

**WENTWORTH CASTLE, STAINBOROUGH, BARNSELEY:
PROPOSED REPAIR OF STRUCTURE AND CEILING AT
EAST END OF SOUTH ('PALLADIAN') WING**

LISTED BUILDING STATEMENT (as submitted December 2011)



This Statement has subsequently been superseded with regard to the extent of the defective structure revealed in March 2012 when the cracked ceiling was demolished and the floor structure fully examined from below.

An addendum, (see section 5 below), describes the additional structural faults discovered and the subsequent dialogue in late March 2012 with English Heritage leading to their recommendation that the severely defective floor structure be fully replaced.

 **Birkett Cole Lowe**
ARCHITECTS
HAWK WORKS,
105A, MARY STREET
SHEFFIELD
S2 4RT
T: 0114 275 7260
e: thepartners@birkettcolelowe.com

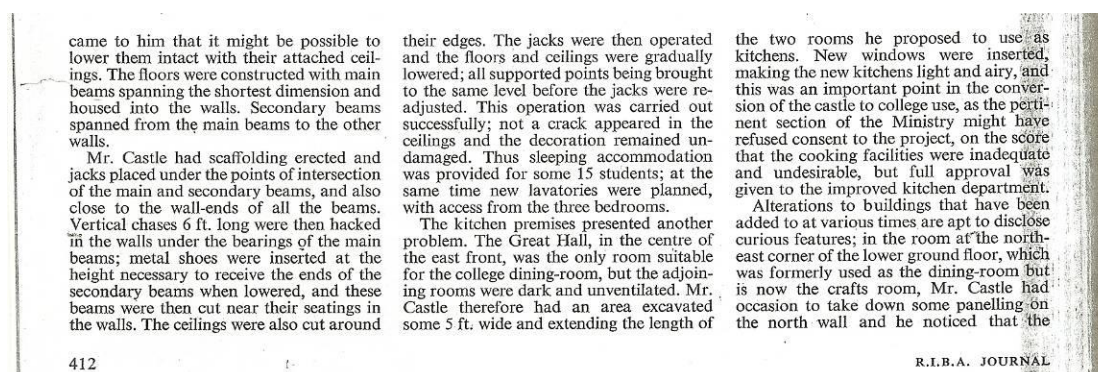
1.0 Context

- 1.1 The south range of Wentworth Castle was built between 1759 and 1764 to the designs of William Wentworth; second Earl of Strafford with the assistance of John Platt: master mason and Charles Ross: superintendent of the works.



1 The south façade – in 2004 before external restoration completed in 2006

- 1.2 Internally the wing was organised with ground floor rooms of modest height with a piano nobile at first floor. The rooms in the centre and at the east end of this storey had lofted ceilings and the floor to ceiling height was about 5.4m. The second (attic) floor above these rooms was restricted in height and lit by windows which straddled the floor level.
- 1.3 In 1950 when Barnsley Corporation had acquired the building it was in poor condition. The building was repaired and converted to be used as a teacher training college. The ceilings of the four first floor rooms at the east of the south range were lowered by approximately 1450mm to give better headroom at second floor level and to put the second floor windows into a better relationship with the floor. Shown below is an excerpt of text from an article in the RIBA Journal of September 1950 which described this building alteration, a copy of the article is at **Appendix H** of the supporting documents.



2 Extract from RIBA Journal Sept 1950

2.0 The Defect

- 2.1 In 2005-6 extensive external restoration work was carried out with Heritage Lottery funding. At this time the roof of the south range was re-covered and infestation of the roof timbers at the east end of the range by death-watch beetle was eradicated. During the course of these works a prop was accidentally allowed to slip causing shock to the structure below.
- 2.2 A few months later cracks appeared in the plasterwork of the first floor ceiling of the easternmost room known as the Michael Barratt Brown Room.
- 2.3 At the time it was thought that load from the newly covered roof was being transferred through the modern second floor partition walls to the first floor structure causing it distress. A repair was made to the plaster and a movement joint was cut at the head of the second floor partitions. Lateral restraint members were provided at the head of the partitions. This repair appeared to have been successful.
- 2.4 In spring 2011 the crack re-appeared in the ceiling. This was monitored and, over the course of a couple of months it became clear that there was active movement in the second floor structure. The floor was moving at a perceptible rate particularly at the east end of the room and it was clear that this movement had caused the plaster to become detached from the structure.



