

Method statements for the construction of building envelopes

Method statements are essential for the safe construction of building envelopes that meet the Client's performance requirements. This Technical Note describes the process of writing a method statement and gives guidance on appropriate structure and contents.

Introduction

A method statement describes the way in which the building envelope is to be constructed. It will be concerned with safety, quality and logistics.

The CWCT Standard for systemised building envelopes requires that a method statement is prepared, and followed, on each contract (*Clause 7.5.2*). It is also a requirement of National Building Specification cladding sections H11, H13, H42 and H92.

On a project, each Building Envelope Specialist Contractor should produce a method statement describing the package of work for which they are responsible. This has to correlate with the method statements of Specialist Contractors undertaking adjoining work including the primary structure and any services that penetrate the building envelope.

The method statement has to be acceptable to the Main Contractor and the Architect may want a role in reviewing the method statement.

The Main Contractor should produce a method statement for the whole project. This will comprise the method statements for the individual work packages, including cladding.

The Main Contractor has a responsibility for:

- Defining the scope and extent of work in each package
- Assigning responsibility for particular work at package interfaces
- Ensuring that the separate method statements correlate with each other and that taken together they cover all aspects of the work
- Submitting relevant method statements to the Architects/Consultants.

Status and function of a method statement

A preliminary method statement will often be submitted with a tender bid. This sets out how the Specialist Contractor proposes to undertake the building envelope construction. A detailed method statement has to be produced before construction begins.

The detailed method statement should be prepared with the same care and thoroughness required for specification or design.

A method statement may be a file of documents including:

- Safe systems of work,
- Lifting plans,
- Quality plans.

All documents included in the method statement should be consistent with each other. It may be appropriate to include some information as drawings which should be properly cross-referenced.

Parts of the detailed method statement may be included in the project health and safety plan to comply with the Construction Design and Management (CDM) Regulations. There is a legal requirement for a risk assessment of work procedures to be carried out prior to commencement of work, and for the outcome to be communicated to the work force. Safe systems of work and lifting plans within a detailed method statement are a good way of doing this.

The detailed method statement will also describe quality procedures to show that the building envelope is being constructed to the required standards of performance and quality.

The terms safety method statement and quality method statement are sometimes used and on

some contracts separate documents are prepared. The use of dual method statements may occur because different individuals in an

organisation have responsibility for safety and for quality. However, a single method statement bringing together all aspects of the work that affect safety or quality is preferred. This is more likely to give consistent methods of working. Operatives undertaking the work have a single method of working and require a single set of instructions.

The Specifier or Main Contractor may require a single method statement.

Writing a method statement

Method statements should be bespoke to a particular contract (design and specification) and take account of:

- Nature of the work including type of building envelope, supporting structure and interfaces,
- Programme and sequence of work,
- Site location and configuration including space available to the Specialist Contractor,
- Site specific restrictions such as noise or traffic control,
- Client requirements for inspection and testing.

The Specialist Contractor should prepare the method statement. It may incorporate method statements by sub-contractors such as glazing contractors or sealant applicators.

The Specialist Contractor will require information from the Main Contractor before preparing the method statement. This will include:

- Site location and access
- Space available to the Specialist Contractor
- Site restrictions
- Client and Main Contractor requirements for inspection and testing
- Attendances

The writing of a method statement is an organic process starting with a preliminary method statement written by the Specialist Contractor and ending with a detailed method statement that is acceptable to both parties.

Figure 1 shows the sequence of activities of the Main Contractor and Specialist Contractor required to develop an agreed method statement. They are:

