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TECHNICAL REFERENCE



# CAVIRO

## Automated warehouse

Forlì (FC), Italy



**Bored Piles**  
**CFA Piles**

Owner : CAVIRO SCA

Main Contractor : TREVI Spa

Duration of works: 2023

## Introduction

### **Solid roots of the Emilia-Romagna region**

A good root system is a prerequisite for the vine, just like solid deep foundations are essential to ensure the solidity and safety of large buildings.

It is therefore no coincidence that, in the land of the Sangiovese wine, three companies of excellence that are based in Romagna, namely Caviro, Trevi and Soilmec, are involved in the construction of a new automated wine warehouse!

As client, foundation contractor and manufacturer of the drilling machines, these three companies have cooperated in the expansion of the Caviro production centre in Forlì, one of the locations of the wine co-operative founded in Faenza and

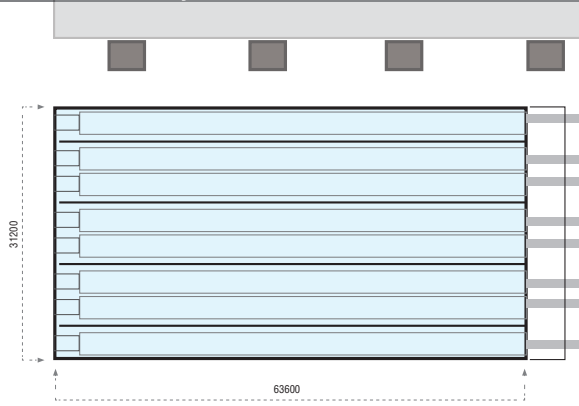
## Geology

The project area, which covers approximately 2,000 square metres, falls within the Forlì territory straddling the Apennine-Paduan border.

The soil geology consists mainly of alluvial deposits of the Po Valley that are characteristic of the Emilia-Romagna Super-synthema. In particular, there are soils belonging to the Ravenna Sub-synthema, characterised by silty clays, clayey silts and sandy silts of alluvial plain.

In detail, the geognostic surveys and penetrometric tests carried out in the working areas have shown that after an initial short layer of backfill there is an alternation of silts, sands and clays with a loose to medium density and medium plas-

Layout of the future warehouse



which consists of 11,650 winegrowers.

The project is aimed at the technological and plant development of the warehouse in order to improve its production yield and environmental performance.

The overall project covers different interventions and installations, including the construction of a new shed, new equipment, energy efficiency measures and a new automated warehouse.

The Cesena city based company Trevi SpA was entrusted with the special foundation works to support the new automated warehouse.

The structure, to be built inside the plant, will be used for the handling of the wine producer's packaging management.

ticity in the first 10 to 15 metres of depth, increasing to stiff and very stiff as drilling gets deeper.

## Works

The foundation structure was defined and dimensioned to support its heavy load and contents, and to dissipate it in depth.

With regard to the deep foundation design of the automated warehouses, it is important to carefully assess the subsidence and distortions that can occur in both the foundation structure and the superstructure. The foundation-soil complex must guarantee uniform support in the event of ground deformation, particularly for high automation warehouses where the automated guided vehicles move according to a pre-set mapping, which must not be subjected to variations



or inclinations in order to work correctly and safely.

**The design solution consists of a foundation slab built on closely spaced piles, which are cast in situ and reinforced. Foundation piles were built with a diameter of 800 mm and four different drilling depths, varying between 12 and 39 metres.**

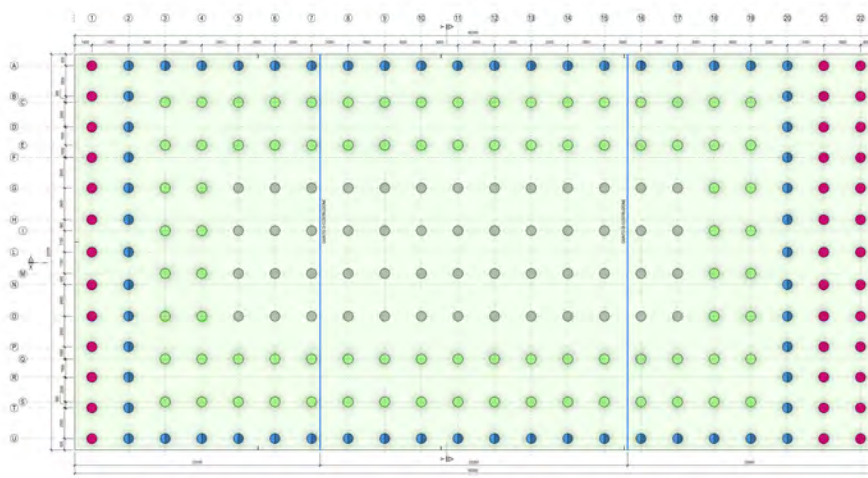
In order to effectively counteract the load of the structure to the underlying soil, piles are arranged in groups, uniformly around the entire perimeter of the warehouse, and excavated with increasing depths towards the centre.

Working within a plant in operation and therefore with personnel and vehicles at work, the two main needs were clearly defined: time and logistics.

atisms to simplify and optimise excavation management by the operator.



Layout for foundation piles



-  Ø800 L=12m N°=39
-  Ø800 L=16m N°=60
-  Ø800 L=22m N°=84
-  Ø800 L=39m N°=52



Pile location control system

DMS On Board control system



In order to carry out the work in the shortest possible time, **two different technologies were used: the CFA, with continuous flight auger, for the 12, 16 and 22 m deep piles, while the 39 m deep piles were drilled using polymer piles.**

The need to occupy as little area as possible, not to mention the considerable number of piles to be drilled, led to the choice of the two drill rigs: the Soilmec SR-30, set up with telescopic Kelly bar and bucket, and the SR-45 set up in its CFA version.

Both machines are equipped with a **rotary power automatic control system** to enhance drilling performance by optimising torque and rotational speed, and a **low-idle system for the diesel engine** that guarantees better fuel consumption and reduced environmental impact.

In addition, the **DMS On Board** is renewed with regard to customisations and is complete with many drilling autom-







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