FIELD TRIP REPORT
By: F. LeBlanc

Taj Mahal, Agra, India
Sept. 23 to 28, 2002

THE TAJ MAHAL CONSERVATION COLLABORATIVE PROJECT - EXPERTS WORKSHOP, SEPT. 23-28, 2002

In India, under the responsibility of the minister of culture, the government agency responsible for the care and restoration of national historic monuments and sites is the Archaeological Survey of India. It is responsible for thousands of monuments and sites. It employs more than 1,300 professional employees and thousands of workers. The task is immense and the financial resources are scarce. Last year, the ministry of culture decided to launch a new initiative. It decided to team up with carefully selected private sector companies and foundations to further the restoration of a small group of important historic monuments and sites.

On June 21, 2001, the Archaeological Survey of India, the National Culture Fund and the Tata Group of Companies through the Indian Hotels Company Limited (IHCL) signed an agreement for the "conservation, restoration, upgrade and beautification of the Taj Mahal and the surrounding areas"

The Archaeological Survey of India
Under this agreement, the Archaeological Survey of India retains full responsibility and control for the management and implementation of the projects listed in the Agreement.

The Tata Group of Companies
The Tata Group of Companies is one of the most important corporate groups in India. It owns and operates a wide variety of companies among which is a major chain of hotels. It is the Indian Hotels Company Limited (IHCL) that signed the Agreement on behalf of the Tata Group of Companies. Under the Agreement, it is responsible for financing the restoration work and for gathering a group of “global” experts to review and comment on the proposed restoration work.

The National Culture Fund
The National Culture Fund is an entity created by the government of India to encourage and facilitate private sector donations that are 100% tax deductible. The funds for the restoration projects of the Taj Mahal will be with this agency and it will pay the bills and audit the books.

To fulfill its obligations, the Indian Hotels Company Limited created The Taj Mahal Conservation Collaborative. It is a small group of professionals
who ensure that the project moves along smoothly and meets all objectives. The Collaborative organized this second Workshop of Experts to review the proposed projects and research. The Workshop gathered experts and managers from the Archaeological Survey of India and conservation professionals from India selected by IHCL (the list follows).

For this meeting, the “global experts” Advisory Committee comprised:

- Sir Bernard Feilden, Conservation Architect, former Director of ICCROM
- Dr. Ebba Koch from Vienna, expert in Mughal art and architecture history. She has published several works on this subject and on the Taj Mahal.
- Professor James L. Wescoat Jr., professor and Head of the Department of Landscape Architecture at University of Illinois at Urbana, Champaign. He is an expert in landscape architecture and particularly in the history and development of Mughal gardens.
- Dr. Martand Singh from New Delhi, a consultant with extensive experience in museum development in India.
- Arup Sarbadhikary, structural engineer and consultant for the rehabilitation of structures and heritage buildings all over India.
- Dr. Wayne Begley, Art Historian, specialist in Mughal art
- Milo C. Beach, formerly from the Smithsonian Art Gallery, specialist in Mughal art paintings
- Dr. Marukh Tarapore, Ass. Dir. For exhibitions at the N.Y. Metropolitan Museum of Art.
- The Getty Conservation Institute, represented by F. LeBlanc.
- The World Monuments Fund, represented by Mark Weber

High-ranking officers of the Archaeological Survey of India participated to this workshop and guided us through the site, identifying the conservation issues that needed to be addressed. The ASI participants were:

- Dr. Kasturi Gupta Menon, Director General
- Dr. R. Grover, Assistant Director General
- Dr. R.K. Sharma, Director of Science
- Mr. Shyam Singh, Director Horticulture
- Dr. K.K. Muhammad, Superintending Archaeologist, Agra Circle
- Mr. K.C. Nauriyal, Dy. Superintending Archaeologist, Agra Circle
- Mr. Vikrama Bhuvana, Assistant Archaeologist
- Mr. M.C. Sharma, Sr. Conservation Assistant
- Mr. Tapan Bhattacharya, Sr. Conservation Assistant

Rahul Mehrotra, architect from Bombay, was hired by IHCL to coordinate the implementation of the Agreement. He lead the group through the meetings and site visits with the support of Amita Baig, heritage consultant from New Delhi. The organizing group did an extraordinary job in bringing everyone together and leading the discussions.
Including arch. Mehrotra and Ms. Baig, the group of professionals assembled by the IHCL also comprised the following persons:

