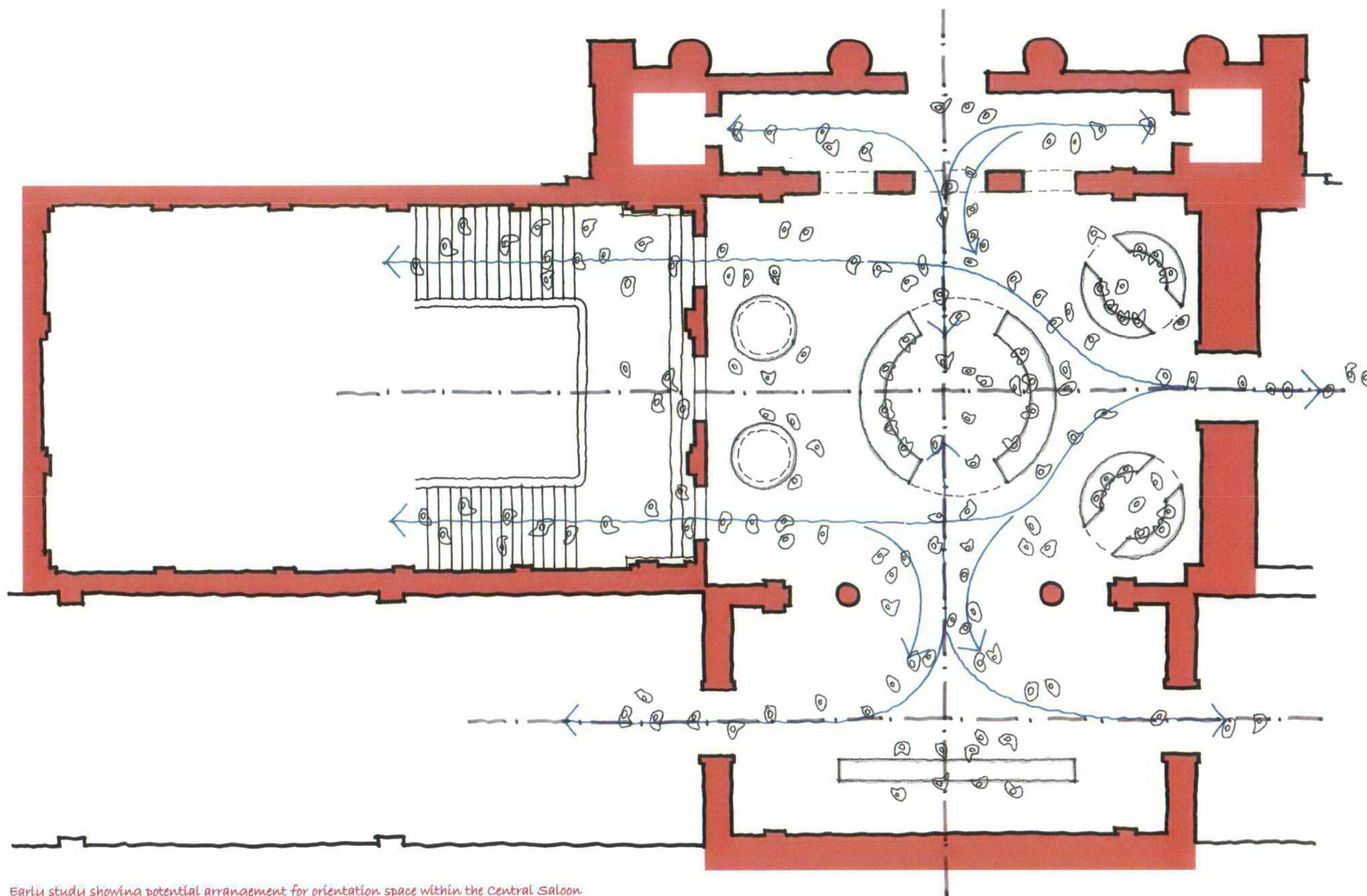


Early study showing circulation desire lines from the South stair through the Central Saloon and adjacent Upper Galleries



Early study showing potential arrangement for orientation space within the Central Saloon.

ROOF AREAS

Historical Development and Record Information

With reference to the Conservation Plan, additional archive information, previous reports, ongoing site investigations and existing photographs, the historic development of the roofs over the South Stair, Central Saloon and Galleries 37 to 40 can be summarised as follows:

