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The Sultan Ahmet Mosque restoration works between 1988-1990

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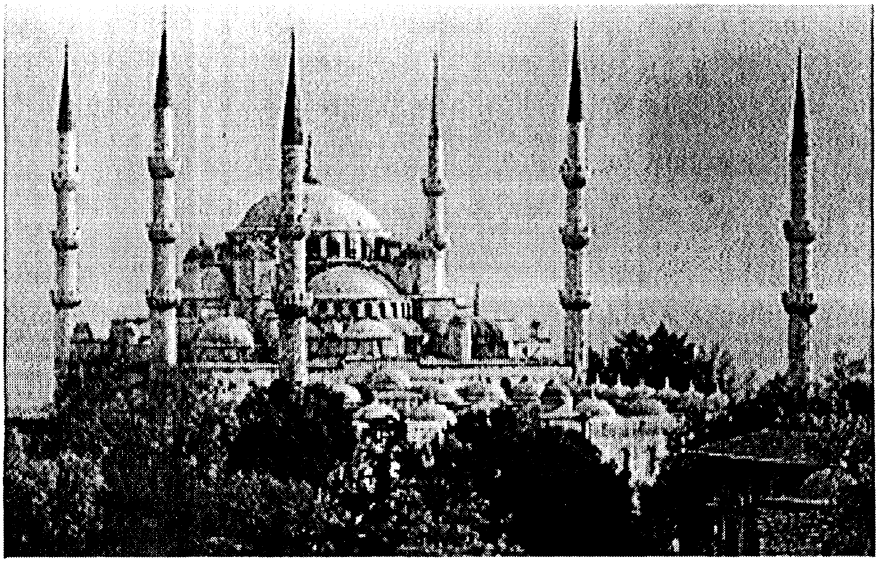
Abstract

The Sultan Ahmet Mosque was built under the instruction of Sultan I. Ahmet. The Architect of the mosque was Sedefkar Mehmet Ağa. He begun to build the Mosque in 1609, and finished it in 1614. Inside the mosque, blue İznik mosaics were used. This is why it is called the Blue Mosque. Until today, many restoration works were done. Especially in 1888-1895, restoration works were very impotant. After this restoration, the most important restoration was in 1988 - 1990. In this paper the last restoration work will be explained. The restoration works may be grouped under seven headings:

1- Work on main dome,
2- Restoration of the stained - glass windows,
3- Restoration of the wooden shutters,
4- Repair of the floors,
5- Disassembling the scaffolding and cleaning,
6- Repair of outer stone wall,
7- The dome's lead plating and care of the cupola



Introduction

After dividing up duties the scaffolding was put up; the scaffolding for the repair of the 44,85 m. high main dome was put up by a team of nearly forty experienced scaffoldiers in quite a short time. During the twenty days it took for this task to be completed a part of the mosque was kept open for prayers and tourists.

For the rasping experienced engravers together with fifteen trainees began work. Trainees were chosen for two main reasons. Firstly because they were more patient and eager to work with their amateur mind and secondly because it would be more economical.

Figure 1

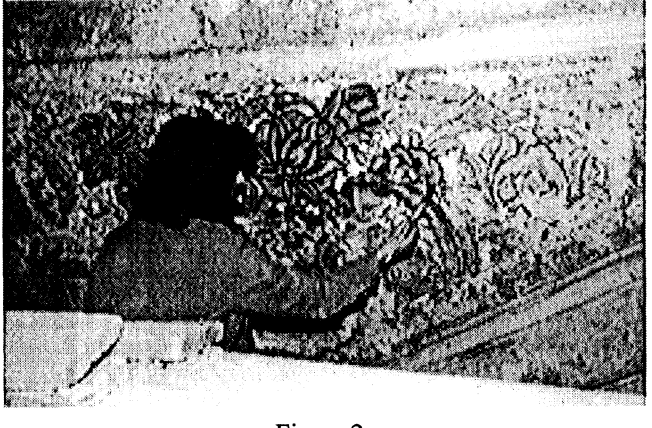


Figure 2

While the rasping work was being done it was observed that the ornamental work on the main dome's bearing side arch was not in it's original state as designed by Sedefkar Mehmet Ağa but in a more simpler geometric intertwining fashion.