3 Second floor structure settling below the second floor partitions pulling screw fixing of partition sole plate away June 2011

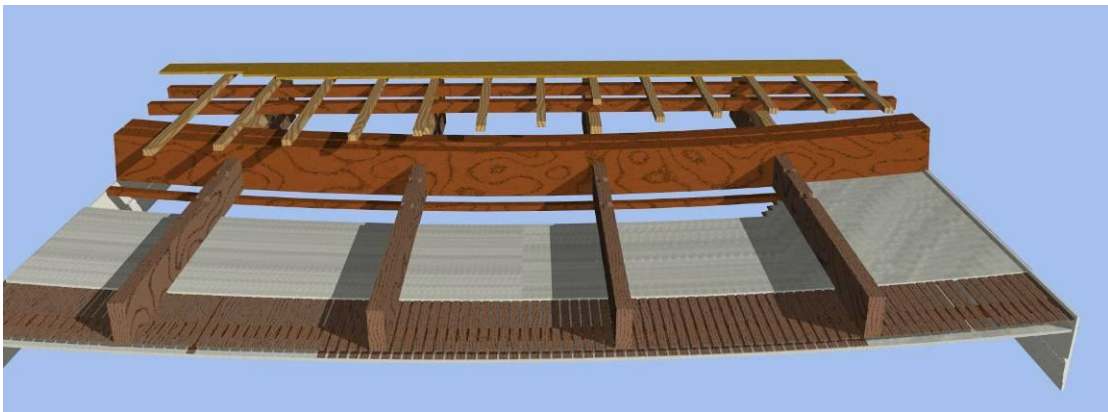
3.0 Investigation

3.1 In July 2011, following discussion with Barnsley MBC and with English Heritage, a scaffold was erected in the Michael Barratt Brown Room to arrest the plaster should it fall and to enable a close inspection of its condition. Opening-up work was undertaken at second floor level to enable an inspection of the structural members.

3.2 Partitions were removed at second floor level and floor boards were removed.

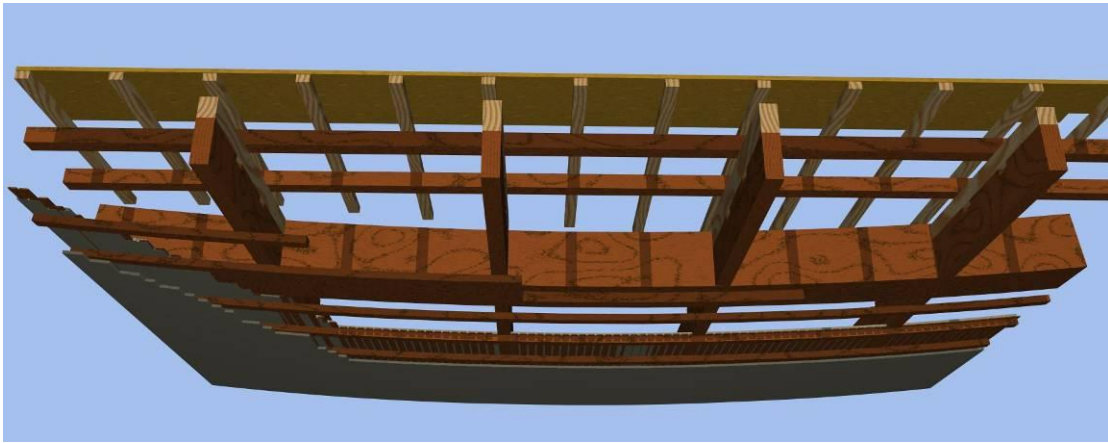
3.3 Structure

The structure of the floor is as follows and as shown on the following drawings. Two large oak principal beams span from north to south. These beams approximately 400mm square support oak secondary beams approximately 275mm x 100mm at approximately 1500mm centres. The secondary beams are morticed into the principal beams. The secondary beams support light ceiling joists approximately 100mm square at approximately 450mm centres. All these members are oak and appear to be original. The floor joists bear on the secondary beams. It is apparent that work was done in 1950 to level the floor. This was necessary since the original structure shows considerable deflection – as much as 225mm.



