Measuring Internal Flush Doors in Accordance With ARM4 - An Introductory Worked Example

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About this demonstration

This demonstration is addressed to students taking (Irish) measurement or quantities modules at first year / entry level of quantity surveying related programmes. The worked example has been carried out using traditional handwritten quantity surveying processes on traditional dimension paper. It is acknowledged that this would be carried out using measurement software or on-screen measurement technology in actual practice. The traditional handwritten approach has been retained in order to enable novice students to develop the necessary measurement skills and build confidence through direct contact with drawn media and written taking off processes. In addition the presentation illustrates how the work may be laid out under typical examination conditions.

The demonstration has been kept simple in the interests of clarity but nevertheless accords with the principles of the Agreed Rules of Measurement (ARM4 – 2009) and aims to provide a foundation for the measurement of more challenging scenarios.

Internal doors

Internal doors provide access to the various rooms of a building and are usually lightweight and can be fixed to a timber lining to which a door-stop is pinned. If heavy doors are specified these can be hung to frames in a similar manner to external doors. An alternative method is to use door sets which may be storey height and supplied with pre-hung doors. Individual doors may be fire resistant, or glazed to provide for borrowed light or vision through the door. Doors come in a wide variety of styles and may be flush, panelled, boarded, painted or polished, etc. This worked example involves the measurement of flush panel doors in the context of a small cottage.
The National Standard Building Elements (NSBE)

In Ireland, the measurement of new building work is typically organised in accordance with the National Standard Building Elements (NSBE). Elements are defined as ‘that part of the building, which always performs the same function irrespective of design or specification’. The object of the NSBE is to enable design teams to adopt, on a national basis, a common approach to the building process. The NSBE sets out what is included and excluded from each element, which helps design teams coordinate their work and allows the measurement of the work to be divided up among teams while ensuring that all aspects of the building works are fully covered in the Bill of Quantities.

The Table opposite sets out a matrix of elements covering the various building works. Internal doors are measured within the Structure Completions group of elements where it is located at Element (32).

Element (32) Internal Walls Completion

The following work is included within the scope of this Element:
- Doors, windows, frames and composites of these;
- Sliding/folding doors and partitions;
- Hatches and serveries;
- Access panels and removable duct covers;
- Ironmongery;
- Glazing, and
- Decoration to forgoing.

The Element excludes:
- Sills and lintels built into walls – Element 22 Internal Walls;
- Doors and windows integral with walls – Element 22;
- Continuous screens and continuous shop-fronts having the nature of walls or partitions.
- Free-standing screens, space dividers, which have the character of fittings.
Measuring Element (32) Internal Walls Completion

The measurement of internal doors is carried out in Element (32) Internal Walls Completion of the National Standard Building Elements (See previous slide). On larger projects doors are usually scheduled and referenced to the various floor plans. It is important to examine the drawings or schedules and the ARM to compile a to-take-list and sort this out into ARM order. In this worked example the measurement is confined to the Woodwork and Painting and Decorating sections of ARM.

The Worked Example

This worked example demonstrates the measurement of Element (32) ‘Internal Walls Completion’ of a simple bungalow type project. The plans identify that five doors are to be taken. In this example the five doors are the only items to be measured, there are no servery hatches or the like indicated. In the interests of simplicity the measurement of the architrave details to the bedroom door have been taken as those shown on the door detail in the next slide, - no adjustment has been made for the ‘corner’ location of this door.
Internal Doors – What the task may involve
A typical Bill of Quantities for internal doors may include:

- first fix timber items such as timber grounds (not required in this instance);
- door frames or linings;
- architraves;
- doors or doorsets;
- ironmongery and sundries on the doors and frames such as waterbars, frame bolts and the like;
- ancillary works such as fixings, bedding and pointing, firestopping and so on. (not required in this instance)
- glazing where detailed (not required in this instance).
- decoration to the door
- decoration to the frames, lining and associated mouldings from which the door is hung
- where sidelights and/or fanlights are to be provided adjacent to the door, these will be measured at the same time as the door.
Woodwork Second Fixings

Architraves

Architraves cover the junction between the wall and the door frame/lining and are measured under the second fixings category of the Woodwork section. These are measured in metres, to their extreme length giving a detailed description stating the cross section area and any moulding. Where the length of the architraves do not exceed 500mm long they may be enumerated and described as in short lengths. Ends, angles, intersections, mitres, splays and the like are deemed to be included in the rates for second fixings.

- Wood second fixings are measured in linear metres giving a detailed description; descriptions shall include details of the moulding and decorative treatments
- The architrave is measured to its extreme length to allow for the mitred cuts at the ends
- Note angles; intersections, mitres splays and the like are deemed to be included in the rate

Note the margin on an architrave is usually 6mm
Door Frames

Door frame jambs and heads are grouped together and measured in linear metres stating the cross section dimensions and labours (i.e. mouldings). Door frames which form part of a screen are included with the description of the screen. The length of the door frame will be the extreme lengths of each section.

The method of fixing of door frames must also be described or measured. This can be done in a variety of ways, - frame bolts, cramps or grounds. Frame bolts and cramps must be counted.

