MSI Station Building



MSI Station Building Roof
Design and Access Statement
January 2021

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1.0

Introduction

Executive Summary

This Design and Access statement accompanies the application for Listed Building Consent for the Station Building Roof. The Station Building is subject to significant water ingress issues of varying levels across the roof.

The statement has been prepared by Buttress Architects Ltd on behalf of Museum of Science & Industry. It explains our response to the work that is required to repair and improve the functionality of the roof to prevent further water ingress in the future. It has been prepared in line with the guidance document 'Design and Access Statements: How to Write, Read and Use Them,' published by CABE.

1.0 Introduction

Following a detailed roofscape feasibility study across the Station Building in October 2020, Buttress Architects have been commissioned by the Science Museum Group (SMG) to further develop and prepare designs and specifications for the repair of the roof, following confirmation to proceed on the basis of a wholesale re-roofing project.

1.1 Purpose

This report has been prepared to summarise design development undertaken in support of the Museum of Science and Industry's plans for a re-roofing project to the Station Building,

The report includes:

- The development of the preferred selected re-roofing scheme.
- The initial working draft drawings and details across key areas of the roofscape.
- Analysis, findings, recommendations and proposals from the structural engineer and M&E consultant
- Additional survey analysis and findings

The building is in a satisfactory condition typically, with the roof and lower ground floor areas in a poor condition due to sustained water ingress issues. The upper floor is currently vacant and is the most affected by these issues.

1.2 Limitations

1. Existing survey information has been used to produce the drawings
2. The scope of works excludes consideration of any issues with the rainwater disposal system below ground.
3. Currently awaiting a full measured building survey, to include plans, elevations and sections

1.3 Authorship

The Statement has been prepared by Emily Green, Architect with Buttress Architects Ltd, under the direction of Alex Scrimshaw, Senior Architectural Technologist with Buttress Architects.



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1. View of the Station Building Roof looking towards the Power Hall
2. Ariel view over Liverpool Rd looking over the Station Building Roof
3. Platform level- underside of the roof

1.4 Application and Project Team

Museum of Science and Industry

Applicant

Buttress

Architects

Heritage Consultants

Principal Designers

Thomasons

Structural Engineer

Silcock Leedham

Mechanical and Electrical Engineers

Appleyard & Trew

Quantity Surveyor

Deloitte

Planning Consultant

2.0

Background & Context

2.0 Context

2.1 Location

The site is situated within the larger Science & Industry Museum complex, located within the historic Liverpool Road station. The Science and Industry Museum is located to the north-west of central Manchester, to the east of the River Irwell and within the Castlefield Conservation Area. The Liverpool Road 1830's Station is one of two Grade I Listed buildings in the SIM complex.

The site is within close proximity to Deansgate, Spinningfields and the Castlefield Basin. The site is well connected with Deansgate train station and Metrolink approximately 550m away.

2.2 Heritage and History

Liverpool Road Station is the oldest passenger rail terminal in the world. It was first opened on 15th September 1830. Trains that ran from the station linked Liverpool with Manchester. The station functioned both as a passenger and freight terminal until it closed to public use on 4th May 1844. The elegant, Grade I listed building was built in the style of the late Georgian period and is now under ownership of the Science Museum Group.

The Passenger Station (or Coach Offices) was built in 1830 and comprised the first and second class booking offices on street level and separate waiting rooms, accessed by separate staircases, on first floor or platform level. It was intended for departures only, with arrivals descending from the other side of the track to Water Street, until a separate arrivals station was built on the other side of Water Street in 1837. The building was extended eastward in two stages; these are denoted in 'Planning Context'. When passenger services terminated in 1844, the building was used for goods offices. In 1982, the Station was restored and turned into museum usage and the first class booking hall fittings reconstructed. The staircase to the second class booking hall had been removed prior to 1975.

At platform level, to the rear of the building, doors open on to the platform from each waiting room. Initially the space was left uncovered; a roof was added in 1834. As of January 2019, the building was being used as offices.



Aerial View of the Station Building

2.3 Historical Maps

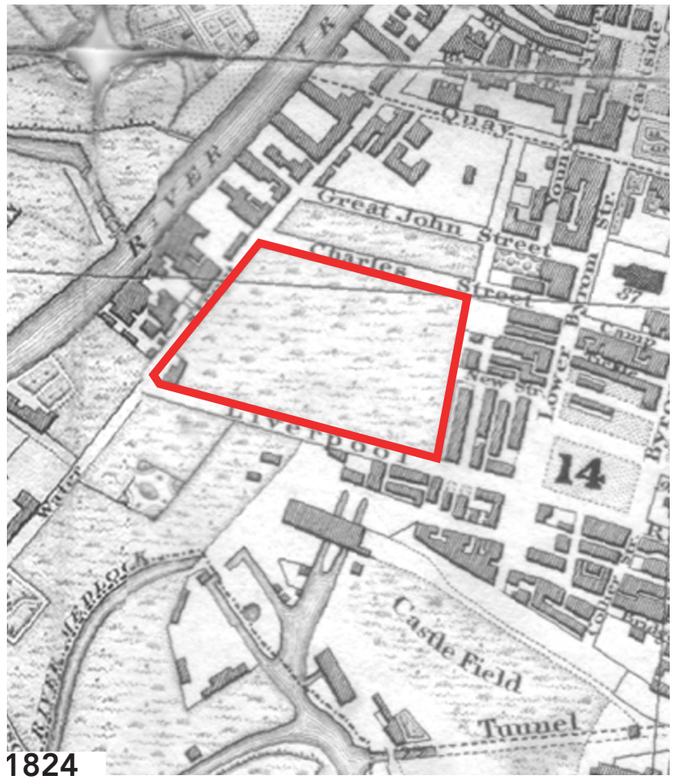
In 1824, much of the site between Liverpool Street and Charles Street lay empty up until the development of Liverpool Road Station in 1830. The 1808 Station Master's House is the only building that can be seen to the left of the highlighted image.