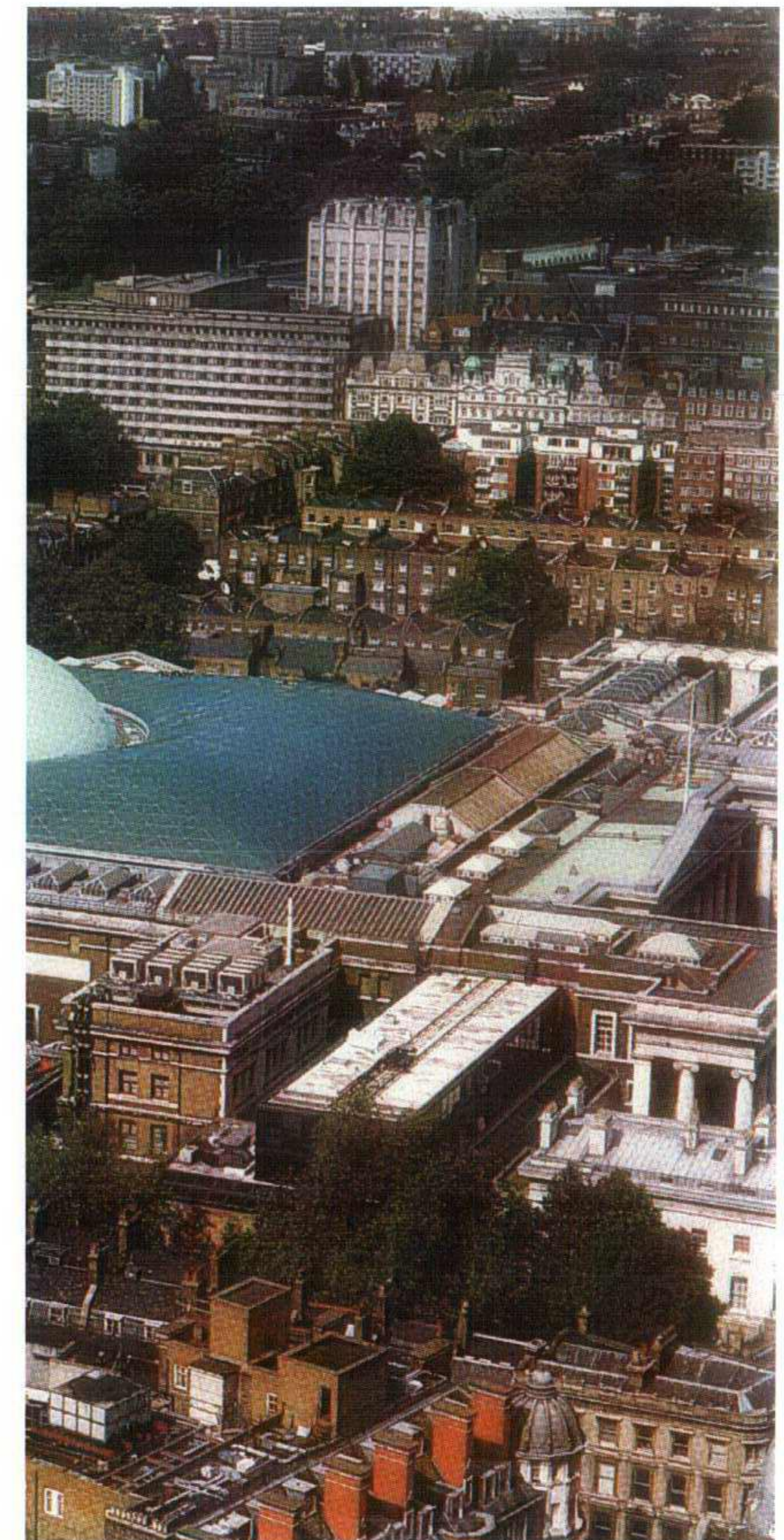
- The original roof above these spaces is best illustrated in an aerial photograph (pg.4) taken prior to 1941 which clearly indicates the original configuration for all the roofs, glazed roof lanterns and parapets in this area.
- The original roofs and structure (and ceilings below) above the Central Saloon, South Stair and Gallery 40 suffered extensive bomb damage in 1941 and were removed and completely remodelled after the war. The result of these alterations is still evident today on existing photographs and drawings and their construction can be summarised as follows:
 - South Stair Roof – Flat roof construction with mastic asphalt finish and single glazed roof lantern above the South Stair. This also includes a roof access stair enclosure and small single glazed roof lantern above the Willoughby Staircase to the west. Although there are no record drawings of this roof, the previous feasibility study by Frank Timothy Associates refers to this being constructed in reinforced concrete.
 - Central Saloon & Gallery 40 Roof – Lightweight corrugated pitched roof finish (glass fibre/plastic) on a modern steel frame/purlins and gutters formed in reinforced concrete.
 - Original brick parapets between the Central Saloon and Gallery 40 and at the east end of Gallery 40 were raised and altered significantly to accommodate the remodelled roofs. These no longer have their original stone copings.
 - As above, the original parapets running along the northern edge of these roofs have since been altered as part of the Great Court Project.
 - Apart from those identified above, there still appear to be a number of brickwork parapets which have retained their original stone copings. In particular, the parapet wall and coping at the west end of this area gives an indication of the original ridge level of the pre-war pitched roof arrangement.
 - Most of the original ventilation flues/chimney stacks which appear at roof level are no longer in use and have been capped off.

