

LINING THE DAM FACE AT EL MOLINO DAM, SPAIN



WALO was awarded the contract for providing the bituminous lining works for the dam face of the El Molino embankment dam, which is located in Álava in the Basque province of Spain and provides water for the local agricultural industry.

The upstream slope of the dam was lined with a drainage layer, a 70 mm thick binder layer and a 60 mm dense asphaltic concrete layer and finished with a mastic coating. The placing works were completed in just 1.5 months using WALO's vertical lining technique. The interconnectivity of the lining to the concrete structures was constructed with a combined sealing element using dense asphaltic concrete, elastic joint filler and copper foil. This ensured the impermeability as well as flexibility of the jointing and lining systems, despite the difference in movements over time of the asphalt lining and the inflexible concrete structures underneath it.

Lining Technique

The asphalt was placed in the slopes utilising a vertical placement methodology. Each paving group consisted of a slope finisher (paver) and attendant main winch as well as slope winch(es) and slope roller(s). For a vertical lining method the paver places a strip (mat) from the slope toe upwards. The main winch is placed at the crest and supports the paver on the slope by means of wire winch ropes. When the paver reaches the crest it drives onto the main winch ramp, which in turn moves sideways along the crest by the width of one strip (mat) and then the paver is lowered to the toe of the embankment. The cycle is then repeated until the slope is finished.

The material supply for the vertical lining at El Molino was done via the crest road with a feed hopper transporting and tipping the material directly into the paver body. The feed hopper was operated inline with the paver and was also secured by the main winch. On slopes of short length the material loading into the paver can be done directly from the base of the embankment slope (toe).

Depending upon the placing machinery used, bituminous layers of up to 150 mm thick and mineral or drainage layers up to 200 mm thick can be placed in one pass. With the equipment available to WALO it is possible to place material in very narrow transverse vertical curves or steep and long slopes with lengths of more than 150m.

Asphalt lining works to the base at El Molino were carried out in a conventional way by paver and direct feeding by asphalt wagons. As with the placing works in the slopes, special attention was needed for the joints and the lateral areas of placed strips. It had to be ensured that the asphalt was placed as soon as was practicable against the adjacent/ previous strip to guarantee that the joints were made "hot-to-hot" to ensure that when compacted the adjacent joints fused together to form one homogeneous sealing. It was also vital to ensure that the compaction/ rolling of the laid material was carried out correctly to ensure the in situ material met all requirements with regard to air voids and permeability. The rollers used are specially designed for the compaction of soft and flexible DAC layers.

Attention to detail when placing asphalt in the slope and in the base is very important. The formation of joints and the specialist skills and equipment needed to place the asphalt create the difference between conventional asphalt work and that required to achieve the required exacting standards for placing asphalt essential in hydraulic engineering works.

Making joints impermeable

Special attention always has to be paid to the treatment of the joints between the placed strips once the material has cooled down – so called ‘day-joints’. In order to ensure the impermeability and homogeneity of the ‘day-joints, these sections need to be chamfered, cleaned, dried and coated by bitumen. Once cooled down, the asphalt adjacent to the joint area is carefully re-heated by infra red heating devices and then re-compacted by manually operated vibro-tampers. The joint, in the form of a ‘wedge’, forms and overlap between the two strips, which when recompacted guarantees a joint which is totally impermeable and extremely durable. Extensive testing of such joints has consistently proven that there is no difference in the quality and permeability of the area forming the joint to that of areas placed by a paver.

For the El Molino project WALO established its own asphalt laboratory at the mixing plant which ensured that the required high standard of quality control could be maintained throughout the project, with testing being carried out during and after each construction phase. This is common practice for WALO and was very reassuring for the client. Operations started in 2013 without any problems and the asphalt lining has already blended well into the landscape.