In 1860, the site of the Science & Industry Museum was now occupied by Liverpool Road Station and the 1830 goods warehouse. In the right image, the Great Western Warehouse has a different position to its current day, and the Shipping Shed was a new addition.

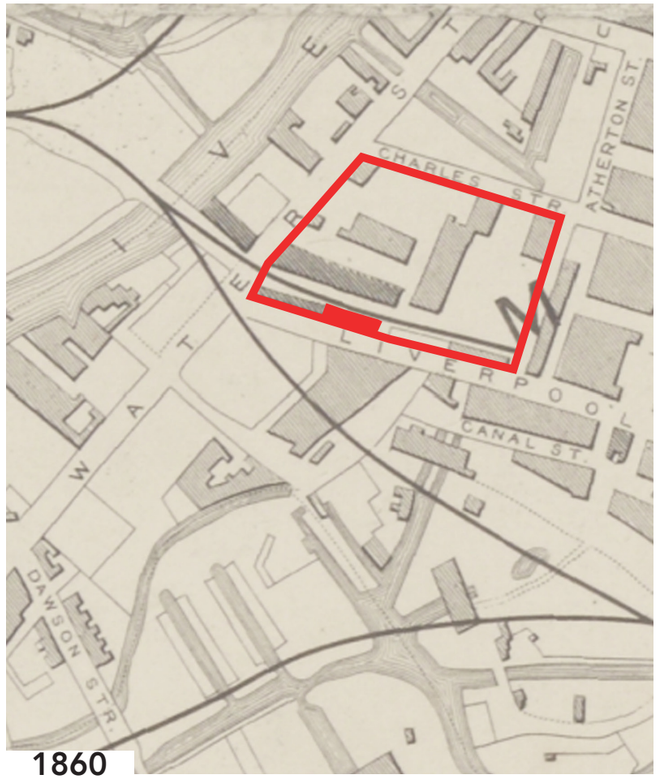
2.4 Planning Context

Change of function to Liverpool Road Station from goods railway to railway and Science Museum. Extension and alterations made to Goods Shed.
Decision issued 4th March 1981 by City Council with no objection.
REF: F15153/LA/LB

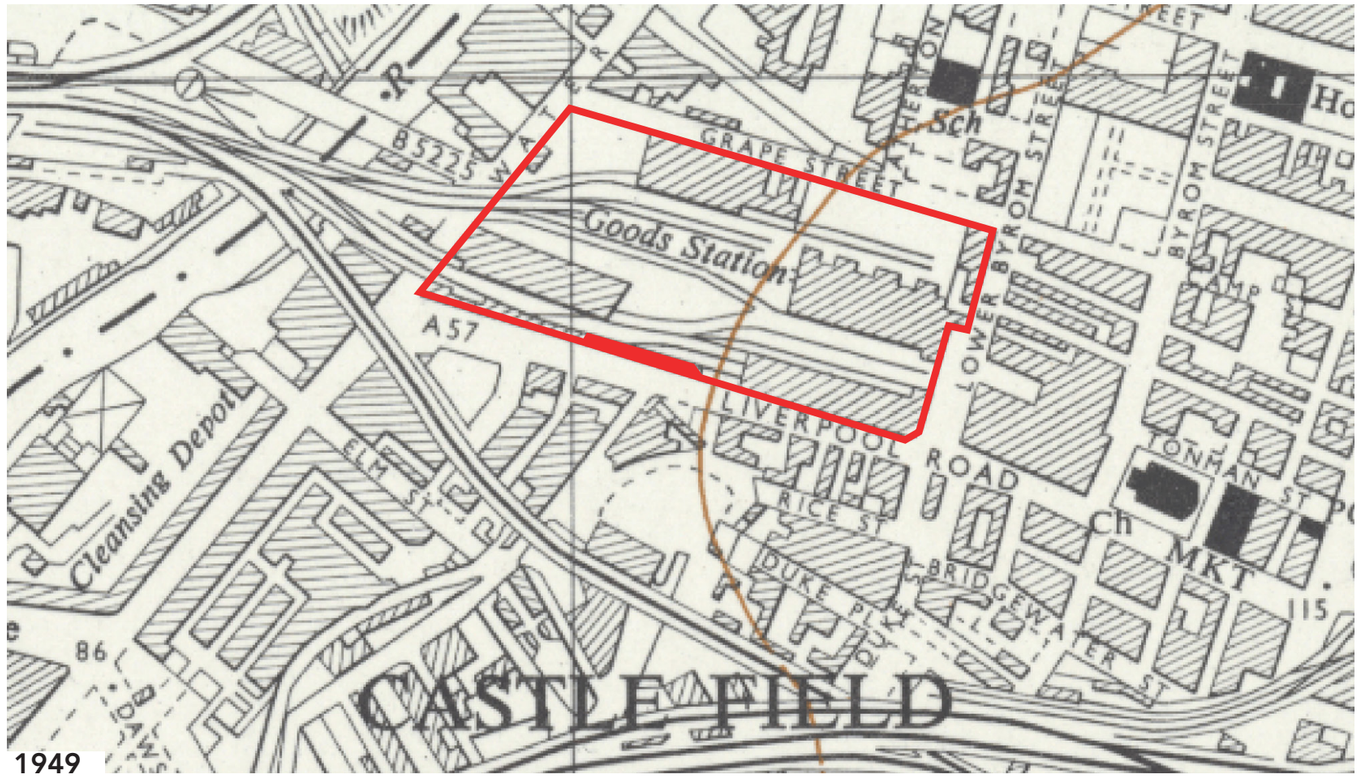
Planning application granted by Manchester City Council 7th January 1984. Proposed works to eastern end of old station building to dismantle, reinstate and stabilise the front elevation, and to upgrade floors to ensure they can withstand museum loading requirements.
REF: 022690



1824



1860



1949

2.5 Summary of Significance

The Liverpool Road Station is the oldest surviving passenger railway station in the world. Therefore, the building is of an exceptional level of significance on local, national and international scales.

