SPRA
Single Ply Roofing Association

TECHNICAL GUIDANCE

SEALANTS

THE USE OF SEALANTS IN SINGLE PLY ROOFING

ENSURING THAT CLIENTS OBTAIN HIGH QUALITY POLYMER-BASED SINGLE PLY ROOFING, THROUGH A PARTNERSHIP OF QUALITY ASSURED MANUFACTURERS AND CONTRACTORS

S7/09

GUIDANCE DOCUMENT

THE USE OF SEALANTS IN SINGLE PLY ROOFING

Over recent years the synthetic roofing industry has seen an increasing reliance and dependence placed by specifiers, main contractors and others on sealants as the first and only line of defence against water ingress at the termination points of the roof waterproofing. Coincidentally, revised Building Regulations have set new and extended performance requirements for building membranes in terms of control of moisture vapour transmission and air leakage. Sealants and sealant tapes are often vital to the achievement of this performance.

Consideration should always be given to traditional, proven methods where upstands of waterproofing are weathered by built-in counter flashings, which are in turn linked to any damp proof course/cavity trays present in the construction. These are proven to be reliable and to last for the service life of the waterproofing itself. However it is recognised that there may be circumstances related to the construction when the use of sealants becomes the only available weatherproofing solution.

Therefore the following guidelines are intended to provide a framework of best practice towards achieving a reliable weatherproof detail when sealants are used.

STANDARDS AND REFERENCES

- BS 6093:1993 Code of practice for design of joints and jointing in building construction
- BS 6213:2000 Selection of construction sealants - Guide
- ISO 11600 Classification of sealants for building construction
  Performance classification of construction sealants
  - Movement capability
  - Elasticity
  - Modulus
  - Life expectancy
  - Colour
  - Adhesion
  - Non staining
  - UV exposure
  - Fire resistance
  - Surface preparation
  - Installation
  - Maintenance
  - Repair
- BASA - British Adhesives & Sealants Association provide guidance on the interpretation of the Standards along with additional information.
- BRE Digest 463 'Selecting building sealants with ISO 11600' February 2002
- Metal Cladding and Roofing Manufacturers Association - Guidance for the effective sealing of end lap details in metal roofing construction. February 2004

SEALANTS FOR JOINTS

Definitions

It is important to consider if the seal is a movement joint or a surface mounted joint.

Movement Joint - a discontinuity in the building fabric located at positions between either similar or dissimilar structural materials and designed to accommodate movement.

Surface Mounted Joint - a sealed termination of the waterproofing system using a pre-fabricated mount where small differential movements are anticipated.

Sealant - a material which is required to maintain a seal between the surfaces of a joint.

IMPORTANCE OF JOINT SEALING

- Prevents water penetration.
- Accommodates structural and thermal movements.
- Compatible with a number of materials.
- Prolongs building durability.
- Assists design and colour concepts.
- May help to reduce building air permeability.

CONSIDERATIONS

Care needs to be taken in the proper design, selection and application of a sealant based weatherproof joint as the consequences of any failures can render the building unserviceable.

Designers must work within the guidance provided by the standards noted above and would be strongly advised to work closely with the membrane manufacturer in developing the details and specification.

Once the details and specification have been decided it must be ensured that this is what is actually installed on site.

DURABILITY

It is unlikely that the design life expectancy of the sealant used will be as long as for the single ply roofing materials to which it is bonded or associated. Therefore designers should consider providing access for maintenance, repair and eventual replacement of the sealant. Some sealants will require total removal before a new sealant can be installed; others will bond satisfactorily to any existing remnants that may be left by the removal process.

JOINT SIZING

The joint has to accommodate a profile of sealant that is of sufficient size to accept all the thermally and structurally induced movements without stress failure or loss of adhesion to the surfaces. The design has to make allowances for normal construction tolerances reducing minimum size of the joint and thus compromising its performance. BS 6093 describes the factors involved in the calculation process.

For the purposes of calculating the thermally induced movements, a temperature range of -20°C to +80°C is recommended, this would be for the worst case scenario of a south facing elevation under direct sunlight.

MATERIALS FOR JOINTING

Guidance on the selection, applications and use of sealants is given in BS 6213.

There is a variety of materials for use as sealants with varying properties and it is recommended in the BS that designers liaise with sealant manufacturers or, in the case of surface mounted joints, with the membrane manufacturers to ensure selection of the correct type.

Some of the most important factors are, life expectancy, adhesion, movement accommodation factor (MAF) and compatibility with the substrates.

BACK-UP AND BOND BREAKER

To ensure proper application and performance it is necessary to provide support to the back of the sealant as it is installed. This back-up is commonly a joint filler or cord.

This would also be correct for a triangular surface mounted joint to provide a trapezium seal shape.

In order to ensure that the sealant is able to expand and contract in line with the joint movements it is essential that it is only adhered to the two faces each side of the joint. Adhesion of the back face of the sealant profile must be avoided as it will not then be unable to distort its shape and thus absorb the stresses of any movement and is likely to become de-bonded or rupture.

Thus the need to ensure that the joint filler is of a type that will prevent adhesion of the sealant to it as it is applied or to first install a thin selfadhesive ‘bond breaker’ tape.

