CWCT CURTAIN WALL INSTALLATION HANDBOOK

Chapter 4 Gaskets

The CWCT is sponsored by:

Ove Arup & Partners
Bovis Lend Lease Ltd
Comar Architectural Aluminium Systems Ltd
Council for Aluminium in Building
Kawneer UK Ltd
Pilkington
Technal
Taywood Engineering
University of Bath

Centre for Window and Cladding Technology
November 2001

ISBN 1 874003 96 3

Published by
Centre for Window and Cladding Technology, University of Bath, Claverton Down, Bath BA2 7AY

This handbook was part-funded by the Department of the Environment, Transport and the Regions under research contract number 39/03/272 cc 862.

This handbook was written by the Centre for Window and Cladding Technology (CWCT) as part of its training programme to improve the standard of curtain wall installation.

It will be of benefit to all those installing, or supervising, the installation of curtain walling and other glazed building elements.

This is one of eight chapters from the CWCT Installers' handbook.

Introduction

The installation of facades and façade elements is one of the more complex operations on a construction site. It requires a range of skills and knowledge yet has not been recognised as a particular skill or trade. Façade failure, particularly water leakage, is the most common cause of failure in new buildings.

This handbook brings together advice on installation of curtain walling including all the major components: frames, gaskets, sealants, finishes, glass and fixings. It is based on experience gained by CWCT in setting up training centres for installers and in training main contractors' site supervisors.

The book explains why things should be done and highlights those things that are most critical to the success of curtain wall and window installation.

This Handbook is a guide to achieving better curtain wall installation. However, it is not a substitute for care and diligence, nor should it be a substitute for proper training. Full details of CWCT's training programme are available at http://www.cwct.co.uk/installers.

4. Gaskets

- **Function**
  Glazing gaskets are required to:

- Limit air leakage and water penetration
- Allow relative movement
- Distribute and absorb loads
- Accommodate tolerances

- **Materials**

There is a very wide choice of gasket materials available to the designer. Materials are selected for their ability to:

- Retain their shape
- Resist weathering
- Work at extremes of temperature
- Resist tearing

Cost is also of course a consideration when selecting a suitable gasket material.

Materials used to make gaskets can be grouped into families but within each family a wide range of performance can be achieved. It is wrong to assume that all gasket materials are the same because they are in the same family. Gaskets from one supplier should not be replaced with those from another without considering the performance requirements given above.

The most commonly used gasket materials can be grouped into the following families:

EPDM	
Shape retention	Good
Low temperatures	Good
Tear resistance	Good
Weathering	Good
Cost	Average

Neoprene	
Shape retention	Average
Low temperatures	Average
Tear resistance	Very good
Weathering	Average
Cost	Average

Silicone	
Shape retention	Good
Low temperatures	Very good
Tear resistance	Poor
Weathering	Very good
Cost	Expensive

Butyl	
Shape retention	Poor
Low temperatures	Good
Tear resistance	Average

Thermos-plastic rubbers	
Shape retention	Poor
Low temperatures	..
Tear resistance	..
Weathering	..
Cost	Average

Hypalon	
Shape retention:	Average
Low temperatures	Average
Tear resistance	Good
Weathering	..
Cost	…

- **Types**

Gaskets are made in a range of shapes and sizes as shown in Figure 4.1 and can be categorised in several ways as follows:

Type of seal
A weatherstrip is a gasket whose primary purpose is to prevent water entering a joint and which will normally be located on the exposed side of the joint.
A draughtstrip is primarily intended to prevent the passage of air through the joint and is normally located at the back of the joint.

Method of fixing
Three methods of locating gaskets are employed:

- Push-in gaskets are designed to be fitted into a groove in the mounting surface, prior to the formation of the joint.

- Drive-in or wedge gaskets are designed to be forced into the gap between the mounting surface and contact surface, usually as the last stage in sealing the joint. A drive-in gasket can usually be removed by pulling it from the joint, although it may be manufactured with a rigid strip that makes this difficult.

- Slide-in gaskets are designed to slide into a groove on the mounting surface, but must be installed from the end of the groove. A slide-in gasket can usually only be removed by sliding it out from the end of the groove.

- Slide in gaskets can only be installed as single lengths and corner joints have to be made after installation. Factory made joints perform better than site made joints.

Principle of operation
Most gaskets form a seal as a result of compression of the bulk material but some gaskets form a seal by deflection, either of a cantilevered arm or a hollow tube and others work by wiping contact with minimal deflection.

To seal effectively a gasket must remain in compression however the compression of the gasket will cause forces to be exerted on the contact surfaces of the joint. The joint must therefore be designed to ensure that when the joint is at its widest there is sufficient compression in the gasket to create an effective seal. However the gasket must also be capable of being compressed sufficiently to fit when the joint is at its narrowest in such a way that the forces on the contact surfaces do not damage the joint components or prevent movement.

