



PROJECT COMPLETION REPORT

OF THE REHABILITATION OF THE HERITAGE WOODEN ROOF OF THE CLOCK TOWER BY GAABESU



भारतीय अभियांत्रिकी विज्ञान एवं प्रौद्योगिकी संस्थान, शिवपुर
INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY
S H I B P U R

Indian Institute of Engineering Science and Technology (IEST), Shibpur
Formerly Bengal Engineering College / B.E. College



The Icon of B.E. College

Preserving an Engineering Heritage for Future Generations

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1. INTRODUCTION

The Clock Tower of the **Indian Institute of Engineering Science and Technology (IEST), Shibpur**, formerly known as **Bengal Engineering College / B.E. College**, is one of the most recognizable landmarks of the historic institution and has, for generations, served as an unofficial emblem of the College.

Located prominently between **Bidisha Lake and the historic cemetery**, the Clock Tower forms an important part of the architectural and engineering heritage of the IEST campus. Its distinctive form has become inseparable from the identity and memories of generations of students, faculty members, alumni and staff.

The Clock Tower, together with its historic turret clock, represents not merely a functional structure but an important part of the living heritage of one of India's oldest engineering institutions, whose history dates back to **1856**.

This document records the **rehabilitation of the historic timber roof of the Clock Tower**, undertaken with the objective of preserving the original character of the structure, protecting the historic clock mechanism from water ingress, and extending the service life of the timber roof for future generations.

2. HISTORICAL BACKGROUND

The institution now known as IEST, Shibpur has a history extending back to **1856**, and subsequently evolved through the names and identities of the Civil Engineering College, Bengal Engineering College, Bengal Engineering and Science University and, since 2014, the Indian Institute of Engineering Science and Technology (IEST), Shibpur.

The Clock Tower became an important landmark of the campus and subsequently acquired exceptional significance because of the installation of its historic turret clock.

According to the Institute's own historical records, the famous turret clock was installed in the Clock Tower in the early twentieth century. The clock was manufactured by **Gillett & Johnston of Croydon, England, in 1919**, and was presented to the College by **Sir Rajendra Nath Mookerjee**, a distinguished alumnus of the 1883 Civil Engineering batch. IEST records identify him as one of the eminent alumni associated with the College.

The clock was installed some time in 1922-23 in an existing high tower with modification to accommodate the massive mechanical mechanism and its four clock faces. The historic mechanism includes an **Invar pendulum, gravity-operated movement, escapement mechanism, gearing and bell**, making the installation an outstanding example of early twentieth-century mechanical engineering. Since then the tower was called as Clock Tower.

The Clock Tower has subsequently become one of the most recognizable visual symbols of the institution and continues to feature prominently in the identity and imagery associated with B.E. College and IEST, Shibpur.

3. RESTORATION OF THE HISTORIC CLOCK MECHANISM

After remaining non-operational for a considerable period, the historic turret clock was restored to operation in **2024** through the efforts of faculty members of the Department of Mechanical Engineering under the direction of the Institute authorities.

The restoration brought the historic mechanism back into operation and revived the familiar movement and chimes of the Clock Tower.

The successful restoration of the mechanical clock reinforced the need to protect the **building envelope and, in particular, the deteriorated timber roof**, since continued rainwater ingress could adversely affect both the timber structure and the historic mechanical equipment housed below it.

The present roof rehabilitation was therefore undertaken as an important complementary measure for the long-term preservation of the Clock Tower and its historic clock.

4. NEED FOR REHABILITATION OF THE TIMBER ROOF

The Clock Tower is crowned by a distinctive and technically interesting **multi-level timber roof system** supported on a structural steel framework.

Over many decades of exposure to the tropical climate of Kolkata, including heavy monsoon rainfall, humidity, temperature variation and biological activity, portions of the timber roof had deteriorated.

Inspection revealed deterioration associated with:

- prolonged exposure to moisture;
- rainwater ingress through deteriorated joints;
- decay and weathering of timber;
- possible fungal and biological attack;
- deterioration of individual timber planks;
- deterioration of weather-protective coatings; and
- localized gaps and defective joints which could permit further water penetration.

Continued deterioration of the roof would not only threaten the timber members but could also expose the interior of the Clock Tower and the historic clock mechanism to rainwater.