The building is Grade I Listed and sits within the Castlefield Conservation Area. The significance of the structures making up the station buildings has been affected in the past by wholesale rebuilding (particularly to the 1831 shops and carriage shed). However, the Station Master's House and First Class Booking Hall are the original construction with a remodelled interior. Even as a rebuild, the Coach Offices, Carriers Offices and Shops were still reconstructed generally in a like for like nature putting the buildings at the highest level of significance - 'exceptional'.

2.6 Summary of the Station Building's Condition

This summary is prepared in reference to the document 'The Science Museum Group Elemental and Condition Survey Suite- Periodic Condition Survey Written Report'

'The two-storey (with basement) building has its main façade onto Liverpool Road, forming a continuous façade with the Station Masters House towards the west. The main façade is mainly of brick disguised by the application of a stucco render, which has a rusticated ashlar effect finish on the ground floors and a smooth finish on the first floor. The building is rectangular in plan on a sloping site. The building can be assessed from street level to the Liverpool Road façade or can be assessed from the station platform to the north at first floor level.

The Station Building can be described as being satisfactory generally, but in a poor condition at roof and Lower Ground levels due to sustained water ingress issues.

This summary is prepared in reference to the document 'The Science Academy-Heritage Significance and Impact Statement' prepared by the Science Museum Group.

There are currently ongoing and severe water ingress issues seen internally at ground, first and roof levels along the entire length of the building in separate locations. The causes for water ingress vary. It was unsafe to gain access at roof level and therefore an Inspection Model was commissioned.

The parapet gutter along the south elevation appears to have undergone a number of previous attempts at repair in the past, which have subsequently failed due to both poor workmanship and the original detail / outlet arrangement (building reconstructed in the 80s). The arrangement and detail at outlet positions is poor with a contorted configuration with no visible overflow or fail-safe provisions. It is recommended that the parapet gutter is overhauled and should include overflow chutes at outlet locations to provide a warning system, given that the parapet isn't readily accessible and is concealed.

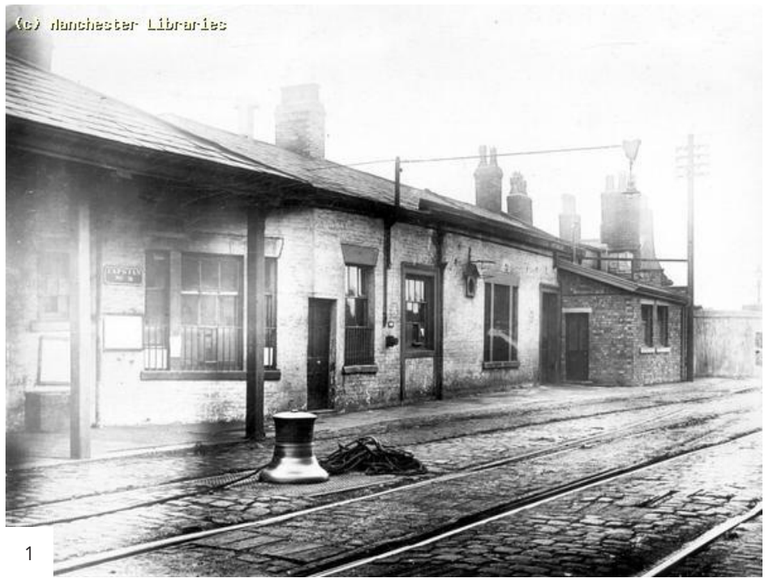
Internally, at first floor level along the south wall (from the station platform), a series of ad-hoc water collection bins, and pipe networks have been orchestrated to collect internal rainwater ingress from the parapet. The ingress is focused over the outlet sumps, which are visible within each room. It is evident that this has been an ongoing issue for some time with evidence of past repair works having been undertaken at embedded truss locations, including the insertion of flitch plates and splicing. The sumps are located over embedded truss ends.

The north slopes are served by a traditional continuous gutter arrangement with outlets connected and incorporated into the hollow cast iron columns, which run the length of this façade. The arrangement of the outlet pipes at present can lead to regular blockage and reduce the water flow. A study should be undertaken to review and improve upon the rainwater detail with the inclusion of rodding access and a less contorted system if feasible.

The embedded truss ends are saturated with evidence of decay. An intrusive investigation of the bearing ends should be undertaken by a timber specialist to check for fungal attack and integrity.

It is unknown as to the route and location of the below ground drainage network from the cast iron rainwater pipes. A below ground drainage survey should be commissioned to ascertain routes, this should include a CCTV survey to identify any defective pipework. There are water ingress issues noted internally, focused centrally within room SB 105 (north wall) with heavily saturated and friable masonry. It can't be confirmed but issues seen here may be linked with below ground drainage issues from the north roof slope. Alternatively, it may be that water is migrating from the 1830s viaduct capping. Please refer to appendices A.3.0 for cost breakdown for rectifying current defects.'

1. Liverpool Road Platform 1895
2. The Carriage Sheds and Shops
3. Area surrounding the Platform May 1980
4. 30th June 1979- Platform Level
5. The Station Building after it was rebuilt



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2.7 Key External Views

The Station Building has two storeys above ground level and a single storey basement which extends across the full length of the building.