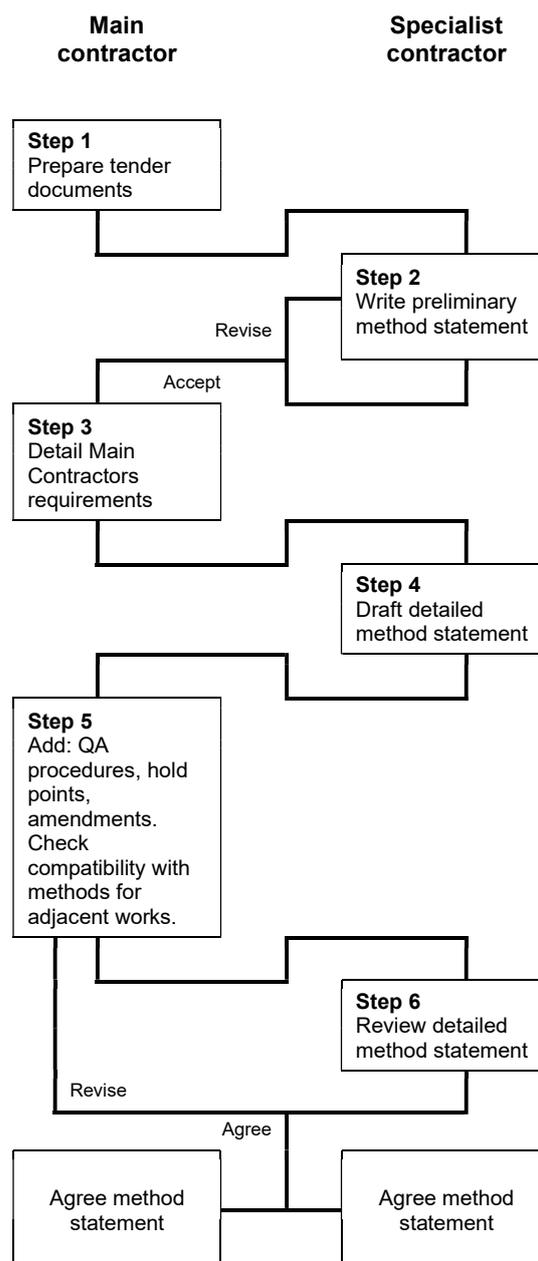


Figure 1 Steps to develop a method statement

Step 1: Preparation of tender documents

The tender documents should contain sufficient information to enable the Specialist Contractor to propose a form of construction that satisfies:

- General arrangement
- Design intent
- Specification
- Programme
- Site constraints

Step 2: Submission of preliminary method statement

When responding to a tender enquiry a Specialist Contractor should provide a preliminary method statement describing the

form of construction proposed. This should include:

- Method of construction (stick/unitised/rainscreen)
- Sequence of construction
- Methods of access
- Lifting equipment required
- Storage requirements
- Attendances

The Main Contractor may want the Specialist Contractor to add detail to, or modify, the preliminary method statement prior to accepting the tender. The Client and Architect may wish to review any modifications.

Step 3: Set out Main Contractors requirements

The Main Contractor will then set out requirements in more detail. These may include:

- Safety procedures
- Skills of personnel
- Handling procedures
- QA procedures
- Supply of drawings

Step 4: Prepare detailed method statement

The Specialist Contractor should prepare a detailed method statement based on the design of the façade.

The detailed method statement should include:

- Method of construction
- Sequence and timing of construction (including co-ordination with other work packages)
- Personnel
- Skill levels
- Method of access
- Handling and storage arrangements
- Critical dimensions
- Site assembly drawings
- Quality procedures
- Materials to be used
- Pre-construction and site testing
- Non-compliance procedures
- Methods of protecting completed work
- Damage and fault remediation methods
- Handover and commissioning
- Procedures for amending the method statement

These are described in greater detail in the Appendices to this Technical Note.

Step 5: Main Contractor review of method statement

Once prepared, the draft detailed method statement should be reviewed by the Main Contractor. It should be checked for:

- Completeness
- Compliance with health and safety legislation and Main Contractors safety requirements
- Acceptability of proposed methods
- Coordination with adjacent work packages

The Main Contractor may also wish to add:

- Additional QA procedures
- Defined stages of construction, known as 'hold points' where approval of work is required before following work commences.
- Additional safety measures and limitations

The Client and Architect may also wish to be involved at this stage.

Step 6: Specialist Contractor review

The Specialist Contractor should review the method statement as revised by the Main Contractor.

The Specialist Contractor has either to accept the revised method statement or to make alternative proposals.

Step 5 and step 6 become an iterative process until a method statement is developed that can be agreed by both the Main Contractor and Specialist Contractor.

The Architect may wish to review the method statement to ensure that it:

- Describes required quality inspection and testing regimes,
- Complies with other requirements in the Specification
- Ensures construction in compliance with the specification.