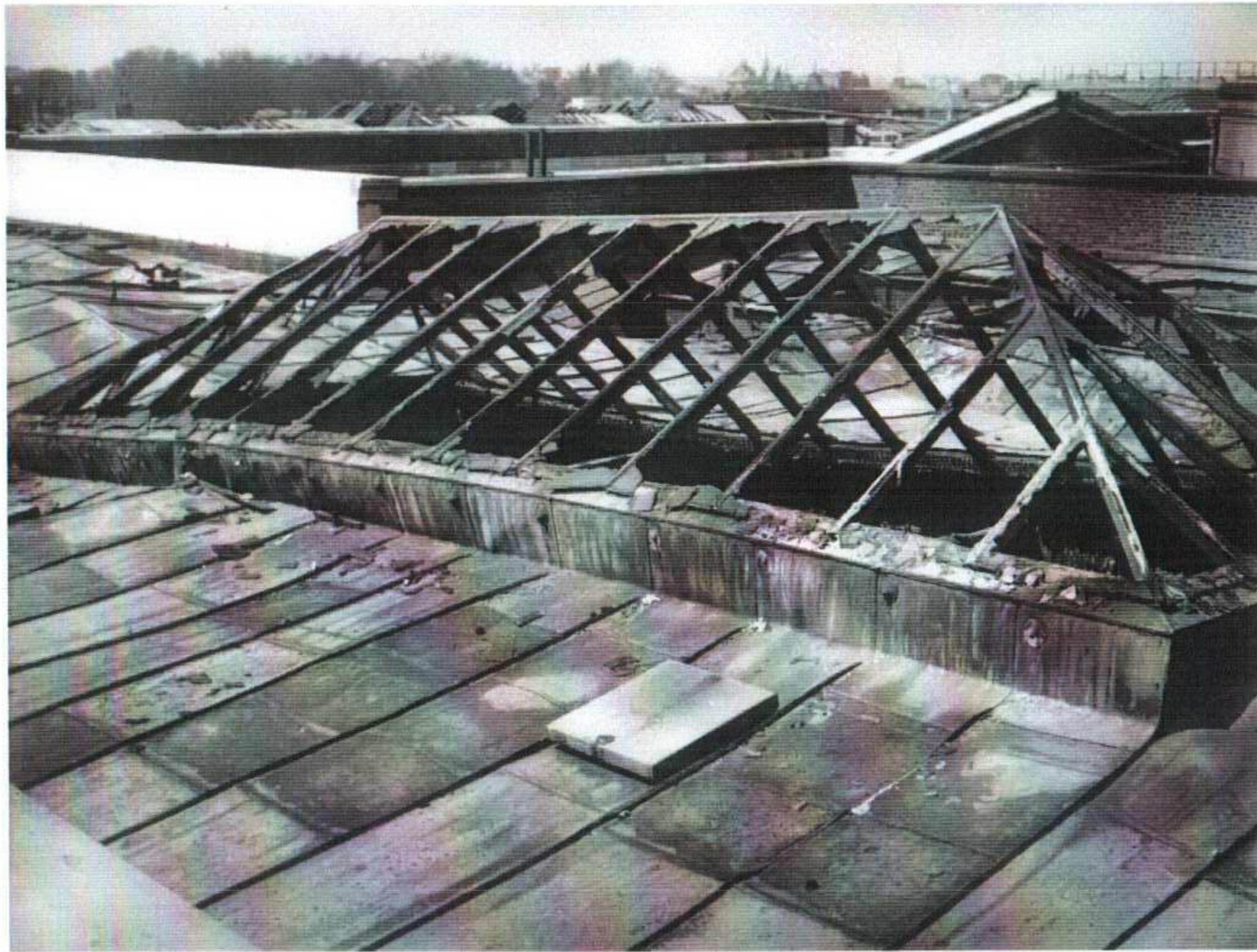
- Existing Drainage – The original roof configuration would have required an equal distribution of rainwater outlets in order to keep the ridge levels below the original coping levels. From existing information and visual surveys, it appears that one of the original rainwater outlets has either been capped off/concealed or bomb damaged and completely removed as part of the roof reconfiguration. Although further investigations have been identified to try and locate this rain water pipe, a relatively recent drainage survey (Hurley Report 1981) provided by the Museum does not identify anything in this location. It would therefore seem likely that this is no longer present.
- The original roofs above Galleries 37, 38 & 39 would appear to have not been materially affected by bomb damage and, as specifically mentioned in the Conservation Plan (Appendix B, Section 7.2), retain their 'original iron and timber composite roof structure, decking and skylight configuration'.

The Conservation Plan guidance for this area of roof states that the 'original structure, decking and skylight configuration of 1847-52 is to be retained and conserved' and that any 'new roof coverings and skylights should respect the original design as closely as possible'.

