Survey & Installation Guidance

General guidance information on the surveying and installation of Masterframe PVC-U sash windows.

"The surveyor is likely to be the first technical trained person on site to assess the suitability of the property and the condition of the apertures. His responsibility is more than just taking sizes; it is to ensure that the specification of the windows is correct for the occupants and, in accordance with all the relevant building regulations and British standards."

Introduction

The information contained within this guidance document is referenced from Building Regulations, the British Standard Code of Practice for the surveying and installation of windows and doorsets, the Glass and Glazing federation best practice guide as well as Masterframe's own manufacturer's instructions.

Unfortunately there is not a single solution to overcome issues found on site; this guidance will address the majority of issues with the surveying and installation of PVC-U sash windows, although much of the information could easily be adopted for either casement or timber products.

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Surveying - Material Consideration

PVC-U as a material is a very versatile substance, however it is considered non-load bearing, it will not support an aperture which does not have a lintel present, or the weight of a substantial bay roof.

PVC-U will expand and contract with heat fluctuation; this must be considered when taking the aperture sizes and confirming the manufacturing sizes of the product.

White PVC-U will expand and contract by 0.7mm / m / 10°C temperature change. Dark colours will expand and contract by 1mm / m / 10°C temperature change.

Bear in mind though that this is referring to a façade temperature not an ambient temperature. A product installed on a South elevation in direct sunlight will heat up to somewhere in the region of 50°C to 60°C

This movement in the material will need to be considered at both the surveying and the installation stage of the process.

Surveying - Surveyors Responsibility

The surveyor must be technically competent to assess the structure and correctly specify all aspects of the installations.

The surveyor is likely to be the first technically trained person on site to assess the suitability of the purchased products for the property and the condition of the apertures. The surveyor responsibility is more than just taking sizes; it is to ensure that the specification of the windows is correct for the occupants and, in accordance with the relevant building regulations and British standards.

The surveyor must consider the safety of both the occupants and the installers during the installation and, should carry out a risk assessment for the proposed works to ensure that neither the occupants nor the installers are put at any risk during the installation, or thereafter. This information can be used in the Construction Panning Phase written scheme required for each replacement window installation under the Control Design Management (CDM) regulations 2015, where applicable.

The surveyor should consider the following checklist to correctly specify the product. If the surveyor has any doubts about the conditions of the installation, further information from the likes of a structural engineer should be sought.

- Is the sold product suitable for the location?
- Will the product meet all current legislation?
- Identify the condition of the structural aperture.
    - Are there any structural defects present, damp, subsidence cracking etc?
- Is there a likelihood of any asbestos being present?
- Calculate and determine the wind load for window specification.
- Determine any applied or dead loads on bay assemblies.
- Measure the apertures and specify the manufacturing sizes.
- Correctly specify any product safety requirements.
- Specify the installation method and required materials.

Surveying - Measuring "Flush" Apertures & Manufacturing Sizes

Measuring for a sash window into a **flush fit** aperture is the same as any other fenestration product. The aperture is undoubtedly slightly out of square therefore the following guidance should be followed to accommodate both getting the new sash window into the aperture, squaring the sash window up and allowing for the linear expansion.

Measure the width and height of the aperture in three locations, top, middle bottom or left, centre, right. Using the smallest measure size make the following deductions:

White PVC-U Deductions.

- Sizes up to 3000mm — Deduct 10mm
- Sizes from 3000mm to 4500mm — Deduct 15mm
- Size over 4500mm — Deduct 20mm

Dark Colours PVC-U Deductions.

- Sizes up to 3000mm — Deduct 15mm
- Sizes from 3000mm to 4500mm — Deduct 23mm
- Size over 4500mm — Deduct 30mm

These deductions are based upon the aperture being in decent sound condition. If the aperture is considerably out of square a greater deduction may be needed.

The sizes required by Masterframe are the overall finished windows sizes, including any projecting cills and frame extension packers.

The surveyor must also determine transom drop (TD) of the sash window, the centreline of the top sash bottom rail. Masterframe considers an equal split window to have equal glass pane heights; this means that the TD is not central to the window because of different frame material at the head of the sash window compared to the cill however, Masterframe can manufacture to any given TD dimension.