MINIMUM JOINT WIDTHS

BS 6093, clause 5.2.5, provides a calculation method for establishing the joint width taking the various factors into account. Though the practical minimum width of sealant quoted is 6mm, many in the industry feel that this is too small and that 12mm is more realistic, for a structural movement joint.

MOVEMENT JOINTS

One of the principle modes of movement is tension and compression as in a simple butt joint where the movement is at right angles to the adhesion faces of the joint.

Another mode of movement is shear as in an overlap joint where the movement is parallel to the adhesion faces of the joint.

Note that shear movements can also occur in butt joints, this can be through settlement or through differential thermal movement between the two adhesion faces. Differential thermal movement can occur where a metal item is fastened to masonry for instance, due to the two materials’ different co-efficient of expansion and contraction. It can also be caused by the fact that metal will heat up and expand at a much faster rate than masonry.

The majority of movements experienced in the joint are likely to be of a more or less regular cyclical nature. These movements can occur at a slow rate with heavyweight, masonry type backgrounds and more rapidly with lightweight, metal backgrounds.

Where metal backgrounds are involved movement is likely to be not only of greater range but also at greater speed.

Where items of differential expansion rates are connected it is possible, due to various constraints, for relative movement to be of a stick/slip type. The effect of this on the sealant can be more severe than a steady expansion and contraction.

SEAL SHAPE

For optimum performance the ideal profile for the sealant is rectangular with a width to depth ratio of approximately 2:1; the ratio should never be less than 1:1 with a minimum thickness of 5 mm.

For other shapes such as a trapezium profile the result can be a less even distribution of stresses through the sealant, but for surface mounted joints where the triangular joint with backing rope is used the stresses are much less than in building movement joints.

Movement stresses produced in the sealant profile are reduced as the volume is increased.

PREPARATION

Inadequate joint surface preparation is the major cause of failure of sealant jointing systems.

Contamination, generally dust, damp, oils, greases, corrosion products, protective coatings etc must be thoroughly cleaned from the proposed adhesion faces prior to commencement of the installation.

In many cases the faces will require treatment with appropriate primers prior to the installation of the sealant itself, this is to ensure a sound bond. Sealant manufacturers can advise on suitable primers. In joints where the two working surfaces are constructed with different materials it can be necessary to use two types of primer. The common omission of primers for cost saving reasons is very unwise as the subsequent failure and the size of the bill for consequential losses will far outweigh the small sums saved.

INSTALLATION

The sequence of operations once the joint has been assembled will be as follows:

1. Clean and prepare as necessary.

2. Insert joint filler/cord as appropriate.

3. Position self adhesive bond breaker tape if required - ensuring it does not impinge onto the adhesive faces.

4. Prime adhesive faces as required.

5. Install sealant in full accordance with the manufacturers instructions; the surface of the sealant must then be tooled to ensure full compaction and full contact with the adhesive faces.

COMPATIBILITY

It is necessary to ascertain that there will not be any adverse chemical reaction between the sealant and the materials that it will be in direct contact with. Manufacturers can usually advise on this.

It should be noted that with PVC based membranes there will be an adverse reaction caused by the plasticisers migrating into the sealant which then degrades both products as well as reducing the adhesion levels. The use of appropriate primers can assist in mitigating this effect.

Always use sealants recommended by the membrane manufacturer.

CAUTIONS

It should be noted that silicone based sealants are likely to cause serious unsightly staining when in contact with masonry, especially stonework. It is not possible to remove the staining afterwards.

MAINTENANCE

As a minimum, joints should be inspected for signs of premature failure as part of the Client's annual inspection of the roof.

SEALING VAPOUR CONTROL LAYERS IN WARM DECK CONSTRUCTION

ROOF FIELD

Bituminous and self adhesive vapour control layers require no other sealant within the roof field. Polyethylene and other polymer-based vapour control layers must be sealed at all lap joints with a tape unless the specification clearly excludes this requirement. The minimum requirement is a flexible butyl tape of 15mm width. When applied over discontinuous decks such as trapezoidal metal, a temporary support must be placed across the troughs to ensure a sound bond.

SEALING FOR AIR TIGHTNESS

It is important to establish whether the design requires the vapour control layer to act as a barrier to air leakage at the roof perimeter and/or at details. If so, this sealing must be achieved by providing an air barrier in contact with the underside of the insulation. Where the abutment is a smooth, medium absorbency

finish such as oriented strand board, ply wood or metal, a butyl sealant may suffice. On backgrounds of high absorbency and irregular finish such as masonry and concrete blockwork a primer may be required, together with a means of mechanical restraint. The single ply membrane manufacturer should be consulted.

SEALING TRAPEZOIDAL METAL DECKS

The use of a separate vapour control layer is recommended in warm roof constructions if proved necessary by calculation. However there may be special situations where a sealed deck, which obviates the need for a vapour control layer, is a practical alternative. In these situations it is important that the deck is sealed with a product capable of accommodating long-term structural and thermal movement without reducing the performance of the sealant because future repair will be very difficult. SPRA has adopted the recommendations of the MCRMA (see references) as follows: a single line of 6 x 5mm tape or 6mm diameter bead sealant positioned 15mm from each end of the sheet lap.

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