

Inspecting historic fibrous plaster ceilings

The risk of collapse of fibrous plaster ceilings is being addressed by a review of current practices throughout the theatre industry.



The void over a fibrous plaster ceiling, showing the fibrous plaster panels fixed to the original timber structure (below), with new reinforcement wads attached to new timber (above)
(Photo: Richard Ireland, © Historic England)

Fibrous plaster is composed of gypsum plaster reinforced with sheets of hessian and timber. Its advantages were numerous: relatively light in weight; cheap to produce; fabricated off-site; and quickly installed. Fibrous plaster ceilings were either fixed (nailed directly to the structure or on to an intermediate timber system); or suspended (secured by means of ‘wads’ of hessian and plaster, sometimes reinforced with wire, to a framework of timber battens fastened to the structure).

Fibrous plaster was patented in the UK in 1856 but did not enter widespread use until the 1880s. It was employed extensively in cultural, commercial, institutional and high-status residential buildings up to the second world war. It was also used for repair work or restoration carried out in earlier buildings.

Despite the ubiquitous use of fibrous plaster in such buildings over this period, there is an astonishing lack of guidance on its characteristics, inspection and repair. This is because surveys and repairs are managed by a small number of busy, specialist contractors, and perhaps because demand for guidance is low, on account of owners, facilities managers or their surveyors and architects being completely unaware of its existence within their properties.

All fibrous plaster ceilings, like those of plaster and

lath, may be at risk of collapse if inadequately monitored, maintained and repaired. Ceiling collapse can cause serious injury or fatality. Failure can occur in suspended ceilings through natural ageing of unreinforced wads under strain, and both suspended and fixed ceilings are vulnerable to water damage from leaky roofs or plumbing. The overall condition can also be compromised by failure of structural elements, or by mechanical installations.

In 2013 the collapse of an area of fibrous plaster ceiling in the Apollo Theatre, London, injured a number of people. Such incidences are extremely rare. Following this incident, building and health-and-safety professionals reviewed current practice throughout the industry, and recognised a need for improvements to survey standards and competency requirements. With representatives from the theatre sector, swift action was taken to draw up guidelines to ensure that ceilings are properly inspected and maintained. The outcome was the promulgation of *Guidance Note 20: Advice to Theatre Owners and Managers Regarding Suspended Fibrous Plaster Ceilings: survey, certification, record keeping etc* by the ABTT (Association of British Theatre Technicians), available at www.abtt.org.uk/wp-content/uploads/2015/03/ABTT-Guidance-Note-20-19May2015.pdf. This was based on consultation between the ABTT, the Health and Safety

Executive, the Theatres Trust, theatre owners (Society of London Theatre and UK Theatre), building professionals, heritage representatives and specialist fibrous plaster companies.

The guidance is addressed to theatres, where suspended ceilings are common. It constitutes the standard required to give formal certification that the premises are safe for public access. All theatres were required to carry out inspections following its recommendations by 1 September 2016. However, it is relevant to any building where fibrous plaster ceilings are found (see HSE statement <http://news.hse.gov.uk/2016/07/27/suspended-ceiling-inspection/>). Architects and surveyors responsible for buildings of the period described above are advised to identify if suspended ceilings are present, and follow recommendations in the guidance. As fixed ceilings can also fail, they should be subject to the same considerations. Fibrous plaster is easily distinguished from lath and plaster by a very hollow sound upon tapping.

This article summarises the ABTT guidance with regard to inspection and how it would be carried out in all buildings. The document should be consulted for its full recommendations.

Summary of ABTT Guidance Note 20

The principles

- The structural parts supporting suspended fibrous plaster ceilings should be inspected by and a report confirming their satisfactory condition be provided by a competent structural engineer.
- The plaster parts of a suspended fibrous plaster ceiling should be inspected and certified as satisfactory by a competent plaster inspector.
- All suspended fibrous plaster ceiling surfaces should be inspected from both above and below unless access is not possible.
- To determine source(s) of any past, present and future water ingress and building movement, all relevant interior and exterior parts of the theatre should be inspected.
- Ceilings should be inspected regularly and each inspection report should make recommendations for individual timescales for re-inspection.