Surveying - Measuring "In Check" Apertures & Manufacturing Sizes

Measuring for a sash window into a check reveal aperture is slightly different. It is desirable to hide as much of the frame behind the external brickwork as necessary to leave a similar amount of the frame visible as the existing. Linear expansion is not so much of an issue as there is likely to be a void to be made good on the inside when the old sash window is removed.

Measure the width and height of the aperture in three locations, top, middle bottom or left, centre, right. Using the smallest external aperture size we recommend the following to leave 23mm or 28mm visible depending on the range.

- Width; Aperture plus 90mm**
- Height; Aperture plus 45mm**

These deductions are based upon the aperture being in decent sound condition. If the aperture is considerably out of square a lesser amount of frame may need to be hidden.

**Care must be taken through to ensure that there is enough space in the check reveal to accept the window frame, especially the head as it is not uncommon for a hidden timber lintel to be present. It is advisable to drill a hole up through the head of the old window to see how much of a void is present.

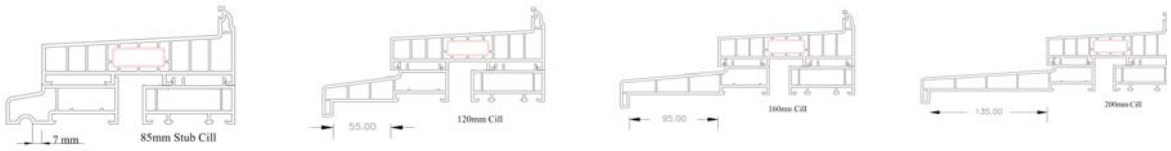
The sizes required by Masterframe are the overall finished windows sizes, including any projecting cills and frame extension packers.

The surveyor must also determine transom drop of the sash window, the centreline of the top sash bottom rail. Masterframe considers an equal split window to have equal glass pane heights; this means that the TD is not central to the window because of different frame material at the head of the sash window compared to the cill however, Masterframe can manufacture to any given TD dimension.

Surveying - Projecting Cills & Frame Extension Packers

There are four different sizes of projecting cills available and due to the front to back dimension of the sash window integral cill, all come in two sections.

In order to correctly specify the size of the projecting cill, the cill should protrude over the structure by at least 25mm from the fabric of the façade to the drip nose, or capillary channel on the projecting cill.



The projecting cill and rear packer is always 30mm high.

Similar to the rear packer used behind the projecting cill, there are frame extension packers available. These are in three basic sizes, 15mm, 30mm & 50mm, or any multiple thereof as these will clip together. These packers could be used in place of the normal cill packer if the aperture requires.

It is possible to clip these packers to either the outerframe or the integral cill and still have if required, a projecting cill as well.

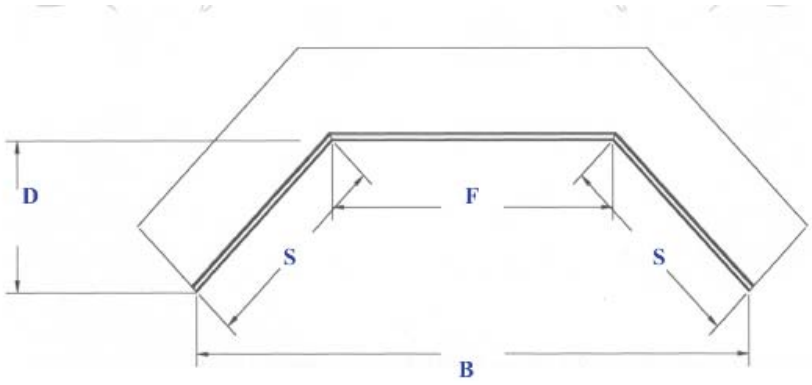
Surveying - Bay Windows

The first most important point to make regarding any PVC-U bay window is to reiterate the point that the PVC-U is not load bearing, it cannot take the load of the façade or roof above the window.

