


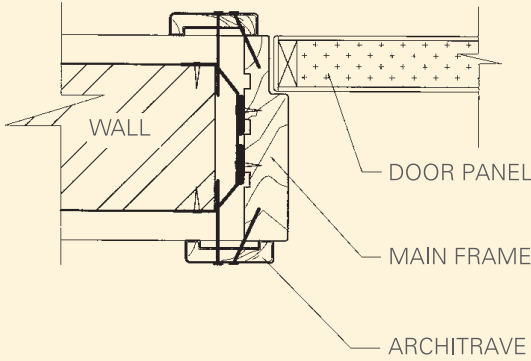
2. Design


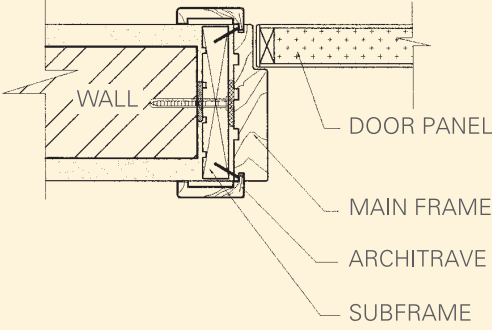

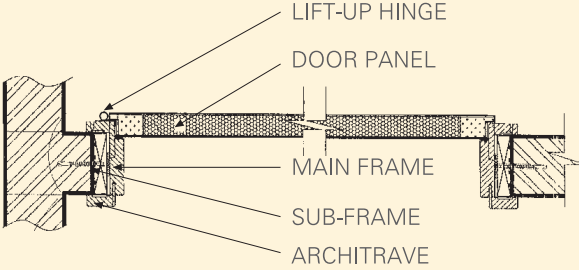
There is a wide range of timber doors and ironmongeries available in the market. This guide focuses only on the commonly used products.

2.1. TYPES OF TIMBER DOORS

Table 2.1 shows the types of timber doors commonly used in local residential projects.

Table 2.1 Types of timber doors

Types of timber doors	Description and uses
1. Swing door	
1.1. Traditional system 	 <ul style="list-style-type: none">• Installation of door frame is carried out as the wall is being erected.• This system is fast being replaced by the sub-frame system as installing the door frame at early stage of construction faces the following problems:<ul style="list-style-type: none">◦ Door frame may warp or shrink due to movement, tension, as well as change in moisture content and temperature during plastering or grouting work◦ Door frame may be damaged/ dented by impact of heavy objects◦ Door frame may be stained by cement mortar or paint• Proper protection of the door frame is needed while other trades are in progress.

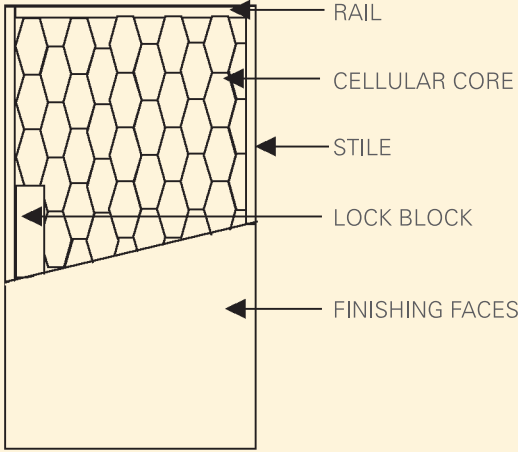
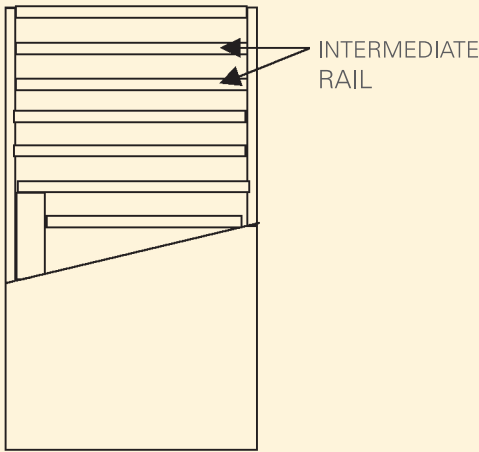
Types of timber doors	Description and uses
<p data-bbox="183 302 427 331">1.2. Sub-frame system</p> 	 <ul style="list-style-type: none"> • Consists of a sub-frame and a main frame. • The sub-frame is installed at the early stage of construction. The installation of the main frame will only commence after the completion of other internal trades. • Sub-frame is usually fabricated with a smaller width (about 10mm) than the main frame to allow adjustment for any misalignment. • There are two methods of installing the sub-frame: <ul style="list-style-type: none"> ◦ before wall erection; and ◦ after wall erection Installing the sub-frame after wall erection is preferred as no studding of door sub-frame is needed. • The advantages of sub-frame system are: <ul style="list-style-type: none"> ◦ Prevent damages to the main frame and save cost and time from undesirable abortive works ◦ No staining of door frame by cement mortar and paint ◦ The main frame is less likely to be subjected to warpage or shrinkage due to differential movement, tension or change in moisture content and temperature during plastering or grouting work
<p data-bbox="183 1523 574 1552">1.3. Rebated and lift-up door system</p> 	 <ul style="list-style-type: none"> • This is a modified sub-frame system with the following difference: <ul style="list-style-type: none"> ◦ Concealed gap between door and frame ◦ Better acoustic effect ◦ More convenient and easier to uplift the door panel with the use of lift up hinges ◦ Lift-up hinges required

