

Scaffolding and temporary works for historic buildings



ENGLISH HERITAGE

Introduction

Scaffolding and temporary works are a fundamental necessity of any building project and when they are erected in or around an historic building it is vital that they do not cause damage.

The basics of scaffolding and temporary works in historic environments are not greatly different from the basics of scaffolding and temporary works to any existing building. However this leaflet attempts to highlight some important points which need special attention if damage to historic fabric is to be avoided.

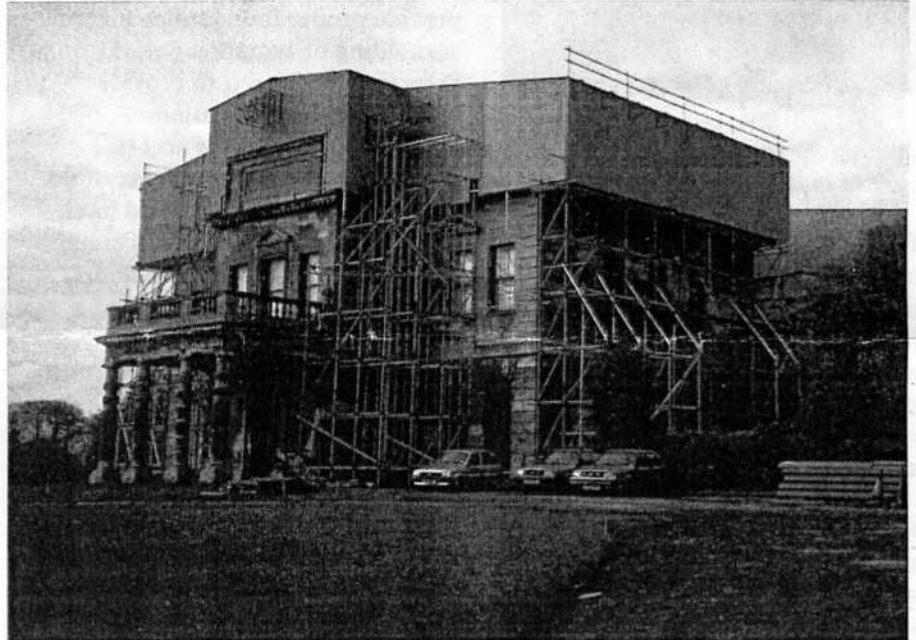
In the non-historic situation damage caused by improperly erected scaffolding and temporary works, while being tiresome and causing unnecessary expenditure, can often be repaired without serious detriment to the building. Where historic fabric is concerned any damage is permanent; significant detail may be lost or an important facade scarred for ever.

All badly erected scaffolding and temporary works, whether to an historically important building or not, has the potential to allow the collapse of either the scaffolding itself or of the building, with disastrous and possibly fatal consequences. Experience indicates that when things go wrong it is usually owing to lack of attention to seemingly minor details.

Scaffolding and temporary works must be capable of being constructed without the need for major intervention into historic fabric.

Access scaffolds

'Independent tied' scaffolds will normally be provided to gain access to historic building facades for



painting, maintenance, or other work. They consist of two rows of standards (the vertical supports) connected by ledgers and transoms (the horizontal elements). They are termed 'independent' because this type of scaffold derives no vertical support from the building and 'tied' because they must be tied to the building for horizontal stability. Because of the need to avoid damage tying to the facade of historic buildings can present difficult problems. Longitudinal bracing must be used.

Shoring or support scaffolding

These are temporary works erected either because there is a danger of collapse or because it is necessary to remove some vital supporting member for renewal or alteration. Obviously the loads to be carried by shoring can be very great and failure can be disastrous causing major damage to historic fabric. Neither access scaffolding nor support scaffolding should be

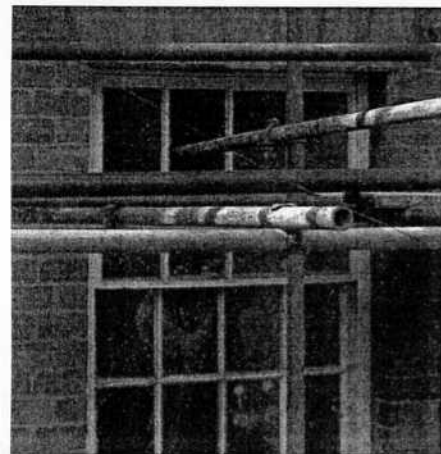
Scaffolding as complex as this must be properly designed

expected to carry out the function of the other unless it has been specifically designed so to do.