Baseline survey

- A thorough one-off baseline survey of existing conditions should be carried out by a competent structural engineer and by a competent plaster inspector.
- The output is a clear, detailed, documented record (including sketches and photographs) of the construction of the ceiling and how it is supported from the main structure of the building.

Access

- To enable access to ceilings from above or below, inspection hatches, platforms or other means of observing ceilings should be considered.
- Until any such necessary methods are employed, the ceiling should be regularly monitored for changes clearly visible to the eye and the advice of a plaster specialist sought as to any interim measures that are necessary.

Unreinforced wadding ties

- If it is not reasonably practicable to gain access to a

suspended fibrous plaster ceiling from above or below, it should be presumed that unreinforced hessian wadding ties (without wire) may have been used.

- If plain (unreinforced) hessian wadding ties have been found to be present and there is evidence of failure in any, consideration should be given to the consequences of further failures.

Obstructions to inspection

- Any obstructions to the visual inspection of suspended fibrous plaster ceilings should be removed wherever reasonably practicable.

Cleanliness of ceiling voids

- Ceiling voids (the volumes above ceilings) should be cleaned to such a standard as to allow reasonable visual inspection of all attachment points.

Caveats and disclaimers

- The conclusions and expert advice as to matters of fact contained in inspection reports and surveys provided by structural engineers and plaster inspectors should be expressed as clearly and categorically as possible.
- The structural engineer or plaster inspector carrying out the inspection or survey should not seek to limit or exclude liability through a general or blanket limitation.

Re-inspection intervals

- The baseline survey and each subsequent inspection should give recommendations as to the maximum interval before the next inspection of the various suspended fibrous plaster ceilings.

Maintaining records

- Theatre operators and employers should compile and maintain a register of all suspended fibrous plaster ceilings in their theatre.
- The baseline survey should form the basis for all future inspection and maintenance of suspended fibrous plaster ceilings.

Ceiling certificates

- Ceiling 'certificates' should be obtained as confirmation and evidence that the premises may be safely opened to the public in accordance with the latest guidance in the Technical Standards for Places of Entertainment.

Competent persons

- Inspection, repair work and maintenance should be carried out by competent persons of sufficient demonstrable experience (both in the technical aspects of the work, and compliance with current health-and-safety regulations) in the inspection and maintenance of theatres with suspended fibrous plaster ceilings.



Fabrication of a new fibrous moulding, consisting of layers of plaster and hessian, reinforced with timber battens (Photo: John Stewart, © Historic England)

Practical application of the guidance

The following table frames the processes recommended in the guidance. Where funds are not available for a baseline survey, it proposes a preliminary survey to assess and manage risk. This is also recommended by the FIS (Finishes and Interiors Sector), the trade association for plasterers.