Ideally it would be best to measure the bay from the inside, but Masterframe can work from external sizes if it is easier to obtain providing the segment sizes to the external point of the bay corners and angles are known. If working from the inside then the segment sizes to the internal point of the bay corner and either bay angles or, back span of the bay is required.

The sizes taken must be the window sizes and not the cill sizes. If the chosen range of windows from Masterframe has a cill upstand that protrudes inwards from the window jambs (133mm frames) this upstand is to be ignored when taking the internal bay sizes.

Masterframe will make the deductions from these sizes to accommodate the bay post. This bay post will be provided 100mm smaller than the bay window height in order to allow for a structural pole (not supplied by Masterframe) to be inserted inside the bay posts (provided by Masterframe) to hold the sash windows in place.



Surveying - Arch Windows

Masterframe would rather not work from templates where possible, all that is required are some basic dimensions, width, height, and the spring line, the point where the curve starts on the jamb.

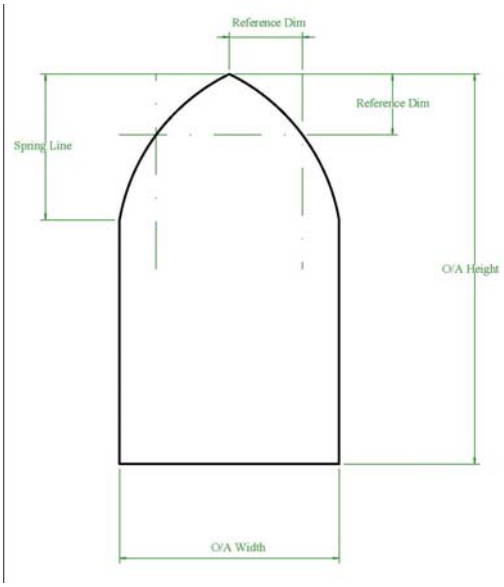
Following the same principles as measuring for a normal square window additional sizes are required when measuring either a true arch or swept head window, see illustrations.

It is not possible to make top sashes slide on true arch windows or on sept head windows if the radius of the arch is less than 800mm. On these occasions the top sash must be fixed.

The radius of the arched head window can be calculated by the following equation, where the OW is the overall width and SL is the spring line of the arch.

$$\frac{SL^2+(OW^2/4)}{2SL}$$

When measuring a Gothic style arched window an additional reference dimension is required to plot the radius of the curved frame. This can be obtained in one of two ways as illustrated, or as a dimension taken from the centre of a line taken between the SL and the top of the frame to the outside of the curve.



Surveying - London Frame Windows

It is a fairly common design; possibly seen more often in and around the London area, to have a square window fitted in check behind an arched external brick façade.

In this instance for either the Bygone range or Vintage range of product, it is possible to recreate the original window design and give a similar appearance of an arched window from the outside whilst in reality, it is a square window.

When measuring this style of sash window, sizes of the aperture are required as opposed to manufacturing sizes of the frame. The external aperture sizes must be taken, overall width, height and spring line, the internal maximum manufactured sash window width and height size must be given, as well as how much visible frame is required to be seen from the outside.

Masterframe will draw the window and provide the finite window sizes based upon the best fit to the given sizes.

Surveying - Provision of Egress

In accordance with the Approved Document B, all habitable rooms where the window is less than 4.5m from ground level, which do not lead onto a hallway with direct access to the outside should be provided with a window which has a clear opening area of no less than .33m^2 and no smaller than 450mm in any direction.

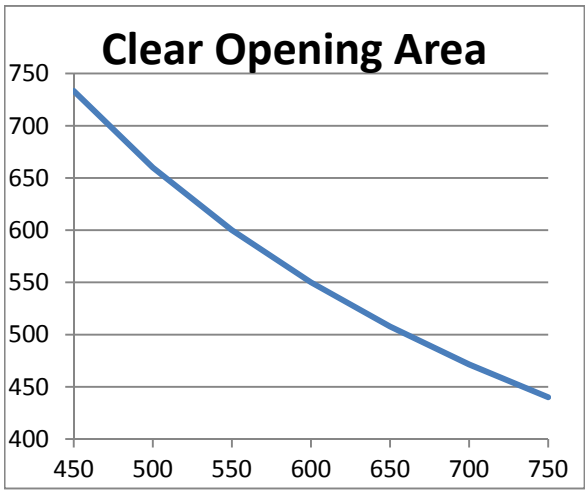
There is a caveat to this interpreted statement from AD B, which indicated that when the windows being replaced does not meet the current regulation and provided the new replacement window does not make the situation any worse, then it would be acceptable to the competent person schemes.

