Engineering Structures for Life


BUILDINGS - INDUSTRY & SCIENCE

# Navigator tissue paper mill

## ABOUT

The "NAVIGATOR COMPANY" selected the manufacturing facility of Cacia in Aveiro for the construction of a new Tissue paper mill, an ambitious plan, with guarantees of future expansion planned from the first design stage. GEG developed the licensing and detailed design of all engineering disciplines and coordination of architecture which allowed the development and successful completion of this ambitious endeavor in 18 months.

The challenges posed by the large size of the equipment, with heavy loads and difficult foundation conditions were solved in an integrated way by the design team. The solutions to meet the demanding construction schedule have been facilitated by the use of effective design tools such as Building Information Modelling (BIM). The application of these tools allowed effective coordination with the company responsible for the industrial design, Pöyry, anticipating several problems that would arise. The entire project was modeled using REVIT software, which made it possible to reconcile and coordinate the solutions of all disciplines in order to ensure perfect compatibility between structures, equipment, infrastructures and architecture.

The project comprises four large areas, set in a vast area of 188.500 m2, comprising roads, car parks, green areas and all supporting infrastructures.

- "Tissue Machine 1" main building and peripheral buildings;
- Jumbo roll conveyor and warehouse (4.843 m2);
- Converting Plant (14.376 m2);
- Automated pallet warehouse (7.148 m2).

## FACTS

**Year:** 2016-2018
**Client:** The Navigator Company
**Services:** Building Engineering, Acoustics, noise & vibration design, Architecture, Building Information Modeling (BIM), Mechanical and HVAC design, Plumbing design, Structural Engineering, Telecommunications & Security, Electrical design & Energy systems, Coordination of the engineering disciplines, Drainage design, Lighting design

## TEAM

## LOCATION

Cacia, Portugal

The different buildings that constitute the complex are physically separated, having an independent structural

behavior.

The industrial purpose of these buildings introduces some constraints regarding their geometry and heavy loads on the floor levels. The geometry should consider the minimization of structural supports, bracing and obstructions to the installation and circulation of equipment. The result of this imposition is the need to design large-span roofs and high-rise structural frames. High loads are also a constraining factor to the structural solutions at the floor levels. The existence of several large-capacity overhead cranes is also an important factor in the design.

The location of the factory on the banks of the Vouga River estuary lies on alluvial soils composed by muds and sandy-muds, very soft up to 18 m maximum depth, below which there are compact sands originated from the deposit formation of old beaches. Given this scenario, it was decided to adopt deep pile foundations in all buildings. The advantages of this solution are the settlement control and the ability to bear very eccentric loads resulting from the wind action associated with modest vertical loads.

The precast structures were intensively used due to the advantages of time and capacity to overcome large spans economically.

In the areas with heavier equipment and with greater vibration control the structure used cast-in-situ concrete. The steel structure has a strong presence in some secondary structures such as stairs and walkways, and also as the main structure type of the jumbo roll conveyor and the automated pallet warehouse.

Video from "the navigator company":