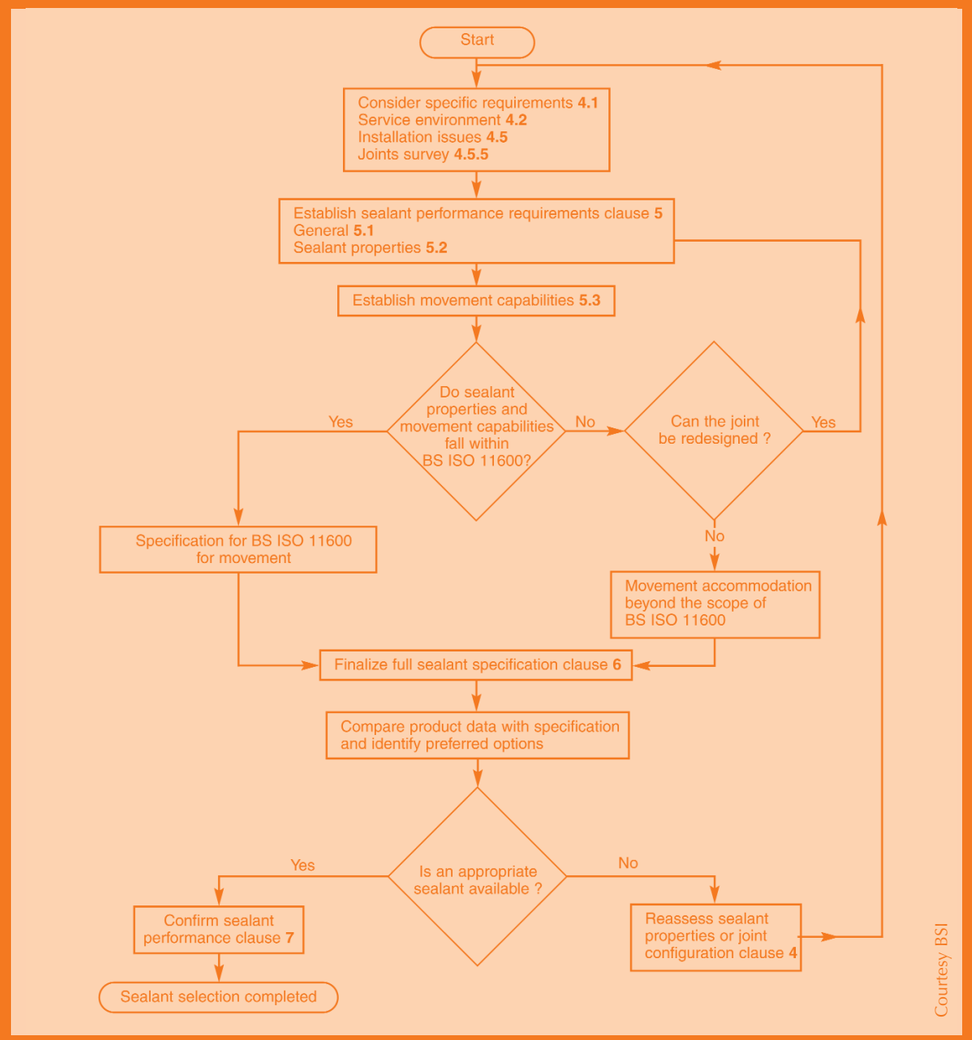
The BASA Guide to the British Standard BS 6213

- Selection of Construction Sealants



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The British Adhesives & Sealants Association

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The Sealant Manufacturers Group within the **British Adhesives and Sealants Association (BASA)** has undertaken to promote the use of BS 6213 and ISO 11600 (classification of Sealants for Building Construction) for the mutual benefit of the manufacturers and users of sealants in construction and glazing. These two standards, together with BS 6093 (Design of Joints and Jointing in Building Construction) and BS 8000. Pts 7 and 16 (Workmanship on Building Sites) form a powerful suite of standards, which if applied properly, will promote high quality products, increase sealant durability and improve site practice. At the same time poor products and application will be marginalised.

