

THE TOWER OF FREEDOM

THE WORK OF COVERING THE TELECOMMUNICATIONS TOWER OF KUWAIT CITY, CARRIED OUT IN DIFFICULT CLIMATIC AND SITE CONDITIONS, WAS COMPLETED ON TIME THANKS TO THE SKILL OF THE WORKFORCE AND TO THE VALIDITY OF THE PRODUCTS USED.

by Giorgio Roncan - Photo by Luca Aliprandi

In 1988 the Ministry of Public Works of Kuwait has given the go ahead for the construction, in Kuwait City, of a new telecommunications tower under the direction of the Swiss design company EWI, Elettrowatt Engineering Service Consultant (manager Dott. Eng. Martin Buxtorf).

The construction, in conical reinforced concrete, with a maximum height of 372 metres, is one of the highest in the world. As can be seen in Figure 1, the tower has, at the height of 150 metres, the first zone used for services, amongst which is a restaurant, while, at the height of 184 metres, one finds the telecommunications station; from 221 to 372 metres rises the extremely high antenna. The two platforms are supported by two "hands" of concrete, respectively of 8 and 12 fingers.

In section the tower is formed by 4 quadrants (Fig. 2),

PHOTO 1

equally spaced by recesses, where the external lifts are inserted that rise spectacularly to the first platform positioned at 150 metres.

In August 1990 the tower had already reached a height of 220 metres, when, because of the Iraqi

invasion, the works had to be suspended. The construction, as the rest of the country, was enveloped in a dense black cloud created by the oil well fires; at that time the greasy soot was so thick that cars were obliged to travel by day with their lights on.

The conflict over, the works were able to be restarted only in 1993; rapidly the tower reached its maximum height and in 1994 the construction in concrete was finished.

A lifting for the tower

The government, having decided that the tower must become the symbol of the re-found freedom of the nation, after the events of war, proposed to change the towers



PHOTO 2

Graph 1
Temperature recorded
in Kuwait during the
course of a year

Fig. 1
Elevation of the tower

Fig. 2

Section of the tower

Photo 1

The covering of the
tower was carried out
by Italian and local
installers

Photo 2

View of the tower
before the installation
of the tiles

Photos 3-4

To avoid the high
daytime temperatures,
the work was carried
out at night

Photo 5

A phase in the
installation of the
clinker tiles on the
upper platform of the
restaurant at a height
of 150 metres

GRAPH 1

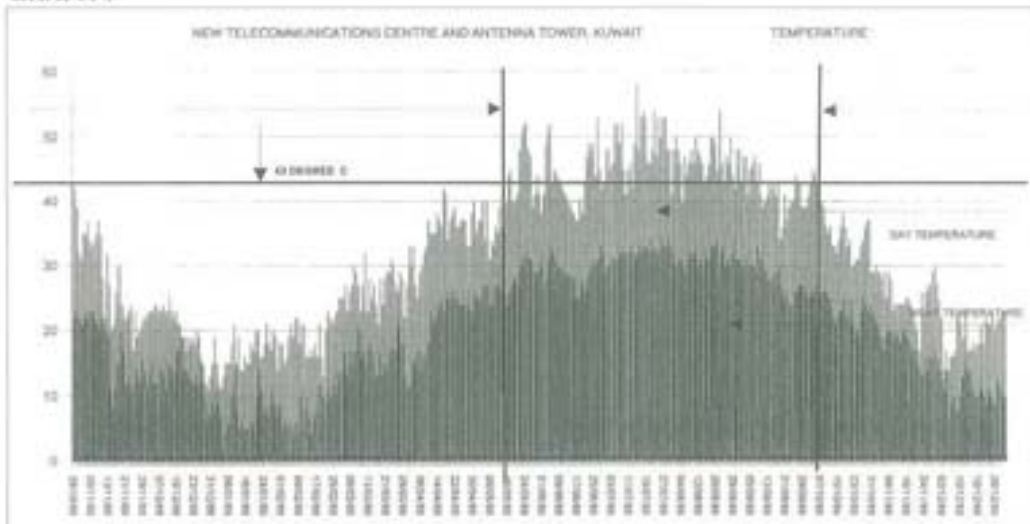


PHOTO 3



PHOTO 4

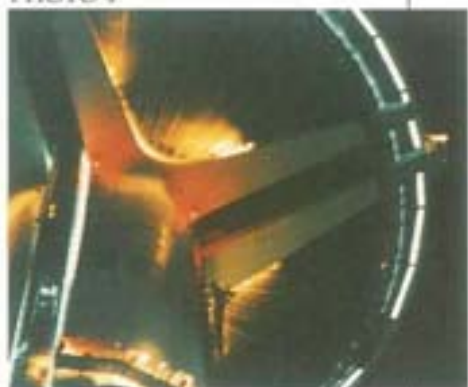


PHOTO 5



"cladding", intervening with an operation of lifting. What was wanted was a stylish covering, either esthetically pleasing and original or capable of resolving some technical problems: to be durable, maintenance free and able to protect the concrete surface from the abrasive action of the desert winds loaded with sand. Diverse solutions

were taken into consideration and in the end the decision was arrived at was to cover the concrete surface with ceramic tiles up to 184 metres and to paint the surface with epoxy paints from 221 to 308 m (the other parts consisted of glass and metal structures). 12x24 cm clinker tiles were chosen from Gail, supplied by the Kuwaiti company Hassan Abul,