After a little research the matter was understood; in 1883 restoration was under taken by a foreign firm and they had chosen these easier and quicker geometric

designs instead of the designs incorporating the olive branches. If the pictures below are examined the difference can be easily seen, Figures 1 and 2 . Copies of the original designs were made onto tracing paper, then laid out and the necessary rectifications were made. The designs were then bored for application, marked into place with graphite dust and then the painting began. This work necessitated a great deal of lengthy and tiring ceiling work and its finished state can be seen in the picture below, Figures 3. As a necessary part of restoration, a sample of previously done work is always kept.

1 Work on the Main Dome

As the main dome had leaked from beneath the cupola, the plaster had worn into the leaking area and caused the plaster to break away from the brick which is the main structural element. All of the loose plaster was broken off and new plaster applied in its place. Here I would like to mention an interesting fact:

It is seen that in the restoration work of 1883 that the foreign firm covered all of the acoustic holes with plaster. Acoustics was discovered around 1875 by physicists in Italy where the subject of resonance was being studied. It was never known before.

However, when Sedefkar Mehmet Ağa's master Sinan the Architect was building the Süleymaniye Mosque, he was reported to the Sultan by certain religious fanatics who requested his punishment for trying out acoustic sounds in the middle of the mosque with a water-pipe .

These acoustic holes have been restored to the original form by leaving an opening about the size of a coffee cup every four square metres. As an interesting coincidence, during the acoustic measurements a group from the Middle East Technical University asked us what we did to improve the acoustics in the mosque. Necessary explanations were made and we were assured that the the acoustic had been corrected without having to carry out any scientific measurements.

After the plaster repairs on the main dome were completed and enough time allowed for drying we began the gilding work. The dome's internal decoration designs had been previously copied out, the workshop rectifications made and after application the painting had begun. While the undercoat and filling out work was being done, the main painting was carried out by a qualified team. After the edging and contours were drawn and all the shading completed, the work was completed. Care was taken to use the same team for the work so that there would be no signs of differing quality.

For the restoration of the strips of verse under the dome, we were helped by the late Mahmut Öncü, a Master of Calligraphy at the Academy for Fine Arts. As he was a professional in ancient writing, all the previous mistakes were corrected. Although the original of the verses were of gilt paint, they were restored in gold surfacing.

The reason for this was a remaining debt of gratuity waiting to be paid to the builders of the Blue Mosque.