The first floor level is aligned with the former station platform with railway tracks beyond onto the 1830s viaduct below to the north. A glazed 20th C. screen has been installed which partially encloses the old platform, providing several flexible use spaces beyond including welfare facilities. To the centre of this level is an open plan space directly off the platform with two store rooms beyond to the east behind timber stud framing.

The station structure is classical in style and is faced in a mixture of red brick, stucco and stone. The stucco is localised to the former booking hall south elevation only. Stone is generally used to frame openings, cornice and ledges.

Internally there are typically masonry walls, with cast iron columns supporting primary beams.

The Station has a slate roof with lead parapet gutters which is supported on timber rafters, purlins and trusses. The trusses are typically supported on the load-bearing masonry to the south elevation and external cast iron columns at platform level, some of which are utilised as rainwater outlets, connected to below ground drainage network.

1. View West along the Platform
2. View East along the Platform
3. Platform and Lower level of the Station Building Entrance
4. The Station Building from Liverpool Road
5. View East along the Platform



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2.8 Key Internal Views

1. Station Building office space at platform level - temporary water collection solution
2. Gallery space at platform level
3. Gallery space at platform level
4. Gallery space at Ground level
5. Gallery space at Ground level
6. Gallery space at Ground level
7. Hallway space at Lower Ground level
8. Gallery space at Lower Ground level
9. Linkage Stair Core Lower Ground to Ground Level



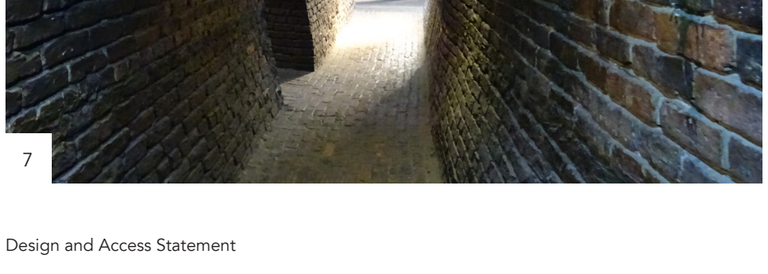
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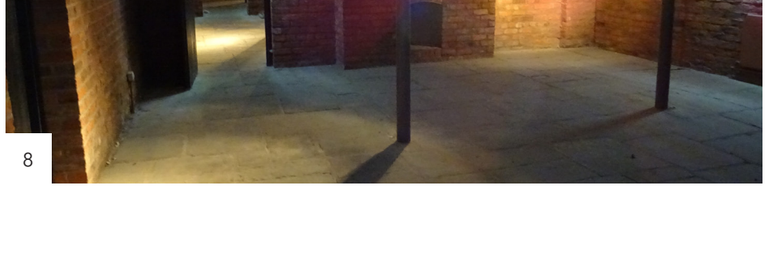
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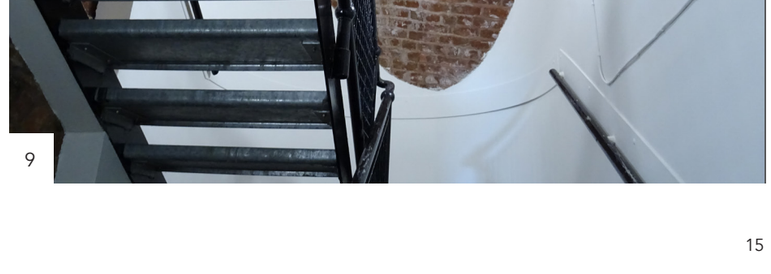
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3.0

Surveys & Condition

3.0 Current Issues

3.1 Site Survey

The survey inspection was carried out over a single visit on Friday 21st August 2020 from 7:00-10:30am. This was carried out by Alex Scrimshaw BSc (Hons) MCIAT, representing Buttress Architects Ltd. Buttress were accompanied by Ged Berry who was representing the Science and Industry Museum and a MEWP operator.

The weather conditions at the time of inspection were clear typically with sporadic rainfall.

The report is based on an inspection from ground level, floor levels and other accessible positions, assisted in areas by a MEWP from Liverpool Road and access ladders at platform level.

Unless otherwise stated, the inspection was purely visual and non-intrusive; no enclosed spaces or inaccessible parts (such as roof finishes, etc.) have been opened up or lifted for inspection.

The purpose of the visit was to understand and evaluate the current roofscape arrangement across the Station Building with focus on rainwater outlets, finishes, coverings, and above ground drainage down to station platform level only. The following indicates the current arrangement of the buildings roof level drainage system at the time of the survey only.

3.2 Summary of Findings

Roofscape

Station Building – Platform Roof – approx. 28° pitch

The roofs across the Station Building are broken into two distinct areas; the primary roof extends across the main station building platform and follows the arc of the railway line to the northern elevation; the roof to the south side runs perpendicular with Liverpool Road. The plan form is circa 70x9lm. The roof is hipped, covered with slate and ridge tiles with a triangular lead flat roof towards the west; the ridge is punctuated with four brick-built chimneystacks. Rainwater discharges from the south and east slopes into a tall masonry parapet capped with stone which extends upwards to circa 1400mm in height, though this varies along the gutter run. The slate covering is in reasonable condition generally with slipped, previously clipped slates evident. The southern slopes across both roofed areas are in a poorer condition typically due the nature of access and the need to step onto slates.

