SPECIFICATION FOR:

SLIDING PATIO DOORS MADE FROM

PVC-U EXTRUDED HOLLOW PROFILES

(REF: 360/1 JUNE 2000)
FOREWORD

This specification has been developed by the British Plastics Federation Windows Group.

This standard applies to sliding patio door assemblies manufactured from PVC-U profiles. PVC-U framed sliding doors typically consist of two or more panels of glass contained in PVC-U frames which in turn are contained within a PVC-U outer frame designed so that one or more panels are movable by sliding in an horizontal direction.

Joints in outer frames, mid-rails, mullions and transoms are made either by welding or be mechanical means (e.g., cleating or screwing). Where necessary, mechanical joints are sealed. This specification covers both methods of jointing. Mechanical joints at the corners of panels are not considered and are outside the scope of this specification.


The performance requirements for the raw materials and properties for PVC-U extruded hollow profiles for patio door assemblies are specified the same as those for windows and are given in BS 7413 "Specification for white PVC-U extruded hollow profiles with heat welded corner joints for windows - materials type A". BS 7413 is currently under review and it is anticipated that the scope will be widened to include larger profiles for doors and patio doors.

In order for an installed patio door assembly to function correctly, it is essential that the recommendations given in the British Plastics Federation publication "Code of practice for the installation of PVC-U windows and doorsets", reference 348/2 March 1996, are followed.

This specification has been developed because of the current lack of product standards for PVC-U patio doors available through the normal sources.

An enhanced security section is being developed to provide a method for assessment of the security performance of patio doors of any material. The work has been overseen by a Steering Committee, with representation from a balance of appropriate expertise and interests, to ensure the specification is both open and practical.

This specification does not supersede any other publication

Compliance with this specification does not confer immunity from legal obligations.
1. Scope
This specification details the test methods and acceptance criteria applicable to PVC-U framed sliding patio doors in domestic applications. It applies to in-line and tilt/slide patio doors.

*Note. Whilst other types of doors are not specifically covered by this specification, certain elements of it may be suitable for application to other types of patio doors or may be adapted for that purpose.*

It does not include sliding doors which exceed 3000 mm in overall length or 2400 mm in overall height.

This standard applies to sliding patio doors manufactured from white profiles as defined in BS 7413.

Information on evaluation of conformity is given in annex A. Information on durability is given in annex B.

2. Definitions
The definitions given in BS 6100: Part 1, BS 7412 and BS 7413 generally apply together with the following.

2.1 bearing device.
A wheeled or roller device to support the weight of a moving door panel.

2.2 glazing gasket
Plastics or synthetics rubber members used between the glass and frame and/or the glass and a bead.

2.3 hardware
Fittings attached to the door which are used to operate and/or secure it.

2.4 outer frame
The PVC-U frame members which fix directly to the opening in the building structure which contain the panels.

2.5 panel
A movable or fixed glazed frame.

2.6 stile
A vertical member of a panel.

2.7 weatherstripping
Material used to improve resistance of the closed door to air infiltration and water penetration.
3. Abbreviations and handing

3.1 Abbreviations
The following abbreviations shall be used to distinguish the types of handing of doors.

- **O**: Fixed panel
- **X**: Sliding panel
- **R**: Opening movement from right to left
- **L**: Opening movement from left to right

3.2 Handing
All handing shall be determined when the door is viewed from outside.

3.3 Examples
Examples of handing and abbreviations are illustrated in figure 1

Opening leaves may be in-line or tilt/slide types

Figure 1 Examples of handing and abbreviations (elevations shown from outside)
4. Materials
Material requirements for PVC-U patio doors are the same as those for windows and are given in BS 7412 and BS 7413.