Responsibility

The failure of a single telescopic prop supporting a major element of a building under repair could have serious consequences. Therefore, as the dangers do not necessarily relate to the size of the project, the architect or engineer should examine the contractors proposals for all scaffolding and shoring. It must be ensured that schemes are erected so as to conform to those proposals. Care must be exercised to ensure that the contractors responsibility for temporary works is eroded as little as possible.

All elements of the permanent works are covered by specification clauses that are often extensive. The same situation is rarely true of scaffolding and temporary works,



Opening the window would have avoided smashing old glass

the correct construction of which is equally important. As damage to historic fabric is permanent and must be avoided at all costs, all contract documentation for works to historic buildings should include a section concerning scaffolding and temporary works.

Statutory inspections

It is a statutory requirement that all working scaffolds are inspected weekly by a suitably qualified person and that the results of these inspections are recorded in the scaffold register.

Necessary features and common problems

The following are some of the features that can make scaffolding dangerous, unsuitable for its purpose or damaging to historic fabric.

Foundations

The soil should be well rammed to ensure that there are no cavities and timber sole plates at least 230mm x 40mm should be used. Where the ground is not firm or where the length of time that the scaffolding is to remain erected exceeds six months, railway sleepers or similar sized timbers are more suitable. Foundations should always be level and should never be undermined. The foundation and the standard or prop set on it should be concentric to avoid inducing bending moments or eccentric forces.

Typical faults include rotten or missing sole plates, foundations dangerously out of level, eccentric or undermined props, and scaffold

standards. Piles of bricks and other unsuitable foundations must not be used. Historic buildings often have basements that are outside the periphery of the ground floor and may well be incapable of supporting scaffolding. Sometimes there are below ground water storage tanks that may not be capable of supporting a great weight.

If excavations are required to provide proper foundations for scaffolding or temporary works there may be a need to provide archaeological supervision.

The foundations for access scaffolding or for a shoring scaffold may not always be at ground level. Sometimes it is necessary to erect such structures on roofs or floors, for example on the aisle roof of a church to gain access to the clerestory wall. In these instances it is important to ensure that the supporting structure can safely bear the weight and that floor or roof finishes are not damaged.

Vertical members

Out of plumb vertical members produce eccentricity of loading within individual members and horizontal forces in the structure as a whole. As historic buildings often have overhanging cornices and other projections correct setting out of the bases of standards needs to be considered in the light of what is directly overhead. Steel baseplates should always be used. Joints in standards should be staggered, that is, joints in adjacent standards should not occur in the same lift.

Ledgers and transoms

These components should always be horizontal. Ledgers should be clamped to the standards with right-angle couplers. Joints in ledgers

All scaffolding must be properly founded



should be staggered and made with sleeve couplers. Transoms should be fixed to ledgers with right-angle couplers or, if not adjacent to a standard, with putlog clips and be at not more than 1.2m centres where required to support boarding. In each bay, one transom should be not more than 300mm from a standard. All transoms should have plastic caps to avoid damage to historic facades. (See also below).