The parapet gutter is stepped, lined with lead with shallow steps between 40-50mm in height, with bays at approximately 2225mm in length. The gutter discharges into a total of five separate outlet (Type 1) sumps which discharge to an external downpipe. There is a lead kerb at the abutment with the parapet wall, which presumably aligns with the stone cornice to the Liverpool Road façade. The gutter and sumps were relatively free of detritus as it was understood that the gutter and outlets had been cleared most recently; given this fact, there was reasonable silt build-up around the mesh grate within each outlet at the time of the visit. There were a number of repetitive defects which extended across the gutter run, typically including cracked leadwork and previous retrospective repair works, involving large extents of flashband and other temporary forms of waterproofing, which worsened continuing west.

The sloped roof to the north discharges into a cast iron gutter laid predominantly level, secured onto fixed brackets. The gutter is a cast iron half round in profile and circa 170x75mm in size, and follows the arc of the railway track beyond. The gutter discharges into 5nr. outlets. Silt and debris build up generally, with areas of standing water visible.

The flat roof towards the west, which takes up the deviation due to the arc of the roof, is lead lined with solid wood rolls in regular bays, punctuated with 2nr. chimneystacks. The lead was fractured in a number of locations, clips missing and previous temporary retrospective repairs visible.

Flashings to the chimneystacks were poor; either missing or unsecured with open mortar joints typically.

The valley gutter shared with the ticketing hall roof is lead with previous repairs visible. Rainwater discharges to the north and is picked up by a cast iron hopper and outlet (Type 2).

The interior spaces from platform level (first floor) extend up towards the roof pitch with timber rafters and roof structure (timber trusses) fully exposed. It appears that a cementitious sarking board has been fixed over the rafters from above to provide an internal finish. It is unknown at the time the exact make-up of the roof build-up, it is anticipated to include a roofing membrane and timber battens and counter battens.

Station Building – Ticketing Hall Roof – approx. 28° pitch

The secondary roof to the Station Building extends over the former ticketing hall to the west and is slate covered with a hipped roof, the roof abuts the gable to the Station Masters House towards the west. Similar to that of the main roof, the roof is served by a parapet gutter to the south and additionally to the north with a shared valley gutter to the east. The plan form is circa 25x9lm.

Access across the parapet gutter to the south is limited, reducing to around 150mm from the wall to the edge of slate. The south slope is only served by a single outlet (Type 5). The gutter is stepped, lead lined. Build-up of silt evident. The slates to this roof are poor with many slipped with fractures.

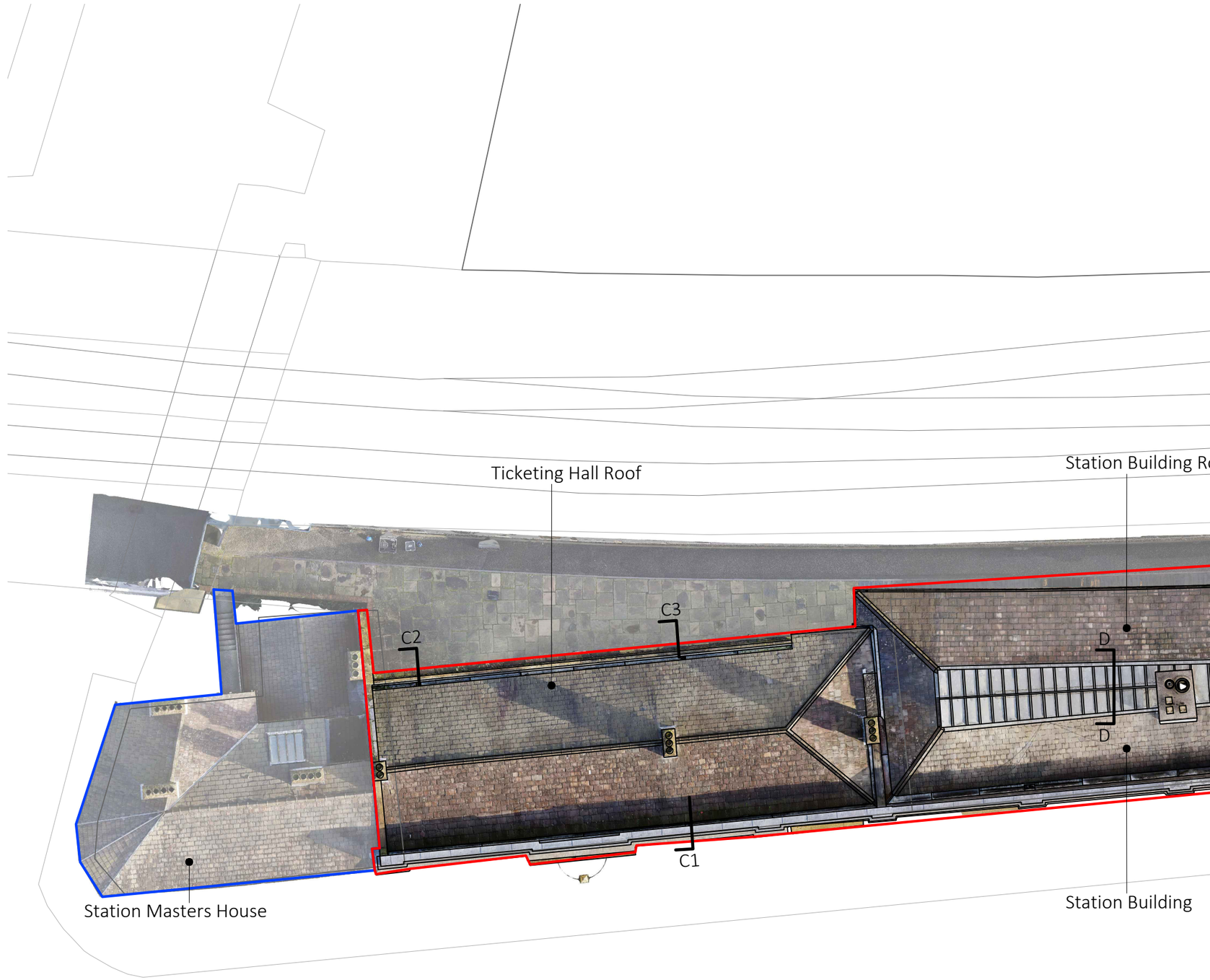
The parapet to the north is shallow and stone built. The gutter is lead lined, stepped towards 2nr. outlets (Type 3).