Figure 3

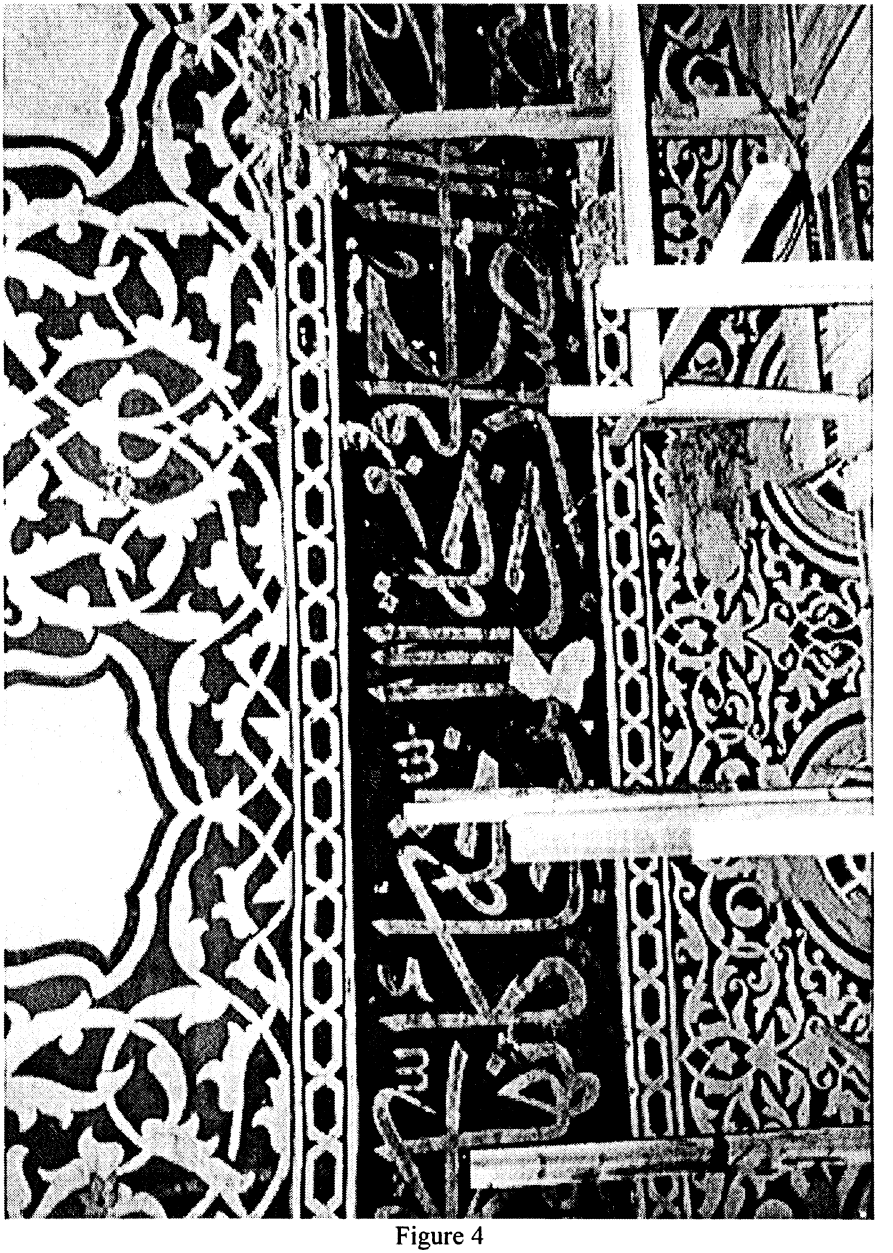


Figure 4

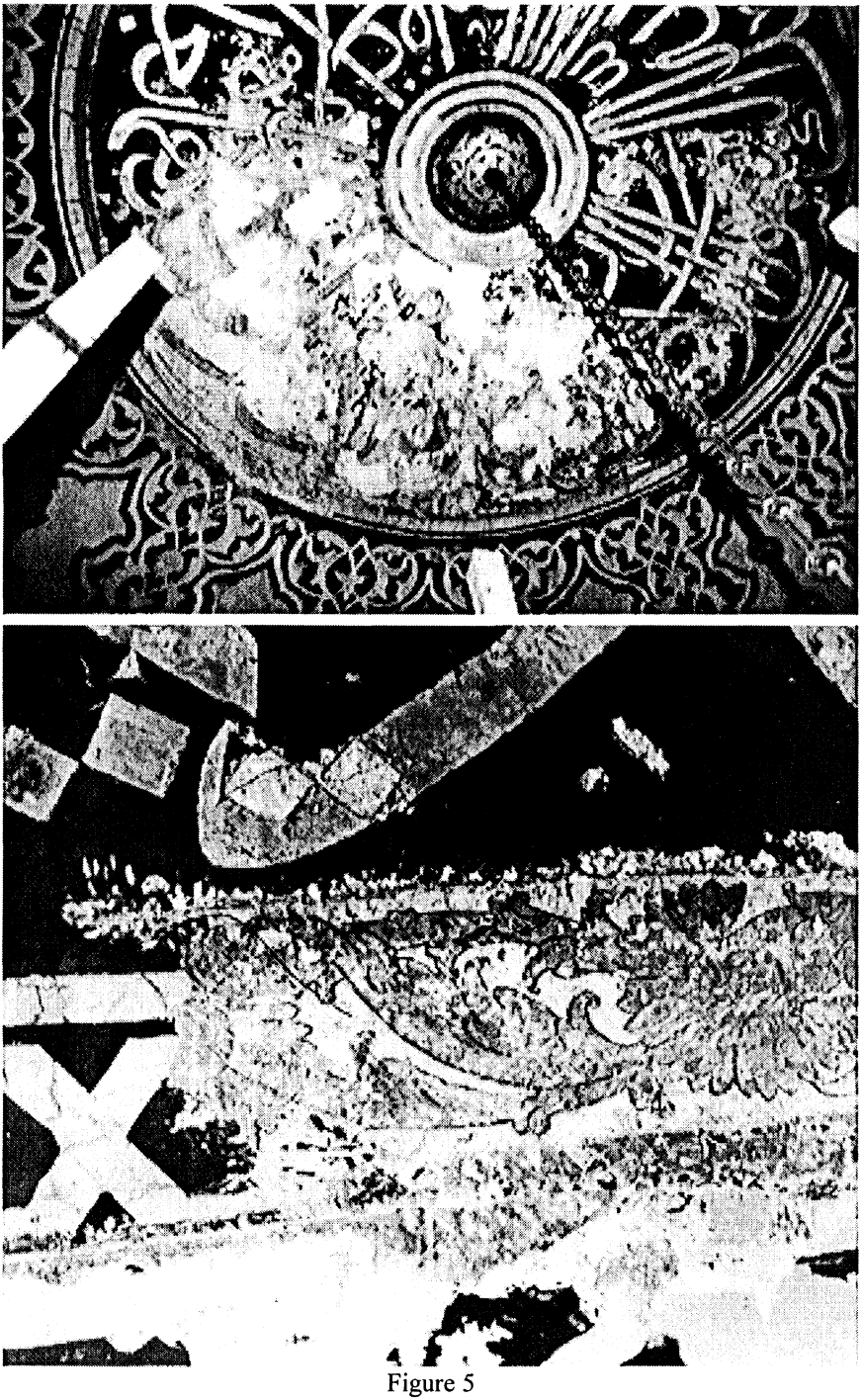


Figure 5

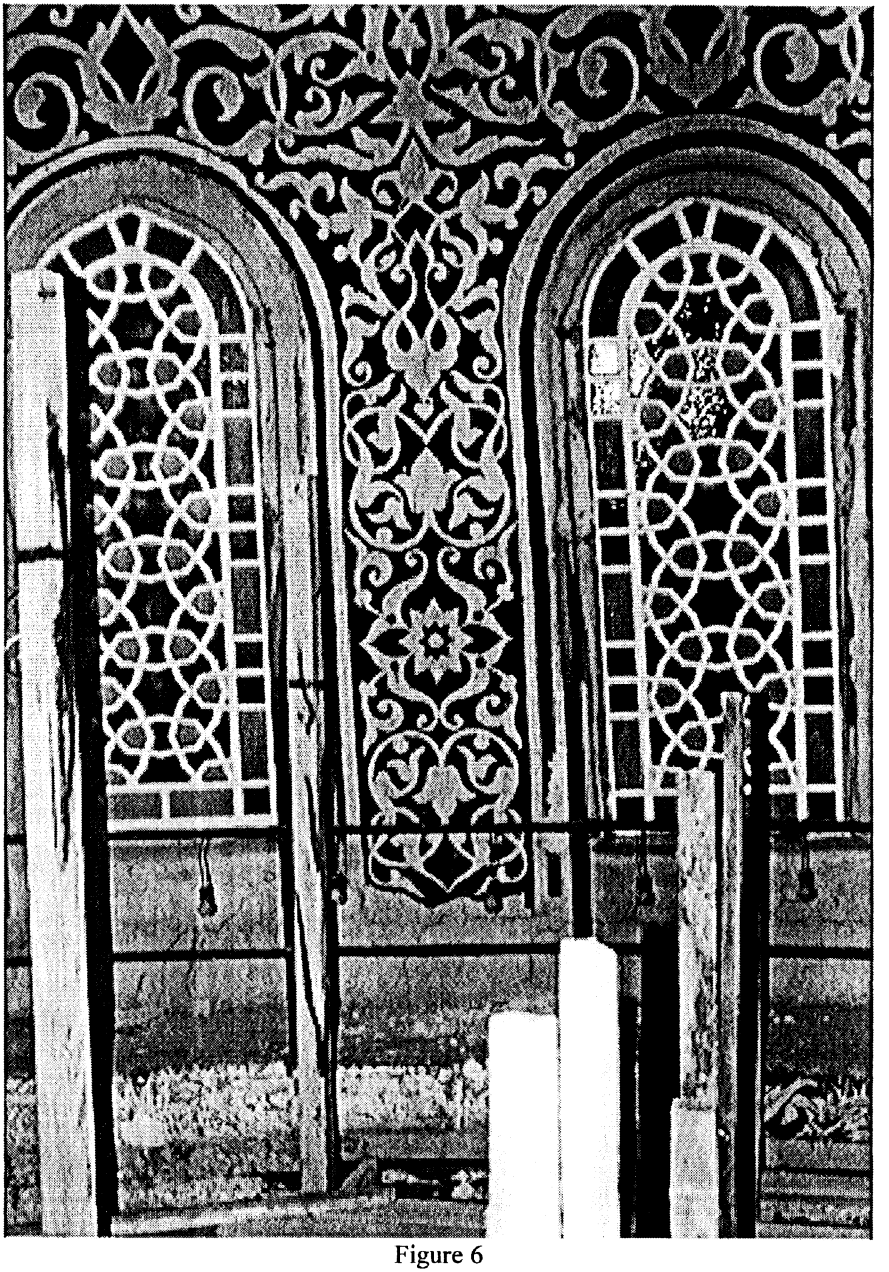


Figure 6

2 Restoration of the Stained-Glass Windows

The windows are composed of coloured glass sections. They are made by applying plaster at the edges of each adjoining section of stained - glass and later touching up the plaster, sometimes even adding motifs to the borders. In order to ensure a more rigid frame, the outer edges were begun in concrete. As the pressure of wind was sometimes higher than desired, the borders would crack causing the glass to fall out. We decided to add support by including iron fitting between the motifs around the stained with glass. We increased the rigidity by welding the iron. We also painted them two coats of anti - rust treatment so that they would not rust and break away from the plaster after we carried out the plaster work. Today, as an afterthought, it would have prefered to use stainless steel fittings instead of going through that procedure, because stained - glass window-making requires very tiring and hard workmanship. It is also hard nowadays to find people working in this field, it is not a widespread art and there are not enough new craftsmen to take the place of the old.