Gaskets and weatherseals covered by BPF publication reference 345 shall comply with that specification: *Gaskets and weatherstrips for windows, doors and curtain walling – Part 1 – Requirements, classification and methods of test for extruded gaskets and weatherstrips, co-extruded beads and cellular adhesive tapes.*

Sealed units shall comply with BS5713 (soon to be superseded by BS EN 1279)

Fasteners shall comply with BPF publication 355 *Specification and Guidelines for the selection and application of fasteners for the manufacture of PVC-U windows and doors.*

If infill panels are used, they shall comply with BPF publication 355 *Infill panels for doors and windows – a product performance standard.*

5. Construction
In the case of a patio door not fully assembled or glazed by the manufacturer, the manufacturer shall provide full instructions for the requirements of the glass, the method of assembly and the correct glazing techniques.

The moving door panels shall be supported by bearing devices that facilitate the movement and prevent direct contact between the panels and the outer frame.

The finished door shall be free from all sharp edges burrs and the like that might be a hazard to the user.

Patio door assemblies should be reinforced in accordance with the BPF Code of Practice for the reinforcement of PVC-U windows and doors, reference 323/1 October 1991, and with the system suppliers recommendations.

All fasteners shall be selected and applied in accordance with the BPF Specification and Guidelines for the selection and application of fasteners for the manufacture of PVC-U windows and doors, reference 335/3 November 1997.

6. Manufacturing tolerances
The manufacturing tolerances for PVC-U patio doors are the same as those for PVC-U windows and are given in BS 7412, 1991 section 6.

7. Glazing
Glazing shall be in accordance with BS 6262.

*Note. Attention is drawn to the safety aspects of BS 6262: Part 4 which requires safety glass to most PVC-U patio doors.*

Where PVC-U patio doors are supplied without glass, they shall be accompanied with the requirements of this clause and full instructions for the glazing methods to be used.
8. Assessment procedure

8.1 Product range

The product range shall be defined prior to the selection of test samples. The definition will include:

(a) Product design specification including profiles, beads and reinforcements
(b) Size range and configurations
(c) Installation requirements
(d) Operating and locking device options

8.2 Samples selection

For type testing, a suitable number of samples shall be selected which represents the most adverse and vulnerable aspects of a product range. The following list, which is not exhaustive, indicates features that require consideration:

(a) Range of profiles available
(b) Glazing options, e.g. single or double glazed, toughened or laminated glass
(c) Glazing installation methods
(d) Threshold options
(e) Range of operating and locking device available
(f) Reinforcement options

8.3 Sequence of tests

The following test sequences shall be applied to separate samples:

Test sequence 1

(a) Operating forces
(b) Air permeability
(c) Water tightness
(d) Wind resistance
(e) Repeat air permeability
(f) Repeat water tightness
(g) Repeat operating forces
(h) Wind resistance safety

Test sequence 2

(a) Operating forces
(b) Basic security
(c) Soft and heavy body impact
(d) Slamming
(e) Mechanical durability
9. Performance requirements

9.1 Weather performance requirements

9.1.1 Guidance to selection and specification of patio doors for weathertightness

It is assumed that most patio doors within the scope of this specification will be at ground level and that design wind pressures will not exceed 800 Pa. This will not be so where locations are in exposed locations or in upper floors providing access to a balcony. In these situations the design wind pressure should be calculated by the methods described in BS 6399: Part 1.

The air permeability requirement has been determined by the following:

(a) The exposure category (design wind pressure)
(b) The heat loss that can be accepted
(c) The health and comfort of the occupants

9.1.2 Air permeability

When tested in accordance with section 10.2.1, the door shall be classified in accordance with table 1.

9.2 Water tightness

When tested in accordance with 10.2.2, the door shall be classified in accordance with table 1.

There shall be no leakage during the test up to and at the test pressure given in table 1.

9.2.1 Wind resistance

When tested in accordance with 10.2.3, the patio door shall be classified in accordance with table 1.

The deflection of members shall be limited to 1/125 of the span and, in addition, such members retaining an insulated glass unit shall not deflect more than 1/175 over the edge length of the glass units.

The design pressure at which maximum allowable deflection is likely to occur shall be stated by the manufacturer. For design wind pressures over 800 Pa, the actual pressure should be stated and this should be the maximum to which the door assembly is tested.

There shall be no permanent damage after wind resistance testing. No permanent damage will be deemed to have occurred if:

(a) The performance value for repeat air permeability is that required in table 1 for the test pressure class achieved in the initial tests.