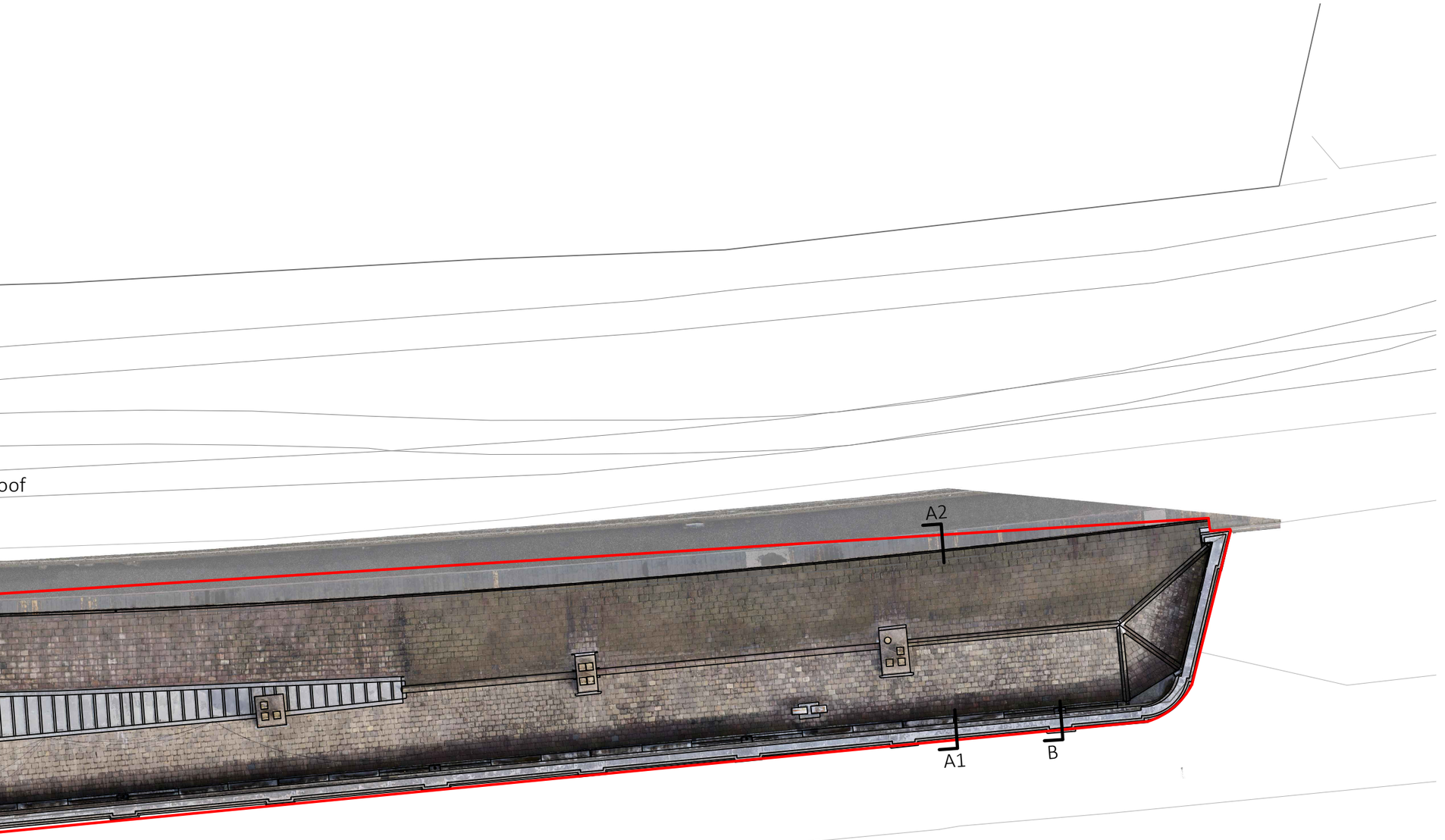
The slate roof is penetrated by 3nr. brick built chimneystacks.

The interior spaces are finished to a high standard with ceilings at wallplate level. The roof void was accessed from room SB 102, from ceiling access hatch. The internal rainwater can be seen to the west, with a transfer pipe extending from the south to the north exterior rainwater outlet.