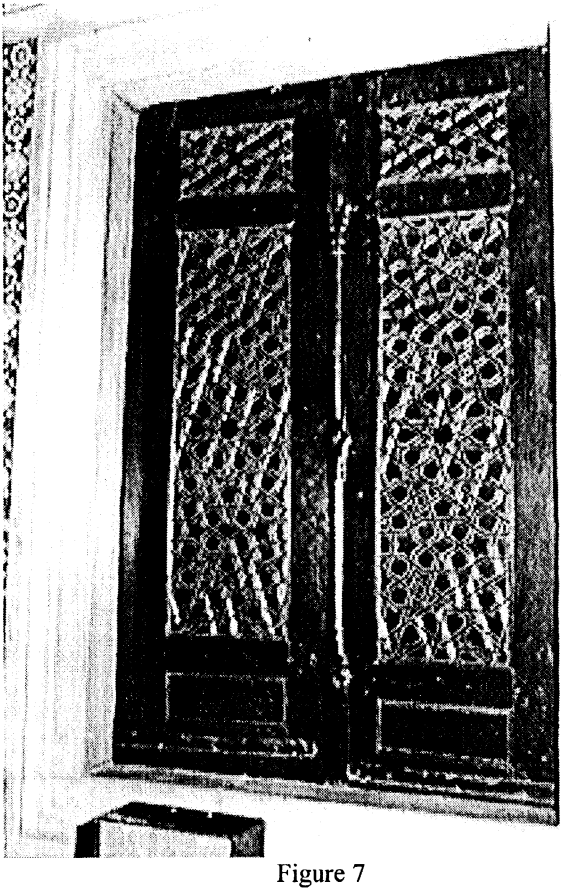


Figure 7

3 Restoration of the Wooden Shutters

It is said that the wooden shutters and doors were made by Evliya Çelebi's father. No nails or adhesives have been used in the making of the wooden interlaced type shutters and doors. As a polish, French polish had been used. For the restoration, the old paint and polish debris has been cleaned off from all of the doors and fresh French polish has been applied according to the original . An interesting detail is that all strips of the shutters and doors are made from wood of different types and colours. Sections taken from the trunks and roots of trees such as olive, rosewood, walnut, chestnut, linden, etc.

Although no rot was detected, as a precaution they were soaked in special length pools with radioactive - based wood preservatives, dried flat with special presses, polished and re-fitted in their original positions. The wooden shutters are made of strips of approx 60 / 400 cm. A special workshop for these processes was set - up in the mosque.

4 Repair of the Floors

The ten thousand square metre floor space of the mosque consists of brick flooring made of terracotta. They have dimensions of 33 / 33 cm. This measurement is a typical example of the 3 M modular unit of modern architecture also used in that day and age. In some places concrete and in other stone was used instead of the brick stone which had worn away or broken.

After a very time-consuming study flooring like the original was developed. It was seen during this study that when drying of the wet clay was made in factory conditions the surface presented criss-cross cracks. Tension-breaker holes were made to contain these cracks. These holes were made in a single direction and thickness of 3.5 - 4.0 cm. and finally after very slow drying and baking flooring very like the original was obtained .

The main reason for a flooring such as this inside the mosque was to provide an insulate, warm surface for kneeling during prayers instead of a cold one. The original thought was to provide central heating from the floor but as natural gas was not available in Turkey at that time the idea was rejected because fuel oil or coal would have a bad affect on the environment. Also, it would have been hard to prevent vagabonds from using the mosque, which are houses of God, as shelters for the winter.

5 Disassembling the Scaffolding and Cleaning

The mosque began to be built in 1609 and was completed in 1617. Over these past 373 years there accumulated a great deal of dust and construction debris in out reach places of the mosque. During this time,cleaning was only done in reachable places. Extra dust and debris collected from elements such as planks, scaffolding, etc, after the construction work. It was obvious that the debris from

disassembling the scaffolding could ruin the newly applied decorations. As one remedy we used an industrial-type vacuum machine and collected 150 bags of dust. It would have been unacceptable to dispose of these two truckfulls of dust in the environment. Therefore, we had the dust hardened with sand and cement and made into blocks with special moulds and buried them in an empty piece of land outside of town.

6 Repair of Outer Stone Wall

The calker - based stone had lost its supporting quality and loosened in many places due to weather conditions over time. These had to be replaced but it was not as easy as it seemed .