And if:

(b) The performance level for repeat watertightness is that required in table 1 for the test pressure class achieved in the initial test.
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9.2.1.1 Wind resistance safety test
After testing in accordance with 10.2.4, the patio door shall maintain its integrity. There is no further performance requirement for this test.

9.2.2 Classification
The weathertightness shall be determined when the door assembly has been tested in accordance with clause 9.1 and classified according to the exposure categories given in Table 1. The test pressure for all requirements shall be attained or exceeded by a door for the door to be included in that exposure category.

Table 1. Exposure categories

<table>
<thead>
<tr>
<th>Exposure category</th>
<th>Test Pressure class</th>
<th>Air permeability*</th>
<th>Watertightness**</th>
<th>Wind resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design wind pressure Pa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>Up to 200 Pa</td>
<td>200 Pa</td>
<td>800 Pa</td>
<td></td>
</tr>
<tr>
<td>Over 800</td>
<td>Up to 300 Pa (graph B)</td>
<td>300 Pa</td>
<td>Equal to design wind pressure</td>
<td></td>
</tr>
</tbody>
</table>

* An air permeability class of 600 Pa (see figure 1, Graph C BS 6375 : Part 1) is applicable when stringent levels of performance are required, for example when exceptionally airtight doors are necessary as in air conditioned buildings, especially when opening directly into a habitable room. Where there is such a requirement the exposure category should be suffixed with 'Special' e.g. 800 special.

** The watertightness test pressure classes given cover most situations. Assemblies of higher performance than stated in the table should be considered where the assembly is located in exposed situations, at high level on the building and or, directly into a habitable room.

9.2.3 Operating Efforts
Efforts required to operate patio doors shall be appropriate for their intended use. When tested in accordance with 10.3, the assembly shall meet the following requirements:

i) Force required to initiate movement in the opening and closing directions <= 80 N

ii) Force required to sustain movement <= 50 N.
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For non-drive gear type tilt/slide patio doors the force required to move the sliding leaf into and from the closed position shall be \( \leq 100 \text{N} \)

Locking and unlocking forces.

(a) Hand operated hardware \( \leq 100 \text{ N} \)
(b) Finger operated hardware \( \leq 20 \text{ N} \)
(c) Key operation torque \( \leq 2 \text{ Nm} \)

Note. Consideration should be given to the choice of handle where hardware is required to be used by the elderly or disabled

9.3 Technical performance

9.3.1 Operating Efforts

Efforts required to operate patio doors shall be appropriate for their intended use. When tested in accordance with 10.3, the assembly shall meet the following requirements:

iii) Force required to initiate movement in the opening and closing directions \( \leq 80 \text{ N} \)

iv) Force required to sustain movement \( \leq 50 \text{ N} \).

For non-drive gear type tilt/slide patio doors the force required to move the sliding leaf into and from the closed position shall be \( \leq 100 \text{N} \)

Locking and unlocking forces.

(d) Hand operated hardware \( \leq 100 \text{ N} \)
(e) Finger operated hardware \( \leq 20 \text{ N} \)
(f) Key operation torque \( \leq 2 \text{ Nm} \)

Note. Consideration should be given to the choice of handle where hardware is required to be used by the elderly or disabled

9.3.2 Resistance to Soft and Heavy Body Impact

This test is designed to simulate accidental impact by humans falling.

Patio doors shall be tested in accordance with 10.4. The impact energy to be applied shall be 150 J.

It shall be applied once to each panel and to the interlock on both sides of the patio door.

Operating efforts shall continue to meet the requirements of 9.3.1.

No component of the assembly shall exhibit any visible failure.
9.3.3 Slamming

The test specified in 10.5 shall be used to determine the resistance of a patio door to slamming of the sliding panel against small objects such as toys, which may be accidentally trapped between the frame and sliding panel, the sliding panel being slammed against its stops in both closing and opening directions.

For tilt/slide patio doors, the test and requirement have yet to be developed.