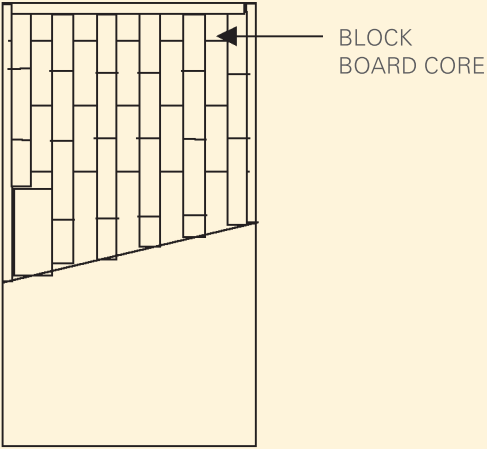
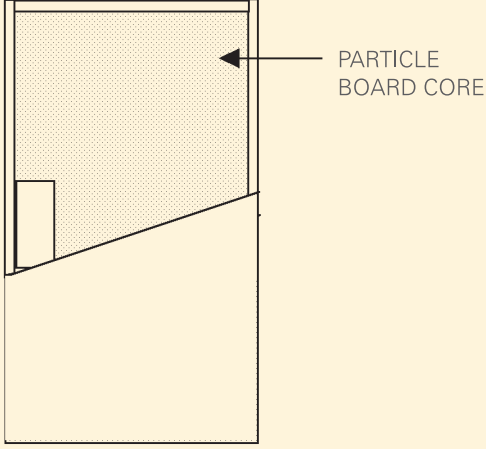
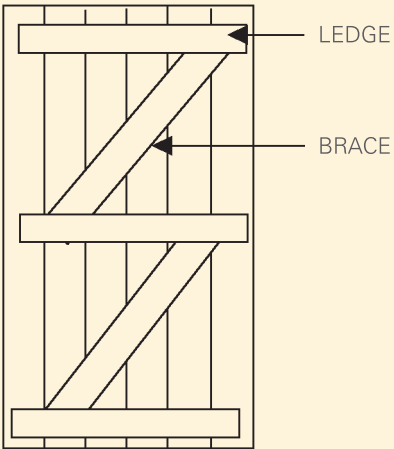
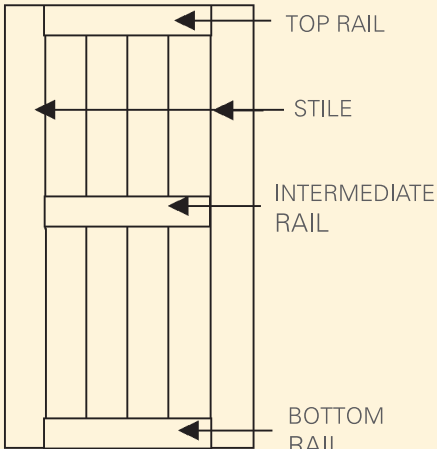
Types of timber doors	Description and uses
<p data-bbox="183 286 347 315">2. Sliding door</p> 	<ul data-bbox="639 353 1294 383" style="list-style-type: none"> • Door panel slides to the left or to the right of the doorway.  <ul data-bbox="639 1227 1406 1458" style="list-style-type: none"> • It is generally used in a narrow space where the use of swing door is not feasible. • Recently, pocket wall framing system that hides a sliding door panel inside a wall is used in some residential projects. This system gives better aesthetics as the track and door panel are hidden inside the wall. However, repair of any damaged sliding track may require one side of the wall to be removed. <div style="display: flex; justify-content: space-around;">   </div>