4 *Model of the floor structure from above*

Modern softwood firing pieces have been provided on top of the secondary beams. The floor joists bear on these and have been wedged level. It would appear that some of the joists are original whilst others are modern softwood. The secondary beams are notched and it appears that these mortices originally received the ends of the floor joists. It would appear that the original floorboards finished flush with the top surface of the principal beams as would have been normal practice in the mid-eighteenth century.



5 *Model of the floor structure from below*

An additional tier of structure has been added, seemingly in the 1950 alteration; 75mm wide x 50mm deep softwood joists span east west and support a floor of narrow north American hardwood boards.

A layer of pugging is present on top of the ceiling joists. It is formed from riven oak laths covered with a layer of lime mortar reinforced with straw. The ceiling in the central portion of the room is of lime plaster on riven oak laths. The ceiling at the margins – between the key-pattern band and the walls – is of plasterboard.



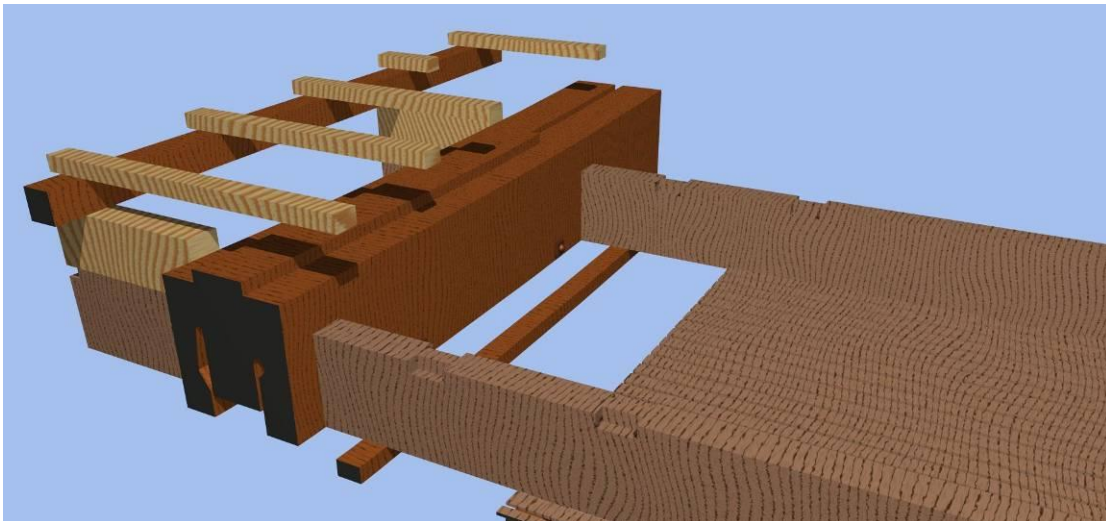
6 *Photograph of the structure from above. The lime mortar and straw pugging has been partly removed to expose the lath and plaster. The re-used riven or rough-hewn floor joists are apparent at the bottom of the photograph. The one beneath the joiner's knee is modern sawn softwood. The repair to the principal beam is apparent (see below)*



7 Mortise in secondary beam – former housing of floor joist – and modern levelling member.

3.4 Historic Repair

The eastern principal beam has been repaired in the past. The date of the repair is not known but it would seem to precede the twentieth century.