After testing operating forces shall meet the requirement of 9.3.1. No component of the assembly shall exhibit any visible failure. If the sliding leaf comes off the track or normal operation is rendered impossible, the patio door is deemed to have failed.

9.3.4 Abusive forces on handles

A patio door should resist abusive forces applied to the handle. When tested in accordance with 10.7 the door shall withstand an applied force of 300 N in each direction.

Operating forces shall meet the requirement of 9.3.1 and there shall be no loosening of the handle fixings, or visible damage to the handle assembly.

9.3.5 Performance of joints

9.3.5.1 Welded joints

Welds shall be tested and shall withstand a stress of 20 MPa. One method of test is given in annex A.

Note. The method of test in BS 7413 may also be used on finished corners.

Alternative tests may be used as long as equivalence with either of these two tests is demonstrated.

When tested in accordance with Annex A, the joint shall not fracture.

9.3.5.2 Mechanical joints in mid-rails, transoms and mullions within panels

When tested in accordance with 10.6, the watertightness must be retained and any movement or torsion effect on the mullion/transom (where present) must not affect the correct performance of the patio door.

9.4 Performance in Use

9.4.1 Mechanical Durability

Testing shall be carried out in accordance with 10.8. Following the completion of 10,000 cycles the operating forces shall meet the requirement of 9.3.1.

No component of the assembly shall exhibit any visible failure.

Note. Patio doors used as main entrance doors may need a higher level of mechanical durability.
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9.4.2 Basic Security

When tested in accordance with 10.9, it shall not be possible to remove the glazing from the panels nor the fixed or sliding frames from the outer frame such that entry could be gained.

9.5 Special Aspects

9.5.1 General

Where appropriate to a specific requirement, the agreed performance should be assessed in accordance with one of the following;

9.5.2 Acoustic Performance

Determined in accordance with BS EN. ISO.140-3 (1993).

9.5.3 Thermal Performance

Determined in accordance with BS 874 Part 3 or an approved calculation method.

10. Testing

10.1 General

10.1.1 Test Samples

Unless stated otherwise all test samples shall comprise of a complete patio door assembly including any associated glazing, hardware, and other accessories, details of which should be recorded and included in the test report. Any glazing shall comply with BS 6262. If glass breakage occurs without damage to the frame members, the unit can be re-glazed once and re-tested.

10.1.2 Sample Conditioning

Unless stated otherwise the test sample should be stored and tested in an environment within the range of 15 to 30 °C and 25 to 75 % RH for a minimum of 24 hours.

10.1.3 Sample Preparation

The sample shall be fixed into a suitable sub-frame using fixings to replicate the manufacturer’s published installation recommendations. The sub-frame should then be mounted into a test frame which is sufficiently rigid to withstand the test loads without deflection which could influence the test result.

10.1.4 Weathertightness Test Preparation

During weather performance testing, permanent ventilators and key escutcheons shall be sealed before commencing tests.

Where patio doors are fitted with permanent ventilators, weathertightness tests shall be carried out with the ventilators taped over.
Closable ventilators and letter plates, if present, shall be tested in the closed position but un-taped. Where a manufacturer can demonstrate equivalence between alternative ventilators, testing need only be carried out on one type of ventilator.

10.2 Weathertightness

10.2.1 Tests for air permeability

Patio door assemblies shall be tested in accordance with BS 5368: Part 1 with the pressure applied to the outside face of the patio door only.

For all types of patio door assembly, the air flow passing through the specimen, at each test pressure difference applied in BS 5368: Part 1 test shall be expressed as an average leakage rate per metre length of opening joint, visible on the inner face of the specimen.

Note. The edges of fixed panels shall not be included in the calculation of the length of opening joint.

10.2.2 Test for Watertightness

Patio door assemblies shall be tested in accordance with BS 5368: part 2: using the spray method No. 2.

10.2.3 Test for wind resistance

Door assemblies shall be tested by the methods described in BS 5368: Part 3: The preparation gust (p1) shall be 500 Pa. The repeated positive and negative pressure gusts (p2) shall be 800 Pa or the greater declared design wind pressure.