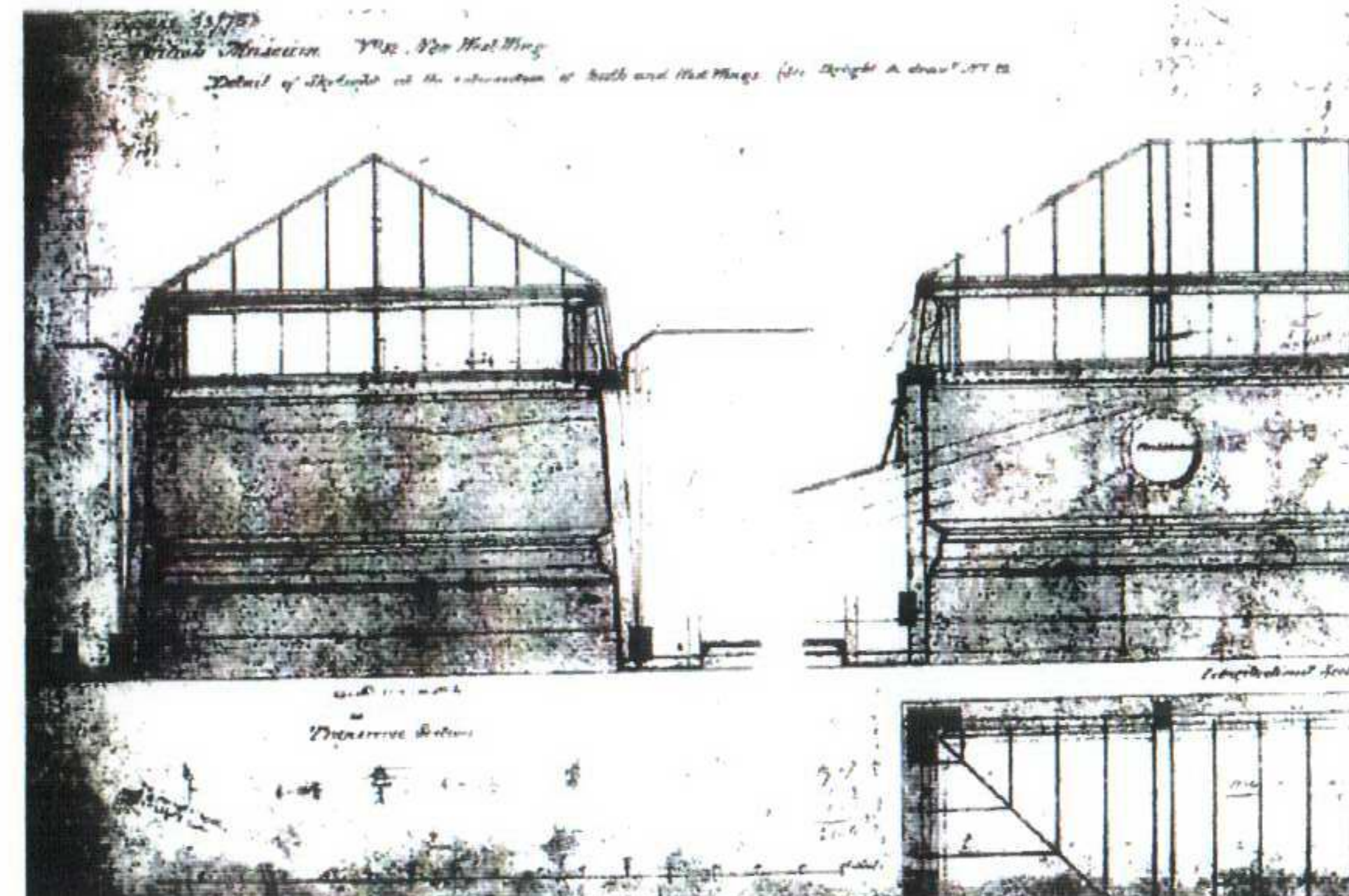
It is evident from the archive pre-1941 aerial photograph (pg.4) and bomb damage photographs that the pre-war roof lanterns did not include vertical upstands or glazing. However, these early 20th century roof lights may not have reflected the original rooflights designed by 'Smirke', as evident in archive drawings (pg11) for the lanterns for Gallery 70.

- The roof above Gallery 68, directly adjacent to Gallery 37 and the South Stair, has been fully refurbished in recent years. This appears to have incorporated new thermal insulation, new copper roof coverings with longitudinal batten rolls and new metal framed roof lanterns with external louvred fins to modulate the light conditions within the gallery below. It is assumed that, in order to overcome difficulties of gaining access below the original decking and incorporating insulation and the necessary ventilation above gutter level, the roof level had to be raised above the original level. This is evident when comparing the existing roof finish level above Gallery 37.