8 Model of historic repair

The central portion of the beam has been hollowed out over a length of about 1.5 – 2m. Presumably to remove material effected by fungal or insect attack. An oak member has been inserted into the centre of the older beam to resist compression in the top part of the beam. The central flitched portion is held in place with wedges and with bolts towards the bottom edge of the beam. These bolts have square heads and appear to be hand-wrought, suggesting

that the repair might have been made before the second half of the nineteenth century.



9 *(Failed) wedge at south end of historic repair*

3.5 **Conjectured chronology of alterations.**

It is now known from the physical evidence that the eastern principal beam was repaired probably more than 100 years ago. It would appear that the beam was hollowed out from below. This would suggest that the first floor ceiling was removed at that time and subsequently made good. This would explain the difference in quality of the plaster-work and the absence of painted decoration.

It is known from documentary evidence that the floor structure was lowered by approximately 1475mm in 1950. It is now apparent that more extensive alterations were made at that time than the article cited above would suggest. There is a border of modern plasterboard approximately 1500mm wide around the ceiling which would seem to date from the time of these alterations. There is no cornice at the wall to ceiling junction. The two adjacent rooms the ceilings of which were also lowered in 1950, have cornices. It would be impossible to lower the floor in the manner described in the RIBA Journal article without first removing any pre-existing cornices. It would appear, therefore, that the cornices in the adjacent rooms date from 1950 (see photo 11).

The decorative plasterwork frieze in the MBB Room, although clogged with paint is of a delicate rococo style and is probably original. It is thought probable that the original ceiling was as shown below.



10 *Conjectured original construction.*

The central panel, enclosed by an enriched band decorated and probably painted in a similar manner to the ceiling shown on photo 11. A large radiused cove or vault extending towards the frieze. At second floor level there was probably a stud partition on the line of the principal beam – evidenced by the slot mortice that is present in the top of both beams.



11 *Ceiling of more westerly room: NB Painted decoration, moulded and gilded radius work within decorated key pattern border. There is a cornice at the wall to ceiling junction- installed after the ceiling was lowered in 1950.*

The central decorative plaster was probably lost when the beam was repaired and made good in the 19th C with less expensive work. The 'cornice' was probably lost in 1950 when the ceiling was lowered. The frieze remains intact.

3.6 Present Failure

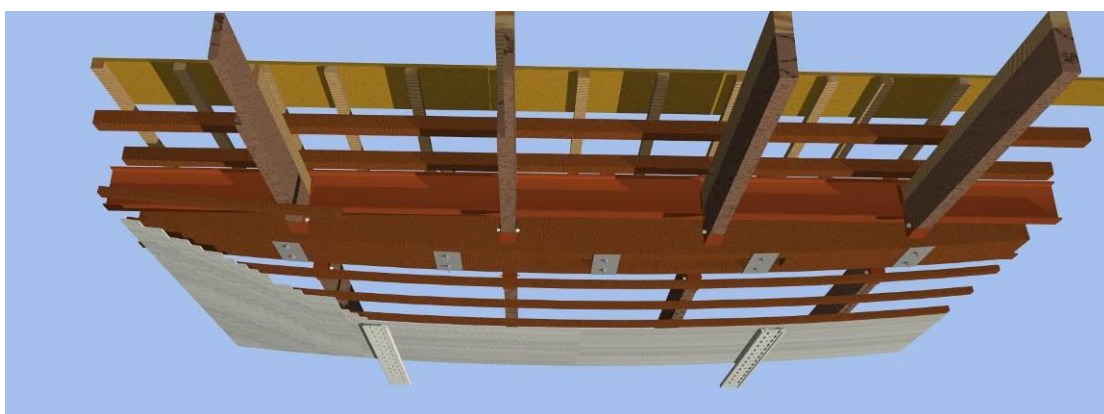
The wedges holding the repaired member have failed (Photo 9) there is a fresh and continuous crack through the western half of the original beam approximately centrally in the repaired section and the tenon of one of the secondary beams has sheared at its junction with the main beam. It is necessary to support the beam with scaffold to prevent a collapse of the ceiling.