Best practice is for the Main Contractor to have an individual or team responsible for co-ordinating design and construction work of Specialist Contractors. Various job titles have been given to this role including 'design co-ordinator'. On more complex projects some Main Contractors deploy façade specialists to review design proposals and method statements.

It should be remembered that method statements should be organic and change to recognise circumstances that evolve as the contract proceeds. This should not be a random process and the method statement should include a process for agreeing changes to the method statement.

Structure of a method statement

Method statements should be clear, comprehensive and realistic.

They should be prepared with the user in mind, particularly for use at site by those who need to access and understand them. Simple diagrams such as those shown later in the Appendices to this Technical Note may be easier to understand than words.

It may be desirable to highlight elements of the method statement that relate to safety or are otherwise mandatory. However, this can create the impression that other elements are less important.

Contents

Method statements should include the elements described in the appendices to this Technical Note. However, this scope is not exhaustive and particular contracts may require the inclusion of other items.

The level of detail should be determined on a contract-by-contract basis. Particular features of a contract should be covered in greater detail if they are:

- Complex
- Novel
- Critical to safety or performance

These may be emphasised by the use of 'toolbox talks' or briefing of supervisory staff.

A very large document is unlikely to be read fully. A document that may be broken down at site into useful relevant sections is more likely to be implemented.

Change of method statement

The method statement agreed at the commencement of a project may have to be revised to account for design changes, programme changes, changes to the design or programme of adjacent works.

A method statement should contain clauses setting out how it may be amended. These should include details of who is authorised to make changes to the method statement and who should be consulted before any changes are made. Interested parties may include:

- Main Contractor
- Specialist Contractor
- Contractors for interfacing work packages
- Architect
- Client

The process for issuing amendments to the method statement and clearly identifying which is the latest version should also be set out.

References

CWCT (2006) - Standard for systemised building envelopes

CWCT (2003) – TN35 Assessing the appearance of glass

CWCT (2003) – TN36 Assessing the appearance of metals and finishes

National Building Specification

- Section H11 Curtain walling
- Section H13 Structural glass assemblies
- Section H42 Precast concrete panel cladding
- Section H92 Rainscreen cladding

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The Studio, Entry Hill, Bath, BA2 5LY

T: +44 (0) 1225 330945
cwct@cwct.co.uk
www.cwct.co.uk

Methods of construction

General method of construction

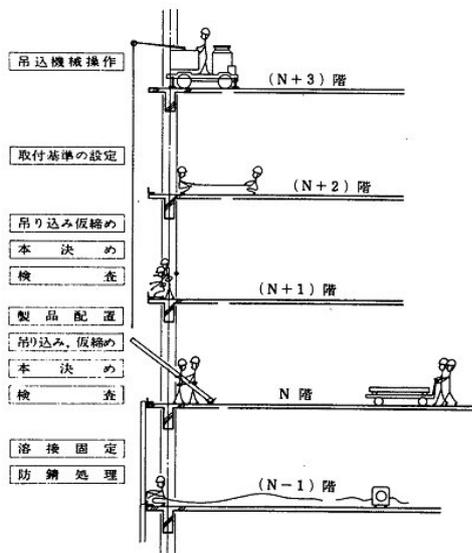
This section of the method statement should describe the different cladding zones included in the work package. It should describe clearly the form of construction (stick/unitised/rainscreen) and the size of any preassembled elements.

It should also describe the method of supporting the cladding from the primary frame and the means of accommodating movement of both the structure and the cladding.

Methods of installation and access

This section of the method statement should describe the methods of installing the different types of cladding in each zone. It should show the sequence of activities, how components are lifted and where they are stored if necessary

This may include drawings as follows:



This section should also describe the means of access for:

- Installing brackets
- Installing flashings
- Erecting mullions and transoms or panels
- Installing windows
- Glazing
- Sealing
- Protecting
- Cleaning down
- Remedial work.

Means of access may include:

- Working from the floor slab
- Scaffolding
- Free standing elevating platforms
- Mast climbing platforms
- Cradles.