1941 bomb damage to roof areas above South Stair and Central Saloon



Original design drawing for roof lantern within Gallery 70



Existing enclosure and small glazed lantern above Willoughby Staircase



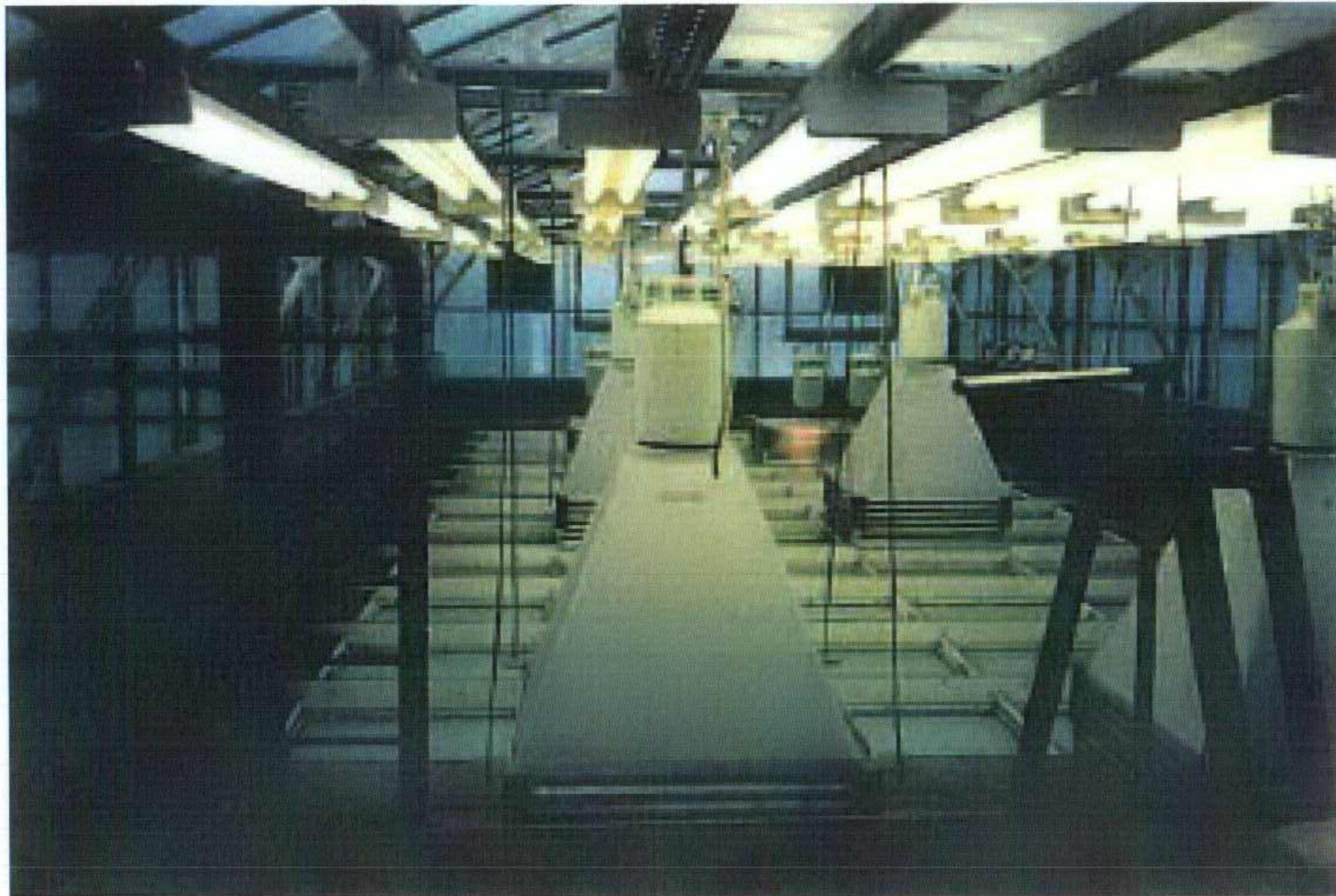
Existing glazed lantern to Gallery 39 in the foreground and the roof over Gallery 40 to the right



Existing glazed lantern and asphalt roof over the South Stair, and roofs over the Central Saloon and Gallery 40 in the background



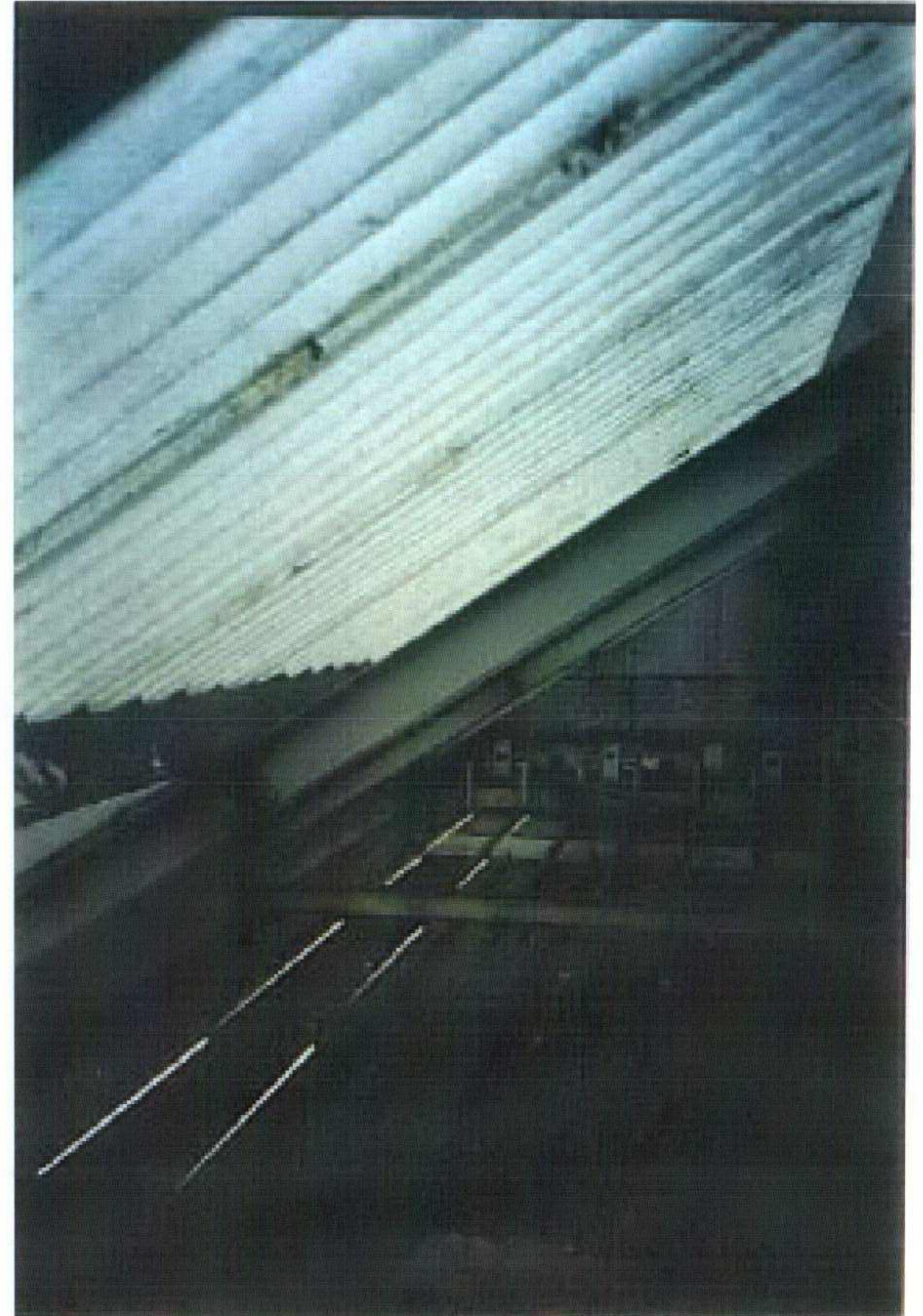
Existing glazed lanterns to Galleries 38 and 39 and roof over Gallery 40 in the background



