



MAPEI PRODUCTS FOR GRANITE FLOORS IN THE NEW TERMINAL 1 OF HAMBURG AIRPORT

10 million passengers a year make the international Hamburg Airport the 5th biggest among the German airports and first in Northern Germany. The airport was built in 1911 on an area of about 44 hectares. Since then, this area has grown tenfold, with 53 aircrafts taking off or landing at the same time.

The city of Hamburg expects that there will be a considerable increase in the number of passengers in the future. That is why they launched a project, called HAM 21, aimed at extending and modernising the airport. Works, which are still going on, also included the construction of a new terminal which was completed in May 2005. 42,000 m² of concrete and 6,800 tons of steel were used for a construction which can now host 8 million passengers a year.

Inside terminal 1 natural stone floorings were laid on about 15,000 m² of screeds, 6,000 m² of which are heated using hot water panels. When choosing the covering materials, the performances of the concrete flooring in the existing terminal (n. 2) were taken into account. Since the latter shows clear signs of wear, cracks and flaking, particular attention was paid to the covering's high resistance to abrasion and high compressive and bending strength, in order to guarantee the flooring's durability.

Thanks to their mineral composition (mainly very hard quartz and feldspar) and their pleasant aesthetic appearance, natural stones are especially suitable for applications in highly frequented environments subject to intense traffic.

Therefore, pink granite slabs from the



1

USA (North Carolina), sized 60x60x3 cm and distributed as "Salisbury Pink", were chosen for the interior floorings of terminal 1.

The stone was laser-treated prior to the installation to ensure it met the R9 minimum anti-slip requirements prescribed by the German regulation BGR 181.

As for the floor on the terminal's terrace, 60x60x4 cm slabs of Chinese yellow "Padang" granite were installed on an area of 1,000 m².

The screeds' preparation and the installation of the granite floor coverings in both areas were carried out by the consortium ARGE Naturwerkstein, which includes Naturstein Billen GmbH from Wolfsburg and Zeidler & Wimmel Natursteinindustrie from Hannover, who decided to use several Mapei solutions.

Photo 1.

The floors of the check-in area in the new terminal 1 sport Salisbury Pink granite slabs.

Photo 2.

Installing 60x60x3 cm granite slabs in the check-in area with Mapestone 1.



2

Photo 3. Padang yellow granite slabs were laid on the terrace's floor with a drainage mortar formulated with the hydraulic binder Mapecem. On the back of the slabs, Granirapid two-component cementitious adhesive was also applied.



The Preparation of Substrates in the Check-in Area

The substrates in the check-in area were made of calcium sulphate (in both the unheated and the heated areas) to take advantage of these materials' low-stress shrinkage. So it was possible to increase the bay sizes of the screed to 100 m², (whereas the maximum bay size of a cementitious screed is usually 40 m²) and to reduce the cost for the systems for sealing the expansion joints. However, the thickness of the screed had to be increased to 12 cm, in order to ensure good resistance to the final loads and mechanical stress. For a proper installation of floor coverings, the residual humidity of a calcium sulphate screed must be <0.3 % for heated screeds and <0.5 % for unheated substrates. If these residual humidity values are exceeded when the installation of the covering material is carried out, humidity might accumulate below the covering. This might compromise the screed's stability and jeopardize the covering's final performances.

In this case, proper drying of the screed was ensured by the heating system enclosed in the floors. The drying of the unheated screed, on the other hand, required intense ventilation of the areas, combined with proper heating.

Even after several months, some of the screed sections still featured an inadequate rate of residual humidity. This required a special solution: waterproofing polyethylene membranes were applied on these sections of the substrates to ensure safe installation of the natural stone coverings. Before laying the coverings, the level of residual humidity in the screed was also measured with a carbide hygrometer.

As the screed's surface featured a

clearly visible sinter layer, devoid of the required mechanical strengths, this had to be removed by shot-blasting. Since after this operation the screed's surfaces featured an insufficient rate of resistance to abrasion, they were treated with PRIMER MF*, a solvent-free two-component product based on epoxy resin with low viscosity. Moreover, the screeds were completely sanded with 0.6-1.2 mm grain-sized quartz sand, in order to guarantee good bonding.

While stone material is only installed on almost completely dry calcium sulphate screeds, humidity can penetrate into the substrates from the upper surface through the joints of the covering, especially during the daily cleaning of the floors. This might cause loss of stability of the screeds and detachments of the covering material. Therefore special attention had to be paid to the protection of the screed's surface from humidity. The aforementioned PRIMER MF* epoxy resin primer was again applied, this time as an additional protective treatment against humidity.

Installing the Floor Covering in the Check-in Area

As well as selecting the correct kind of natural stone, the choice of which adhesive to use also played a crucial

role in ensuring the floor covering's durability. This choice mostly took into account the adhesive's compressive strength, bonding strength, resistance to the staining of the slab, fast-hardening and short waiting times before the flooring can be put into use.