Note that scaffolding and mast climbing platforms may be designed to match the geometry of the building envelope, bespoke platforms and rising scaffolds may have to be procured well in advance of erection of the façade.

Sequence of work

It is necessary to describe the sequence of work to enable coordination with adjacent work packages.

This section of the method statement should set out the sequence of work in terms of:

Enabling works:

- Installation of brackets
- Construction of adjacent cladding packages (if necessary).

Installation:

- Erection of frame/panels
- Window installation
- Glazing
- Fixing of brise soleil.

Following works:

- Sealing
- Protecting
- Cleaning down.

Some stick curtain wall frames do not have to be erected in a particular sequence whereas unitised wall normally has to be erected in a rigid sequence.

Handling and storage

The logistics of handling and storing the materials, components and assemblies will have been described in the general description of the construction method. This section of the

method statement should give greater detail of handling and storage requirements and facilities.

It may be more appropriate to give detailed handling and storage material in the sections on particular materials, components and assemblies and to give a summary here.

Details should be given of internal and external storage areas and weights of materials to be stored.

Weights of materials to be lifted by crane and by hoist should be given.

Setting out and critical dimensions

This section of the method statement should, along with the construction drawings, describe the setting out points to be used for the structural frame and for the cladding. The specification and drawings should show the tolerances allowed on the final dimensions of the wall.

Critical dimensions should be given. These are dimensions and positions of interfaces, boundaries and some intermediate points. Critical dimensions may relate to:

- Overall dimensions of a facade
- Interfaces between different building envelope packages
- Interfaces with ventilation openings and other building services penetrations
- Correlation of mullions and columns of the primary structure
- Interfaces with internal partition walls

The position and dimensions of components may affect the loads in the components and the transfer of loads in the structure. In particular brackets installed with too great an overhang will:

- Be subject to greater bending moment
- Impose greater loads on the fixings
- Have greater potential to crack the edge of a floor slab

Limits to position of brackets should be regarded as critical and given in the method statement.

Allowance for movement

Joints in the building envelope may have been designed to accommodate movement. They will also be used to accommodate tolerances

on the size of components and the supporting structure

It is important that the width of a completed joint is adequate to accommodate movement. Minimum widths of movement joints should be included in the method statement or on construction drawings.

Temporary conditions

A partially constructed wall may be subjected to different loads than the completed wall and may have less strength.

Requirements for temporary fixings securing glass and panels should be included in the method statement. They may be described in detail under the different material and component method statements and a summary given here. Limitations may be placed on the use of some temporary fixing arrangements at times when high winds are expected.

The construction of some glass assemblies, particularly suspended glass screens involves the progressive transfer of load to the supporting structure. In some cases a temporary load is applied and gradually removed as the weight of the glass is added to the structure. Any operations involving complex load transfer should be detailed in the method statement. The sequence of operations should be given and the responsible individual should be named.

Interfaces

Interfaces between adjacent building envelope packages, between the envelope and supporting structure and with any services that penetrate the envelope should be identified in the method statement.

The Contractors responsible for design and construction at each interface should be listed with along with the extent of their responsibility.

Protection of completed work

This section of the method statement should identify materials and components that require protection during subsequent activities. These may include, but are not limited to:

- Glazing
- Metal finishes.

The type of protection required will depend on following activities. In particular

- Zones adjacent to access routes may require more robust protection.
- Protection may be required where preparatory work is carried out above erected cladding.

There are two approaches to protecting completed work:

- The Specialist Contractor may be required to protect work as it is completed and leave protection in place until all subsequent work is complete;
- Contractors responsible for subsequent work may be required to provide local protection for the duration of their activities.

Some of the activities that may cause damage to the building envelope are:

- Dismantling of scaffolding;
- Use of mortar and plaster;
- Welding, gas cutting and other hot work;
- Use of angle grinders.

Quality assurance and testing

Quality procedures

Quality procedures based on the principles and guidelines embodied in ISO 9000 should be developed specific to the needs of the contract.

This process should be auditable through the supply chain and principal suppliers should operate comparable quality systems.

The quality system will be based on inspection procedures, testing, checklists and audits. These should be developed at the time of detailed design and agreed before the commencement of fabrication.