- Tara Sharma, architectural historian and specialist in Indian art and culture
- Abha Narain Lambah, architect
- Annabel Lopez, architect
- Navin Piplani, conservation architect
- Arup Sarbhadhikary, structural engineer
- Romil Sethi, architect
- Dr. Priyaleen Singh, landscape architect

Results of the Workshop

Following are my notes from the meetings. They do not in any way represent a full or exact report of the meetings. I simply wish to share with you some of the highlights, discussions and recommendations made during the meetings. It should give you a general idea of the current concerns and issues brought forward during the first stages of the conservation project of this important world monument.

Report of activities during the past year

R. Mehrotra reported on the main issues raised during the previous experts meeting held almost exactly one year ago.

E. Koch, Prof. of Islamic and Indian Art History, from Vienna, had presented a vision for developing the site and had urged the group to look carefully at how the local population and the visitors perceive the site. She expressed ideas for reviving the concept of a waterfront city (the Taj was originally only one of many waterfront garden sites along the Yamuna River) and building a model to scale that would illustrate what the area was like during the mid seventeenth century.

F. LeBlanc had stressed the importance of preparing a Management Plan in the early stages of the project, suggesting that it focuses on three main aspects:

- Managing values (architectural, historical, economic, social etc.)
- Managing assets (buildings, roads, grounds, vegetation, collections etc.)
- Managing people (workers, security, professionals, visitors etc.)

He had introduced the notion of “life cycle” of materials, systems and also of conservation interventions.

He had discussed several ideas concerning systematic documentation and developed a format for ASI to present projects; during the meetings, one such proposal was prepared for the restoration of the Meman Khana.

James Wescoat, specialist in Mughal landscapes had demonstrated that the landscape at the Taj Mahal was integral to the understanding of the
monument, and that it required careful study to develop a conservation plan.

He had identified many components and developed a list of tasks.

Martand Singh, museum and visitors experience specialist from India, had offered a vision for the visitor experience and what the proposed site museum could do. The museum as well as the visitor reception center could be fragmented into two components and located in the East and West Gate buildings. He had also proposed a visitor circulation pattern to ensure that they would have a quality experience.

Security issues
During this meeting, the TMCC and the ASI reported on the difficulties encountered concerning site security. As early as the 1980s the Indian government had considered the Taj Mahal to be a prime target. To protect against that threat, the national police had moved into various buildings on site and taken over site security. Visitor security screening was done at the Main Gate. The visitor’s first view and experience of the Taj was through security lines and metal detectors… not very good.

It took six months of negotiations and a Supreme Court ruling to have them move out of these premises. The Central Industrial Security Force, a special governmental security agency was contracted by the ASI to secure the Taj. Discussions were long and arduous. The CISF is most often called upon to secure commercial sites such as airports, train stations and potentially targeted public or private sector industries. One of its standard approaches is to make itself highly visible to deter potential aggressions. In the case of the Taj, it was necessary to
convince the agency to become mush less visible, which it agreed to in the end. Its equipment will be housed in the buildings located at the East and West Gates, and the visitor security screening operations will be done in those buildings. The visitors will be more comfortable, not having to queue in the blaring sun, and once finished, will be free to enjoy their visit without any further inconveniences. Their first experience of the Taj will be through a barrier-free Main Gate that offers a breath-taking view of the Taj.

Copyright
The question of copyright was discussed for the first time with the group. Though copyright was not considered to be a major issue at this time for the project, now that the ASI is collaborating with the TMCC and that some international experts are involved, the question of copyright should be clarified before documents are prepared and material is published in traditional or web formats. Just after a few minutes of discussion, it became obvious that this was going to be a bit more complicated than what everyone had thought. The TMCC will look further into this question within the context of copyright law in India. I promised to share our experience at the GCI with the group.

Management Plan and Conservation Philosophy
A draft Management Plan was presented to the participants who are asked to comment on its structure and content. This will be done during the next few weeks.

The subject of conservation philosophy was discussed on several occasions during the meetings. It was first brought up during the presentation by the landscape architects who said that they would be aiming at developing a garden restoration design proposal that was:

- True in spirit
- True in form
- Making use of original materials.