4.0 Previously proposed repair (as at December 2011 now superseded following the discovery in March 2012 of much worse structural condition - see section 5 for further explanation)

4.1 Pre-application consultations have taken place with the LPA and with English Heritage during the investigation stage. The principles of the proposed repair as described below have been agreed.

4.2 Structure

The existing, defective beam will be left in-situ. It has been decided that this approach is in accordance with best conservation practice. The cost of removing the member would, in any case, have been prohibitive. A pair of parallel I section steel beams will be provided one either side of the existing beam. It will be necessary to cut back the secondary beams and remove some floor and ceiling joists to make space. Small bridging members will be provided between these beams and the defective oak beam will be hung from these. 15mm dia stainless steel rods will be inserted through holes drilled in the timber and plates provided under the beam. The existing secondary beams will be supported from the new steel beams. The connection will be formed with new steel shoes.



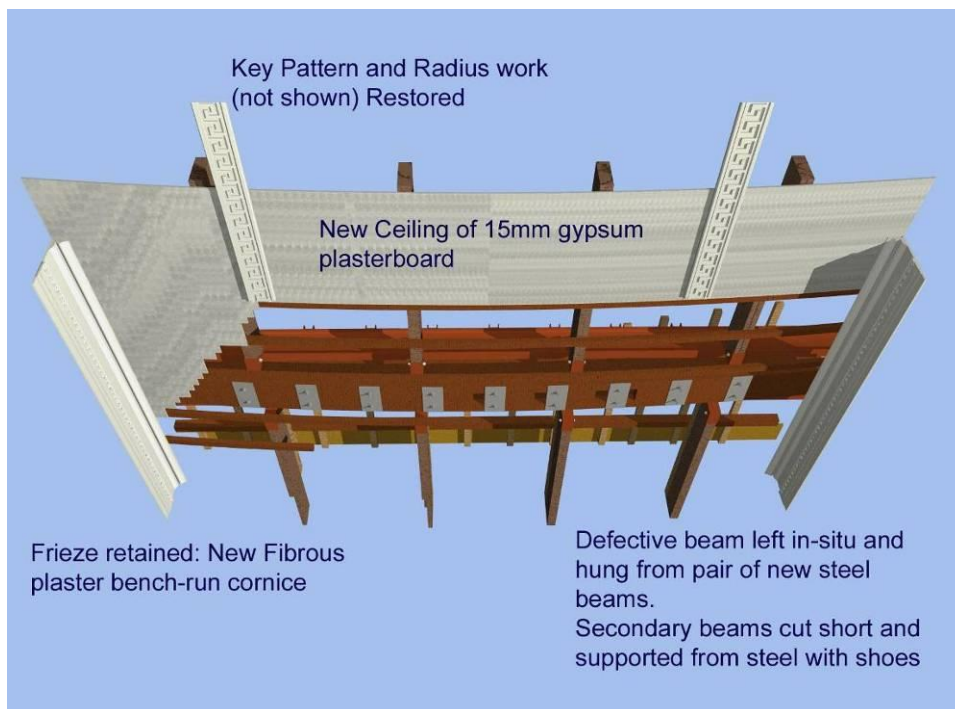
12 Model of proposed structural repair from below



13 Model of proposed structural repair from above.

4.3 Ceiling finish

Sections of the existing decorative sections have been taken down and moulds will be taken after the paint finishes have been stripped. The existing ceiling will be removed completely. The pugging layer will be removed over most of the area to enable a thorough inspection of the remaining structural timbers. It will not be replaced. An area of pugging will be left insitu to the west of the junction between the western secondary and the western principle beams to evidence the original construction. The ceiling will be replaced with 15mm gypsum plasterboard and skim. The embellishment will be replicated and adhesive fixed. The key pattern band will be bench cast to the mould in modern casting plaster. The radius work will be run on the bench in casting plaster in sections. A small new cornice of a pattern to be agreed will be provided at the wall to ceiling junction. This will be fixed as near as possible parallel to the frieze to reconcile the distorted geometry of the room caused by the structural movement.