Composite Items - The Flush Doors

Composite Items are defined as ‘those which may arrive on site ready for incorporation in the works without further assembly’. Descriptions for Composite Items shall include the overall dimensions and the cross-section size and moulding of each component where not shown on accompanying drawings.

Composite Woodwork items such as doors are enumerated (counted) and described in detail with each leaf being counted as one door. This means a double door contains two doors. Doors are usually described by referencing them to the Architect’s door drawings or by including a bill diagram in the Bill of Quantities. If there are no such details they must be described in detail stating the size, thickness and construction details of the door.

‘Off the shelf’ or stock-pattern doors can be described using a precise and unique manufacturer’s catalogue reference. Fitting and hanging doors are deemed to be included with the doors.
Ironmongery

The provision and fixing of units or sets of ironmongery is enumerated and fully described items. Where ironmongery is fixed to backgrounds other than timber, the nature of the background shall be stated. Items of ironmongery may be described by the set where appropriate and this shall be stated in the description. Rates for Ironmongery are deemed to include the following.

- Screws, bolts and the like;
- Labours on timber and to receive units, and
- Fitting and hanging doors, windows and like items.

The manufacturer of butt hinges is seldom specified, but the architect may require that their source is approved.
Painting and Decorating

The measurement of painting and decorating is regulated by section Q of ARM4.

Painting specifications include the following information:
1) Preparatory work to base
2) Kind and quality of materials
3) Number of priming or sealing coats and undercoats
4) Number of finishing coats stating the surface finish
5) Abrasive or other treatment applied between coats.
6) Method of application where not at the contractor’s discretion.

This worked example involves painting new wrot softwood which requires no particular preparatory work, abrasive treatment or restrictions on the methods of application.

Painting is categorised as work to 13 separate work categories including general surfaces and second fixings which apply to this worked example.

The coverage rules of ARM define general surfaces as work to skirtings, dado rails, picture rails, wall mouldings, cappings, margins, frames to doors, associated linings, sills and unglazed doors.

In general, painting to general surfaces is measured in m²
Painting to second fixings is also measured in m² where it exceeds 300mm girth
Painting work not exceeding 300mm girth which is isolated from similar work is measured separately in linear metres and stated as not exceeding 300mm girth.
Architraves

**Note** ARM requires that fixings other than nails and fixings other than to timber shall be stated in the description. In this instance the architraves are fixed to blockwork which involves shot fixing or plugging the wall for masonry nails.

The measurement of the architrave is quite tricky as there is a need to calculate how far the architrave overlaps onto the door frame. The convention is to leave a 6mm margin between the opening edge of the door frame and the leading edge of the architrave. The stop on the door frame (a 12mm rebate taken) also must be deducted. This calculation determines that the architrave extends 32mm onto the frame.

The approach taken here is to add the width of the architrave (75mm) to the structural opening dimensions and then adjust back for the overlap onto the frame (32mm). The lengths of the architraves take account of their mitred junctions.

Door Frames

**Note** the door frames are fixed with Hilti door frame bolts. These are measured in the ironmongery section (see slide 12).

Frames are measured in linear metres stating the cross-section dimensions and describing the labours (rebates – 1). In this case it is assumed that the frame will be built on site therefore the structural opening size (900x2100mm) become the head and jamb dimensions.
Flush Doors

This demonstration accords with ARM4 sequence; many practicing quantity surveyors, however, start this element by measuring the doors first and then proceed to measure the remainder of the woodwork section.

Where door sizes are not given they must be calculated by taking the thickness of the door frame from the structural opening dimensions. The depth of the doorstop (is taken here as 12mm) must be deducted out of the frame thickness to give the actual door dimensions.

Note: Fitting and hanging the doors is deemed to be included in the door description.
**Locks and Handles**

In this instance the precise type of ironmongery and door furniture has been selected and therefore can be fully described.

Alternatively Prime Cost Sums are often used, to cover the supply of ironmongery. A second approach is to include a Prime Cost Rate for the supply of each of the various items of ironmongery. In both cases, fixing the various items of ironmongery is enumerated under the heading of FIX ONLY.

Items of ironmongery are typically enumerated, however it may be more appropriate to bill certain items (such as the handles in this example) as pairs.
Door Bolts

The door frame is fixed with door bolts – 3 bolts are taken per jamb.

Metal frame anchor HT 10X132
Priming Backs of Frames Before Fixing

Designers may require the backs of second fix and framing sections to be primed before fixing. This has been measured here in linear metres (as the girth is less than 300mm) and the totals have been directly copied from the architraves and frames above.

Another approach is to describe this activity as isolated painting and count the number of occurrences.

Gloss Work to Doors

Painting to flush doors is measured in m² and classified as work to general surfaces. Note: no further final classification is required under Category 2 and stating that the work is over 300 mm is not necessary, however it may be included by surveyors to maintain a consistent description style approach.

The convention in measuring the edges of doors is to measure both side edges and the top edge. The total is then multiplied by 0.04m (44mm is the thickness of the door).
Painting the Frames and Architraves

These are measured under the category of painting second fixings. The girth of the painting to the frames and architraves is calculated as shown in the thumb-nail sketch here.

As the overall girth of the painting exceeds 300mm it is measured in m².

*It is noted that general surfaces includes door frames but it is considered impractical to separate the frame from the architraves and the approach here is to measured them overall as a single painting operation.