It was therefore considered essential to rehabilitate the roof while retaining, as far as practicable, its **original geometry, construction methodology, materials and architectural appearance**.

5. STRUCTURAL AND ARCHITECTURAL CONFIGURATION OF THE ROOF

The timber roof is a distinctive construction consisting of seasoned Shegun (teak) timber boarding supported on a structural steel framework.

The principal features of the roof include:

1. Structural steel trusses supporting the roof;
2. Secondary steel members and cross-trusses;

3. A **primary layer of flat timber planks laid edge-to-edge** over the supporting steel framework;
4. A **second layer of timber planks laid over the primary layer as a protective covering**;
5. The timber planks of the second layer are **arranged with overlapping joints**, providing an additional barrier against rainwater penetration; and
6. A timber box-frame around the upper portion of the tower associated with the four clock dials.

The two-layer timber construction is an important characteristic of the roof. The **first layer forms the continuous primary deck**, while the **second layer functions as an overlapping protective weatherproof covering** over it.

The approximate roof plan is **25 ft × 25 ft (7.6 m × 7.6 m)**.

The Clock Tower rises to approximately **65 ft (19.80 m)** above ground level.

The tower structure is predominantly traditional **brick masonry in lime mortar**, while the roof is supported by steel framing and timber construction.

6. CONSERVATION PHILOSOPHY

The rehabilitation was undertaken following the basic principles of **heritage-sensitive repair and conservation**.

The principal objectives were:

- to preserve the original architectural character of the Clock Tower;
- to retain as much of the existing historic timber as reasonably possible;
- to replace timber members that were found to be substantially deteriorated or unsuitable for continued service in the first layer;
- to replace all the timber members of the top layers
- to use timber of appropriate species, quality and dimensions for replacement;
- to maintain the original geometry and appearance of the roof;
- to improve resistance against moisture and biological deterioration;
- to minimize future rainwater ingress;
- to protect the historic clock mechanism; and
- to ensure that the rehabilitation would provide a durable solution without compromising the heritage character of the structure.

The work was planned and executed with the involvement and knowledge of the **Heritage Consultant associated with preservation works on the IEST campus through CPWD**.

7. REHABILITATION METHODOLOGY

7.1 Phased execution

The roof rehabilitation was undertaken **one side at a time**.

This methodology was adopted to minimize the possibility of uncontrolled rainwater entering the Clock Tower during the period when portions of the roof were opened.

The phased approach also enabled detailed inspection and repair of each portion of the roof before proceeding to the next.

7.2 Inspection and removal of the upper timber layer

Connection method of these timbers with the first layer was inspected and then entire timber planks from the upper layer was carefully removed to expose the underlying timber deck.

The exposed timber was then systematically inspected for:

- decay & fungal deterioration;
- termite and borer attack;
- moisture damage;
- splitting and cracking;
- loss of section;
- defective joints;
- mechanical damage; and
- other signs of distress.

The objective was to retain sound original timber wherever practicable and to replace only members that were considered unsuitable for continued service.

7.3 Replacement of deteriorated timber

Where deterioration was significant, the affected timber planks were carefully removed and replaced with **well-seasoned Shegun (teak) timber** of matching or compatible dimensions and profile.

Particular attention was given to maintaining the original roof geometry and appearance.

The replacement timber was selected with consideration to:

- species;
- seasoning;
- dimensions;
- straightness;
- freedom from significant defects; and
- suitability for long-term exterior exposure.

8. TREATMENT AND PROTECTION OF NEW TIMBER

The replacement Shegun timber was subjected to protective treatment before incorporation into the roof assembly.

8.1 Creosote treatment

The timber was initially treated with **Creosote Oil** to provide protection against biological deterioration, including termites, borers and fungal attack.

The treated timber was allowed to dry adequately before subsequent coating operations.

8.2 Epoxy insulating undercoat

After drying, the timber surfaces received an additional protective coating using **Asian Paints WoodTech Epoxy Insulator**.

This epoxy-based insulating coat was adopted as an additional protective layer over and above the normal wood primer system, with the objective of improving resistance to moisture penetration and providing enhanced protection to the timber.

8.3 Wood primer

Following the epoxy insulating treatment, the timber was further prepared for the finishing system using **Berger Parrot Wood Primer**, as applicable.