Considering this in the contexts of our sash windows, it is fairly easy to work out the clear opening area by the following calculations.

Bygone or Vintage:	Overall Width minus 146mm Transom Drop minus 205mm
Classic, Authentic or Heritage:	Overall Width minus 136 Transom Drop minus 200mm

Now plot the results of the calculation on the graph, any result which falls above the line will be compliant with AD B.

Any result falling below the line should be referred back to Masterframe where egress options can be discussed to overcome the situation.



Surveying - Provisions for Ventilation

There are four systems of ventilation within the Approved Document F; for a new build project the architect will dictate the system of ventilation and the provision of trickle ventilation in the window, if this is indeed the method that they have adopted.

On replacement windows though, it is down to the surveyor to specify this ventilation provision. If the windows are being installed and registered with a competent person scheme then the same caveat applies to AD B; if the windows being replaced have a ventilation provision, then the new windows must have a ventilation provision which will be in accordance with either system 1 or 3 of AD F.

System 1; trickle ventilation in windows when there are either no extractor fans or intermittent extractor fans in the wet room.

1. 2500ea ventilation to the wet rooms.
2. 5000ea ventilation to all habitable rooms.

System 3; trickle ventilation in windows when there is a continuous running extractor fane in the wet rooms.

1. 2500ea ventilation to the wet rooms.
2. 2500ea ventilation to all habitable rooms.

Special care must be taken to ensure that any combustion device, a boiler, gas fire or a open fire, has its air supply maintained. Failure to do so will result in that appliance having an unbalanced combustion chemistry which could lead to the generation of Carbon Monoxide. In the worst case scenario when loss of life occurs as a result of replacing a window, all persons involved, the business owners / directors, the surveyor and the installers, in rendering that device unsafe will have contravened regulation 8 of The Gas Safety (Installation and Use) Regulations 1998 and, be liable to criminal proceedings.

Surveying - Safety Glazing

Despite a recent change from the requirement now being part of the Approved Document K in England (AD N in Wales) the actual requirements for safety glazing has not changed in years, yet continues to be the biggest cause of failures for the competent person scheme inspections.

In its rawest form, any window in a critical location should have safety glass fitted; these areas include any glazing which is within 800mm from a standing surface, floor, stair tread, in a bath or shower basin etc, any glass pane within 300mm either side of a door and within 1500mm from the standing level and, any glass within a door itself which is within 1500mm from the standing level.

All safety glass should be correctly, permanently marked (etched) to comply with the requirement of EN 1279

It is worth noting, that a common practice of checking this internally is not necessarily concise. The top sash of a sash window could be lowered and that glass pane could fall within 800mm of the external standing level (a raised garden perhaps). In this case the top pane of glass shall be a safety glass on both panes in order not to breach AD K.

Installation – General Guidance

A good installation is the main factor in the process of a consumer replacing windows that is going to determine whether or not the installation company is recommended to friends and family.

In order to ensure that this is the case, the installation team must be professional and suitably qualified for the tasks undertaken, not just in the practical activities of replacing products but also in the management of the site activities including customer relation.

It is worth a special mention that the room where the windows are being replaced is technically a site; therefore the installer must assess the risks to both themselves and the homeowners whilst they are working. Ideally the occupiers should not be present in the working area.

This document is not a valid risk assessment, nor guidance on how to conduct a risk assessment and it might seem obvious to state in a document of this nature, but all relevant PPE and property protection must be used diligently at all times.

