

CROWNING GLORY

Humayun's Tomb, the first of the magnificent mausoleums built by the Mughals, has been symbolic of Mughal creativity and assimilation of architectural elements found in Indian building pre-dating the Mughals. The dome is crowned by a 18 feet tall finial with a core of a 22 feet tree-log on which are fixed 11 vessels of pure copper crowned by a brass inscription – the whole finished by the Mughals with layers of pure gold.

Though stone finials, no more that 3-5 feet in height can be seen on tombs built during the Sultanate period in Delhi, there is no precedent - before the building of Humayun's Tomb - for a finial of this grandeur on any structure, anywhere in the world. Just as the *chattris* or canopies on the roof of Humayun's Tomb are inspired from Rajput architecture, similarly the copper - gold finial erected here, seem to have been inspired by temple architecture and built precisely to fit the dome profile. Later, the Taj Mahal used a similar copper finial.

THE COLLAPSE

On 30 May 2014, during a sandstorm of unprecedented wind velocity exceeding 150 km/ hour the wooden core of the finial snapped at the point where this rises above the dome - causing the 300 kilos of copper vessels to come crashing on the roof – 70 feet below.

In 2009, during inspections the finial seemed to have been in a stable condition and as such it was considered unnecessary to dismantle the finial and scientifically assess the condition of the wooden core. 2009-10 repairs on the finial were thus limited to installing a state-of-art lightning conductor.

Inspections carried out in the aftermath of the May 2014 collapse by the Archaeological Survey of India's senior officers, as well as officers of the ASI Science branch and team of AKTC, revealed the friable condition of the octagonal wooden core of the finial as a cause of collapse. A section of wood, almost 1 foot tall, had virtually turned to dust as a result of decades of rainwater percolation and retention. As such the unstable wooden core had snapped in the high velocity sandstorm.

REVEALING THE SIGNIFICANCE

The access to the finial vessels allowed analysis and documentation that revealed the remarkable scientific achievement of the Mughal builders and the immense art-history value. Several inscriptions were found inscribed on the finial mentioning past repairs as well as artwork depicting a praying bearded man in a kneeling position.

Scientific analysis revealed the 99.42% purity of the copper sheets used here by the Mughals – in 8 inch strips – embedded into one another using toothed joinery. Copper of such purity is not even commercially available today – 450 years since it was used at Humayun's Tomb.

Finally, the use of pure gold to finish the 18 feet tall finial by the Mughals was revealed during repetitive lab analysis of the metal fragments– underlying the significance of the finial as well as continuity of Indian craft traditions by the Mughals.

PRESERVATION & SAFEGUARDING

The understanding of the significance of the 16th century finial as well as the damage that the copper and gold vessels suffered in the May 2014 collapse led to the agreement that following repairs to the vessels the finial should be preserved and displayed in the secure environment of the proposed Humayun's Tomb Interpretation Centre. The finial will thus be a centrepiece of the Interpretation Centre - the gallery heights in the building determined by the 18 feet tall finial.

Access to the finial in a museum environment for scholars and scientists will, it is hoped, lead to further research that sheds light on both the pluralistic architectural traditions of the Mughals as well as scientific achievement in 16th century India.

AN AUTHENTIC REPRODUCTION

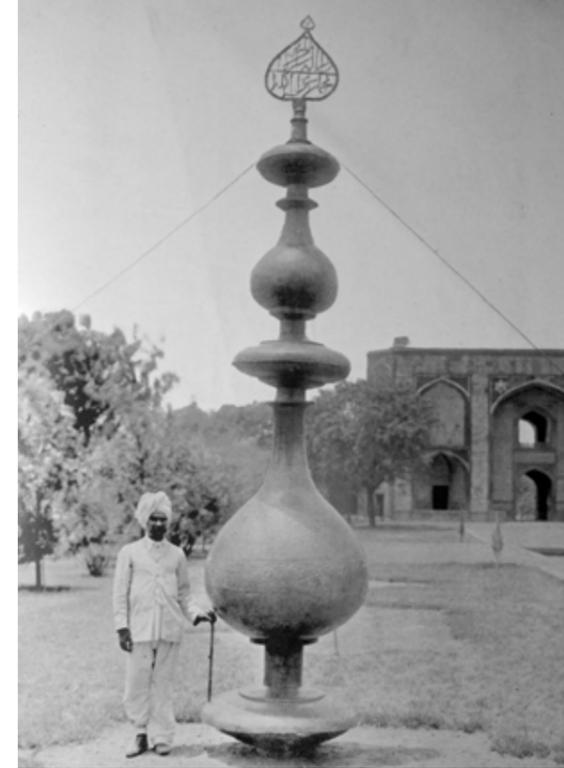
Conservation guidelines for World Heritage Sites recommend a desirable adherence to authenticity. Sites are understood to meet the conditions of authenticity if their cultural values are truthfully and credibly expressed through a variety of attributes including: form and design; materials and substance; use and function; traditions, techniques and management systems; location and setting; spirit and feeling, amongst other factors.