Ties

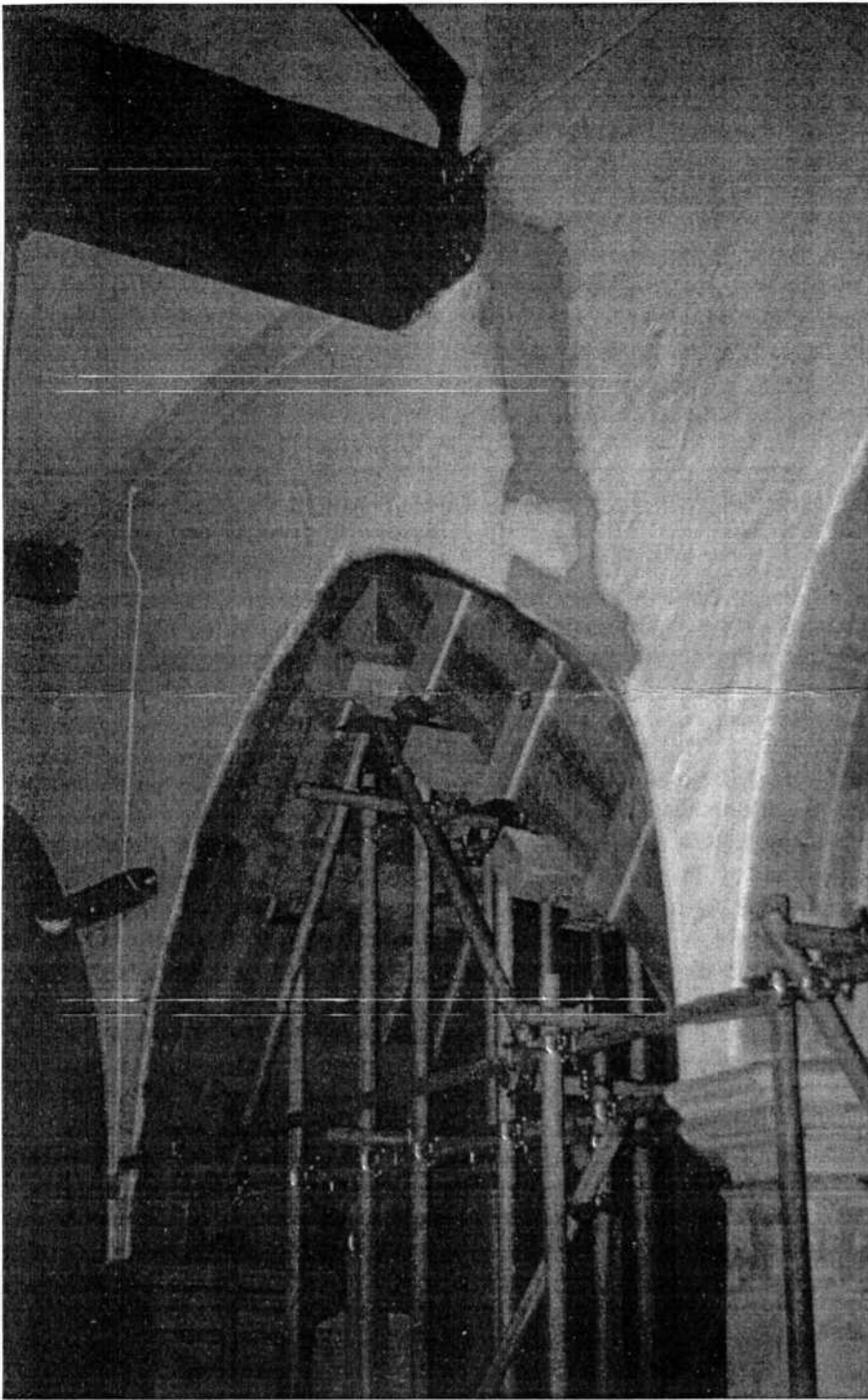
Badly fixed, incorrectly positioned, and an insufficient number of ties are frequent problems. Any tie taken out to enable work to proceed must be replaced as soon as possible. Through ties (which 'hook' back to the inside face of the wall) must have protective coverings where they touch the inside face of the wall, but such ties may not be suitable where there is panelling to the inside face.

Through ties are simple to use with sash windows. The sash can be raised to allow the tube to pass through, the resulting gap sealed temporarily with plastic sheeting or hardboard, and the sashes screwed to each other to prevent unauthorised entry. Casement windows are more difficult. If they carry leaded lights it may be possible to remove one small pane but casements with a single glazed sheet may need to be taken off their hinges and stored safely. Regrettably, some scaffolders just smash a window to get their fixings. This is particularly likely in a derelict building.

Reveal ties (which use screw jacks to grip against the reveals of a window) must also be given good protection to ensure that they do not damage the building facade. Sheeted scaffolds will need extra ties.

Fixings to masonry

Where fixings are made to stone or brickwork it must be ascertained that the masonry is adequate for this purpose. Such a fixing to a facade could dislodge a stone or an area of brick, thus endangering the safety of the scaffold. All fixings made to the wall of an historic structure must be of stainless steel for two reasons: firstly because ordinary mild steel fixings will corrode and cause rust stains, and



A well designed temporary support

also possibly split masonry; and secondly because stainless steel fixings, which will not corrode, can be reused.

Bracing

Ledger bracing at right angles to the building should be fixed to alternate pairs of standards. Facade bracing should be to the full height, at an angle of 45 degrees, and at not more than 30m centres. Zig-zag bracing may be used for facade bracing. Joints in bracing should only be made with sleeve couplers, never with expanding joint pins.

Bracing connections should be made within 300mm of standard/ledger/transom junctions. Bracing should always finish at ground level or at some adequately strong point on the permanent work as bracing that finishes one or two lifts above ground applies horizontal forces to the scaffolding that cannot be satisfactorily dissipated. Likewise, bracing should always go to the very top of the scaffolding structure.