Photograph of the roof void over the glazed lay light to the South Stair from the report by Arnold & Boston, Architects 1994



Photograph of the roof void over the glazed lay light to the Central Saloon from the report by Arnold & Boston, Architects 1994



Photograph of the roof void over the glazed lay light to the Central Saloon from the report by Arnold & Boston, Architects 1994

Design Proposals

An outline description of the roof proposals is identified below, followed by a more detailed description of the proposed scope of work to the building fabric. Details of the proposed structure and building services are identified in a following section together with separate reports issued by Alan Baxter & Associates and TGA.

- Complete removal of the existing roof structures and finishes above the South Stair, Central Saloon and Gallery 40. Replacement with a new shallow pitched roof with consistent ridge level and new roof lanterns similar to the original roof configuration shown on the pre-1941 aerial photograph. This roof configuration will need incorporate two small recessed plant wells which follow the size and rhythm of the roof lanterns.
- Removal of the existing copper roof finishes and early 20 century roof lanterns above Galleries 37, 38 and 39. Refurbishment of the existing structure and decking (where practical) in order to incorporate new copper roof finishes, thermal insulation, ventilation and roof lanterns.

South Stair, Central Saloon and Gallery 40:

A more detailed description of scope of work to the roof fabric above these spaces can be summarised as follows:

- Removal of the existing flat roof, supporting concrete slab, steel roof lantern (including identified asbestos), internal laylight (and surrounding ceiling) above the South Stair.
- Removal of the existing flat roof, supporting concrete slab, steel roof lantern and roof access enclosure above the Willoughby Stair and adjacent Greek/Roman store room.
- Removal of the existing corrugated pitched roof (including identified asbestos), supporting steel structure, reinforced concrete gutters, lay light (and surrounding ceiling) above the Central Saloon.
- Removal of the existing corrugated pitched roof (including identified asbestos), supporting steel structure, reinforced concrete gutters light (and surrounding ceiling) above the Gallery 40.
- Replacement with a new shallow pitched roof incorporating new roof lanterns above all three spaces, similar to the original roof configuration shown on the pre-1941 aerial photograph (pg. 3). This new roof will generally consist of the following:
 - New primary horizontal steel roof structure with timber secondary joists and horizontal plywood decking.
 - New thermal insulation on top of the horizontal plywood decking to comply with the current Building Regulations Part L.

- New timber superstructure (rafters and studwork) forming and supporting the new shallow pitched stepped roof, stepped gutters/hoppers and vertical aprons to the new roof lanterns.
- New lead roof finishes laid to falls over stepped WPB plywood decking and traditional longitudinal batten rolls running from ridge to eaves. Roof void below finishes and above horizontal insulation to be ventilated along gutter/parapet abutment/eaves and at ridge/roof lantern apron, as appropriate, and in line with LSA recommendations. Roof to incorporate lead lined hatches at regular intervals for future maintenance access to void below.
- New lead lined gutters laid to falls over stepped WPB plywood decking down to existing rain water outlets (at existing levels).
- Existing original parapet, stone coping and flues at the west end of the South Stair to be raised by approximately 225mm to suit the new roof ridge level.
- Existing parapets between Central Saloon and Gallery 40 and Galleries 40 and 41, previously raised as part of the post-war remodelling, are to be lowered to suit the new roof ridge level.
- All existing parapets, copings and cappings to top of internal flues to be repaired/repointed where necessary.
- New hipped, double glazed roof lanterns with full perimeter vertical opening lights over the South Stair, Central Saloon and Gallery 40. Roof lanterns to incorporate opaque solar control glazing and external metal louvres (pitched sides only) in order to control direct sunlight affecting sensitive objects within the galleries below.
- New recessed plant wells for smoke extract plant and cooling condensers to be incorporated either side of the Central Saloon roof lantern but following the footprint size and general rhythm of the new roof lanterns above Gallery 40.

These are to be formed with a horizontal concrete deck on steel beams and timber superstructure forming a perimeter lead-clad apron/screen to match height, size and construction of adjacent new roof lantern aprons. Roof deck to be insulated and finished in mastic asphalt.

- New fire rated smoke extract ducts to be routed within roof void and through the internal vertical aprons either side of new roof lantern above the South Stair. Final details of how this will be resolved visually and technically will need to be developed in the next stage of detailed design.

- New electrical services routes to run within the roof void feeding all three spaces at high level.
- Provision of new duck boards and rationalisation of existing roof access and walkways are to be agreed in the next stages of design development.