BASA is committed to raising standards in the industries it represents. In addition to this Guidance Note, the sealant manufacturing companies in BASA offer lectures and seminars on the selection of sealants.

The BASA Guides to ISO 11600 and BS 6213 can be downloaded from the BASA website www.basa.uk.com

For further information contact The Secretary.

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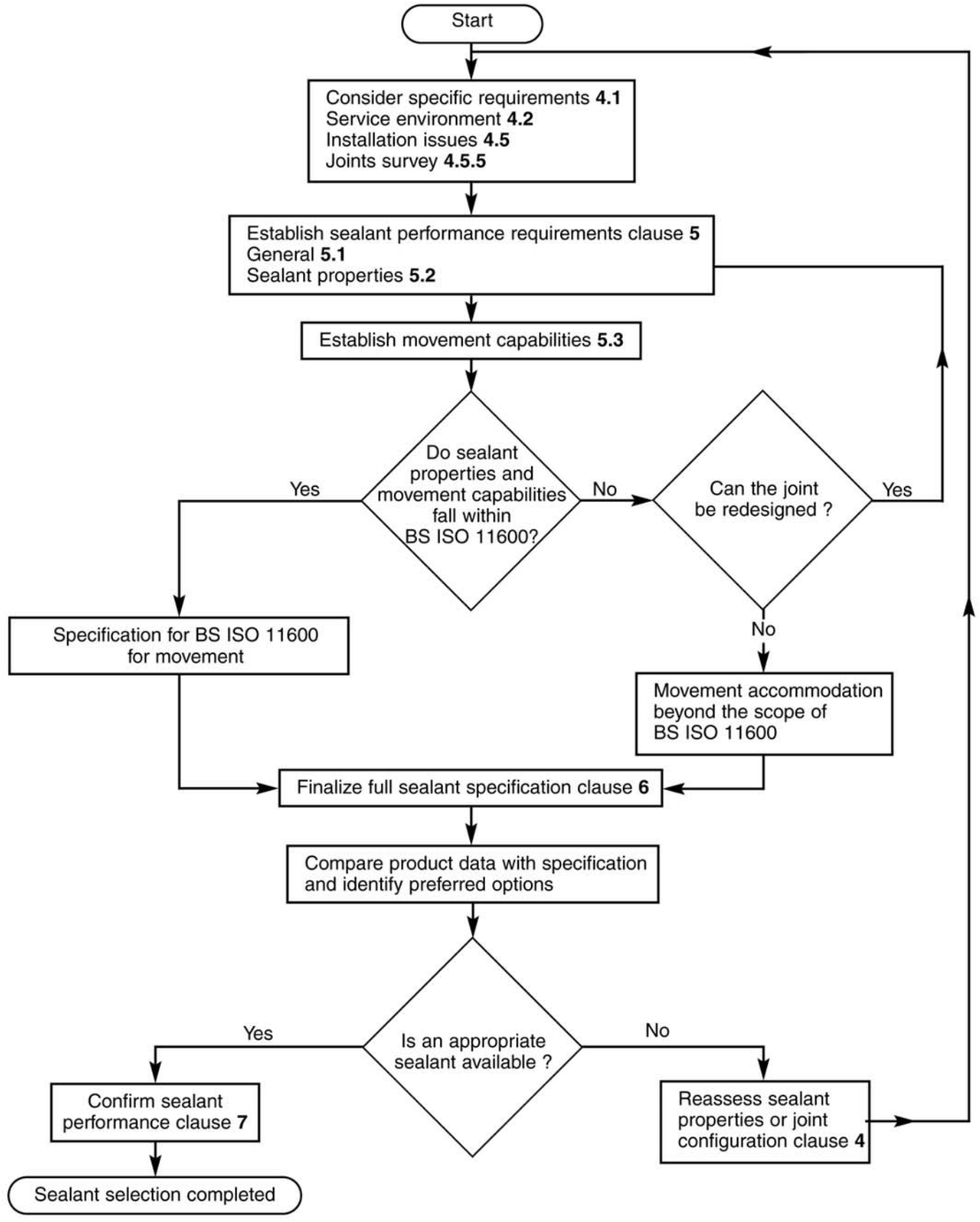