8.4 Final finishing coats

The final exposed timber surfaces were finished with **two coats of Berger Luxol Hi-Gloss Enamel Paint**.

The complete coating system was intended to provide:

- weather protection;
- resistance to moisture;
- improved surface durability;
- protection against environmental deterioration; and
- a uniform and aesthetically appropriate finish consistent with the heritage character of the Clock Tower.

9. RECONSTRUCTION OF THE FLAT TIMBER DECK

After removal of the entire upper layer and the affected portions of the underlying timber deck, the flat timber decking was reconstructed by replacing worn-out, deteriorated or damaged timber planks with correctly sized seasoned timber.

The primary timber planks were laid **flat and edge-to-edge**, continuously over the supporting steel framework, to form the primary timber deck. Particular care was taken to ensure proper fitting and continuity of the joints.

The completed primary deck then provided a continuous base over which the second layer of timber planks was installed.

10. BONDING OF NEW AND EXISTING TIMBER

Where new timber had to be joined with retained historic timber, particular care was taken to achieve proper and durable bonding.

For joining and bonding of timber members, a compound consisting of:

Araldite Standard Epoxy Resin AW 106 + Hardener HV 953 IN was used.

The epoxy system was selected to provide strong adhesion and durable bonding between the new and existing timber components.

The joining arrangement was executed carefully so that the repaired areas would remain compatible with the original timber construction.

11. SEALING OF FINE GAPS AND JOINTS

Following completion of the timber decking and bonding works, the joints were thoroughly inspected. Where minor gaps or openings were observed, these were sealed to minimize the possibility of water penetration. For this purpose, **Feviseal / Dr. Fixit Silicone Sealant GPS Premium Acetoxy Cure (Clear)** was used at appropriate locations.

The sealing of these fine gaps was particularly important because even relatively small openings in an exposed heritage roof can permit repeated rainwater penetration over time. Before taking up the fixing of the second layers of timber planks, the entire surface was coated using Epoxy based Insulator undercoat.

12. SECOND LAYER OF TIMBER ROOFING

After completion and inspection of the primary timber deck, the second layer of timber planks was installed.

The timber planks of the second layer had been treated with Creosote Oil and, after adequate drying, coated with an epoxy-based insulating undercoat.

Unlike the first layer, in which the planks were laid **flat and edge-to-edge**, the second layer was constructed as an **overlapping protective covering** over the primary deck. The adjoining timber planks were arranged so that their edges overlapped, thereby reducing the possibility of direct rainwater penetration through the joints.

The second layer therefore acts as the principal exposed timber weathering surface while the first layer provides the continuous underlying deck. Together, the two layers form the characteristic timber roof construction of the historic Clock Tower.

This arrangement was retained/reconstructed as an important feature of the original roof construction, while improving its resistance to rainwater ingress and weather-related deterioration.

13. SURFACE PREPARATION AND PAINTING

Following completion of the timber replacement, joining, sealing and decking works, the roof surfaces were thoroughly inspected.

The timber surfaces were appropriately:

- cleaned;
- sanded;
- prepared; and
- made ready for the protective coating system.

Further another coat of epoxy-based insulating undercoat was applied to provide additional protection and to improve adhesion of the subsequent coating system.

The final finishing system comprised one coat of Berger Parrot Wood Primer and two coats of Berger Luxol Hi-Gloss Enamel Paint.

Particular care was taken to ensure complete coverage of exposed timber surfaces and properly finished edges and joints.

14. MATERIAL SELECTION AND TECHNICAL REVIEW

The materials used for the rehabilitation were selected with due consideration to their suitability for the conservation and protection of an historic timber roof.

The principal materials included:

Sl. No.	Material	Purpose
1	Seasoned Teak (segun) Timber	Replacement of deteriorated timbers
2	Creosote Oil	Timber preservation / biological protection
3	Asian Paints WoodTech Epoxy Insulator	Additional insulating and moisture-protective undercoat
4	Araldite AW 106 + Hardener HV 953 IN	Bonding new and existing timber
5	Feviseal / Dr Fixit Silicon Sealant GPS Premium Acetoxycure, Clear Silicon	Sealing fine gaps and joints
6	Berger Golden Yellow	Final coat below the first layer Planks
7	Berger Parrot Wood Primer	Wood primer system
8	Berger Luxol Hi-Gloss Enamel	Final protective finishing coats

The various epoxy-based coatings, adhesives, sealants, primers and finishing paints were reviewed and compared with equivalent products and specifications available from other manufacturers.