Work in the desert

Around 14,000 square metres of tiles had to be installed, respecting very tight completion times: the start of the work in fact was fixed for the 1st of April '95 while completion was programmed by the end of the year in order to allow for the inauguration in February 1996. A difficult situation in normal conditions, made more problematic in view of the particular climatic conditions of the country. In graph 1 we show the temperature in the various months of the year,

both during the day and during the night. As can be seen, already in April, the daytime temperature never falls below +30°C, while from May to October it is nearly always above +40°C, falling at night by about +10°C. Humidity is obviously extremely low, being a desert zone: it varies in fact from 50% to 7-8% during the whole of spring, summer and autumn.

Products and men for a quick and perfect installation

The management for the installation of the tile covering was entrusted to the Kuwaiti company GSTC-PSC Group that, after careful consideration, decided to

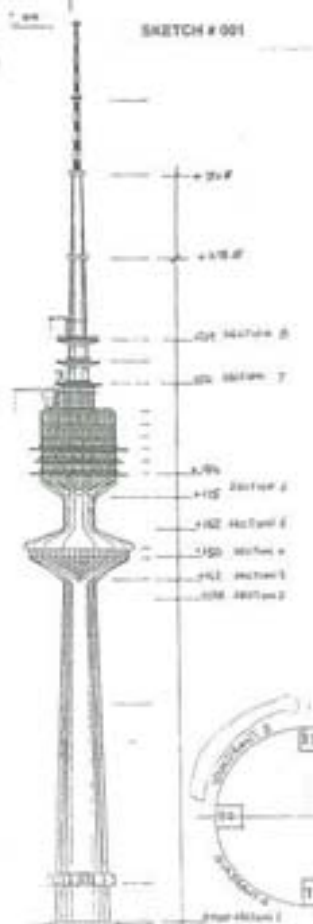


FIG. 1

FIG. 2

PHOTO 6

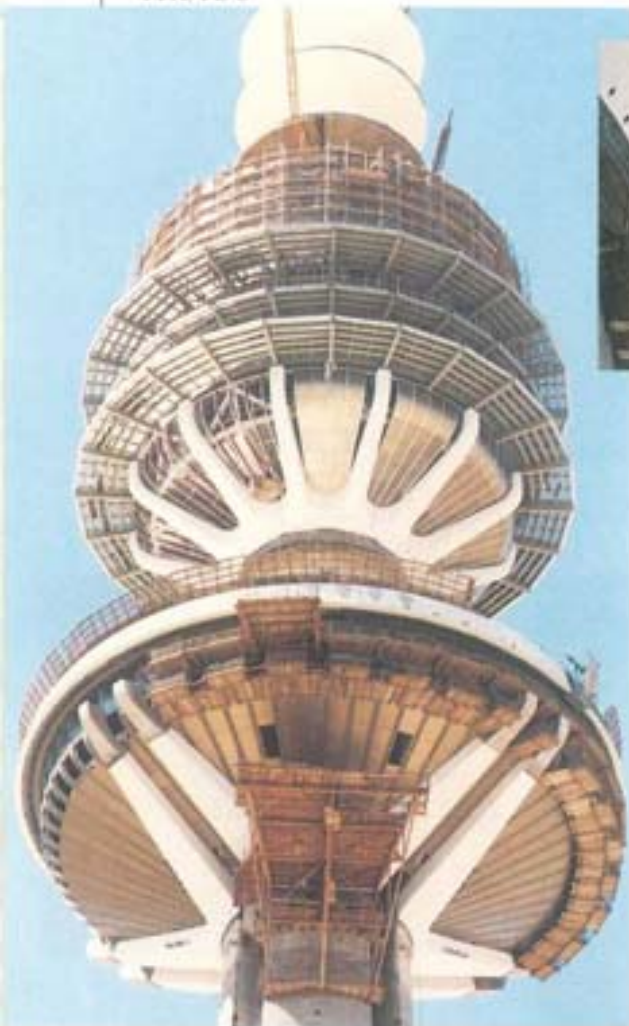


PHOTO 7



Photo 6
The upper part of the tower consists of platforms supported by "hands" covered with ceramic tiles
Photo 7
Detail of the installation on the upper "hands"

Why KERABOND + ISOLASTIC

KERABOND has been chosen because the adhesive, being made of a cement powder and a synthetic acrylic based latex, combines all the indispensable requirements for an installation as that described.

It is easily prepared and the mix has excellent workability: the paste is creamy, easy to spread and adheres to the support perfectly.

Moreover it guarantees a very long open time; specifically for this project, a special formulation has been designed by our laboratories, with a prolonged open time that has allowed the excellent Latina installers also to work in prohibitive conditions (up to +34/36°C).