The stone had to be removed and replaced without disturbing the static system of the structure. The most commonly used method is to wear away the stone and put a new one in its place which is what we did. Unfortunately I do not think this process was very successful because it will change the structure' supporting quality in time. Also, as a limestone-based mortar called khorasan

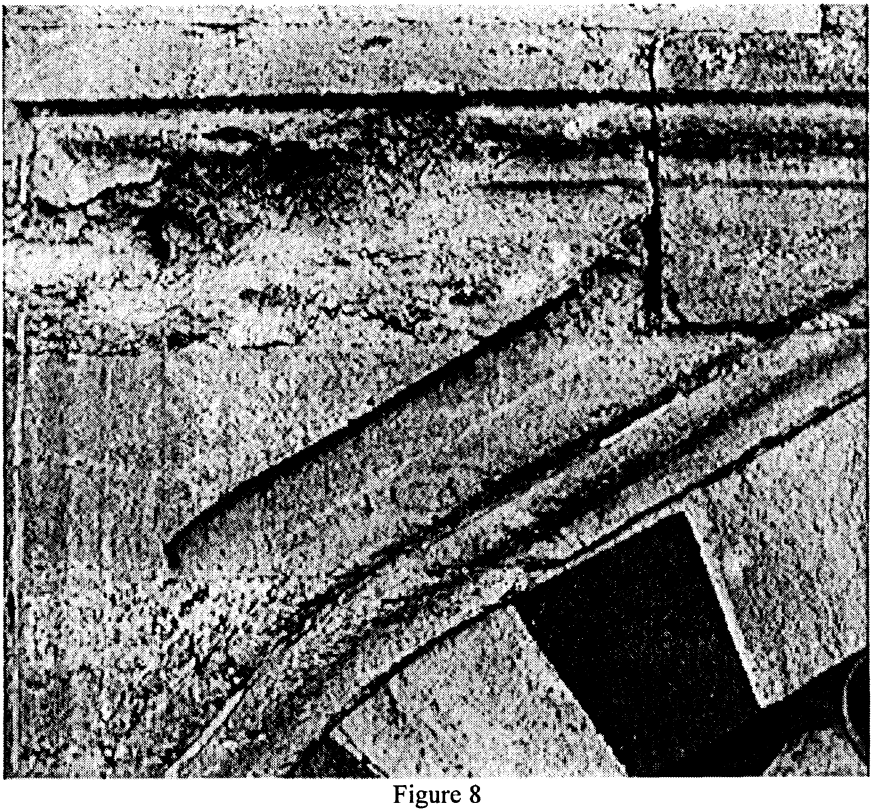


Figure 8

was used in old building , no damage was done to the stone.

Nowadays cement mortar is used and although it is not a problem regarding resistance the cement has an acidic base and the stone will gradually wear away due to the acid seeping into its pores. The outer wall of the Sultan Ahmet Mosque is made of a stone, called the minaret stone which is a very tough calker type and is extracted from the Bakırköy region. However, winter conditions and water which enters through the cracks and freezes can ruin the stone .

Although it was suggested that certain epoxy or silicone based preservatives be painted over the stone, although the idea was discarded because the stone could completely be cut off from air. It was applied in some sections as an experiment, and when it was examined some eight years later no differences were noted.

In my opinion, the most important point in replacing stone is that not enough tightening is obtained when stones are put into place. Tightening with wedges sometimes caused the stone or surrounding stones to crack presenting more work as the damage increased. It would cause no mortar to enter behind the stone leaving it empty which could present a hazardous condition. In such instances the use of a small compressed mortar pump would be useful.

7 The Dome's Lead Plating and Care of the Cupola

As it is known, lead plating is done by joining through interlocking. The lead should have a soft underneath while it is being pressed and hammered . Otherwise the lead can be torn through. As in the original, the underneath of the lead was plastered with a mortar consisting of clayey material and hay. One disadvantage of this is that in time pollen carried by birds and wind may take root and lift the lead causing water to enter the dome .