The deformation test described in 9.1 of BS 5368 Part 3 is omitted but the deflection of members shall be measured during the repeated positive and negative pressure test.

On completion of the wind resistance test the door shall be opened and closed 5 times.

10.2.4 Wind resistance safety test

The safety test shall be carried out in accordance with clause 9.3 of BS 5368 Part 3.

10.3 Operating Efforts

The measurement of the minimum force or torque required to engage or disengage the hardware (locks, handles etc.), commence opening and complete closing of the sliding panel shall be determined as follows:-

10.3.1 Equipment

Means shall be provided for the application of forces in increments not exceeding (1.0 ± 0.1) N for loads up to 10N if load greater than 10N (± 1N) to manipulate the hardware uniformly and without shock.
10.3.2 Procedure

10.3.2.1 Preparation
Tests shall be performed after manual operation of all moving parts 5 times.

10.3.2.2 Procedure to determine the force to commence and sustain motion.
With all the hardware disengaged and the sliding panel in the closed position and with tilt sliding panels in the sliding position, apply a load to the operating point to initiate movement of the sliding panel in the opening and closing directions.

Make 5 measurements of the peak load in each direction to sustain constant motion after 100 mm displacement of the sliding panel.

In the case of tilt sliding panels without driven gear, determine the force required to move the panel into and from the sliding mode, with all gear disengaged apply a force to the operating hardware in the appropriate direction.

Make 5 measurements of the peak load in each direction.

10.3.2.3 Procedure to determine the force to operate the opening device.
The forces required to operate all opening devices shall be measured using a suitable force gauge acting at the end of the opening device.

Keys should be operated with a suitable torque driver.

Make five measurements of the peak load during the operation of the device and take the mean for each test undertaken.

10.4 Resistance to Soft and Heavy Body Impact

10.4.1 Equipment
Impactor of total mass 30 kg ± 2%, consisting of a spherocnical leather bag of diameter approximately 350 mm, containing dry sand of apparent density approximately 1500 kg/m³ which passes through a sieve of 2 mm mesh. A device for measuring drop height of the impactor to an accuracy of 5%.

10.4.2 Procedure
The door assembly to be tested shall be closed with the locking hardware engaged. Identify the impact point. This shall occur at the centre of each face of each panel. Where the impact point coincides with any hardware, this shall be removed.

The sample shall be impacted three times on each side of each panel.

Suspend the impactor so that at rest it makes light contact with the surface of the panel and with its centre of gravity opposite to and at the height of, the impact point. Raise the impactor to a height of (500 +/- 10) mm above the height of the impact point. Release the impactor such that it strikes the panel at the impact point.

*Note: Repetition of this operation will necessitate re-shaping of the impactor.*

The angle at which the impactor is raised should not exceed 30 degrees.
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After the last impact, measure the operating forces in accordance with 10.3. and examine all components for visible evidence of mechanical failure.

10.5 Slamming tests
Patio doors are tested for slamming shut towards the lock side outer frame, and slamming open against either limiting stops or the outer frame.

Test arrangements

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10.5.2 Equipment

*Light strong line*

*Steel bar, 25 mm ± 2 mm in diameter, of suitable length.*

*Weight, of 15 kg ± 2%.*

10.5.3 Procedure

Open the sliding panel approximately 300 mm. Attach the line to the sliding leaf at the position of the operating handle. Arrange the line to pass horizontally from the sliding leaf over the steel bar arranged horizontally, with its axis perpendicular to the plane of the patio door. The line shall descend vertically from the steel bar and carry the 15 kg weight at its lower extremity.

Arrange the length of line so that as the leaf is closed by the action of the descending weight, the weight strikes a platform, so removing tension from the line just prior to the instant of contact with the lock side outer frame and/or limit stop.

Slam the leaf against the outer frame by the action of the descending weight. Repeat the slamming operation to a total of 20 times.

With the line similarly arranged on the opposite jamb to slam the door open, carry out the slamming operations against either limit stops where fitted, or against maximum opening, 20 times.

After the last cycle, conduct the operating forces in accordance with 10.3.