Everyone agreed that there should be a single conservation philosophy for all interventions that are to take place at the Taj. It should equally apply to landscape, archaeology, conservation and architecture. Therefore, all discussions to develop this philosophy should involve professionals from all of these disciplines.

Sir Bernard Feilden said that in his opinion, the Taj Mahal was “all about perfection” or at least trying to achieve it. If the participants all agreed to this, then the principles guiding the conservation of this monument should not be based exclusively on archaeological authenticity, but more on architectural harmony and unity. In this case, “minimum intervention” would not necessarily be a guiding principle, especially in situations where alterations over time have removed or changed elements that contributed to the harmony, understanding and appreciation of the whole complex.
Aesthetic value of the Taj Mahal

Why is the Taj Mahal universally acclaimed as being one of the most beautiful buildings in the world? Though the Taj Mahal was nominated to the World Heritage List for its aesthetic value under criteria 1 which basically says that it is “unique” or a universally acclaimed “master piece”, what constitutes its aesthetic value has not yet been described in aesthetic terms. Its proportion system, color palette, play of shadows and lights, texture, view points, relationship to Mughal art aesthetic principles, etc. need to be studied and clearly articulated.

In the context of this discussion, Dr. Wayne Begley shared with us that the Mughals did not use a decimal mathematical system to design the Taj and that their basic unit of measurement was a Mughal yard that contemporary scholars have come to estimate at being 31.55 inches. Therefore, any attempt at understanding the Taj’s design and proportion system should be based on a good understanding of the Mughal’s mathematics and geometry.

World Monuments Fund proposes a pilot GIS project

The WMF sponsored a mission to the Taj Mahal to assess the feasibility of preparing a proposal for developing a GIS system to record all the documentation that will be generated by the conservation project.

What this is about is that a great deal of documentation already exists concerning the Taj, and a great deal more will be produced during the next few years. If a “system” to gather, link and synthesize this information is not put in place at the beginning of the project, then it may quickly become impossible to find and correlate the information that will be necessary to all the professionals involved. Geographic Information Systems were created a few decades ago to do just that. Based on a site plan that is tied to world coordinates, all survey, illustrations and text information can be tied to specific site components such as buildings, structures or landscape elements.

The WMF delegation was lead by Mark Weber. The participants were:

- **Elena Charola**, material scientist and stone conservator from Philadelphia
- **Lucas Fabiani**, Italian surveyor, developing a GIS system for Pompei
- **Vincenzo Somella**, Italian architect specializing in GIS systems
- **Paola Coghi**, Italian conservator from Rome
- **Nuno Proenca**, Italian conservator from the Instituto Centrale in Rome.

On the basis of a detailed topographical plan that would be prepared by a local Indian surveyor firm, the team would develop a GIS system to gather and cross-link data on four major components:

1. Architectural conservation
2. Gardens
3. Waterworks
4. Visitor facilities
A new recording technology would be introduced and tested. It is based on building a wire frame of all elevations by acquiring points in 3-D with a laser pointer. Then digital photos are taken at close range of every elements of the surface and rectified if necessary. They are placed in the wire frame and referenced in the GIS system. Then, when conservators or architects proceed with the condition assessment, all information can be keyed to the drawings and the photos.

Should you wish to learn more about this technology, please contact C. Cancino, R. Eppich, C. Gray or me. I have used it on a few buildings in the past; Claudia Cancino has done her thesis on a similar approach for a site in Mesa Verde; the condition assessment at Copan Hieroglyphic Stairway also makes use of a similar technique.

The WMF proposal will be based on a transfer of knowledge and technology and a team of ASI technicians would be trained on site.

The WMF will next proceed to the preparation of a detailed proposal that will be sent to the Advisory Committee for review.

**Project documentation centers**

Large and lengthy conservation projects such as the one being undertaken for the Taj require access to historical as well as current project information. The necessity of bringing in one easily accessible location all the existing documentation on the Taj was discussed. There are plans to create two documentation repositories on site. Ensuring that all this precious data is duplicated and safely stored at a different location was emphasized. One never knows when disaster will strike (fire, flood, riots etc.).

**On a technical note... pietra dura restoration**

There is a great deal of *pietra dura* inlay on the buildings at the Taj Mahal. Some are of simple geometric form and others are exquisite floral patterns and inscriptions in Arabic.