Decking

Boards should always be fitted with a hoop iron at each end. Decayed, warped, or split boards must never be used. Boards that have been

exposed for a long time and have become slippery or damaged should be discarded. Boards should oversail their last support by at least 50mm but by less than 150mm. Boards oversailing more than 150mm become dangerous trap boards, which tip when walked on; conversely those less than 50mm from the transom on which they sit are in danger of slipping off. Precautions should be taken to hold boards down in high winds. Excessive loading on platforms should be avoided unless the scaffolding has been specifically designed to carry heavy loads.

Guard rails, toe boards, and ladders

Guard rails should be between 914mm and 1143mm above the platform and toe boards must not be less than 150mm high. Ladders must be sound, securely fixed, and set at an angle of 4:1. To prevent unauthorised access by vandals or children, lockable ladder boards should be used when the site is unattended. Alternatively the bottom ladder should be removed. Brick guards are required where there is risk of tools or materials falling from scaffolding.

Scaffolding to building interfaces

Scaffolding, however well constructed, is always likely to move slightly and a tube end rubbing on a wall face can easily cause permanent scarring. All tube ends that either touch a wall or are within 25mm of it should have plastic end caps. All other points of contact or near contact between scaffolding and historic buildings should be protected in some way. All standards should sit on timber sole plates to spread the load and floors beneath should be protected with polythene sheet, old carpet, or similar materials to prevent damage.

Sheeting

Sheeting provided for the protection of the building and/or workforce must be strong enough to avoid tearing in high winds, must not flap excessively and annoy neighbours, and, very importantly, must be fireproof. Rapid spread of fire across a sheeted scaffold is a risk which must be avoided.

Shoring

Shoring must be designed by a competent person and account must be taken of wind, dead and superimposed loads, slenderness ratio of members, slenderness ratio of structure, bracing, foundations, fixing to permanent structure, permissible stresses of materials, safety factors, and any other relevant considerations. The main difficulty with shoring historic buildings is to ensure that temporary works do not cause damage in the process of being installed.

Telescopic props

These may need bracing if they are over 2m high or if they carry heavy loads. They must be plumb and must be properly founded. It is common to find a missing support pin being replaced by a short piece of reinforcing bar or something even less satisfactory, such as a big nail. Only the manufacturers high tensile steel pin should be used.

Temporary roofs and temporary buildings

Such structures are often erected to protect historic buildings after a fire or other disaster or during roof repairs. In relation to their area or volume they are, by nature, light structures. As a consequence their need for lateral stability and resistance to wind uplift is a major, but often ignored, requirement. It is usually advisable to seek the help of a structural engineer in the erection of such structures. The contractor should always be required to provide a drawing of his proposals and, in any but the smallest of cases, supporting calculations.

Earthing

All scaffolding structures that are at risk from lightning strikes should be properly earthed.

Access to the building

Historic buildings often have important interiors and these must be well protected. Carrying a 7m length of steel scaffold tube into a building is not easy and major damage can be caused by a scaffolder inadvertently hitting a



All tubes within 25mm of a wall must have plastic caps

door frame or a panelled wall with the end of a tube. It may be wise to provide stout protection to vulnerable surfaces.

Workforce

Efforts should be made to ensure that the workforce is aware of the value of the historic fabric. It must be ensured, particularly in the early stages of a contract, that proper attention is paid to the details discussed above. Scaffolders may not always bother to use plastic caps in the necessary locations or when installing through ties they may simply smash the glass not understanding that old glass may be important. Ensuring that supervisors are aware of such details and close supervision is vital.

Conclusion

Scaffolding and temporary works are not always given the consideration that they deserve. Consequently there is risk of damage to the historic fabric of a building either in relatively minor ways, such as scarring of surface finishes, or in more serious ways, such as partial collapse. There is the additional risk of injury or death to members of the workforce or to passers-by.

Documentation, both that produced by the architect or engineer and that produced by the contractor, needs to be commensurate with the scale of the job, bearing in mind that failure of even a small element can cause serious problems. Even if only a

single telescopic prop is proposed it is important that some proper estimate of the weight to be carried is made and reference made to literature to ensure that the proposed prop can carry the weight safely.

Architects and engineers involved in historic buildings work (or any other building work for that matter) should have a clear understanding of the requirements of scaffolding and temporary works and be aware of the consequences if something goes wrong. The safety and success of scaffolding and temporary works in the historic building field relies heavily on two things; forethought and attention to detail.

With an historic building there will be no second chance.

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