Method of test and requirements for tilt/slide patio doors are under development.
10.6 Watertightness of mechanical joints

Two tests are carried out in accordance with BS 5368 : Part 2, preferred spray method number 2, up to a value of 600 Pa.

The sample shall be mounted in the appropriate orientation with the relevant drainage aperture open and any other drainage channel sealed.

Water must not penetrate through the joint:
- into the reinforcing chamber other than those designed to allow water ingress
- onto that part of the construction in contact with the patio door
- to the inside of the building
- into any un-drained chambers (this can be determined by dismantling the specimen after testing).

10.7 Abusive forces on handles

10.7.1 Equipment

A suitable loading device accurate to ± 2%.

10.7.2 Procedure

The test should be applied to all handle types on the most accessible face

(i) in a vertical downwards direction with the sliding panel open at its approximate mid-position

(ii) in an horizontal direction parallel to plane with the sliding leaf closed and the locking mechanism engaged.

Progressively and without shock apply a load of 300N to the handle in each direction in turn for 60 seconds (± 5 seconds). The load should then be removed without shock.

After removal of the load, measure the operating forces in accordance with 10.3. and examine the handle for evidence of loosening of fixings.

10.8 Mechanical Durability

10.8.1 Test specimen

Where a mechanically jointed mid-rail, mullion or transom is to be included in the range to be assessed, this feature shall be incorporated into the test specimen.

10.8.2 Equipment

Suitable apparatus to operate the locking and opening equipment, and sliding panel.

Masses and scales accurate to 2%.

Force gauge and torque meter accurate to ± 3%
10.8.3 Procedure

The sliding panel of the test specimen is opened to the required resting position, is brought to the closed position and its lock and fasteners secured before rest. This cycle is repeated for the specified number of times or until failure.

Additional proprietary security or safety devices shall be tested in isolation and do not form part of this test.

Operating equipment shall act at the position of normal operation and where possible shall be supported by the test surround. The loads applied by the operating equipment shall be within the range of the specified operating forces and shall be applied via the operating device which shall be balanced so that the dead load applied on the operating point does not increase in any position the weight of the leaf by more than 5%.

Adjustment and lubrication in accordance with the door manufacturers published instructions shall be carried out before and during the test, but not more than once every 5,000 cycles.

With the test specimen installed in accordance with clause 10.1.3, the door leaf shall be subjected manually to 5 operating cycles before taking initial measurements.

A dynamic force should be applied at both opening and closing elements of the cycle. There shall be no more than 5 cycles/min.

The fastening device should be released by the operating equipment and the sliding panel is set into motion as continuously as possible.

The sliding panel shall come to a stop on the closing member of the frame at the test velocity. In the closed position the fasteners and primary locking devices shall be fully secured. The test is completed either when mechanical failure occurs or when the specified number of cycles has been carried out. In the event of interruption of testing the cycling can be restarted after examination for failure.

After completion of the required number of cycles measure the operating forces in accordance with 10.3 and the weathertightness in accordance with 10.6.

10.9 Basic Security Test

10.9.1 Equipment

Two paint scrapers, with a blade width of approximately 75 mm.

One flat blade screwdriver, of nominal length 200 mm and nominal blade width 7 mm.

One flat carpenter’s chisel, of nominal blade width 25 mm.

10.9.2 Procedure

Attempt to gain entry from the exterior face using the tools provided by the removal of gaskets, beads, sliding or fixed panels, any security devices and the infill. Testing shall be limited to a period not exceeding 3 min.
11. Reporting

The test report shall include the following information:

**Part A**

1. A reference to this Standard

2. Name of the test house, test engineer and date of testing

3. Product design definition

Details of:
   * design range covered
   * size range covered
   * issue No. and date of fabrication and installation manuals used

**Sample Selection**

Details of:
   * overall size
   * size of sliding panel
   * size of mid-rail (if any)
   * type of glazing
   * details of locks, fixings and any additional security devices
   * details of glazing methods
   (these may be taken from the manufacturer's manuals)

**Statement of assessment**

**Part B**

* weathertightness classification
* results of the mechanical performance tests
* results of the performance in use requirements
  - mechanical durability
  - basic security
* any special aspects assessed

Annex A Weld test (Normative)

Cut sections of profile and weld into either a "T" shape or "L" shape as appropriate, or cut welded joints from a frame. Remove the weld sprue and finish the joint in manner used by the manufacturer, i.e. grooving, knifing, polishing, etc..

