Estimating of Forest Resources from Large Diameter and Long Materials Used for Wooden Cultural Buildings

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Wooden cultural buildings are a symbol of Japanese culture. It is necessary to secure a supply of large logs to maintain these important cultural buildings in perpetuity. Besides having a large diameter and length, these logs need to have a high quality of wood. However, it is difficult to secure a permanent supply of such logs. That is because required large diameter and long materials logs are usually not offered at a customary timber-market. Prescribed conditions to maintain important cultural buildings are strict and require using the same building technique as well as using the same tree species of the same tree quality. That imposes a demand for the trees of the same kind, size and wood quality as it is used in existing wooden cultural buildings. Therefore, there is a need to conduct a research on the quantity of the demand and to investigate capability of forests to fulfill such demands. We need to secure a sufficient supply of required trees and to find out a present state of large sized trees. This paper presents our developed technique to estimate a standard size of standing trees which have served to produce a large-sized building material for wooden structures.

We have taken a representative sample from published reports on Japan’s cultural buildings built throughout Heian (794-1185) and Kamakura (1185-1333) period. Furthermore, in order to presume the size of saw-wood, we have measured logs at the warehouse and have calculated the width of sapwood. Moreover, in order to calculate the height and the relative taper-curve using a three-order equation, we have measured heights, DBH as well as diameters along the trunks of standing Japanese cypress trees growing at Kiso area of Japan. Finally, we have estimated standard sizes of standing trees which have served to produce a large-sized building material for wooden structures.

Now, we have information on standard sizes of standing trees which have served to produce a large-sized building material for wooden structures. Furthermore, using our developed technique and measuring only the DBH, now we can assess a present state of standing trees being suitable for the maintenance of wooden cultural buildings. The standing trees being the most difficult to obtain were the trees of size used to build the 18 pillars of Nandaimon at Todaiji temple. These pillars have a size of 1 meter in diameter and 19.17 meters in length. We have estimated that the standing trees should have a DBH more than 150 cm to be of use in producing such large sized pillars. Even at Kiso area where a large-sized Japanese cypress trees still can be found, it is extremely difficult to secure a supply of trees having a DBH larger than 150 centimeters. Hereafter, the present state of
large trees should be assessed. Furthermore, a relatively large forest area should be bequeathed for the purpose of securing a permanent supply of large-sized trees having a required good-quality. Our next tasks are to follow up the growth of the prospective trees in forests.

**Key Words:** Wooden cultural buildings; large diameter and long materials