14 Model of proposed ceiling reinstatement

5.0 More extensive floor structure defects discovered leading to a re-think of the proposed repairs

On 20th March 2012 following receipt of Listed Building Consent for the works as proposed above, the ceiling of the MBB Room was demolished. This enabled full examination of the timber floor structure from below and led to the discovery of a similar crack at the mid-span point of the second principal beam to that previously found in the first beam. It is clear that both beams had been extensively repaired in the same way and probably at the same time in the 19th century.



15 propped ceiling showing mid line cracking and deflection

Furthermore wood boring beetle attack to the structural timbers generally was extensive but particularly to the ceiling joists and secondary beams which had been impossible to fully examine from above due the pugging layer above the now removed laths. Multiple other cracks in the secondary beams and patches of worm holes with frass and crumbling wood and loose or broken mortice and tenon joints between the joists and beams were also found. It is now apparent that the full extent of the deflection at over 225mm at the longitudinal midline below the failed principal beams is due to deflection of the structure: the plaster had remained quite tightly attached. The secondary beams were held at the east and west walls with steel shoes let into the masonry but with barely enough timber bearing the load onto the shoe, some had rot at the beam ends. It became clear that the intended repairs would not be enough to rectify these serious defects.



16 crack through principal beam requiring scaffold propping



17 Secondary beam end barely bearing on the masonry at western wall



18 Ceiling joists eaten away by beetle attack



19 *Cracks through the second principal beam*



20 *Deep pockets of soft crumbling decayed wood in secondary beam*

The reinstatement of the ceiling would still have the same extreme deflection unless this was mitigated by allowing the ceiling perimeter to meet the walls lower than the old ceiling. However this would be limited by the position of the surviving C18th frieze which in places was barely 75mm below the old ceiling line. It would be difficult to achieve a good result with the installation of the ceiling enrichments with such a severe sag in the ceiling and the addition of a modestly sized cornice would be impossible.



21 View of the underside of the propped floor structure showing the severity of the deflection in relation to the wall frieze

5.1 Consultation with and advice from English Heritage

Giles Proctor, English Heritage Architect for North Yorkshire and Heritage at Risk Adviser, was informed of these findings and consulted for advice. It was agreed that the timber structural deflection is a likely to lead to an unsuccessful execution of the new replica ceiling and that the new ceiling should really have a suitably proportioned and style of cornice in keeping with the frieze. Examples of very similar bobbin and flat frieze bands are evident in other rooms of the south range and it was suggested to the College that something similar could be achieved if the old and failed timber structure were removed and replaced by a thinner new floor structure giving sufficient further headroom to install such a cornice.

This view is summed up in the following e-mail from Giles Proctor dated 26th March 2012:

"Dear Nick,

Looking at the photographs, which show that the floor will have a considerable sag even after repair, I do wonder whether it is time to accept that the floor is in need of replacement. After the repairs are complete we will have the remains of a purely functional C18 floor, extensively repaired in the early C19, dropped from its original level in the 1950s and with further extensive repairs in the early C21. To the underside will be attached a reproduction of an early C19 ceiling which will lack a cornice and which will have a significant sag towards the centre.

I would suggest that if we accept that the floor is not worthy of repair, you could replace it with a composite steel and timber floor which would actually be level. The new floor would presumably be significantly thinner than the old floor, which might give sufficient room for a cornice above the surviving C18 frieze. This would help to give the reproduction of the early C19 ceiling a more appropriate context and would improve the proportions of the room, which would be a significant aesthetic benefit. We would lose the remains of the C18 floor, but this was never anything more than functional, is severely compromised by the extent of repair and is not even at its historic level.

Do you agree? I have discussed this with Kath Gibson and Craig Broadwith (who has now taken over the area from Kath) and they are content with replacement rather than repair in this instance. Replacement is likely to require LBC, but I would hope that Barnsley would be understanding.

