

Structural Analysis and Strengthening Method of Toshodai-ji Kondo in the Heisei Restoration Project

The restoration project of *Toshodai-ji Kondo* was started in 1998 and completed successfully in 2009. As the project was aimed to solve the problem of the inward tilting columns and to take essential and effective reinforcing action, the structural engineering technology was expected to make a leading role. A scientific method of structural analysis was applied to the project combining with investigations on the site and experiments in the laboratory. This has been the first time for the structural engineer to participate actively in the restoration works of a national treasure. The 3-dimensional computer model of the Main Hall was created using the results of investigation and experiment works to find why the tilting of the columns occurred and how the proposed reinforcement system is effective. The capacity of *Kondo* against earthquake and typhoon is also evaluated. The reinforcement result has been confirmed as expected. It should be emphasized that the scientific approach developed in this project will be of great help for the preservation and restoration of cultural assets of traditional buildings and that finding out the ancient wisdom how the buildings have been lasted for more than millennium will promote the long-lived architecture in the future.