To prevent this, the dome should be insulated with an insulation mixture consisting of polyurethane foam or a perlite-limestone mixture. As perlitecontains acidic based silica it does not allow plants to take root thus preventing such damage. When the dome is not insulated properly the air accumulating at the top of the dome will cause humidity which in turn will immediately destroy the decorative work. It is also important to sufficiently insulate against water where the cupola sits on the dome. The brass cupola had corroded over the years, therefore it was repaired by coating it with gold surfacing and welding with brass. As the sections called the apple and pear were very heavy we decided that only a heavy duty helicopter could lift them, so the idea to have them brought down was abandoned. Instead ,only necessary repairs and maintenace work were carried out.

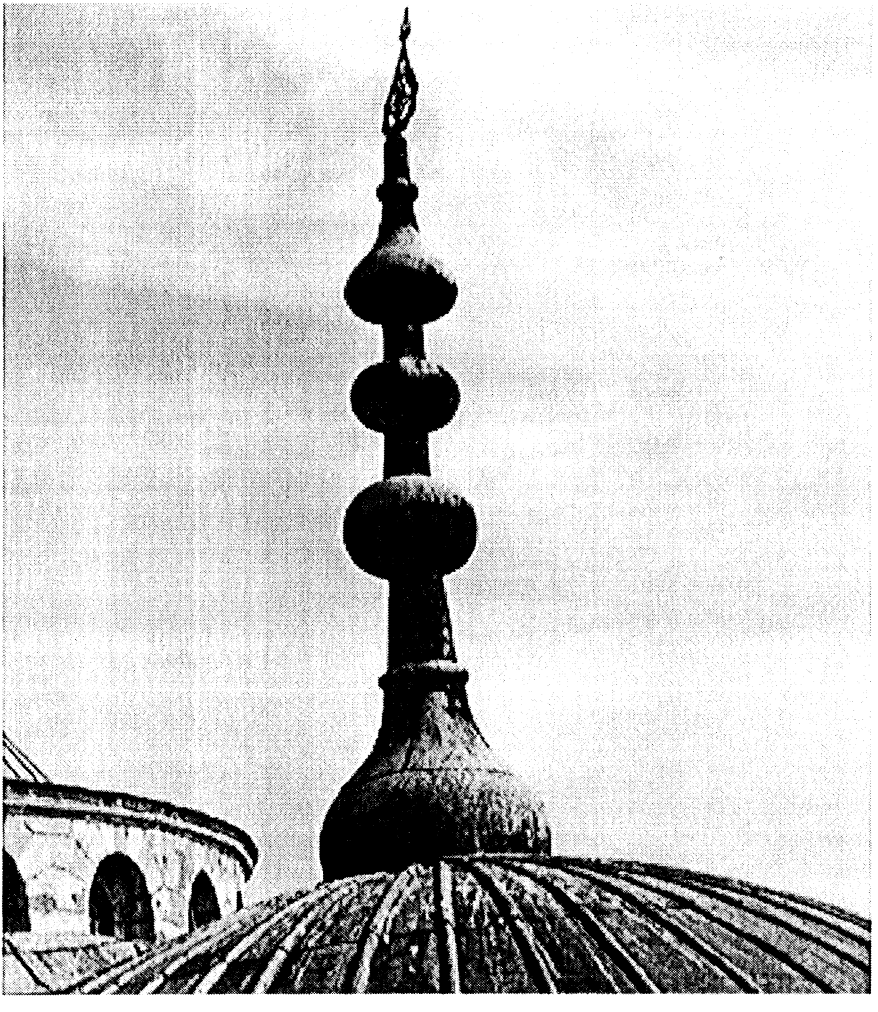


Figure 9

Conclusions

Restoration work need very hard work. Especially, because of the difficulty in finding experienced people or very good trainees. The firms can't make enough profit so that the good trained firms are hard to find. Restoration work is then left fondations or social committees which do not think about making profit.