The final selection was made with due consideration to:

- suitability for timber;
- exterior exposure;
- moisture resistance;
- durability;
- adhesion;
- compatibility with the timber substrate;
- availability; and
- heritage-conservation requirements.

The material selections and their application were undertaken with the **knowledge of the Heritage Consultant** associated with the project.

15. HERITAGE CONSERVATION CONSIDERATIONS

The rehabilitation has not been conceived as a conventional replacement of an old roof.

The principal objective has been **conservation through careful repair and selective replacement**.

Wherever the original timber was found to be sound and capable of continued service, it was retained.

Replacement was undertaken only where deterioration made continued retention impractical or unreliable.

The rehabilitation therefore represents an attempt to preserve the maximum possible amount of the historic fabric while ensuring that the roof remains structurally and functionally capable of protecting the Clock Tower and its historic mechanical equipment.

16. PROTECTION OF THE HISTORIC CLOCK

One of the most important purposes of the roof rehabilitation is to protect the historic turret clock installed in the Clock Tower.

The clock is an exceptionally valuable item of engineering heritage. IEST records identify it as a Gillett & Johnston clock manufactured in Croydon, England, and installed in the Clock Tower in the early twentieth century. The clock's restoration to working condition in 2024 makes the protection of the surrounding structure particularly important.

The rehabilitation of the timber roof therefore forms an essential part of the broader conservation of the Clock Tower as an integrated heritage structure.

17. QUALITY CONTROL AND INSPECTION

During execution, the following aspects were given particular attention:

1. inspection of existing timber before removal;
2. identification of timber requiring replacement;
3. quality and seasoning of replacement Shegun timber;
4. proper fitting of replacement planks;
5. preparation of timber surfaces;
6. correct application of preservative treatment;
7. adequate drying between successive treatments;
8. proper mixing and application of epoxy adhesive;
9. inspection of all joints;
10. sealing of fine gaps;
11. correct staggering of joints between the two timber layers;
12. proper application of primer and insulating coats; and
13. application of the specified final finishing coats.

The work was monitored with the objective of ensuring that the repaired roof would provide reliable protection against rainwater while retaining the appearance and essential construction character of the historic roof.

18. SIGNIFICANCE OF THE WORK

The Clock Tower is much more than a physical structure.

For generations of B.E. College / BESU / IEST students, the Clock Tower has represented:

- the identity of the institution;
- the memories of student life;
- the passage of generations;
- the engineering excellence of the Alma Mater; and
- the continuity of the institution's long history.

The familiar Clock Tower has appeared in institutional publications, alumni memorabilia, photographs and representations of the College for decades.

Its preservation is therefore not simply a matter of repairing a roof. It is an effort to preserve a tangible part of the collective memory of generations of engineers.

19. ROLE OF GAABESU

Recognizing the heritage significance of the Clock Tower and the importance of protecting its historic timber roof, the **Global Alumni Association of IEST Shibpur (GAABESU)** undertook to provide professional and financial assistance for the rehabilitation. Alumni from different parts of the world contributed like Canada, Australia, UAE, UK Qatar, USA besides India

The initiative reflects the fundamental spirit of GAABESU:

“Give Back to the Institute.”

The project demonstrates how alumni participation, professional knowledge and institutional cooperation can contribute to the preservation of the physical heritage of the Alma Mater.

GAABESU's involvement is intended not merely to complete a repair project but to ensure that an important part of the institution's heritage is preserved for future generations of students and alumni.

20. CONCLUSION

The rehabilitation of the Clock Tower's heritage timber roof is an important step towards the long-term preservation of one of the most recognizable symbols of **B.E. College / BESU / IEST, Shibpur.**

The work has combined:

heritage conservation + engineering judgement + appropriate materials + careful workmanship + alumni commitment.

The guiding principle throughout the rehabilitation has been:

“Repair where possible, replace only where necessary, preserve the original character, and protect the heritage for the future.”

The restored timber roof will provide renewed protection to the Clock Tower and, importantly, to the historic turret clock housed within it.

It is hoped that the Clock Tower will continue to stand as a proud symbol of the Alma Mater and that its clock will continue to mark the passage of time for generations of students, faculty, staff and alumni to come.