I was concerned that the restored black marble inlay pieces appeared to turn gray after a few years. This certainly affects the aesthetic appearance of the monument. I wondered if this was due to a chemical reaction in the stone or because the wrong type of marble was used. The explanation I was given is that the technique used during the 1920s to restore the inlay work involved gluing a thin sheet of “tin” to the stone before cutting it. When removed, if the stone is not polished, this film of glue remains on the surface of the stone and quickly oxidizes to a gray color. If the stone is polished, it returns to its dark color and retains it. There are literally thousands of inlay pieces on the Taj Mahal that need to be polished.

Here is a short quote on this subject from a manual published in 1989 by Sir Bernard Feilden:
“This manual is based on the Conservation Manual written by Sir John Marshall in 1923 when he was Director General of the ASI.

**Inlay work**
In the repair of inlay work (pietra dura) the greatest care is necessary in order to ensure that the new stones fit exactly, and that the edges of the existing groundwork are not scraped or chipped. The following is the process to be followed. At the outset a tracing on a thin sheet of mica is taken of the patch to be filled, and the tracing is then cut out carefully and its accuracy tested in order to ensure a perfect fit. It is then reproduced in thin sheet tin by means of a pair of tin man’s scissors. The tin plate is next glued with lac to the surface of the stone out of which the piece of inlay is to be carved and the roughinlay block is then mounted for convenience on a wooden pedestal about 1’-6” high and held rigidly in a slot at the top by means of a wedge. The pedestal, which is about 1” square in section, is fitted into a heavy stone base to keep it steady.

The fret cutting is done by means of a plain soft iron wire (20 B.W.G.) bow to maintain the proper pressure on the stone. Solid patterns are cut by working the bow like fret-saw, and if the required pattern has a hole in the center, a hole is likewise bored through the stone and the wire of the bow passed through it before stringing. The inlay blocks are cut on the slant, i.e. with an inward slope of about 15 degrees on the edges to facilitate the fitting. When properly shaped, the edges are finished on a san or emery wheel, which is a composition of emery powder and lac in the proportion of 2:1. The edges of the pierced work are also finished off with a file made of the same emery composition reinforced with an iron wire core.

After removing the tin pattern, the piece of inlay is tested for size and corrected by filing until it is an exact fit. The edges are then roughened so as to grip the cement. And the piece is embedded in the recess with special cement, and driven home by means of a light wooden mallet. The surplus cement having been removed, the inlay is allowed to set for at least a week, after which the surface is cleaned and rubbed with a thapi made of emery powder and lac and washed with water.”

**Technical visit to Fatehpur Sikri, World Heritage Site**
Located approximately 40 miles west of Agra is the famous city of Fatehpur Sikri, a World Heritage Site. It was built some seventy years before the Taj and many construction details are similar to those used for the Taj.

Fatehpur Sikri represents an enigma for the student of medieval Indian history. A city brilliantly conceived and actualized, it was abandoned after just fourteen years as the imperial capital of one of the mightiest empires in history.
By the time Akbar became emperor in 1556, the Mughal Empire had settled down. By the late 1550s, Akbar had survived rebellions and attempted coups and had begun to win control over increasing areas in north India. Convinced about the importance of architecture in empire-building, Akbar embarked on a sustained and systematic program of construction. Beginning in the 1560s, he constructed forts in Agra and Lahore, and smaller ones at Attock, Allahabad, Jaunpur and Ajmer.

In 1571, Akbar decided to build himself a capital city. For it, he chose Sikri, a village on the road between the Mughal’s imperial center at Agra and their spiritual center at Ajmer.

Fetehpur Sikri rose rapidly from a nondescript village to a thriving center of commerce once Akbar’s court took its seat here in 1571-72. Historians estimate that the total population of Fatehpur Sikri in 1580 was just short of a quarter of a million. In 1585, the English traveler Ralph Fitch visited the city at its apogee, and wrote “Agra and Fatepore are two very great cities, either of them much greater than London and very populous”.

However, in 1585, only fourteen years after it was built, Akbar and his court left Fatehpur Sikri never to return again. Political exigencies made him move his capital to Lahore till 1598.

Today, Fatehpur Sikri is a spectacular historic monument that is owned and managed by the ASI and visited by hundreds of thousands of people each year.