The high thixotropy of the adhesive has allowed the installation of the tiles, as well as vertically on the very long conical trunk wall, also overhead on the reinforced concrete hands that support the platforms. The adhesion with

values above 10 kg/cm² has assured, together with the elasticity which is the highest that can be found for a cement based product on the world market, a perfect technical blend able to overcome the stresses from the continuous thermal dilation to which the tiles are subjected to (the temperature in fact can go far above +50°C) and from the action of the hot winds that is often very strong. In the end KERABOND with ISOLASTIC has been chosen also because it is the most widely used adhesive in the world for the external laying, with millions of square metres of tiles laid in over twenty years of always successful experiences.



Mixing Kerabond and Isolastic

PHOTO 9



PHOTO 8



give responsibility for the tile installation to the company Pafint srl of Latina (Italy), under the management of surveyor Gianfranco Moretto. The team of 20 Italian installers, accompanied by about 40 assistants, for the main part Indian and Pakistani, started the works on the 1st of April 1995. In the meantime Mapei having beaten the competition by offering a system of installation that, with careful examination by the commission consisting of all the components of the technical staff (ministry, consultants, construction companies, installation companies), supplied the greater guarantee of success.

The technical specifications, prepared by Mapei technicians, after numerous visits to the project site, practical tests and evaluations of the particular conditions of the work, covered these fundamental points.

• Cleaning

First of all the cleaning of the concrete surface with water at a pressure of 2,000 atmospheres, in order to remove 1-2 mm of concrete impregnated with soot, formed because of the greasy cloud provoked by the fires during the Gulf war.

• Repairs to the concrete

Where necessary, work proceeded with repairs to the concrete using NIVOPLAN,

Photo 8
Detail of the ceramic covering of the "hands" of the tower during stuccoing
Photo 9

Detail of the structure of the upper beams during the stuccoing phase

Photo 10

An interesting view of the body of the tower after the application of the ceramic covering



*Photos 11-12-13
Some images of the
phases of installation
on the upper and
lower parts of the
platform*



PHOTO 11



PHOTO 13



levelling mortar for walls, with the addition of PLANICRETE, synthetic rubber latex for cement mixes. In some zones small and quick repairs were carried out (only in periods that were not too hot) with NIVORAPID, thixotropic levelling mortar for ultra-rapid drying applications.

• **Bonding of the tiles**

To deal with the fluctuations between day and night time temperatures and to ensure the perfect bonding of the tiles over the total height, the adhesive KERABOND was used, mixed with ISOLASTIC, flexible latex for cement based adhesives, without dilution, and applied with a N. 6 notched trowel, both onto the surface of the concrete and onto the back of the clinker tile.

• **Grouting and expansion joints of the tiles**

The 8 mm grouting joints were filled using KERACOLOR large grain, colour

PHOTO 12



Manhattan grey n. 23; while the expansion joints, installed every 4x4 m, were sealed with MAPESIL LM, colour Manhattan grey n. 23.

• **Cleaning**

The cleaning of the residual KERACOLOR was carried out with KERANET.

A strengthening layer

With consideration that the "hands" that supported the platforms could be subjected to small deformations due to the weight of the restaurant and of the area occupied by telecommunications, it has been planned to cover the concrete of these two areas, before the laying of the tiles, with a further 2-3 mm layer of KERABOND and ISOLASTIC as an anti-cracking precaution.

Work in a record time

The installation of the 14,000 square metres of clinker tiles was carried on until the 10th of July, working in the last few weeks only at night, from 24 to 7 in the morning, when the temperature was lower at +34-36°C.

PHOTO 14



PHOTO 15



Photos 14-15
Details of the covering; mobile platforms were used to carry out the installation
Photo 16
Some members of the installation team at the completion of the works

PHOTO 16



The works, suspended for two months, started again on the 26th of August and finished, ahead of schedule, at the beginning of November.

Italians, professionals of the desert

Particular mention is merited of the extraordinary professionalism demonstrated by the Italian workforce that carried out the work in extremely difficult, and often very dangerous, conditions.

In fact they have been obliged to work day and night at temperatures reaching +36°C, living during the day in the hotel, where the air conditioning allowed them to forget that the outside the temperature was +48-50°C, drinking only orange juice and Coca-Cola because wine and alcohol is strictly forbidden. □

The technical information sheets for the products mentioned in this article are contained in Mapei binders number 1 "Ceramic line" and number 3 "Building line".



TECHNICAL DATA

Project: Telecommunications tower, Kuwait City

Start of works: 1/4/95

Completion of works: November 1995

Managing contractor: EWL, Elettrowatt Engineering Service Consultant

Project Manager: Dott. Eng. Martin Buxtorf

Contractor for the installation of tiles: Pafint srl, Latina, (Director: Surveyor Gianfranco Moretto)

Coverings: Clinker tiles 12x24 cm from Gail, supplied by the Kuwaiti company Hassan Abul

Products for the levelling of the concrete:
NIVOPLAN
PLANICRETE
NIVORAPID

Products for the installation of the covering:
KERABOND + ISOLASTIC
KERACOLOR LARGE GRAIN Manhattan grey n. 23
MAPESIL LM Manhattan grey n. 23
KERANET

The Mapei products were supplied by the Hassan Abul company.