids or dry;
- CFA, Continuous Flight Auger piles;
- FDP, Full Displacement Piles;
- SM, Soil Mixing treatments;
- LDTH (Large DTH): large-diameter down-the-hole hammer drilling.

The CH 650 also features special Low Headroom configurations that allow operation in confined spaces, particularly where height is restricted.

and 150 piles of 800 mm at 13 m. The Colorina underpass is slightly smaller, requiring 200 piles of 1,200 mm at 19.8 m, followed by approximately 200 piles of 1,000 mm at 17 m and 150 piles of 800 mm at 13 m". Fondazioni Speciali has relied on two Comacchio machines: the CH 650 handles the 1,200 mm piles, which are also the deepest, while the CH 450 is dedicated to the smaller piles. "During the construction phase" Benzi continues, "we prioritized the 1,200 mm piles as they are closest to the railway and need to be completed first before moving on to the subsequent infrastructure works following the piling phase".

### A DIFFICULT PILE IN A COMPLEX TERRAIN

"The main challenges we faced" Benzi explains, "are related to the size of the pile we are constructing. The 1,200 mm pile caused the most concerns as it is a non-standard pile, rarely constructed. It requires significant torque on the machines and skilled operators to manage the various phases. Additionally, the type of terrain is quite challenging: we are in Valtellina, in the Adda Valley bottom, where we encounter inconsistent soils, silty sands with peat, and sporadic boulders. Essentially, the ground does not hold and tends to collapse onto the auger. Moreover, the work surface

is prone to subsidence, meaning the ground level drops during drilling. To address this, we implemented measures in site preparation to ensure adequate support during excavation. As if that weren't enough, there is also a water table just 2 meters below ground level. We manage a concrete pour of nearly 30 cubic meters, all through a pump, dealing with all the associated pipeline and pumping dynamics.



## The operator's perspective

**T**ommaso Troia, the CH 650 operator at Fondazioni Speciali, has over 25 years of experience handling drilling rigs. "The CH 650" he states, "is an excellent machine; I was amazed by its performance. I previously used the CH 450, so I am familiar with Comacchio machines, but the new drill surprised me even when using a particularly heavy auger. It is very stable, drills efficiently, and performs well even during extraction despite working in silty soil that grips the auger walls. Despite these challenges, I can maintain an average of four piles per day".



undercarriage for transportation. We also worried about managing such a large machine. However, after acquiring and deploying it directly on this site, we have been extremely satisfied. In this case, we opted to use only new equipment to avoid maintenance-related issues or inefficiencies, given the tight schedule we must adhere to. The two underpasses must be completed by December 2025, and in the meantime, we will start working on a third one nearby".

Finally, we must insert a reinforced cage with sonic pipes, often under the supervision of RFI, which is constantly present on-site as the project overseer". To prevent the work platform from collapsing under the effects of drilling and the water table, thus ensuring the machine's stability and verticality, Fondazioni Speciali uses a support plate system positioned under the machine's tracks. "Even the handling phase is extremely delicate," Benzi continues, "because the auger is very heavy due to a reinforced double-wall structure needed to withstand the torque applied by the machine's drive.

Given the complexity of the work and the non-standard nature of the piles, we perform both the drilling and concrete pumping phases in assisted mode, allowing us to directly monitor the operating parameters".

### A MACHINE THAT DELIVERS SATISFACTION

Benzi adds: "after using the CH 450, this is the second Comacchio machine in our company. We were very pleased with our first purchase, so the CH 650 seemed like the ideal solution for sites like this. Initially, we were concerned about its size, especially its 3-meter-wide

### A TRUE CHALLENGE

The CFA pile presented a real challenge, one that Fondazioni



The reinforcement cage insertion phase





Speciali took on with its characteristic determination. "On this site," says Mattia Benzi proudly, "a bentonite pile was initially planned - a 1,200 mm pile using bentonite slurry, the traditional technology for diameters over 1,000 mm. However, due to environmental concerns related to excavation spoil management and an environmental plan devised by RFI, it was converted into an auger pile. Not everyone would accept such a challenge, but we tackled it with the dynamism and ingenuity that define us, built on extensive experience in the sector. For this

site, we equipped ourselves with specialized machinery: a crawler service crane, a new 120 m<sup>3</sup>/h pump, and a new 15 ton excavator. It was a challenge, but today, seeing our machine at work, we are very satisfied. The inconsistent terrain causes less abrasion and allows for manageable drilling times, but it is a soil that must be handled carefully. It collapses onto the auger, making extraction significantly more difficult. This was our biggest concern, but we overcame it through experience, geotechnical design expertise, and a machine that has proven to be extremely reliable".

The terrain is particularly inconsistent and tends to collapse onto the auger. Note the use of the excavator to preserve the work area



**THE COMACCHIO CH 650 IS CONSTRUCTING HUNDREDS OF CFA PILES WITH A DIAMETER OF 1,200 MM, TACKLING AN EXTREMELY INCONSISTENT SILTY TERRAIN THAT COLLAPSES ONTO THE AUGER, CAUSING SIGNIFICANT CHALLENGES, ESPECIALLY DURING EXTRACTION. THE MACHINE IS FULLY MEETING THE COMPANY'S EXPECTATIONS AND ADHERING TO THE PARTICULARLY TIGHT DEADLINES SET BY THE CLIENT.**

## ↓ About **Fondazioni Speciali**

Fondazioni Speciali was formed from the merger of several companies with over 40 years of experience in the sector. Its internal technical office, comprising experienced geologists and geotechnical engineers, conducts geognostic investigations to model subsurface conditions and evaluate soil and rock properties. The company specializes in a broad range of underground works, including foundation ground consolidation, rock wall and excavation face reinforcement, and pile foundations for supporting and stabilizing surface foundations in residential and industrial settings. Additionally, it performs geognostic investigations (boreholes, penetration tests, etc.), water well drilling, and geothermal applications.