Prepare the notch at distance L (as specified by the system supplier for each profile) to achieve a minimum 20 MPa stress as defined in BS 7413. Place the welded joint in the apparatus: see figure A.1 Apply the load, (either 25 kg or 50 kg as appropriate with a tolerance of ±1 %), carefully and without shock. Leave the load applied for a (60 ± 2) s. The load shall remain clear of the ground at all times. Remove the load and visually examine the welds for signs of cracking.
Figure A.1 Apparatus for weld testing.

Fig 1.
Annex B Evaluation of conformity (Informative)

B.1 Selection of samples for type approval

When considering a product range of patio doors for testing and approval there are a number of aspects that need to be considered when making the selection in order to cover the worst case situation. These aspects include:

- The size/weight of the patio doors - Largest sliding leaf
  Glass used in sealed unit
- Reinforcement
- Use of mid-rails/letterplates
- Operating device options
- Internal / external beaded systems
- Glazing - single / double glazed - consider window having the thinnest glass with maximum area for wind loading classification being considered (if applicable) and window having double glazed unit of maximum area for wind loading classification being considered.
- Other supporting hardware used to support the weathertightness / mechanical performance.

B.2 Procedure to be followed after design or component change

In the event of a design or component change on a patio door within an approved system, the manufacturer notifies the relevant authority, who then carries out a technical evaluation. This could involve the Scheme Manager and other technical experts within the Approvals Body. The technical evaluation will then conclude as to whether there is a need for further verification testing immediately, retrospectively or the change does not require any further testing. Verified conclusions are then included in the approval certificate as a change, or as an alternative the originally approved system.

Audit test sample selection made by the quality assurance inspector, for on-going third party verification. - The inspector either witnesses a sample window within the approved range being manufactured and then authorises despatch to the testing authority, or, selects a sample from a stock of approved windows and then authorises despatch to the testing authority.

B.3 Testing schedule

The following tests are carried out to test all patio doors within a system, where appropriate.

a) Weld test
b) Mechanical joint test
c) Manufacturing tolerances
d) Basic security
e) Weathertightness
f) Operating efforts

(g) Mechanical durability

(h) Acoustic performance

(i) Thermal performance

(j) Marking

Type tests are carried out initially and at significant changes to the window construction. Further testing should be carried out in accordance with the manufacturer’s Quality Plan.
Annex C. Durability (Informative)

The durability of PVC-U patio doors is affected by a number of factors:

- The specification of the framing material
- The ambient atmosphere - coastal, industrial, etc.
- The conditions of use/abuse, frequency of operation.
- The specification of the components used in the manufacture
- The quality of manufacture and assembly
- The quality of installation
- Maintenance and replacement of components

Because of all these variables, actual performance can vary under actual service conditions and any figures given for predicted working life can only be general estimates. Any indications given bear no relationship to warranties given by the manufacturer.

C.1 Components

C.1.1 PVC-U Profiles

PVC-U profiles manufactured in accordance with BS 7413 should provide a long life with only an occasional wipe down for appearance purposes. There may be a gradual loss of gloss over time which has no effect on the functional performance of the patio door. PVC-U profiles have been successfully used for fenestration products for the last 40 years, so it is anticipated that PVC-U profiles manufactured in accordance with BS 7413 will last in excess of 40 years. When PVC-U profiles are no longer able to accept replacement components or withstand the rigours of use, then this signifies the end of the life of the patio door.

C.1.2 Sealed units

Sealed units manufactured in accordance with BS EN 1279, which is expected to replace BS 5713 during 2000, can last in excess of 20 years if they are correctly glazed into the patio door. Sealed units can be simply replaced without removing the outer frame from the fabric of the building.

