HONEYCOMB TIMBER DOOR AND INTEGRATED ARCHITRAVE FRAME
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10.1 BACKGROUND
Hollow core door comprises a framed door in filled with structural paper formed into a honeycomb pattern to provide support and rigidity which is glued in place between the door skins. As there are no solid materials within its frame, these doors are lightweight and are an affordable alternative to solid core timber doors. The door surface is usually wrapped with veneer to achieve a uniform appearance. Often, the veneer is sanded and varnished to create a striking appearance. However, hollow core doors are not suitable for exterior use for safety reasons as they are easy to break.

Honeycomb paper
The honeycomb shaped inner core material is made from layers of paper or cardboard, bonded together in parallel and uniformly spaced. When it is expanded for use, it forms a honeycomb configuration with hexagonal cells. It is manufactured from recycled paper and generally is non-toxic. The honeycomb sheets can be made of various thicknesses and cell sizes to cater for a variety of applications. It can replace the solid filling materials used in solid core doors.

10.2 CAUSES OF WARP AND TWIST IN TIMBER DOOR PANELS
"Warp" is any distortion in the panel itself and does not refer to the relationship of the door to the frame or jamb in which it is hung from. Warp is mainly due to timber expansion and contraction caused by temperature and humidity changes. The term "warp" also includes bow, cup, and twist, and they are measured by the deviation from a straight-edge or string placed on the suspected face of the door at any angle (i.e. horizontally, vertically, diagonally) with the door in its installed position. The chances of warpage are higher in longer panels, because of its higher length to width ratio.
Occurrences of warp and twist can be minimized with infill like honeycomb papers, especially for tall panels. During the production stage of the honeycomb paper, moisture content is about 14% (8% from paper, 6% from glue). This can be reduced and its pressure strength increased through an expander cum dryer in the manufacturing process. The highest pressure strength can be achieved at 3% moisture content.

Fig. 10.3 – Warp or twist are caused mainly by expansion and contraction of timber.

Fig. 10.4 – Relationship between moisture content and pressure strength.

Fig. 10.5 – Honeycomb papers stretched mechanically and dried to achieve the desired strength.

Fig. 10.6 – Tall and thin panels are possible using honeycomb infill.
10.3 MANUFACTURING PROCESS OF HONEYCOMB INFILL DOOR PANEL

Fig. 10.8 – Key steps in the manufacturing process.

1. Form a skeleton by solid timber.
2. Stretch and dry honeycomb infill.
3. Fasten infill into frame.
4. Cover frame with veneer board.
5. Sand and varnish veneer surfaces.
6. Install ironmongery.

Fig. 10.7 – Hollow core door suitable for lift-off hinges door system because of its light weight.
10.4 INTEGRATION OF DOOR FRAME AND ARCHITRAVE

An architrave is a piece of timber that covers the gap between the door frame and the wall. When the frames are fixed on the door opening, a joint is formed between the timber and masonry. Since timber and masonry do not bond well due to dissimilar expansion and contraction properties, the architrave serves to cover the cracks or gaps between the dissimilar materials.

Typically, the architrave mitres will need cutting to 45 degree profile in order to align with the main frame. They are fixed to the main frame using nails. This process of cutting, assembly and fixing is often carried out on site. If the works are carried out on site, quality issues such as misalignment of architrave, exposure of nail holes, or non-matching timber putty colour can often occur due to variation in the skill level of tradesmen or other constraints.

Further, the works consist of three separate operations i.e. installation of sub-frame followed by main-frame and finished with the architrave. This will require close monitoring, coordination and added time to the process.

The quality issues posed by the traditional 3 stage installation process can be minimized by using an integrated door frame and architrave system where the architrave is preassembled and fastened together with the main frame at the factory. The members are secured with glue and concealed nailing. Thus, no nailing is required during site installation resulting in better consistency in workmanship. It also eliminates onsite manual effort and expedites the installation process.
10.5 SUMMARY

As door is one of the important components in a building, the selection criteria on the type of door to be used should be based on needs as well as performance. Each door system has its merits, limitations and differences in performance. For example, although solid doors are much heavier, they are stronger than hollow core doors and close with a more "solid" feel. It is also important to note that the ultimate performance of any type of door not only depends on the aesthetics but also the supporting accessories and adjacent works.