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Conclusion

The new BS 6213 represents a significant advance in the selection of sealants for building construction. By following a series of steps, laid out as a flowchart, the specifier can describe the required sealant in considerable detail. The specification will correctly select the movement capability of the sealant, as classified in ISO 11600. Elasticity and modulus can be specified. The requirements of the sealant with respect to the environment in which it will perform can be fully defined. Consideration is given to the application of the sealant on site – slump, flow, work life, cure time. Finally, with the specification written, the sealant manufacturer not only has to match it with a suitable product, but provide evidence of satisfactory performance and durability in similar applications.

If no sealant that meets all the requirements of the specification is available, BS 6213 provides a pathway by which consideration can be given to modifying the specification.

The full and correct use of the procedures given in the new BS 6213 will take the guesswork out of sealant specification and selection.

Introduction

The first version of BS 6213 was published in 1982. This document was a useful guide to types of sealant, sealing technology, types of joints and sealant application. The selection of a sealant for a specific job relied on the use of tables in which types of joint and specific end use environments were matched against several generic types of sealant. The weakness of the process was in these tables. An application might suggest as many as sixteen different sealant types, all apparently of similar performance and suitability. The text did warn that all the sealants indicated might not be of equal durability and fitness for use. This warning applied both to the different generic sealant types and to the products within a single generic group. It was suggested the specifier sought assurances from individual sealant manufacturers.

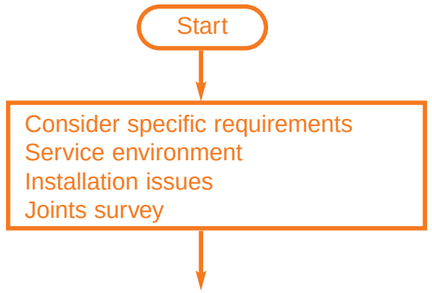
BS 6213 was completely rewritten in 2000.

The new BS 6213

The revised BS 6213 gives comprehensive guidance to the selection of a sealant for a specific application. In defining a suitable sealant, the specifier is taken through a process, starting with the designed joint in its environment and finishing with a list of specific properties and performance requirements. The end product is *a full specification for the sealant,* including its class according to the newly revised ISO 11600. At no point in this process are the generic, chemical names of products given or specific chemical types of sealant recommended, i.e. it is a *performance* specification, which sealant manufacturers have to match with products. A specific aim of the process is that specifier and sealant manufacturer(s) work together to select the correct sealant for the application.

The Flow Chart

The new BS 6213 uses a flow chart to take the specifier from the designed joint through to the final sealant specification. Boxes in the flow chart cross-reference the relevant clauses in the document. The following text considers the key elements of the flow chart:



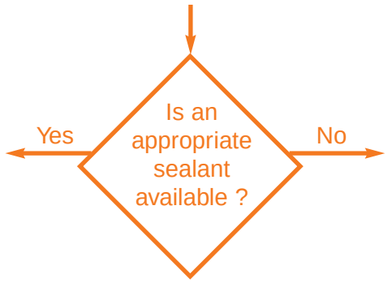
Step One

The Standard does not write in detail about designing joints, but references BS 6093, *Code of practice for design of joints and jointing in building construction.* Thus, the starting point for sealant selection in BS 6213 is the designed joint, either in new buildings or in remedial work. For new build it is assumed that the designer has considered the potential for movement in the joint and any limitations this might put on effective, durable sealing, i.e. the designer is aware of sealant movement capability. Because of the complexity of the joint design in some structures, the designer must be aware that the movement is not always distributed evenly and must calculate the *maximum* movement to which the sealant might be subjected in a particular sealant run.
It is this that will determine the required sealant movement capability.

BS 6213 points out that for the resealing of a joint it is useful to understand the reasons for the failure of the original sealing system, eg: excessive movement, failure of the substrate, adhesion loss, mechanical damage etc. Whether it is possible or not to determine this, it is important to evaluate the joint and understand its movement patterns in order to determine the movement capability of the sealant to be used.