Sash windows are often very heavy and care should be taken when moving these around; dragging the window on any surface is not advisable as this will scratch the integral cill. It may be worthwhile removing the bottom sash or both to reduce the weight of the overall window. This is easily achieved by tilting the bottom sash inwards and sliding the sash up as far as it can go and then removing the two part black rivet from the pivot bar, located on the bottom side corners and releasing the tilt rest arms through the red moulding on the sash; it is now possible to lift the sash out of the frame. Under no circumstances should the balances be removed from the frame in the process, as following the described procedure will keep the balance tension intact.

Installation – Fixing Methods

There are two main methods for fixing the windows, either through frame fixing or lug fixings. Whichever method is adopted the windows should be installed in accordance with the British Standard BS 8213:4.

In essence all four sides of the window should be fixed to the aperture, with fixings in accordance with the following criteria:

1. Between 150mm & 250mm from the corners
2. Every 600mm (Max) centres down the window jambs
3. At least one central fixing for windows over to 1200mm and up to 2400mm at the head if PU foam is adopted as a fixing method and, a second for windows over 2400mm.

Masterframe does not recommend through frame fixing as it is not possible to fit in accordance with the fixing centres without removing balances, leaving unsightly fixing screws showing in the frame, or worst of all, having screw heads protruding into areas of moving parts.

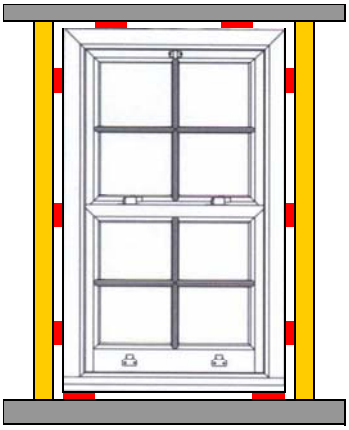
Under no circumstances should a direct fixing be placed down through the integral window cill, as this will lead to water ingress.

Masterframe recommends lug fixing as the quickest, easiest and most robust method of fixing the sash window into the aperture.

Installation – Frame Packing

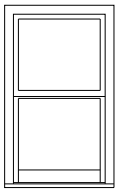
It is essential that the packing of the sash window is sufficient to hold the window square, preventing the cill and jambs from bowing.

Frame fixing packers are required at all fixing points and **critically underneath the window jambs**, to transfer the weight of the window from the jambs through the cill to the structure. Failure to do this will result in the cill bowing and the window not operating correctly.

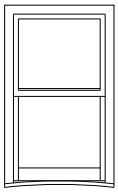


The illustrations below explain the effects of not packing a sash window correctly.

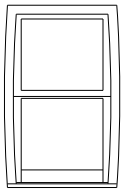
Level, plumb, square; this window will operate correctly.



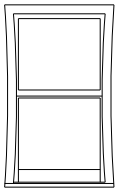
Bowed Cill; the cams on this window will not engage correctly as the reduced travel of the bottom sash means the alignment of the cam and keep is incorrect.



Jambs bowed outwards; this window will be draughty, especially at the meeting rails.



Jamb bowed inwards; this window will not slide correctly and will not tilt inwards for cleaning.



Installation – Bay Assemblies and Trims

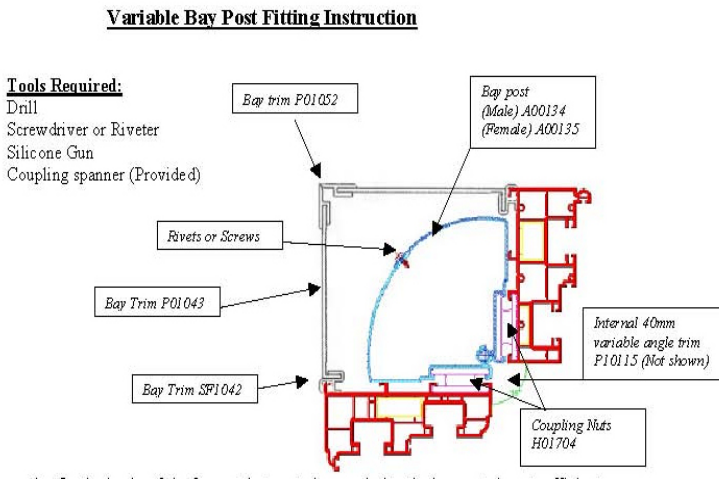
Due to the weight of sash windows the bay segments will come as individual window ready for assembly on site. As much preparation work as possible will be done in the factory to make the process as easy as possible; the cill upstand, where required will already be cut back to the correct angle, as well as the external cover trims which will have also been pre-cut to the correct size.