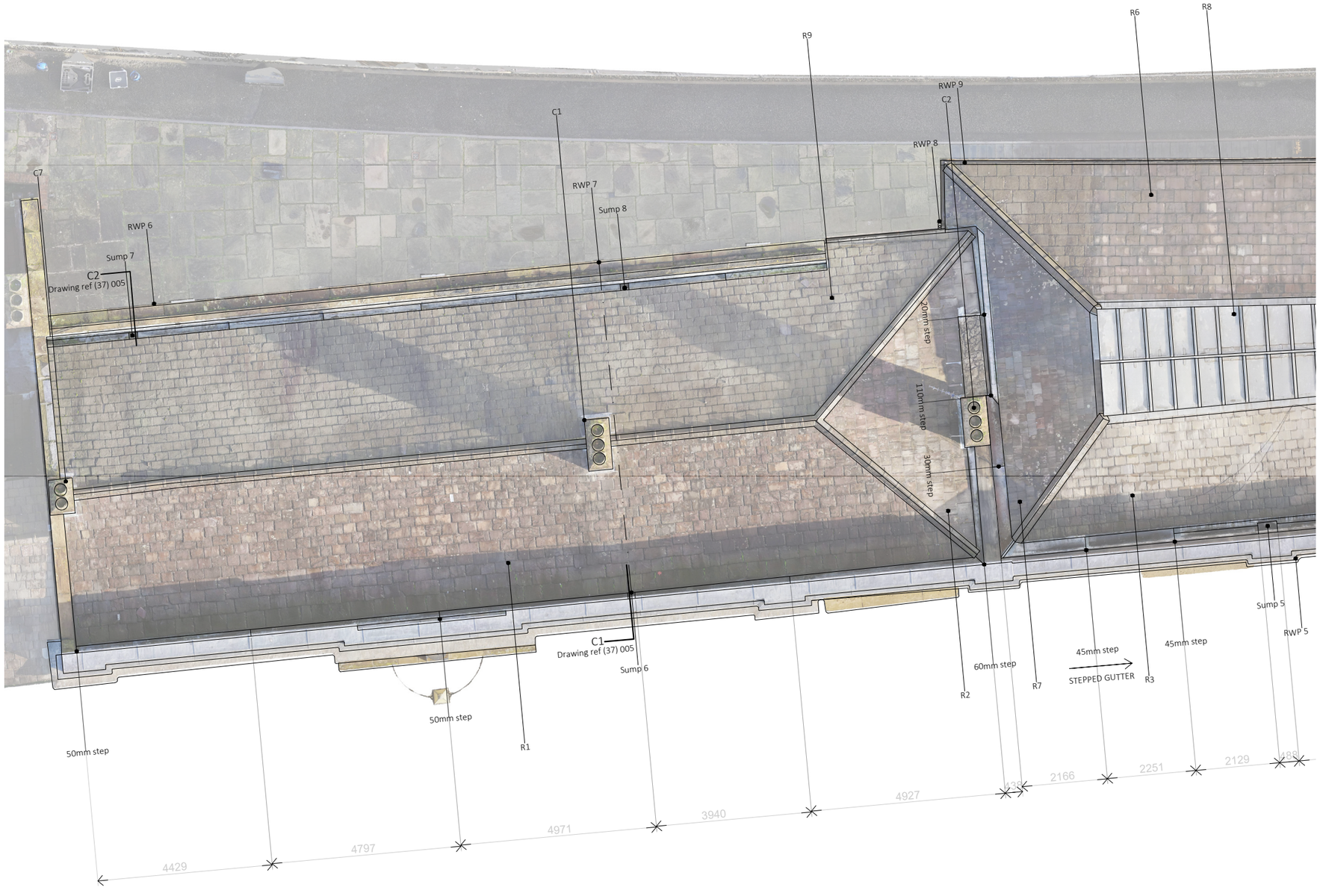
Timber roof structure was exposed with bitumen felt membrane evident.