Galleries 37, 38 and 39:

A more detailed description of scope of work to the roof fabric above these spaces can be summarised as follows:

- Retention of roof structure and boarding (see below), ceilings and roof lantern aprons above all three galleries.
- Removal of copper finishes to existing shallow pitched roofs and gutters above all three gallery spaces.
- Removal of early 20th century steel framed roof lanterns (including identified asbestos) above all three gallery spaces.
- Careful removal and setting aside of existing timber boarding to enable access into roof void below and allow a full condition survey of existing structure, reinforcement of the existing timbers to the roof lantern aprons and installation of new electrical services for the galleries below. Original timber boarding to be reinstated where possible.
- New thermal insulation on top of reinstated boarding to comply with the current Building Regulations Part L above all three galleries. New layer of 18mm WBP plywood decking to be installed on top of insulation with battens/cross battens to allow continuous ventilation path from eaves to ridge/roof lantern aprons below new roof finish.
- New copper roof finish laid 'traditionally' in single longitudinal sheets (no steps) onto WBP plywood decking (as above) with separating underlay. Copper detailing to incorporate longitudinal batten rolls running from eaves to ridge and ventilation details at eaves and ridge/roof lantern aprons, in line with CDA recommendations. Roof to incorporate copper lined insulated hatches at regular intervals for future maintenance access to void below.

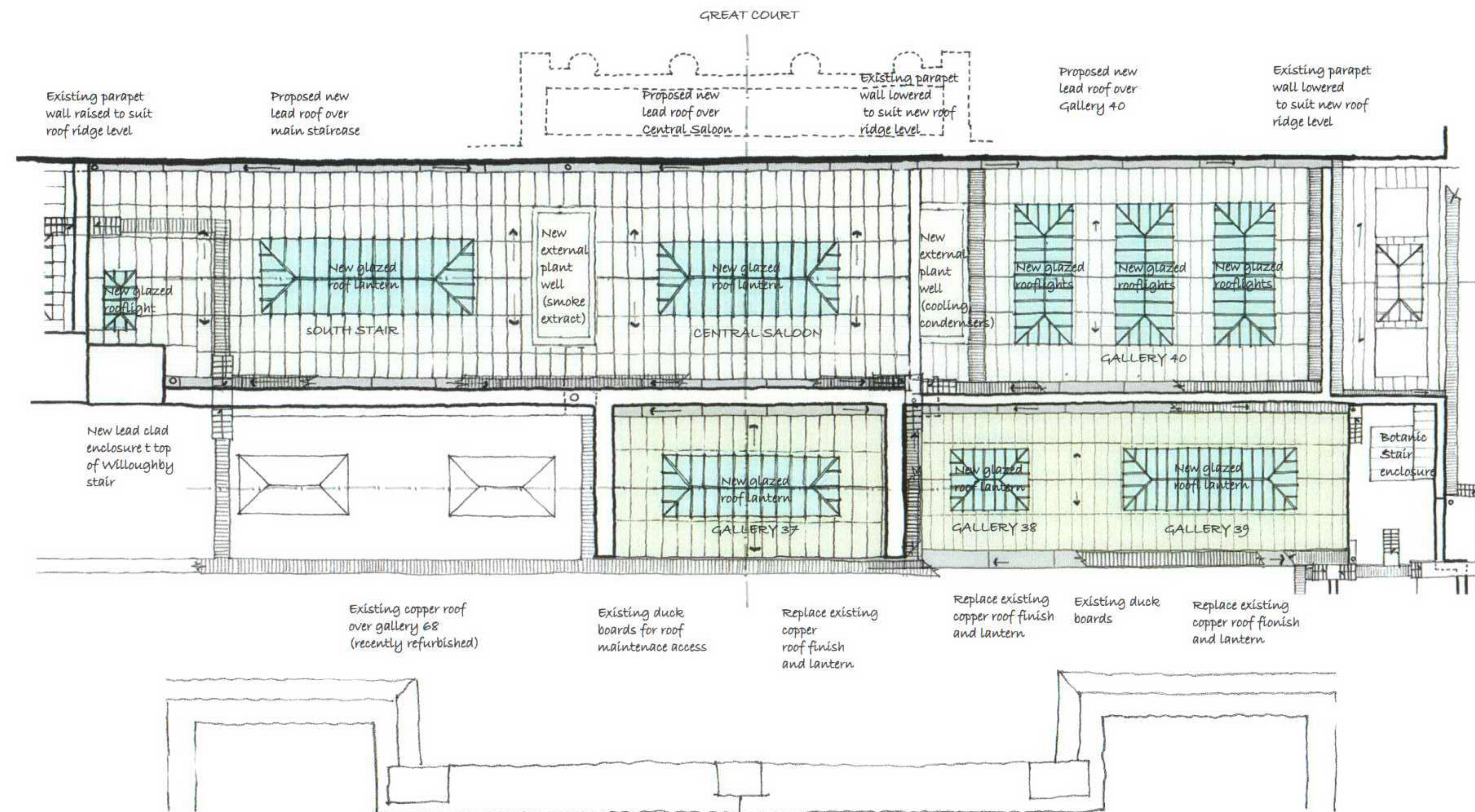
Following recent access to these existing roof voids, the design team will explore any opportunities for reducing the impact of this in the next stage of design development.

- New copper lined gutters laid to falls over existing stepped boarding down to existing rain water outlets (at existing levels). The edges of the existing copper lined roof over the South Portico will need to be carefully and temporarily lifted to allow the gutter at this interface to be replaced.