As for the installation of the Salisbury Pink slabs in the check-in area, the use of the high performance mortar MAPESTONE 1* (which Mapei's local subsidiaries distribute on the German, Austrian and Swiss markets) allowed the irregularities of the natural stone slabs and the substrates' unevenness to be well compensated for.

Beside guaranteeing fast hardening and drying times (so that the floors could be set to light-foot traffic after only 4-5 hours), MAPESTONE 1* also gives the professional installer the possibility to adjust the stone slab by "tapping" after bedding it into the mortar.

The expansion joints in the covering were set according to the joints of the screed. In the heated areas additional expansion joints were arranged at 5 m intervals in order to reduce the deformations caused by temperature.

When grouting the floor joints, the installation company chose the traditional method with quartz sand and



3

cement to make "silent" joints. Since there was no gap between the slabs and the joints, the noise caused by the traffic on the floor could be minimized.

The Preparation of the Terrace's Substrates

The installation of the natural stone slabs on the terraces was carried out after the preparation of a 10 cm thick substrate. Taking into account how the weather affects the final surface, the project designers decided to make a drainage screed allowing for quick drainage of stagnant water, thus reducing the risks of damages due to freeze-thaw cycles, as well as of stains in the natural stone covering. In order to reduce the load, they also decided that the screed had to be lightweight and made of expanded clay featuring a 4-8 mm diameter. Mapei technicians suggested the use of MAPECEM* special fast-setting and drying hydraulic binder which guarantees the mortar's good workability and the screed's proper hardening even in unfavourable weather conditions. The mortar prepared with MAPECEM* and expanded clay was tested by the Institute for Materials Analysis of the Darmstadt University and the Technical Institute for Building and Environment in Greven (Germany).

The test results were consistently positive regarding the mortar's mechanical strength and drainage properties.

Therefore, the substrates' preparation included laying a special drainage membrane and mixing a drainage mortar made of expanded clay and MAPECEM* (250 kg/m²).

Thanks to both the screed's low shrinkage rate and the open joints in the covering, there was no need for expansion joints in the screed.

Installing the Floor Covering on the Terrace

Regarding the terrace's floorings, the project designers decided to lay the Padang yellow granite slabs in the drainage mortar using the "fresh-on-fresh" installation method. After installing a waterproofing membrane on the surfaces, the mortar was mixed with expanded clay and MAPECEM*, as described above.

Due to the limited contents of cementitious matrix, drainage mortars feature low adhesion values. In this case, proper adhesion of the floor covering was ensured by applying GRANIRAPID* two-component cementitious adhesive on the back of the slabs before laying them on the fresh drainage mortar.

The 6 mm wide joints of the floor covering were not sealed to guarantee proper water drainage and avoid the need of further expansion joints.

Ready to Leave

The co-operation among the installation company, the Mapei Technical Service Department and the project designers helped to successfully deal with and solve the problems met during the work carried out on this project. The perfect installation of the floorings was completed in time, which allowed the new terminal of the Hamburg airport to be completed before the beginning of the summer season.



Our thanks go to "Realta Mapei" (n. 4), the in-house magazine published by Mapei's German, Austrian and Swiss subsidiaries, from which this article was taken.



*Mapei Products:

the products referred to in this article belong to the "Products for Ceramic Tiles and Stone Materials" range. The technical data sheets are available on the "Mapei Global Infonet" CD/DVD or at the web site: www.mapei.com.



Mapei's adhesives and grouts conform to EN 12004 and EN 13888 standards.

Granirapid (C2F): two-component high performance, fast-setting and hydrating cementitious adhesive.

Mapestone 1 (C2F): fast hardening and drying mortar for small and medium laying beds.

N.B. This product is distributed in the German, Austrian and Swiss markets by Mapei's local subsidiaries.

Mapecem: special fast-setting and drying (24 hours) hydraulic binder for shrinkage-compensated screeds.

Primer MF: solvent free, two-component epoxy primer to be used as an adhesion promoter for products from the Mapeifloor range and to consolidate and waterproof cementitious substrates.

TECHNICAL DATA

Hamburg Airport, Terminal 1, Germany

Work: installing natural stone floorings in the check-in area and on the terrace

Years: 2001-2005

Customer: Flughafen Hamburg GmbH

Project: Gerkan Marg & Partner, Hamburg

Works Management: Bernd Wienert, Zeidler & Wimmel Natursteinindustrie GmbH & Co. KG, Hannover (Germany)

Installation Companies: ARGE Naturwerkstein (Hamburg) including Naturstein Billen GmbH (Wolfsburg) and Zeidler & Wimmel Natursteinindustrie GmbH & Co.

Installation Materials: Salisbury Pink granite in the check-in areas and Padang yellow granite on the terrace

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