Abstract

The bamboo plant and its utility to mankind in many forms, as fodder to construction, was well established across the globe since ancient time. From ancient time, the bamboo usage in wall construction for rural housing was common. The transition from mud plaster to cement based plaster was a significant improvement in the last century and it gained immense popularity in north-eastern part of India. With the ingression of modern construction technologies, all these techniques of wall making are losing its charm and presently the use is mostly being restricted to scaffolding, household items, and furniture.

Out of the different applications, the use of bamboo in wall construction using cement plaster can effectively decrease the dependency on the usage of non-green, non-renewable wall material resources. In this aspect, the rejuvenation of modern ekra wall or bamboo concrete composite wall of ‘Assam type house’ which prevailed widely across north-eastern part of India, has the potential to replace the mostly adopted construction technique of conventional non-green brick masonry wall. This system is easy to build and effective against earthquake forces. Despite all positive features, this technology is in dying phase due to lack of scientific research and some traditional flaws in the construction technique.

Hence, this research is an attempt to understand the worthiness of Bamcrete (bamboo and concrete) walling system from the basic level of its construction process. In order to understand this system precisely, a 40 years old Bamcrete panelled house which was in good condition was studied.

Following the same Bamcrete wall’s construction process, panels were fabricated. In comparison to wooden frames, options of a bamboo frame and metal frames were considered. W-shaped metallic framing helped to create a double wall system providing the possibility of
concealed electric wiring. In the plastering process, options for design mix mortar and spray mortar were examined. The study was extended to different structural and non-structural tests for scientifically validating the Bamcrete panels.

To understand the strength and energy absorption capacity of the Bamcrete panel, impact test and monotonic load/static load test were performed. For the performance grade of Bamcrete partition wall, small hard body impact, large soft body impact, stiffness test, lightweight, and heavyweight anchorage tests were studied. In case of non-structural functional study of the Bamcrete panel, thermal and acoustic insulation properties were studied in comparison to the other walling materials. In case of thermal study, the thermal transmittance (U-value) behaviour of the panel through heat-flux sensor method was performed. Similarly, the in-situ acoustic study was conducted to understand the sound transmission class through a single sound rating number of Bamcrete panels in comparison to other wall materials. These technical studies of Bamcrete walling system were performed to understand the benefit of this walling system. It was found that this panel technology has sufficient energy absorption capacity undergoing larger deflection. In building science performance, the twin meshed Bamcrete panel showed a better level of thermal and acoustic performance compared to other walling systems.