The Aga Khan Trust for Culture led conservation effort on monuments in the Humayun's Tomb – Nizamuddin area has aimed to ensure authenticity through use of traditional building materials and substance such as lime mortar, employ master craftsmen using traditional techniques to match the original form and design.

For the restoration of the finial to the dome of Humayun's Tomb this meant architects, engineers, scientists and traditional craftsmen – carpenters, copper-smiths, gilders – all worked alongside to procure and carve the wooden core, commission the manufacturing of the copper and beating it to the required profile, casting the crowing brass inscription and finally, Titan Company Ltd. providing the gold and supervising the gilding of the copper vessels with layers of gold leaf in a manner that would ensure long term preservation of the gilding in the extreme weather conditions the finial is exposed to. The scientific expertise employed in modern watch making and jewellery manufacturing at Titan considerably enhanced the quality of traditional workmanship.

Authenticity is achieved since the finial matches the original exactly in weight and profile for each of the 11 vessels; is built of material of exactly matching composition (Copper, brass, wood and gold) used by the Mughals in the 16th century; continues to crown the white marble dome - representing the pluralistic architectural traditions employed by the Mughals by their adopting architectural elements from monuments pre-dating their arrival in India; is a product of living craft traditions that have passed-on for generations in craftsmen families.

Without the gold being made available by Titan, the authenticity would have been severely compromised and the protection the gold layers provide to the more malleable copper missing. While restoring gilding as part of conservation effort is standard practice in Europe, this is the first ever instance in India.



Past repairs to the finial included one in 1912, when the finial was taken down in an attempt to insert a lightning conductor on the finial (top); Gilding work on the copper vessel was carried out after each vessel underwent series of scientific tests like the gold density test, thermal shock test in the Titan lab (centre); The original finial will be repaired and showcased as a centrepiece of the Humayun's Tomb Interpretation Centre (bottom).

3D Laser Scanning and detailed physical documentation was carried out in 2009 providing an accurate record of each vessel (top); Following the collapse, immediate site inspections were carried out by senior officials of ASI and AKTC and a repair strategy was finalized (centre); A team of architects, engineers, scientists and traditional craftsmen – carpenters, copper-smiths (bottom), gilders – worked towards this mammoth restoration effort.



300 KILOS OF COPPER

In early 2015 a temporary finial was installed on the dome of Humayun's Tomb to ensure the integrity of the structure is not compromised for the time the authentic reproduction would take to complete.

Titan Company commissioned manufacturing of copper sheets of required 99.4% purity, as impurities in the copper would result in the deterioration or peeling away of the final gold layers. On the availability of copper in required purity and thickness a traditional workshop in the Shahjahanabad, Delhi area was employed by Aga Khan Trust for Culture team to prepare the 11 copper vessels required – matching exactly in profile and weight as the original.

LAYERS OF GOLD

Master craftsmen skilled in the traditional process of gilding gold onto copper were identified and several rounds of experimental gilding carried out and subsequently tested for various factors, including durability, to plan for the actual gilding.

Titan Company Ltd. , provided the gold required to authentically finish the finial. Titan's support extended to their undertaking the gilding within their secure factory premises and under the supervision of their team of scientists.

The traditional gilding process required mercury to be first applied to the clean copper vessels following which gold foil - manually beaten down from gold strips - was applied. Heating the vessels would then lead to the evaporation of mercury - leaving the gold layer bonded to the copper. Systematic and scientific cleaning of the vessels as well as applying heat in advance of the mercury were introduced to the traditional craft process.

A first application of two layers of gold leaf simultaneously was followed by the application of a third layer and a finishing with two to three additional layers - the final polished with glass beads. Regular testing of the gold layers during the application process was carried out to ensure a consistent and high quality of the gilding.

INSCRIPTION IN THE CROWN

The top inscription was made in brass – not as malleable as copper and much more sturdy. This original brass inscription was found to have evidence of several past repairs with several broken fragments riveted to one another and thus included many joints or 'weak spots'. Though the original inscription was cast in brass, the inscription for the replica finial - though matching in every other respect – was laser cut from a single brass sheet - thus ensuring accuracy in exactly matching the original. The brass inscription, as with the copper vessels was gilded.

*For more information please visit www.akdn.org or contact the Aga Khan Trust for Culture,
P.O. 3253, Hazrat Nizamuddin East, New Delhi 110013 Email: info@nizamuddinrenewal.org
Follow on: www.nizamuddinrenewal.org or Facebook: www.facebook.com/NizamuddinRenewal*



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Humayun's Tomb - Sundar Nursery - Hazrat Nizamuddin Basti URBAN RENEWAL INITIATIVE



RESTORING THE GOLD FINIAL
with funding and technical supervision of the
Titan Company
and in partnership with the
Archaeological Survey of India