Technical Note No 97

Selection of access equipment for facade maintenance

This Technical Note considers the different forms of access for façade maintenance and repair, their integration with the façade design and the consequences of selecting particular means of access.

This Technical Note should be read in conjunction with:

TN 96 Assessing cradle and suspended access equipment loads

Introduction

Access equipment is necessary to facilitate safe maintenance and repair of facades and roofs. This should be considered from the early design stage of the façade.

BS8560 'Code of practice for the design of buildings incorporating safe work at height' is a good guide for the building designer.

The methods of access may be split into four categories:

- Ground based access
  These include MEWPs (Mobile elevating work platforms), Access scaffolds and scaffold towers.

- Temporary suspended cradles
  These are cradles suspended by cable from arms temporarily attached to the building.

- BMUs are generally cradles suspended by cables on an arm attached to a trolley running on tracks around the top of the façade. The arm may extend, luff or rotate.

  Variations from the standard BMU include:

  - Platforms connected directly to an hydraulic arm mounted on the building at a fixed point,
  - Cradles suspended by cables from an arm mounted at a fixed point on the building,

- Roped access
  This is predominantly abseiling although other equipment such as a bosun's chair may be used.

Basis for selection

The selection of a particular means of access will depend on:

- safety considerations
- building Geometry
- activities to be carried out
- risk of façade damage
- consequences of façade damage
- appearance
- cost

Safety considerations include risk of:

- operatives falling
- equipment and materials falling
- dislodgement of materials or components from the façade that might fall

Materials and equipment that fall from a tall building may travel considerable distances horizontally, particularly if they are sheet materials or they impact on the building as they fall.

For less tall buildings it may be practical and acceptable to maintain a clear zone below any operations that are being carried out at height.

Building geometry may place severe limits on the means of access to be adopted. Factors to be considered include;

- non-vertical surfaces, particularly outward sloping walls,
- Variation in roof height
- overhangs,
- parapets,
- need to work above glass,
- other obstructions including;
    - Brise-soleil and other shading devices
    - Balconies
    - Signage

BS8560 gives advice on the effects of building geometry on means of access to the building envelope.

If access involves working on glazed roofs or above glass CWCT TN66 gives guidance on the specification of glazed roofs.

Activities to be carried out may include;

- cleaning
- other maintenance
- inspection
- repair and replacement of façade components
- repair and maintenance of;
    - lighting
    - signage
    - aerials

When considering the activities to be undertaken it is necessary to consider whether a platform or cradle is necessary and how large this should be. Does it have to carry one, two or more operatives and what materials and equipment also have to be accommodated?

If only roped access is provided the range of people who can inspect the façade will be limited to those who can use roped access. It may not be easy to gain access for the most appropriate people such a building owners, contractors, consultants and so on.

Roped access by abseiling will limit the ability of the operative to work with both hands and limit the range of tools and materials that can be carried. A bosun's chair may make it easier to work with both hands.

Different means of access may be provided for different activities.

Risk of façade damage has to be considered whatever means of access is adopted.

It is wrongly believed that some means of access do not cause damage to a façade. All forms of access have risks of façade damage associated with them but the nature and frequency of the possible damage differ.

The different forms of façade damage and the likelihood or frequency of occurrence are described later in this Technical Note.

Consequences of façade damage depend on:

- form of construction
- materials used
- client view of damage
- repair costs

The consequences of façade damage are also governed by the means of access and the ability to repair any damage working from the access provided.

Responsibilities

The means of access for construction, inspection, maintenance and repair should be considered at an early stage of the design process.

In particular the design of the wall will govern the need for maintenance and repair and the robustness of the wall will affect the risk of damage occurring during

routine inspection and maintenance operations.

BMUs are likely to impact on the appearance of the building and in particular its silhouette against the sky. However, it is possible to conceal a BMU and there are many good examples of incorporating access equipment into facades in a sympathetic way.

At the detailed architectural design stage potential designers of the access equipment should be consulted to ascertain the outline dimensions of the access equipment, both in use and when stowed. All too often this is left too late such that the design of the equipment is difficult and its complexity and cost greater. Architects frequently under estimate the size of BMUs and the space required for counterweights.

At the structural design stage it is essential to ascertain

- The loads that will be imposed on the building structure by any BMU when it is in use.
- The loads from any anchorages for roped access.
- The loads imposed by any cradle restraints.

Potential façade damage

All means of access have an inherent risk of damaging the building envelope.