CEILING INSPECTION PROCESS (based on ABTT Guidance Note 20)				
1 PRE-SURVEY ACTIVITIES				
	Task	Objectives	Personnel	Comments
1.1	Identify measured survey drawings, asbestos surveys, etc	Support eventual condition survey and repair record	Owner or facilities manager	
1.2	Identify presence of fibrous plaster Close access to area if there is apparent risk	Determine extent Determine ease of access (above and below)	Competent architect or surveyor on behalf of owner	Need reasonable access to identify (touch) potential fibrous plaster
1.3	Identify competent structural engineer and competent plaster inspector	Ensure survey is carried out by relevant expert to meet HSE competency	Owner or facilities manager	See ABTT Guidance Note (Appendix B) and FIS webpages
2.0 CEILING SURVEY				
2.01	Engage competent plaster inspector and competent structural engineer to quote for surveys	Inspect ceiling and provide quote for preliminary survey, baseline survey and access requirements Consult records	Owner or facilities manager, possibly with their architect or surveyor	A baseline survey is ultimately required, but only a preliminary one may initially be feasible for a charitable trust
2.02	Secure funding for survey	Ensure adequate funds are available to complete the work to satisfactory standard	Owner or facilities manager	Charitable trusts may have to seek funds from grantor
2.03	Obtain listed building consent if needed	Where no access to ceiling void exists in a listed building, new permanent access points will be needed	Owner or facilities manager	These should be in discreet areas with least damage to the integrity of the ceiling
2.1 PRELIMINARY SURVEY (omit if full baseline survey can be funded)				
2.1.1	Preliminary survey	Characterise condition and risk when only modest funds are available for survey	Competent plaster inspector	Baseline survey and repairs will have to be phased where funding is not available
2.1.2	Close access to areas deemed at risk	Protect people and property	Owner or facilities manager	
2.1.3	Write survey report with recommendations	Prioritised list of next steps	Competent plaster inspector	
2.1.4	Fundraising for measured survey and baseline survey	Respond to survey recommendations	Owner	As funds become available, follow subsequent steps
2.2 BASELINE SURVEY				
2.2.1	Identify contractor for measured survey of ceiling (above and below)	Obtain quote for measured survey drawings to be used for baseline survey. Determine access requirements	Owner or facilities manager	
2.2.2	Specify access for surveys	Ensure safe access for measured survey and condition survey	Competent structural engineer or competent plaster inspector	
2.2.3	Install access in ceiling void		Competent plaster inspector	
2.2.4	Cleaning risk assessment and cleaning of ceiling void	Remove detritus and insulation concealing ceiling. Clean back of ceiling so its condition can be accurately recorded	Competent plaster inspector	Must not damage ceiling or associated structure
2.2.5	Carry out measured survey		Survey contractor supervised by competent plaster inspector	Must be accompanied to ensure safety of contractor and ceiling
2.2.6	Structural survey	Record materials, structure and condition of primary structure as basis for remedial works programme	Competent structural engineer	Liaise with plaster inspector
2.2.7	Plaster survey Label each individual wad and wire fixing	Record materials, structure and condition of plaster as basis for remedial works programme	Competent plaster inspector	Liaise with structural engineer. Note any obstructions to inspection, also on drawings, and assess risk
2.2.8	Write survey report with recommendations	Propose prioritised remedial works programme. Provide ceiling certification after completion of any remedial works	Competent structural engineer and competent plaster inspector	Any uninspected area thought to be at risk or of indeterminate risk should be logged as a defect and dealt with as soon as possible
2.2.9	Install interim protection if needed	Protect people and property	Owner or facilities manager	

References

Association of British Theatre Technicians, Chartered Institute of Environmental Health, District Surveyors Association, Institute of Licensing (2015), David Adams (ed) *Technical Standards for Places of Entertainment*, Entertainment Technology Press, Great Shelford, Cambridge
 Harrison, David (1999) 'Dramatic plasterwork: fibrous plaster in theatres', *Building Conservation Directory*
 Health and Safety Executive, *What is Competence?*
www.hse.gov.uk/competence/what-is-competence.htm

John Stewart, senior architectural conservator at Historic England, is co-editor of Mortars, Renders and Plasters (Ashgate, 2012).

The ABTT guidance note constitutes the new standard by which all fibrous plaster ceilings should be assessed. The heightened awareness of fibrous plaster ceilings is prompting other initiatives. The FIS has a dedicated heritage group that has created additional guidance on survey format and determination of competency

(www.thefis.org/about-us/special-interest-forums/heritage-plastering-forum/heritage-buildings/). Historic England is working with various partners, including the Theatres Trust, the FIS and specialist fibrous plaster companies, on several research streams to better understand and manage this material.