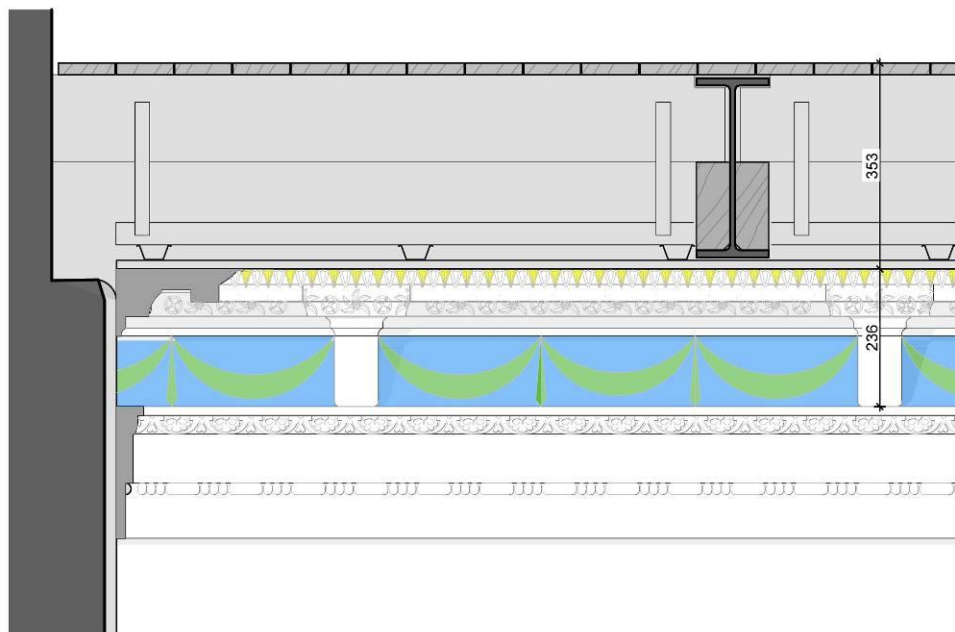
Please get in touch if you wish to discuss.

Best wishes,

5.2 The new design proposal

The College has consulted the local Buildings Conservation Officer and is advised that a new Listed Building Consent will be required for this change from an in-situ structural repair to the removal of structure and its replacement with a thinner floor construction that will permit the reinstatement of an aesthetically appropriate cornice to a well executed reproduction of an early 19th Century ceiling as advocated by English Heritage. This will be prepared and submitted by 20th April 2012 and it is hoped that unless the other statutory consultees raise objection which is unlikely, the project could proceed by mid June 2012.

The new proposal will require a thinner floor composite steel and timber floor construction to achieve the additional height above the frieze to fit the new cornice. The structural engineer has confirmed that the steel beams can be 305mm deep and the overall construction around 353 mm yielding enough space for a cornice of overall depth of around 236mm. Below is shown an indicative design based on an existing frieze and cornice below the coved ceiling of the Aviary room to the western end of the same wing.

