MECHANICAL LAYING OF PAVING BLOCKS

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Summary.

This paper is to give information on how mechanical laying is exercised in Norway an to open up for a discussion on mechanical laying. Today there is still some doughts about mechanical laying being the best way, but to us this is not understandable. You get more accurate and cheaper laying and one saves the layers a lot of health problems.

Historical survey.

Laying of paving blocks and flags by machine has a comparatively short history in Norway. The development started for real in 1989 with the introduction of Uni Coloc. Since then more types of blocks and supplyers have entered the market.

With this type of paving blocks mechanical laying trollies were put into use. With a team of two men it was possible to lay 200-300 m² ready pavement per day.

At about the same time there were introduced hydraulic clamps fitted on, for instance, excavators. These offered a noticeable improvement in capacity compared with laying trolley. At the same time the working environment was improved.

New and larger building projects demanded constantly higher quality and capacity. The first machine exclusively intended for laying of paving blocks was imported to Norway in 1991 and put to work at Kjevik Airport in Kristiansand. This was a building project of 7000 m² that had to be carried out in a periode of two weeks.

Today there are several of these machines in use in Norway.

Working environment.

Laying by machine brings quite evident advantages for those who handle the paving blocks. The machine operator sits comfortably in his cab, and the man who catches and directs the clamp at the paving front can work with his back upright when the layer of blocks is put into place.

Few or none heavy lifts are necessary during the working-day.

Compared with laying by hand this working methode gives far less health problems to the worker, and improves the working environment.

Improved working environment brings forth noticeable advantages to the quality of the work done.

Quality.

When laying by hand it is difficult to maintain exact joint widths because two persons do not lay blocks exactly the same way. Some persons lay loose and others tight. This makes it difficult to keep directions in the pavement under control.

A laying machine with mechanical squeezing of the cluster gives the same pressure on the blocks, and concequently the same width of joints every time it catches a new layer. This makes it easy to keep exact directions in the pavement provided that the size of the paving blocks do not differ.

Capacity of laying.

To gain the maximum effect of a laying machine it is recommended to have a laying team of 3 men. One operating the laying machine, the second directing the clamp, seeing to that the pavement is correctly in proportion to strings and directions. The third sees to the supplying of pallets for the paving front, removes packing and clears the empty pallets.

As to capacity it is important that the pallets are located at the right place and with the correct distance between them. Note that one must be careful when driving on pavement without sand in the joints.

Planning of area.

It is necessary to make high quality demands on the bedding sand when laying paving blocks by machine. This is essential because rather large areas must be made ready before laying the blocks. This means that parts of the bedding sand area may be open for some time.

Crushed material is recommended, for instance 0-8 mm in thickness of 30 mm.

Well compacted this material will stand up to som wind and rain. You may also walk on it without leaving any traces on the surface.

How large areas with beddingsand that can be laid before laying the paving blocks, is partly dependent on the size of the building project. As a rule it should be sufficient for some days of block laying. This is necessary to secure a regular progress of the process of laying, and also to make it easier to control the levelness of the beddingsand.

The size of area for laying by machine.

How large building projects you may decide reasonable to lay by machine depends entirely on the price. Areas less than 250 m² might not be laid cheaper by machine than by hand. This is mainly due to cost of rig.

In any case, laying by machine is more economical the larger the project is.

Capacity.

A well organized team will normally lay 500-600 m² per day by machine.

During a normal Norwegian season a machine laying team ought to lay 50000-60000 m² to obtain satisfactory profit.

K.LINTHO STEINMILJØ - MYSEN got the contract with FBT Sola for rehabilitation of the area in front of the hangar of the helicopter squadron. The area covers about 3000 m² and was done in 1993.

Background information on the Sola installation.

The military part of Sola airport was mainly built during the 1939-45 war. The airport is placed on a flat area close to the sea front and only 3 - 6 m above the sea level. The whole area is covered with sand of good quality with fairly little fines so it drains well. The sand has an estimated CBR of 12%.

Could we use concrete paving blocks on a NATO airport?

The problem was looked in to for the first time in 1989. We wanted to find out if it was possible to use concrete paving blocks on this airport. Being a NATO airport normally Bruxelles has to except the choice of products. But due to this work was put under maintenance work the Airport Authority themselves were able to decide about the paving system, - and they said YES to use concrete paving blocks. The first area was laied in 1989 and a new area have been laied every year since.

Build up.

Due to the way this airport was built by just excavat the top soil and cast concrete slabs 5 x 7 m on the sand underneath we needed a special construction. The airport is used for all types of NATO aircrafts, including F-16 and tank aircrafts.
Erling Reinslett designed a construction with geogrid and well graded strong crushed material. The total construction was only 250 mm thick. I chose a bedding sand of good strong crushed material 0 - 8 mm (this is on the area laid in 1992 and -93 altered to 0 - 10 mm washed natural sand).

Start of the work in 1993.

The old concrete slabs were removed. They had a thickness of 180 - 220 mm. Excess sand was excavated and the surface was compacted and leveled before the geogrid was laid. The base material was filled in, compacted and leveled to the correct height with a levelness of approximately +/- 10 mm.

We used local contractors for breaking up old slabs of concrete and construction of the build-up.

For laying the sand in a thickness of 3-5 cm an asphalt spreader was used.

Before the paving blocks could be laid, the whole area had to be screeded. A 4 m long aluminium ladder was used. It was loaded with suitable weight and was dragged criss-cross by the laying. By using a 4 m screed we managed to remove all unevenness and get the correct and described tolerance.
The new pavement had to be joined with an existing Uni Coloc pavement. To get a satisfying result in the joints between the old and the new pavement, it was necessary to pick up some of the old paving blocks. About 1 m width of the edge of the old pavement was picked up, and the beddingsand was levelled and corrected in proportion to existing level.

Then the laying of the Uni Coloc pavement started. Moreover it proved that joining of old and new blocks had some disadvantages. The existing pavement was laid in 1991 and turned out to have slightly different measures of modules than the new one. When working on correspondent building projects we will ensure that the new blocks have the same measurement as the existing blocks. This can be ensured by using the same moulds when producing the blocks. If this is not possible, it is recommended to make a joint in the pavement which later must be sealed with fuel resistant rubber asphalt or similar.

After laying the pavement the joints was filled with dry sand 0,5-1,5 mm, compacted twice with a 500 kg vibrating plate. Then the entire area was brushed clean for superfluous sand and sealed with Pavseel.

For spreading the Pavseel we used a sprinkler can and a rubber swab. Consuption: 0,45 l per m^2.

The last part of the work was sealing of joints between pavement and the gutter system. These joints, with a width of about 1,5 cm, were fitted with fuel resistant rubber asphalt.

Conclution.

We find that mechanical laying is to prefer even below 1000 m², and on larger areas mechanical laying is the rule in Norway to day. It is quicker, cheaper and normally has a higher quality than hand laying. We do understand that in areas with a lot of unemployment hand laying can be a way to get people into work. It is also easier to hide bad tolerances on blocks with hand laying. To us hand laying is not a solution on larger areas - well planned - mechanical laying gives a better quality.

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