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Suitability of Woodwool Boards as Core Material for Wooden Flush Door Shutters

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The use of woodwool board as core in solid core type flush doors has been investigated. Board with bulk density 350 - 400 kg/m³ developed adequate bond with PF resin adhesive and produced a stable, light and low cost door.

There has been a continuous increase in the demand for flush door shutters in India in the recent past. These door shutters are now considered superior to the traditional panel door shutters. There are two types of wooden flush door shutters : solid core type, IS:2202-1966 and cellular and hollow core type, IS:2191-1966. A solid core door shutter consists of a door frame which holds the core. The core may be block board or particle board with or without block board. In a cellular or hollow core type door shutter, the core consists of a network of wooden battens or strips with a total void content not more than 40%. In the hollow core type, intermediate rails are used and the void area in any segment is less than 500 cm². The plywood forming the face veneer on both sides of solid core shutters is decorative or non-decorative type and is normally 3 mm thick. However, in the case of hollow core shutters, the face panel is never less than 6 mm in thickness¹. Of these two types, the solid core type is preferred in India.

The wooden battens constituting the block board core in a solid core shutter are made carefully to standard size from seasoned wood. Their laying in the door frame costs nearly 25 paise per sq m. Thus, a lot of timber and labour go in its making and this increases the cost of production of these door shutters. The use of

block board core is, however, eliminated in the manufacture of cellular and hollow type door shutters and some reduction in cost is obtained. But the preparation and fixing of battens and strips in them call for greater attention and care.

In view of the growing scarcity of timber and increased demand for door shutters, an investigation was carried out at this institute to cut down the quantity of timber normally used in their production.

Woodwool boards of standard quality and size are now available in India in large quantities. The technology of their preparation is very simple and they can be made even in small scale industrial units. Woodwool board is light, fire resistant and fairly strong and durable. Its linear expansion and contraction are even less than those of the normal wood particle boards. Thickness swelling on water soaking is almost nil. These boards can be used in place of wood battens and strips as one piece. A good bond between the board and wood veneer may not be possible. The cement coating on woodwool may not provide a strong base for the adhesive. These and a few other problems related to the use of woodwool board in solid core type of door shutter have been investigated and the results are presented in this paper.

Experimental procedure

Portland cement bound woodwool boards were made from pine wood excelxior. A ratio of 1:1.5 by weight of excelxior to cement was taken and boards of 350 - 400 kg/m³ bulk density were made. After two weeks' air drying in shade, the boards were oven dried to a moisture content less than 10%. Test specimens of 30 × 30 × 2.5 cm size were cut from the boards and laminated with wood veneer using PF resin adhesive.

Full size solid door shutters of 2100 × 600 × 25 mm size were made at M/s Sitapur Plywood Manufacture, Sitapur. The experimental door shutters were absolutely free from unevenness, blistering and hollow sound. Test specimens from these door shutters were cut and subjected to glue adhesion and end immersion tests.

The test specimen were subjected to glue adhesion test and end immersion test as per IS:2202 (Part I) - 1966. Four square sections of 150 × 150 mm size were cut from the middle of the test specimens and boiled in water for 4 - 8 hr. They were examined for delamination, etc. after drying them at 63 ± 3°C for 20 hr. No delamination occurred in the glue line at the end of the test. For end immersion test, the specimens were immersed vertically in water for 24 hr and then allowed to dry at room temperature. The wetting - drying cycle was repeated eight times. Delamination of wood veneer did not occur in this test. The specimens were also tested for other characteristics and were found to conform to the relevant Indian standard specification².

Discussion

The door shutters having woodwool board as core material are light and at the same time

remain functionally similar to solid core type door. The board is glued with the wood ply which becomes an integral part of the door. The chances of sagging of the skin ply are, therefore, completely eliminated. On the other hand, it provides structural stability and rigidity to the door.

The requirements of wood for solid block board core door of size 1990 × 890 × 32 mm is approximately 6.8 kg for the frame work and 23 kg for block board core. As against this, 13 - 14.5 kg woodwool board of bulk density 350 - 400 kg/m³ is required for the core. Therefore, these doors are lighter than the normal solid core type doors. The quantity of woodwool used for making boards is 5 - 6 kg. Taking wastage of wood equivalent to 35 - 65% in the manufacture of woodwool there is a clear saving of 6 - 9 kg of wood for each door. Thus, the use of woodwool board core in the manufacture of flush door confers two main advantages: (1) these doors are light, and (2) there is 25 - 40% saving in the wood. In addition, the use of woodwool board makes the manufacture of flush doors easy and rapid and improves their fire resistance characteristics.

Acknowledgement

The paper is published with the approval of the Director of this Institute.

References

- 1 IS:2202 (Part I and 2) 1966 *Specification for wooden Flush Door Shutters*, Indian Standard Institution, New Delhi, 1966.
- 2 IS:4020-1967, *Method of Testing wooden flush doors*, Indian Standard Institution, New Delhi, 1967.