- New hipped, double glazed roof lanterns with full perimeter vertical opening lights over all three galleries. Roof lanterns to incorporate opaque solar control glazing and external metal louvres (pitched sides only) in order to control direct sunlight in relation to sensitive objects within the galleries below.
- New electrical services routes to run within the existing roof voids feeding all three spaces at high level.
- All existing parapets, copings and cappings (to top of internal flues) to be repaired/repointed where necessary.
- Provision of new duck boards and rationalisation of existing roof access and walkways are to be agreed in the next stages of design development.

All roofs

It should be noted that although the scope of work includes new finishes around rainwater outlets and hoppers, it does not currently include any repairs or replacement of rainwater down pipes below roof level. However, the design team has recommended that the Museum carry out a CCTV survey of all down pipes to confirm their current condition.



Final arrangement for duck boarding and metal access steps for safe roof maintenance access to be agreed with the Museum.

Sketch showing proposed configuration of roof and glazed lanterns (see drawings in later section)

Appraisal of Design Proposals

The following is a summary appraisal of the roof proposals in the context of the existing historic building, with particular reference to the Museum's Conservation Plan and the agreed conservation and design strategies for this project.

South Stair, Central Saloon and Gallery 40:

The removal of the existing roof structures (and ceilings below) built after 1941 and the replacement with a new roof highlights certain opportunities and issues relating to the above including the following:

- As identified in the Conservation Plan (3.5j), reinstatement of a roof configuration similar to the original allows the reintroduction of the scale, orientation, and rhythm of original roof lanterns and therefore ceilings, which formed an integral part of the original 'Smirke' interiors. These also help to reinforce the pivotal importance, hierarchy and spatial organisation of these spaces in the sequence of the upper galleries.
 - The proposed new steel and timber roof structure offers the opportunity to appropriately reflect the original cast iron and timber construction destroyed by bomb damage in 1941 (pg.3). In particular, the setting out of the new primary steelwork will relate to the proposals to reinstate the original coffered ceiling configuration, including down-stand cross beams above all three spaces.
 - Introduction of a new lead roof with traditional detailing instead of the original historic copper finishes is proposed in this area as this remains relatively set back and separate (dividing parapet wall) from those roofs above Galleries 37, 38, 39 and the Forecourt Colonnade. It also relates to other adjacent areas of lead work roofing previously carried out.
 - Introduction of new hipped roof lanterns (and natural daylight) which, although sympathetic to Smirke's original design, incorporate modern opaque double glazing and external louvres to improve both thermal performance and control of direct sunlight into the gallery spaces below.
- Perimeter opening lights also allow the introduction of natural ventilation, where possible, in order to reduce the extent of intrusive mechanical ventilation required to achieve the Museum's environmental criteria within the galleries.
- The opportunity to relatively simply and efficiently incorporate thermal insulation into the new roof fabric to improve environmental performance and meet current building regulations standards.

- The opportunity to sensitively incorporate new building services infrastructure within the new roof configuration and fabric including new smoke extract ventilation and two new external plant wells which relate to the footprint size and general rhythm of the new roof lanterns above Gallery 40.
- As noted previously, in order for the original ridge levels to have remained below the original stone copings at either end of the roof, it is likely that there would have needed to have been a rainwater outlet within the north-west corner of Gallery 40. The absence of this and the subsequent need to maintain the existing drainage distribution has meant that the proposed new roof ridge level and existing parapets will need to be altered to a level higher than the original.

However, in order to try and retain the original coping levels, the design team will explore the potential for introducing a new rain water outlet in the original location, as part of the next stage of design development.

Galleries 37, 38 and 39:

The issues arising from the proposed refurbishment of the existing roofs above these galleries can be summarised as follows:

- Upgrade of existing copper roof finishes with new matching copper, laid 'traditionally' with no steps, but incorporating longitudinal batten rolls (in lieu of the original seam detail) as recommended by the CDA for a fully accessible roof (foot traffic).
- Thermal upgrading of the roof fabric in these areas to improve environmental performance and meet current building regulations standards. This will, however, require the general roof level to be raised by approximately 150mm, both to incorporate the new insulation build up and to appropriately raise the eaves ventilation details above the existing gutter levels. This will include the need to slightly raise the existing parapet at the east end of Gallery 39 to suit and the internal roof lantern aprons within these spaces.

Following recent access to these areas and in order to minimise any impact of this, the design team will explore the potential for incorporating insulation with the existing roof voids below in the next stage of design development.

- The opportunity to sensitively incorporate new building services infrastructure (electrical) within the existing roof voids.

- Replacement of existing steel framed single glazed roof lanterns with new hipped roof lanterns to match those proposed for the new areas of roof above the South Stair, Central Saloon and Gallery 40 (see above description).

Although it is clear from the pre-1941 aerial photograph (pg.4) that these are not the original roof lanterns, the existing structure below has been identified as original. Although this will be retained, due to the additional weight of these new lanterns and the raised roof level, it will be necessary to locally strengthen the existing studwork around the base of the new lanterns and raise the existing apron slightly.

- Due to the shallow pitch of the existing roof, the space available to safely carry out the works identified above is very limited. For this reason it will be necessary to carefully lift the existing original roof boarding directly below the copper in order gain full access to voids below. This will also enable a thorough inspection of the existing roof structure (particularly below gutter areas) and the condition of the original ceilings below.

All roof boarding will be reinstated, where possible, following completion of the works within the voids below.