For a sealant to work in a joint over a long period of time there are many requirements which have to be met. BS 6213 makes it clear that the requirements are determined not only by the design of the joint, *but also by the environment in which the sealant will be placed:*

- The geographical location and orientation of the joint will determine the daily and annual temperature ranges experienced by the joint. These, plus the thermal



Question Two

BS 6213 now asks the specifier one more question:

Is an appropriate sealant available?

Once again the flow chart gives two options. If a good match between specification and an available sealant is found (**Yes**), the specifier can write the sealant into the specification.

N.B. this process is a very precise way of specifying a sealant and *therefore the term* 'or similar' *is no longer acceptable*.

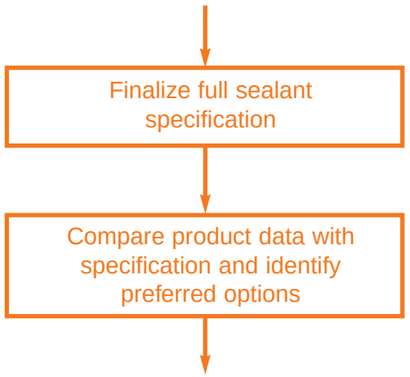
If a match cannot be found (**No**), it is necessary for the specifier (ideally in co-operation with the sealant manufacturer) to reassess the requirements. Quite often the specification can be relaxed without compromising the durability of the sealed joint.

BS 6213 suggests the specifier makes one final important check on the chosen sealant:

Step Six

Can the sealant manufacturer produce evidence of the selected sealant being used in a similar joint in a similar environment? If such evidence is offered, the specifier must seek assurances that the sealant offered is identical to the one described in the case histories, i.e. the formulation of the sealant (and primer system if used) has not changed.

If the specifier is not fully satisfied by the evidence of performance, further testing should be requested. If the specifier is fully satisfied, the end result is a sealant, which matches a very precise specification. If the sealant is correctly applied it should perform satisfactorily for the design life of the joint.



movement according to the test BS EN ISO 9047. As MAF is only one of many sealant properties, the specifier must also obtain written assurances from the sealant manufacturer that *the sealant will continue to perform with this high MAF over the lifetime of the sealed joint – whatever the end use environment.*

The specifier should by now have listed out all the main requirements of the sealant for the joint (i.e. the specifier's ISO 11600 designation *plus* other sealant properties)

Step Four

BS 6213 emphasises that if there is any doubt about the sealant performance in the specific joint to be sealed, in the specific environment of the structure, the specifier should seek further professional advice from experts in the fields of sealant technology or construction.

Armed with the full specification, the specifier can now compare the requirements with available commercial sealant products:

Step Five

If the specifier has not involved the sealant manufacturer in the selection process so far, now is the time to do so. Only the sealant manufacturer can know with confidence if a perfect match is available or, alternatively, discuss the sealants, which come nearest. The sealant manufacturer will select a sealant with the required ISO 11600 designation and match wherever possible the other sealant requirements.

Sometimes the sealant manufacturer will have to carry out further assessment of the proposed sealant. For example it may be necessary to confirm the sealant adheres to and is compatible with a special substrate material. Staining tests on natural stone is a good example.

characteristics of the substrate materials, enable the designer to calculate the maximum amount of movement the joint will see. The designer should also think about the likely *speed* of movement. Materials, which expand and contract rapidly in response to rapid and large changes in temperature (e.g. black coated metal, plastics), will require the use of highly elastic sealants.

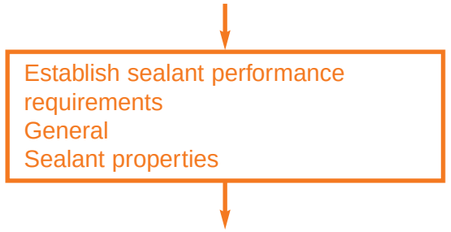
- Exposure to weather (including potentially damaging UV radiation).
- Exposure to external influences, such as water immersion, chemicals, abrasion, traffic etc.