Personnel

The individuals responsible for ensuring quality and managing the quality systems on the contract should be given. This should include:

- Main Contractor
- Specialist Contractor
- Sub-contractors
- Principal suppliers.

Skill levels

The minimum acceptable skill levels of installers/operatives should be set out. This requirement may be given as a absolute minimum for any individual or may state the minimum proportion of installers/operatives to be of a particular skill level.

CWCT administers a training scheme for curtain wall installers. Trained installers will be able to show a 'CWCT installers card'.

Schemes operate for other skills. In particular the method statement may require operatives using suction lifters to move glass to be trained in use of the equipment.

Certification

Any requirement for products or assemblies to have certified performance should be given in the method statement.

CWCT operates a certification scheme for the integrity of building envelopes.

BBA operates certification and quality schemes for many products and issues Agrément Certificates.

BSI operates certification and quality schemes for many products and issues 'Kitemarks'.

In all cases it is necessary to agree that the certification scheme is acceptable for the particular use to which the material or assembly will be put. For example:

- Are the dimensions of a curtain wall different from those certified?
- Is a cladding panel or render applied to the same background structure?
- Is the environment the same when considering corrosion?

Testing

Testing may be undertaken pre-construction or during the construction phase.

Pre-construction testing is described in CWCT Standard for systemised building envelopes (2006). The detailed method statement should be modified to include any construction changes introduced as a result of the pre-construction testing process.

During construction the following tests may be required:

- Strength of fixings
- Strength of permanent safety devices
- Water permeability testing:
 - Hose test
 - Spray bar
- Whole building air leakage testing
- Thermal imaging

For each test required the method statement should set out:

- Test procedure
- Testing authority
- Reports required

It is also necessary to state any pre-requisites for the test, for example:

- Weather conditions
- Restrictions on other site operations

- Work stages that must be completed for the test to be valid
- Work stages that must not be carried out to allow a test or remedial work to take place.

Inspection

Inspection of work in progress or completed work will form part of the quality procedures. The method statement should state who is responsible for inspection:

- Self-inspection by Specialist Contractor
- Inspection by Main Contractor
- Independent inspection by a consultant or other third party

Requirements for recording inspections should also be given.

Hold points

Method statements should detail any hold points and state who is responsible for giving approval prior to allowing following work to proceed..

Examples of hold points are:

- The torque of bolts in brackets and fixings should be checked before anything is hung from them,
- No glazing should be installed until a pre-glazing check of the glazing frame shows it to be satisfactory,
- Sealants should not be applied until the joints and back up material have been inspected.

Non-compliance procedures

If at any stage of the construction process materials, components, assemblies or workmanship are not compliant with the specification and method statement some action will be required.

The method statement should state who is required to agree any action in response to a non-compliance issue.

Possible actions include:

- Training in compliant procedures
- Remaking components
- Design changes
- Remedial work

Remedial work

A probable outcome of non-compliance will be a requirement for remedial work. It is unlikely that a method statement will be able to cover all scenarios leading to remedial work and acceptable methods. Rather this section of the method statement should set out who should be consulted regarding the acceptability of remedial work.

Handover

Handover of the building envelope should involve:

- Removal of protection
- Cleaning down
- Final inspection of finishes and glazing
- Demonstration of operation
- Inclusion of information in the Building Manual

The method statement should detail procedures for handover and give checklists to be used at this stage.

Materials, components and assembly

Materials

Separate sections of the method statement should cover the different materials, components and assemblies and their installation. These may form method statements that can be used as part of QA procedures or project specific training.

It may be appropriate to summarise some of this detail in the sections on general construction methods and quality procedures.

Brackets and fixings

Depending on the type of bracket and fixings the method statement should show:

- Maximum outreach allowed for a bracket
- Minimum edge distance for fixings into slabs
- Maximum shimming distances
- Minimum embedment depths for bolts

The method statement should detail the correct torques for fixings and bolts and the quality procedures to be followed.

Expansion bolts should not be tightened to the required torque more than once to avoid the risk of cracking the concrete. Possible checking procedures are:

- Painting bolt heads after checking
- Using collapsible torque indicating washers

Components assembled at site

Assembly of components at site may be complex and involve numerous small components such as preformed seals or the use of wet applied sealants. To enable quality inspection of the assembly process, drawings such as figure C1 should be provided showing all of the parts and the assembly sequence.