C.1.3 Glazing gaskets and weatherstrips

Glazing gaskets and weatherstrips manufactured in accordance with BPF publication reference 345/1 (currently being revised) will, when correctly applied, ensure the weathertightness of the window. Over time, the performance of glazing gaskets and weatherstrips will generally decline. It is possible that glazing gaskets and weatherstrips will need replacing after 10 - 20 years. These can be replaced without removing the outer frame from the fabric of the building. Whilst it may prove impossible or impractical to replace glazing gaskets and weatherstrips with exact replicas, most gasket manufacturers carry a sufficiently wide range of gaskets that a near match can be achieved which will enable the performance of the window to be maintained.

For a co-extruded rigid/flexible profile to have the flexible element replaced it is necessary for the profile to be designed with a method of retention of separate replacement flexible elements incorporated.

For those co-extruded profiles without such a means of retention, then alternative methods of replacing the flexible elements will be required.
C.1.4 Hardware and fasteners

These components come in many shapes, sizes and performance levels. Items of hardware can be hardware manufacturer specific, system specific and profile specific. Many items of hardware require profiles to be routed and it may not be possible to replace hardware with items which require exactly the same routing which will then require further work on site which may include routing or drilling new slots or holes and/or stopping up existing ones to prevent moisture ingress into the profile. Consequently, longer life hardware may be more desirable where replacement may be complex.

C.2 Corrosion resistance of hardware

The level set in BS 7412 is 240 hours corrosion resistance in a neutral salt spray test carried out on unused samples tested in isolation. It should be recognised that this is a benchmark test and there can be no correlation with real life conditions when used hardware may be subjected to a corrosive environment. For instance, coated steel hardware in an aggressive atmosphere combining coastal and industrial environments would need to be coated to a higher specification to achieve the same performance of hardware in a less aggressive environment. Specifying alternative materials such as austenitic stainless steel, or specifying higher levels of corrosion protection is necessary in such environments if the hardware is to not be replaced frequently.

Because of the wide range of specifications of hardware and the variations of environments to which they will be exposed, is it not possible to give any meaningful indication of working life with respect to corrosion resistance as this could vary from a few months for poorly protected hardware in an aggressive environment to many decades for higher specifications elsewhere.

In particularly aggressive environments, to achieve maximum hardware life, higher levels of corrosion resistance may be necessary.

C.3 Maintenance of hardware

Most hardware will require maintenance of some sort. Details of any required maintenance should be available from the window supplier. Failure to carry out this maintenance can reduce the working life of the hardware or even the whole window.

C.4 Installation

Poor installation can effectively prevent any adequate performance of a window and is the most common cause of inadequate performance. BS 8213 Part 4 gives guidance on the installation of replacement windows in domestic dwellings. Much more detailed information on the survey and installation of PVC-U windows and doorsets is given in the BPF publications reference 347/2 and 348/2 and on the installation of PVC-U windows and doorsets in new buildings in BPF publication 356/1.

C.5 Recycling of components

PVC-U profiles from windows in accordance with this standard at the end of their life can be recycled, for instance into the core of a co-extrusion as specified in BS 7413.

Glass from windows can be recycled.

Gaskets and weatherstrips made from natural and synthetic vulcanised rubbers can be recycled into granules and fine powders for different applications in the rubber and other industries. Thermoplastic materials can be recycled into other applications such as sports and leisure equipment, e.g. gym mats.
The metallic components of windows are readily recyclable.

C.6 Further reading

BRE Digest 404 PVC-U windows April 1995 has some information on durability.

BRE Digest 377 Selecting windows by performance December 1992 has some information, including endurance.

BRE Information Paper IP 16182 The selection of window hardware by performance, S A Covington, September 1982, gives appropriate numbers of cycles for wear testing for light and heavy duty, in addition to likely abuse forces.

BRE Information Paper JP 25181 The selection and performance of sealants, J C Beech, gives information on joint design, and the life expectation of different types of sealant.

Manual of good practice in sealant application, from CIRIA 1 Sealant Manufacturer's Conference has useful information on designing joints and selecting sealant for long life.