21. PROJECT RECORD

Project: Rehabilitation of the Heritage Wooden Roof of the Clock Tower

Location: IEST, Shibpur Campus, Howrah, West Bengal

Project Initiative: Global Alumni Association of IEST Shibpur (GAABESU)

Nature of Work: Heritage-sensitive rehabilitation of timber roof

Principal Timber: Seasoned Teak (shegun) Wood

Roof Construction: Two-layer timber decking over steel supporting framework

Heritage Consultant to CPWD: Dr Himadri Guha (BE Civil 1973)

Executing Agency / Contractor: M/s Design & Display of Kolkata

Commencement Date: 17th July 2026

Completion Date: 12th October 2026

Supervision / Inspection: Team of Alumni under Executive Committee EC-10

22. PHOTO DOCUMENTATION

A complete photographic record should form an integral part of this document.

The following stages are recommended for inclusion:

Photo 1: View before rehabilitation

Photo 2: Condition of first-layer timber after removal of upper layer

Photo 3: Creosote treatment of new teak (segun) timbers

Photo 4: Application of epoxy insulating coat on creosote treated timbers

Photo 5: Entire top layer timbers being removed

Photo 6: Completion of first timber layer

Photo 7: Installation of top layer timbers

Photo 8: Completed timber roof before final painting

Photo 9: Sealing of fine gaps and joints with silicone

Photo 10: Application of primer (undercoat)

Photo 11: Application of final Hi-Gloss paint

Photo 12: Completed / rehabilitated roof view (Scaffoldings removed using AI)



Photo-1 View before rehabilitation



Photo-2 Condition of 1st layer timber after removal of the upper layer timbers



Photo-3 Creosote Oil Treatment of new timbers



Photo-4 Application of Epoxy Insulation coat on creosote oil treated timbers



Photo-5 Entire top layer timbers being removed



Photo-6 Completion of first layer timber fixing



Photo-7 Installation of top layer timbers

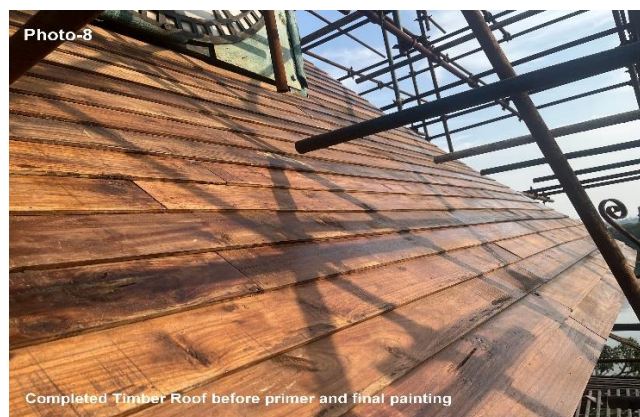


Photo-8 Completed timber roof before application of primer and final painting



Photo-9 Sealing of fine gaps & joints with Silicone



Photo-10 Application of Primer (undercoat)



Photo-11 Application of Final Hi-Gloss Paint



Photo-12 Completed View (Scaffoldings removed using AI)

23. ACKNOWLEDGEMENT

GAABESU places on record its appreciation to the **Director, Prof. VMSR Murthy, Dean P&D, Prof. Aparna De Ghosh, Dean IRAA, Prof. Anirban Gupta, Prof. Rajib Chakraborty** of

Mechanical Department and the authorities of IEST, Shibpur; the Heritage Consultant to CPWD, Dr. Himadri Guha (BE Civil 1973); the concerned engineering and technical personnel of IWD; the executing team; and all alumni and well-wishers whose sincere support and dedication made the rehabilitation of this important heritage element possible.

A special thanks to the authorities of IEST for extending their support by providing the steel tube scaffolding through CPWD (meant for repairing of the Clock Tower masonry structure), which helped us carry out the rehabilitation work smoothly and economically.

The project stands as an example of the enduring bond between the **Alma Mater and its alumni** and demonstrates that the preservation of our heritage is a shared responsibility.

“May the Clock Tower continue to stand tall, and may its historic clock continue to tick for generations to come”.

Reported by:

Amitabha Datta (BE Civil 1974)

President - GAABESU

Global Alumni Association of IEST Shibpur

12th October 2026