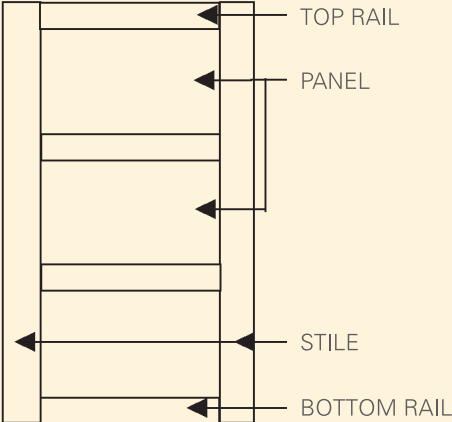
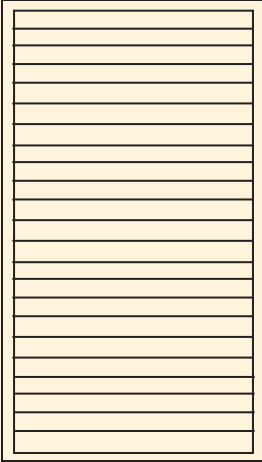
2.2. TYPES OF DOOR PANEL

There are a number of different door panel designs. While the door design is chosen by the designers, the contractors should also ensure the selected door meets its performance requirements. The types of door panel, material and other related requirements are stated in SS 347:1990 Specification for Timber Door. Table 2.2 provides a summary of the types of door panel stated in SS 347.

Table 2.2 Types of door panel

Types of door panel	Description
1. Flush door	
<ul style="list-style-type: none"> • Flush door is a door having two plane faces which entirely cover and conceal its structure. • It includes doors with cellular, intermediate rail, block board or particle board cores. 	
<p>1.1 With cellular core</p>  <ul style="list-style-type: none"> • The door panel comes with cellular type core infill, to which the finishing faces are bonded. 	<p>1.2 With intermediate rail core</p>  <ul style="list-style-type: none"> • The door panel comprises intermediate rails evenly distributed at a spacing of not exceeding 200mm centre-to-centre, to which the finishing faces are bonded.


Types of door panel	Description
<p>1.3. With block board core</p>  <p style="text-align: right;">BLOCK BOARD CORE</p> <ul style="list-style-type: none"> The door panel is made of block board cores glued edge-to-edge to form a solid door. A finishing face is then bonded over the block board core. 	<p>1.4. With particle board core</p>  <p style="text-align: right;">PARTICLE BOARD CORE</p> <ul style="list-style-type: none"> The door panel is made of particle board cores to form a solid door. A finishing face is then bonded over the particle board core.
<p>2. Joinery door</p>	
<ul style="list-style-type: none"> Joinery door has solid vertical members, rails and panels. 	
<p>2.1. With ledges and braces</p>  <p style="text-align: right;">LEDGE BRACE</p> <ul style="list-style-type: none"> Each door should have no less than three ledges. Braces should be neatly scribed to the ledges. 	<p>2.2. With frames and ledges</p>  <p style="text-align: right;">TOP RAIL STILE INTERMEDIATE RAIL BOTTOM RAIL</p> <ul style="list-style-type: none"> The framing members should be joined by means of mortises and tenons, or dowels, to produce a rigid framing.

Types of door panel	Description
<p>2.3. With panels</p>  <ul style="list-style-type: none"> The panels can be made of plywood, hardwood, glass or particleboard. 	<p>2.4. With louvres</p>  <ul style="list-style-type: none"> The louver blades should not be less than 6mm thick.


2.3. IRONMONGERY

The selection of quality ironmongeries, especially the hinges and securing devices (i.e. latches or locks), is critical to ensure the performance of door. Table 2.3 describes the types of ironmongery commonly used in the local industry.

Table 2.3 Types of ironmongery

Types of ironmongery	Description and uses
<p>1. Door handle, latch & lock</p> 	<ul style="list-style-type: none"> In most cases, door handle, latch & lock work as a set and operate in conjunction with one another. Door handles can be classified in the following two categories: <ul style="list-style-type: none"> Those that have a basic knob design; and Those that operate in a lever fashion. The type of latch & lock used for a door depends mainly on the degree of security required. Internal door normally require only a latch fitted with suitable handle. Exterior door may require a lock and a latch, which are often incorporated in a single piece. The quality and security level of lock vary considerably. Careful selection of lock for exterior door is, hence, critical in ensure adequate security.