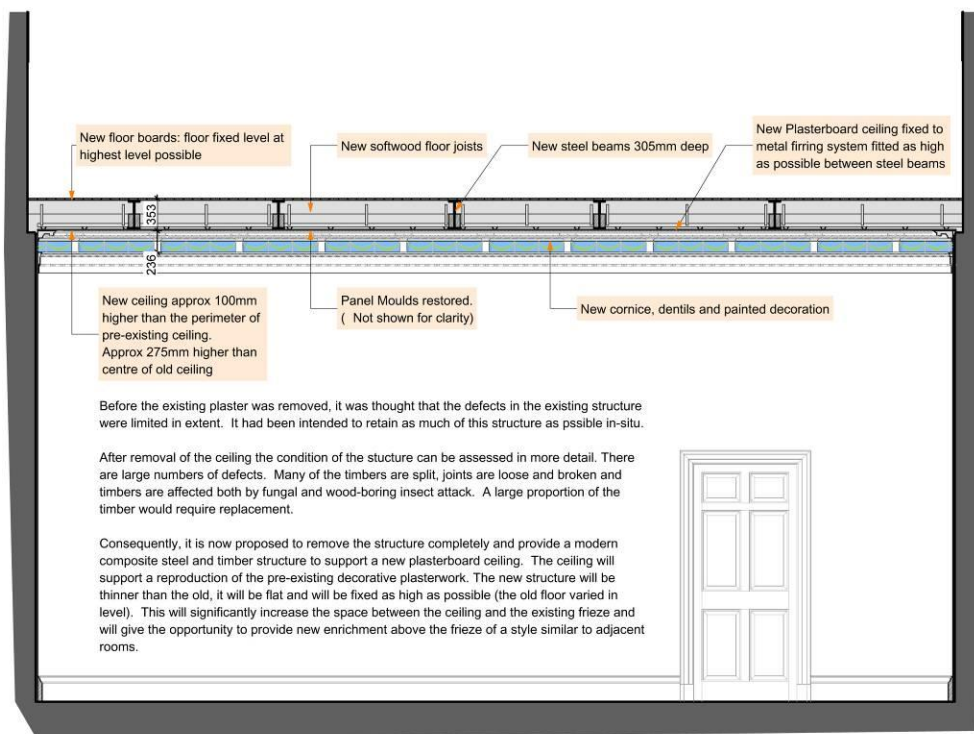


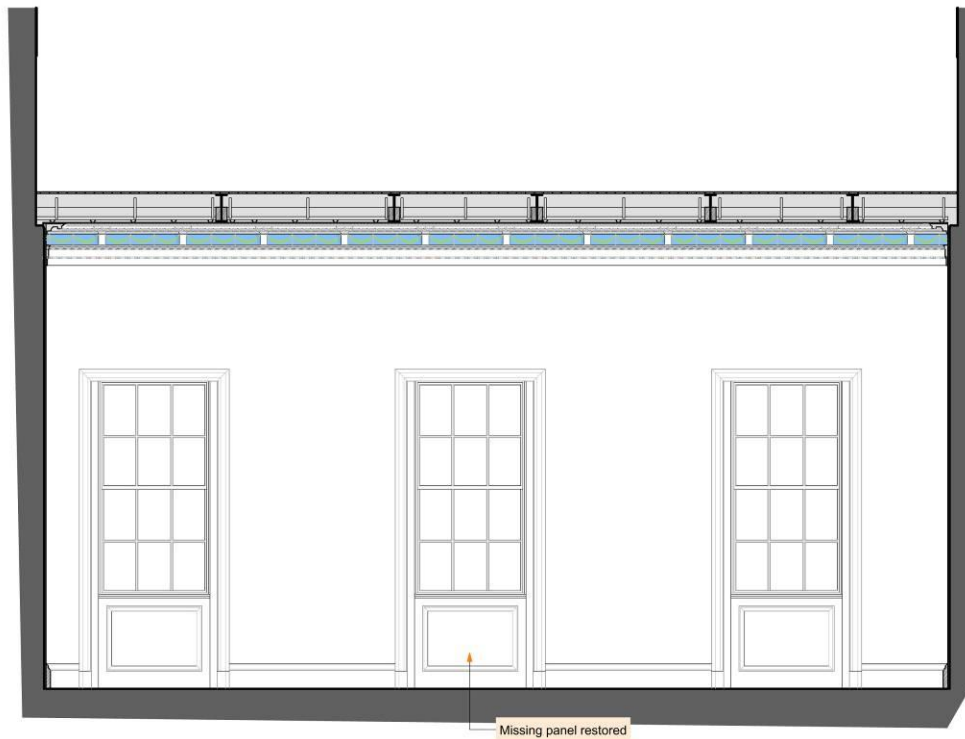
22 Indicative design for a cornice with hand painted panels above the existing frieze inspired by the existing in the Aviary room as shown below



23 Existing cornice and frieze in the Aviary Room of the South Palladian Wing

Overleaf is a section showing the new proposed floor, ceiling and cornice construction





43 Sections showing the new proposed floor, ceiling and cornice construction

Stephen Croall
Head of Estates & Facilities
The Northern College

Birkett Cole Lowe
ARCHITECTS