Most system supply companies are able to provide these drawings. Similar drawings are essential for the assembly of a bespoke wall.

Even if a standard system is being used the interfaces at the head, sill and sides of the assembly are likely to be bespoke to the project. These are the details that will be unfamiliar to the installer and assembly drawings should be provided to show the

installation and sealing of internal sills, flashings, DPMs and air barriers.

Similar considerations apply to the installation of windows into rainscreen or rendered walls.

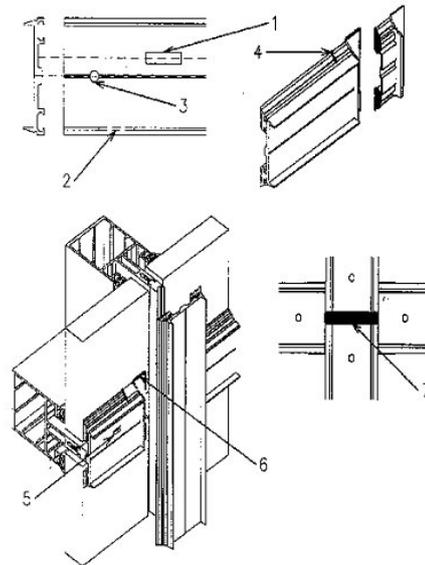


Figure C1 Assembly diagram

Finishes

The quality of finishes is one of the most frequent and hotly disputed issues on envelope contracts. The method statement should state clearly:

- Methods of acceptance testing
- Requirements for protection of finishes
- Methods of inspecting the constructed works

It is recommended that samples showing the limits of colour, gloss and texture of the surface should be provided by the Specialist Contractor and agreed by the Architect and Main Contractor prior to manufacture. These samples may be used as the basis for accepting or rejecting finishes. The method statement should state what reference samples are to be provided and whether finishes should be inspected at the factory or at site.

Profiles are normally finished and then cut to length. Finishes should also be inspected for

edge damage that could be a cause of corrosion.

CWCT TN36 'Assessing the appearance of metals and finishes' gives guidance on assessing the appearance of the completed envelope.

Glass and glazing

Damage to glass and imperfections in glass are one of the principal causes of dispute on building envelope contracts. Faults with glass may lead to poor appearance, early failure or loss of performance.

Pre-installation checks should be described in the method statement. They should include:

- Dimensions
- Bowing, warp and roller wave
- Make up of glazing units
 - Glass types
 - Glass thickness
 - Gas filling
 - Correct edge seals
- Surface damage
- Edge damage

Glazing checks may be carried out during the glazing process. These should be described in the method statement. They may include:

- Position of setting blocks
- Use of anti-walk blocks
- Adequacy of drainage routes
- Edge cover

Post glazing checks should be described in the method statement. They should include:

- Use of safety glass as appropriate
- Correct orientation of:
 - Safety glass
 - Coated glass
- Appearance

CWCT TN35 'Assessing the appearance of glass' gives guidance on assessing the appearance of the completed envelope.

Sealant joints

The nominal width and allowable tolerances should be shown on the drawings or given in the method statement. The depth of sealant should also be given.

The method statement should give details of materials to be used:

- Primer
- Back up
- Sealant

Wet applied sealants should not be applied in extreme environmental conditions and acceptable environmental temperatures should be given.

Recording of time, environmental conditions, material batch numbers and operatives' names may be useful when investigating subsequent failures.

Requirements for inspecting partially completed joints should be set out in the method statement. Correct cleaning and priming of the joint cannot be easily checked once the sealant has been applied.

Operation

Operating components of the wall should be checked at the time of handover. These include windows, doors, blinds and smoke vents.

If restrictors are required on windows then the method statement should require a check that restrictors are fitted to the correct windows.

Windows and doors normally require adjustment to ensure that:

- They close smoothly
- No excessive force is required to open or close them
- Friction stays hold the window open under moderate wind load

The method statement should describe the testing of blinds and state when this should take place.

Responsibility for checking and commissioning of the smoke vents should be identified in the method statement. This may well be part of the M&E package.