Where a single gasket cannot accommodate the full range of possible joint widths due to manufacturing and erection tolerances, it may be necessary to have a range of gaskets available. The installer can then select the appropriate gasket by measuring the width of the joint gap.

The force exerted by a gasket in compression will gradually decrease over a period of time due to the effects of creep and stress relaxation. There will also be a reduction in recovery of compression when the load is removed.

Corners
Gaskets are either injection moulded or extruded. Most glazing gaskets and other gaskets used in the facade are extruded as continuous lengths. At corners the gasket has to be cut and joined.

The practice of bending the gasket around the corner is generally unacceptable as the cross section of the gasket distorts locally to the corner.

The following options are available for making corner joints:
- Cut extrusions to length and glue
- Cut extrusions to length and heat weld
- Cut extrusions to length and site vulcanise
- Mould corners and bond to extrusions
- Mould corners onto extrusions

All of these methods will produce a single gasket that forms a continuous seal around the infill panel or glazing. This is recommended for the inner (air) seal of a curtain wall, Figure 4.2.

For window glazing and for the outer (water) seal of a curtain wall it may be acceptable to mitre the corners of the gasket and make an unbonded butt joint at each corner.

• Installation

It does not matter how much effort is expended in designing the perfect joint and the perfect gasket if it is then installed by an untrained workforce with little appreciation of the performance requirements of a sealed joint.

Basic good practice includes:

- Careful handling of the gaskets to avoid damage
- Cleaning of joint surfaces including removal of swarf. Lubricants may be used to ease fitting of gaskets but must be compatible with the gaskets and adjacent materials.
- Leaving gaskets unpacked in a warm environment to relax and recover their natural shape prior to installation is also recommended although this may leave the gaskets prone to damage.
- The gasket should be inspected before installation and discarded if visible defects such as cuts and abrasions are found.

Temperature may affect the flexibility of the gasket and width of the joint. Generally it is not recommended that gaskets are installed at temperatures below 5°C and even at this temperature the joint may have opened up due to thermal contraction of the components, leading to the risk of crushing the seal at higher summer-time temperatures.

The correct gasket should be used. The size of gasket to be used depends on the frame dimensions and thickness of the glazing unit or infill panel. Different sizes of gasket may be available to accommodate different glazing types and tolerances.

Gaskets that are undersize and easy to insert will not be compressed and form a proper seal throughout the life of the wall. Gaskets that are too tight and are forced into position may crush the edge of the infill.

Gaskets that are stretched as they are fitted will return to their original length after installation leaving gaps at any butt joints. Gaskets should be cut slightly over size and compressed lengthways as they are fitted. Fitting commences from the ends followed by the middle, Figure 4.3. Gaskets are available with co-extruded cords that prevent stretching of the gasket. Gaskets should not be twisted or folded during fitting.

Most glazing systems are designed to be dry glazed using only gaskets. However some systems require the use of a sealant with the gasket. This need arises with special systems such as blast resistant glazing. This should be done in accordance with the system designer's recommendations. The arbitrary use of sealants in combination with gaskets should not be allowed.

Like sealants, gaskets are a target for cost cutting. A fabricator will buy cheaper gaskets from another supplier just to save a few pence on the cost of each metre length, without any form of guarantee that the new gaskets will perform satisfactorily. The cost of even a small amount of water leakage, in terms of problem rectification/damage repair never justifies the initial cost saving, but the capital cost saving is made by the fabricator, who rarely sees the clients' costs of repair.

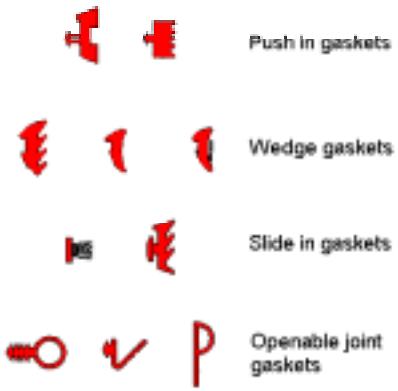

Figure 4.1 Types of gasket

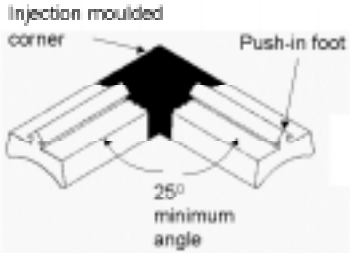

Figure 4.2 Moulded gasket corner

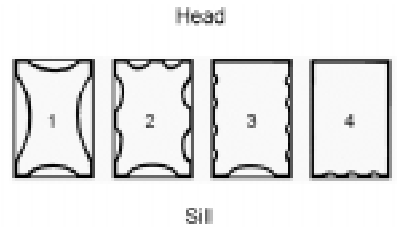

Figure 4.3 Sequence of fitting a dense gasket