Types of ironmongery	Description and uses
    	<ul style="list-style-type: none"> • The common types of lock & latch used are as follows: <ul style="list-style-type: none"> ◦ Mortice lock This is operated by a latch and a lock. The latch is operated by a handle while the lock is operated by a key. ◦ Security cylinder This is used when a degree of security is required. ◦ Cylindrical lock This is mostly used for internal doors. It is relatively cheaper and easy to install. ◦ Latch This is normally used for added security for external doors. ◦ Door guard This is normally used for added security for external doors. It allows the occupier to open the door slightly to see who is outside the door, and yet remain secured.
<p>2. Hinges</p> 	<ul style="list-style-type: none"> • The most commonly used hinges for internal and external doors are butt hinges. For large doors such as width of door more than 1.2m, pivoted hinges are quite commonly used. • The number and type of hinges used depends on the door design (i.e. types and dimensions). Manufacturer's recommendations and instructions should be followed.

Types of ironmongery	Description and uses
<p>3. Other accessories</p> 	<ul style="list-style-type: none"> • A door closer automatically closes the door in a controlled and smooth manner. The closer can be either surface mounted or concealed. • The selection of concealed closer is mainly due to aesthetic consideration. However, if the door is heavy, closer with compatible strength should be chosen.

2.4. STANDARDISATION

It is recommended to standardize the door size and door structural opening wherever possible. Table 2.4 shows examples of ideal structural opening sizes recommended by manufacturer. The advantages of standardizing the door size and opening are as follows:

- Simplify design details and less change of misunderstanding
- Less co-ordination on site

Table 2.4 Ideal structural opening sizes

Location of door	Structural opening sizes (mm)
1. Main entrance	900 950 1,000
2. Bedroom	800 850 900
3. Bathroom	700 750
4. Kitchen	850 900

2.5. STRUCTURAL SUPPORT

Inadequate design may transfer the vertical load of the wall to the door frame. This affects the ease of operation of the door. Vertical load above the door must be designed to be transferred to a lintel or other structural systems to minimize deflection in the door (Figure 2.1).


Figure 2.1 Types of lintel used for door opening



2.6. PLANNING FOR SEQUENCE OF INSTALLATION

Installation of door involves the fixing of the door frame/ sub-frame at an earlier construction stage and subsequent installation of door panel, main frame (for sub-frame system), architrave and ironmongery at the later stage of construction. To ensure quality, it is important to plan and follow the proper sequence of installation. Table 2.5 summaries the recommended sequence of installation to achieve a quality timber door.

Table 2.5 Sequence of installation for different types of doors

Installing timber door	Sequence of installation
1. Swing door	
1.1. Installing door frame	<ul style="list-style-type: none"> • For traditional system, installation of door frame is carried out as wall is being erected (before plastering or installing wall tiles).  <ul style="list-style-type: none"> • For sub-frame and rebated systems, there are two methods of installing the sub-frame: <ul style="list-style-type: none"> ◦ Before wall erection or ◦ After wall erection The installation of main frame is carried out only after completion of all the following trades: <ul style="list-style-type: none"> ◦ Plastering and painting of wall or wall tiling ◦ Flooring ◦ Other internal trades, such as installation of built-in cabinet, etc.
1.2. Installing architrave, door panel and ironmongery	<ul style="list-style-type: none"> • Installation of architrave, door panel and ironmongery should only commence after completion of all the following trades: <ul style="list-style-type: none"> ◦ Plastering and painting of wall or wall tiling ◦ Flooring ◦ Other internal trades, such as installation of built-in cabinet, etc. • For wall with skirting, the interface between architrave and skirting should be well coordinated.

Installing timber door	Sequence of installation
<p>2. Sliding door</p> <p>2.1. Installing sliding track/ cavity wall frame</p>	<ul style="list-style-type: none"> • For sliding door, installation of the sliding track is carried out after the completion the following trades: <ul style="list-style-type: none"> ◦ Plastering and painting of wall ◦ Flooring • For pocket wall framing system, the installation of cavity wall frame commences as wall is being erected (before plastering or installing wall tiles) <div data-bbox="762 689 1289 1384" data-label="Image"> </div>
<p>2.2. Installing architrave, door panel and ironmongery</p>	<ul style="list-style-type: none"> • Installation of architrave, door panel and ironmongery should only commence after completion of all the following trades: <ul style="list-style-type: none"> ◦ Plastering and painting of wall or wall tiling ◦ Flooring ◦ Other internal trades, such as installation of built-in cabinet, etc.