Where the access is to be used for maintenance and repair of items other than the building envelope, for instance building services equipment, the operatives may not be familiar with building envelopes and the risk of damage may be greater.

Ground based access
The use of free standing scaffold towers that do not contact the façade may appear to reduce the risk of façade damage. However, the assembly and dismantling of scaffolding may involve damage of the façade by impact with scaffold poles or tools.

The use of MEWPs runs the risk of collision damage to the façade. A direct impact on to the vertical face of a façade may occur as a result of incorrect operation of the controls. Passing collisions and snagging on ledges and shading devices may be due to incorrect use of the controls but more likely to the operator not being observant.

The hydraulic operation of MEWPs means that following the initial collision or snagging they continue to be powered and may cause more serious damage. When assuming that access will be by MEWP the architect and façade designer are not able to predict what equipment will be used and are unable to assess the likely impact loads on the façade.

Roped access
The use of roped access will apply forces to the building envelope and although these may be lower than those associated with cradles and platforms they may still be damaging.

Impacts of operatives may be soft body impacts that damage thin metal cladding or hard body impacts from tool belts that damage glazing or terracotta panels.

Ropes will also apply forces where they pass over parapets or ledges.

A further cause of damage associated with roped access is abrasion of surfaces from ropes, foot wear and tools. This form of damage may not be catastrophic but will be incremental and lead to a degradation of the façade surface.

With roped access there is inevitable and routine contact with the façade. This frequent contact with the façade may lead to degradation of the façade across large areas which may be as costly to remediate as isolated accidental damage associated with other forms of access.

BMUs with suspended cradles
Damage from impact by suspended cradles may arise as a result of operator error or wind action on the cradle.

The control systems for a suspended cradle are simpler than for some MEWPs and for complex articulated hydraulic arms. Simple controls for raising/lowering, transiting and luffing are easier to understand and the risk of operator error is correspondingly lower.

The risk from impact as a result of a wind gust acting on the cradle may be reduced by operating the cradle when wind speeds are lower, although this will affect the maintenance and cleaning periods and the inability to work at times may increase the costs of cleaning and maintenance.

Impact loads from suspended cradles may be moderated by the use of suitable restraints and buffering systems. They can be calculated and allowed for in the design of the building envelope. CWCT TN96 gives a method for calculating cradle and impact loads.

Platforms on articulated hydraulic arms
Whilst these are not affected by wind in the same way as suspended cradles collisions are still possible as a result of operator error.

The controls of complex articulated hydraulic arms may be less easy to understand and manipulate than those for simple suspended cradles. As with MEWPs the hydraulic operation may continue to propel the platform following the initial collision and cause further damage.

Consequence of façade damage

Façade damage resulting from access for cleaning, maintenance or repair may range from a minor nuisance to extensive and costly damage and there will be safety issues if components fall or are left insecurely attached.

Minor damage to panels may only have a visual impact on the façade but seemingly minor damage to panels may damage edge seals and minor cracking may allow the ingress of water past renders.

If damage has to be repaired the severity of the event may be evaluated by considering:

- The ability to obtain materials
- The ease of repair/replacement
- The cost of remediation

Natural stones may be difficult to match, particularly if they are imported stones not commonly used.

The ease of making replacement components will depend on their complexity and whether bespoke moulds, dies and other tooling were used in their manufacture. It should be remembered that what today are commonly available building systems may not be readily available at a future date.

The ease of replacement will depend on the means of access designed as part of the building or on temporary access equipment available.

A major factor affecting the ease of replacement is the ease of disassembly. Replacing a rainscreen panel may be possible by removing a single panel. More complex walls, particularly unitised walls may require removal of larger zones of wall to allow for a single panel to be replaced.

In the case of snagging or impact on projections it may be desirable that the projecting component deforms without transmitting damaging loads to inner components such as mullions and transoms that are more difficult to repair or replace.

The costs of remedial work will almost certainly be disproportionate to the initial cost of the building envelope as a result of:

- mobilisation costs
- manufacture of a one-off component
- access costs
- street closures where necessary

Safety considerations require that no materials or components fall other than into a closed zone with no people in it.

Specification

Access cradles and platforms are not simply specified. The architect and client should determine the maintenance cycle and maintenance operations. This includes the number of operatives, materials to be carried and method of working from the cradle or platform.

The design of the access equipment then becomes an integral part of the building design with the access equipment contractor consulted at an early stage.

References

BS8560 Code of practice for the design of buildings incorporating safe work at height

CWCT TN66 Safety and fragility of overhead glazing: guidance on specification

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