The projecting cill where requested will have been welded and this needs positioning as one of the first steps. The packer for the rear of the projecting cill will be separate pieces, this needs knocking onto the integral cill before the windows are lifted into the aperture. There is also a trim on the sides of the window to accept the bay trims. As this can get damaged if the frames get moved on the ground, it is left sitting high from the bottom of the cill and needs knocking into the correct position.

Working from one side, fitting the bay is a matter of assembly. The bay post locks to the sash window frames without the need for screw fixing. The bespoke coupling nuts will lock the legs of the frame to the legs of the post with a quarter turn of the spanner. Caution is needed as these only fit into the section one way; the side with the rounded corners goes to the window.

After assembling all windows into the bay, a screw or pop rivet must be used to fix both sections of the post together. The trims are then easily knocked into place.

The illustration shows the complete assembly; note both the 147mm and 133mm frame sections are shown for information purposes.



Installation – Making Good

For sealing between the PVC-U sash window and the structure, a low modulus silicone seal should be used, as this has enough elasticity to accommodate the linear expansion of PVC-U. If the gap between the frame and the structure exceeds 6mm, a backing rod is required to provide suitable back pressure and minimise 3 sided adhesion.

The size of the perimeter seal should be sufficient to allow for the linear expansion as well as provide an adequate bond to the window frame and the substrate. The seal should have a minimum 5mm bond to the PVC-U and 6mm bond to the substrate.

When Sealing between PVC-U and PVC-U trims, either low-modulus silicone seal or a Stelmax type material should be used.

Before French pointing a window, firstly apply a low modulus silicone seal to the window, as previously described.

When sealing to internal wooden architraves or plasterwork, an acrylic seal should be used as this can be painted, rather than silicone. Sealing between the window frame and the PVC-U architraves, a low modulus seal should be used.

When sealing between the architrave to the internal wall, score along the edge of the architrave, through any wall paper so that when the property is re-decorated there is not a risk of the architraves being pulled off with the old wall paper.

Installation – Trouble Shooting & Frequently Asked Questions

Symptom	Cause	Remedy
1. Window Will not lock.	A. Cill Bowed. B. Frame not installed square	A. Refit packing under jambs. B. Refit and pack to keep diagonal sizes accurate.
2. Window will not tilt.	Outerframe jambs bowed inwards.	Refit packing jambs straight.
3. Inconsistent seal shape / line at the head of the window frame..	Frame not square	Refit and pack to keep diagonal sizes accurate.
4. Inconsistent seal shape / line down the jambs of the window frame.	Frame Jambs bow outwards or inwards.	Refit and pack jambs straight.
5. Sash is heavy to lift.	A. Frame bowed inwards B. Balance become disconnected. C. Balance connected but faulty.	A. Refit window packing to keep jambs square. B. Reconnect balance into the pivot shoe. C. Replace balance or tension balance (Ultralift only)
6. Sash drops by itself	A. Balance disconnected B. Balance broken.	A. Reconnect balance into the pivot shoe. B. Replace balance.
7. Sash raises by itself	Balance too strong.	A. Let off some tension (Ultralift Only) B. Replace Balance
8. Window is draughty	A. Frame or cill is bowed. B. Frame is out of square.	A. Refit window packing the outerframe correctly. B. Ditto
9. External condensation present	Environmental condition due to Relative humidity high.	Normal working parameters
10. Internal condensation present	Relative humidity too high.	Change the air in the property, fit a form of background ventilation provision.
11. Condensation between the panes of glass	Insulated Glass Unit seal has failed.	Replace IGU