

ACO Engineering

October 2010



South Apron of Portela Airport in Lisbon

Partial view of the south apron of Portela Airport – Domestic flights terminal

Once again, it was ACO that was chosen to supply the linear drainage systems for an ANA Aeroportos de Portugal, SA project: a new parking apron for domestic flights at Portela International Airport, in Lisbon.

The project for this taxi-way apron began in 2007 when Lusitana ACO - Elementos de Construção Unipessoal, Lda submitted a preliminary study directly to the ANA Studies and Projects department. In 2008, this study was included in the final design by the company Viaponte and subsequently revised by the company Cenor, two of the largest private engineering project companies operating in Portugal.

The project included the draining of a large sealed area of around 28,500 m², the flow from which would have to be treated in hydrocarbon separators. The proposal involved two ACO Qmax 900 system lines. The first 400 m line would serve an area of around 13,900 m² and the smaller 315 m second line would serve an area of about 14,600 m².

The rationale behind the use of this material is to boost a high flow-capacity drainage system, considering discharges only at the ends of the lines, also taking advantage of allowances in its section to increase some volume in order to regulate the flow at the separator inlet.

Normally in these cases the need for headers in parallel with the continuous drainage system is almost a mandatory requirement due to lower flow capacities, requiring also the corresponding access chambers, connections, access covers and other accessory materials, the use of this new system having shortened lead time and reduced the amount of materials used, permitting savings while always guaranteeing the good operation of the drainage.

The water-flow calculations were made using basic information provided by the employer itself, for a 10-year return period and verified for a 100-year period, 20% of the total flow to be treated in a hydrocarbon separator system with a by-pass system.

These data were processed by ACO and resulted from rainfall readings at the Portela rainfall station over the course of several years.

Complying with one of the most interesting functions of the ACO Qmax system, retention, the system was dimensioned for the use of just one separator, for which purpose we had to constrict the discharge permitting only a flow corresponding to the maximum permitted by the separator for the intended efficiency. This retention function can be achieved through the use of one of the accessories from the Qmax range, the Qbreak regulator. However another simpler and cheaper method was adopted, which was a reduction in the cross section of the discharge tube in the junction chamber at the end of the Ø800 lines to Ø500.

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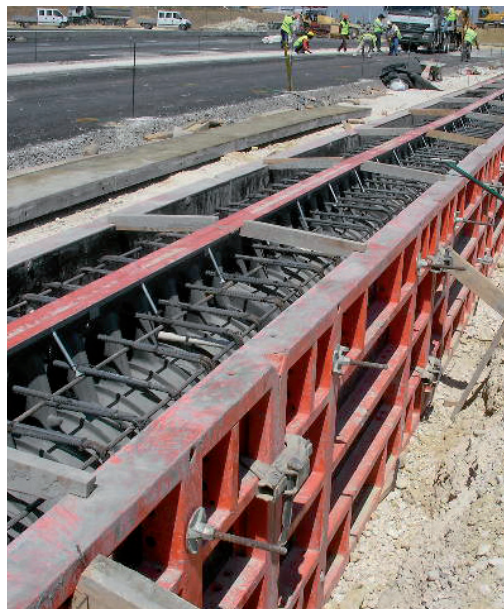




Alignment and start of installation of the Qmax 900 channels



Site, installation of reinforcement and side formwork



Site, material ready to receive concrete surround

The calculation was made using various different rainfall duration possibilities, the most unfavourable cases having been adopted.

Given that the customer is a habitual user and defender of concrete systems, this was a victory with which we were very pleased, since we were able to go against a tradition that has lasted for many years in the customer's modus operandi, thus undoubtedly creating advantages in terms of operability.

The challenge continued in the installation of the system since it was the first time it was being used in a project in Portugal. As we are on an airport apron, load class F900 to EN 1433 is required for any system or device installed.

Qmax 900 can also achieve this class provided its concrete surround has reinforcement duly calculated for this purpose, in order to comply with load requirements. The minimum concrete surround and reinforcement requirements had already been provided at the design stage, as well as their types and characteristics, which we consider only recommendations to achieve F900 class in laboratory tests, in accordance with the requirements of the standard.

One factor that significantly influenced the installation was undoubtedly the ambient temperature. Since we were in the summer months, during the hottest part of the day temperatures rose to 40 °C, which does not cause damage to the material from which Qmax is made, but may alter its dimensions until it is surrounded by the concrete, causing some problems during the concreting stage and requiring repairs to the formwork. The lightness of the material was also a challenge, since even when attached by its two supports to the concrete base using steel bolts and plugs, it was necessary to create an upper barrier to prevent the central part from rising up when the concrete surround was being filled.

The material's flexibility and the dimensions of the Qmax 900 system raise another challenge during the stage of filling the concrete surround, since this process had to be adjusted, the two side concreting stages becoming three, preventing quite considerable deformations in the side wall, which would threaten its stability and that of the stressed structure.

In addition to these parking apron drainage systems, a road around the apron also had to be drained, as well as some specific points in the surrounding area that required localised draining.

For the first situation the ACO RoadDrain system was proposed as it is a one-piece system installed between the airport deck concrete surface and the tarmac surface of the road, and can be crossed at any place and in any direction.

In the second situation and as there cannot be any elements without an attachment system, the F900 class 500X500 gully top in cast iron was suggested, with a bolt attachment system.

Project Summary

Project: South and South East Apron of Portela Airport

Customer: ANA-Aeroportos de Portugal, SA

Project designer: Viaponte - Projectos Consultoria Engenharia, Lda

Contractor: Mota-Engil Engenharia

Year of construction: 2007 - 2008

ACO Products

ACO Qmax 900-715 ml

ACO Qmax 900 access chamber -10 pairs

ACO RoadDrain 100 30.1 -150 ml

ACO RoadDrain 30.3 -10 units

ACO Cover Guss Begu DN 600 F900 -10 units

Gully grating ACO Guss 500X500 F900 – 20 units

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