The specifier also has to consider and list out some of the fundamental descriptors of the sealant:

- Slump resistant or self levelling?
- Colour.
- Ability to adhere to the specific substrate(s) used in the joint.
- Interaction with adjacent surfaces (e.g. non-staining, compatibility with coated or treated surfaces).
- Surface priming (the sealant supplier will advise whether this is necessary for adhesion or for the protection of adjacent surfaces).

- and take into account the needs of the applicator and the location of the joint:

- Work life of the sealant (important if the joint to be sealed is difficult to access).
- Cure time of the sealant (important if the joint being sealed is likely to experience considerable movement during and immediately following installation).
- Surface preparation (especially the removal of residual sealant when resealing a joint).



Step Two

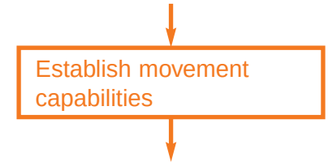
The next step in BS 6213 is all about determining the sealant classification according to ISO 11600, *Building construction - Sealants – Classification and requirements*. (For a full explanation of this standard and its application see the ***BASA Guide to ISO 11600 on our website www.basa.uk.com***):

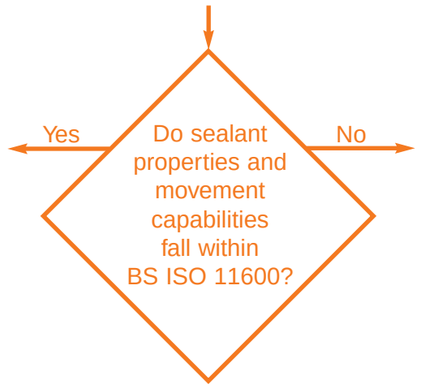
There are three key parameters in ISO 11600 relevant to the performance of the sealant in the joint:

- Elasticity. If a joint is going to experience significant cyclic movement (a 12.5% increase of the minimum joint width or greater), the sealant selected has to be from the elastomeric Class E. Joints which are going to experience high movement (up to 25% increase of the minimum joint width) and rapid movement, will require sealants which are highly elastic.

  Joints which are expected to move very little, or not at all, can accept sealants from the plastic Class P. In between these two classes are the so-called 'elasto-plastic' sealants. Because they have the property of stress relaxation, such sealants find use in joints which are expected to move significantly, but only once (e.g. in structures which settle). There is no 'elasto-plastic class in ISO 11600. If necessary, the sealant supplier can help the specifier select such a sealant.

- Modulus. There are two classes in ISO 11600, low modulus (LM) and high modulus (HM). For most joints which move a lot and rapidly, elastic low modulus sealants are used. These put less stress on the substrate materials and on the adhesive bond between the sealant and the substrate. However, if the sealant is likely to experience external influences such as foot traffic or vandalism, a tougher, high modulus sealant can be specified. For cold climates, it is important to remember that modulus can increase as the temperature falls.





Movement Accommodation. The third of the three key parameters in ISO 11600 is the ability of the sealant to accommodate anticipated joint movement:

Step Three

Sealant movement capability is a critical property for the durability of a sealed joint. BS 6213 clearly states it is important for the specifier to have correctly calculated the movement the joint will experience within the year. Only then can the movement accommodation factor (MAF) of the required sealant be specified. For this standard MAF is defined as:

$$\text{MAF} = \frac{\text{Total Movement} \times 100}{\text{Minimum Joint Width}}$$

Question One

BS 6213 now asks the first of two important questions:

Do sealant properties and movement capability fall within ISO 11600?

In ISO 11600 the MAF can be 7.5 or 12.5 or 20 or 25 and if the maximum joint movement is 25% or less, a sealant classified to ISO 11600 can be used (**Yes**).

If the maximum movement of a designed joint or an existing joint is found to be greater than 25%, then in principle no class of sealant can be specified using ISO 11600 (**No**).

If the answer is 'no', the BS 6213 flow chart offers two routes out. The first is to redesign the joint. However, if the joint cannot be redesigned, the second option is to specify a sealant with an MAF greater than 25. Before such a compromise can be agreed by all the parties concerned, the candidate sealant must not only meet all the requirements of the highest classes in ISO 11600, but will have been additionally tested to the required higher