3.3 Roof Plan As Existing

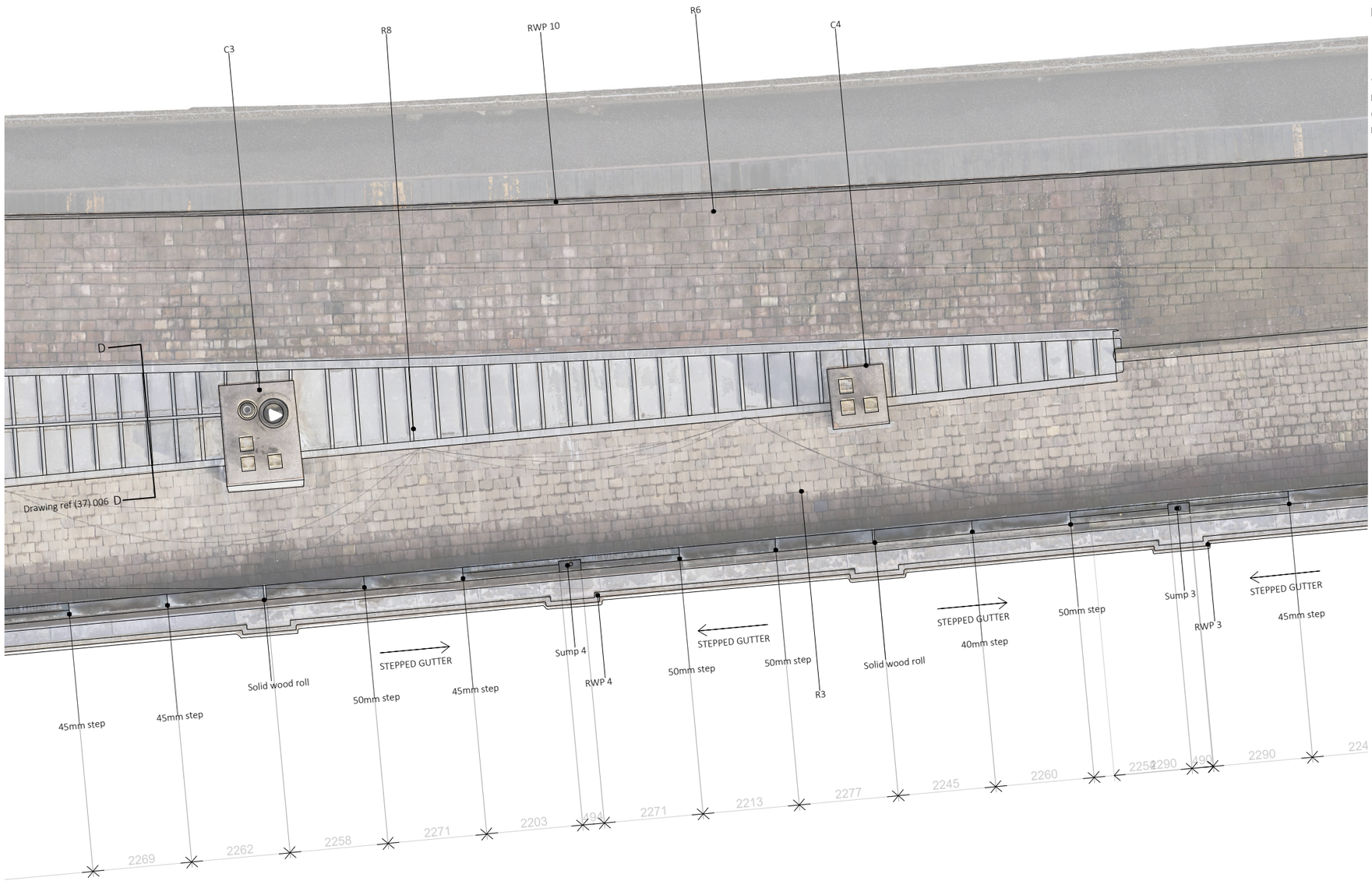



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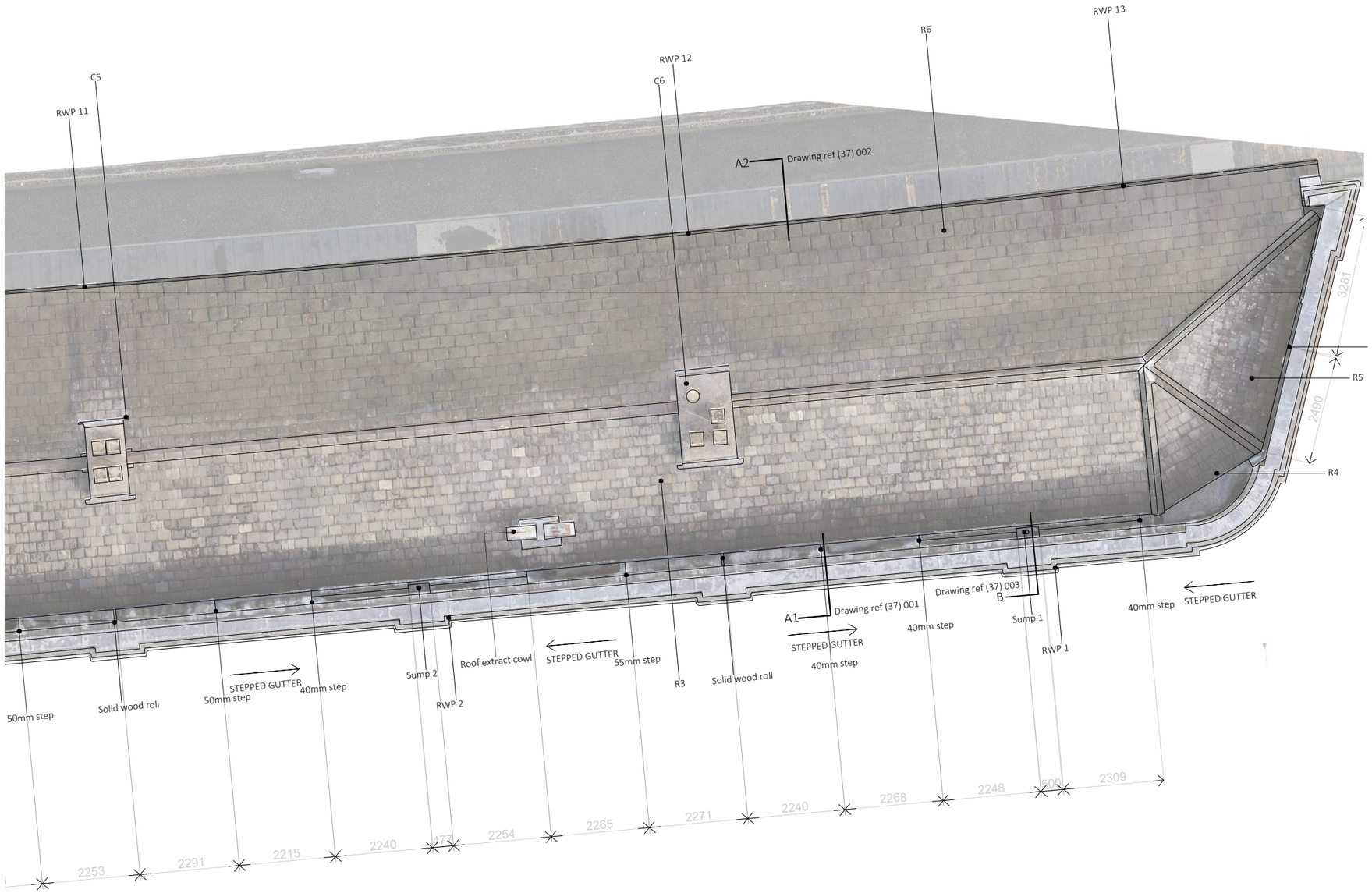
3.4 Part Ortho Plan 3



3.5 Part Ortho Plan 2



3.6 Part Ortho Plan 1



4.0

Design Proposals

4.0 Design Proposals

4.1 Preferred Options: Analysis & Development Summary

Large Project

Following the detailed feasibility study undertaken in October 2020, which included review across a wide range of project types from small isolated packages of works, to medium phased packages, extending to large scale projects across 8 alternate options.

The options were broken down into the following headings, which were then further sub-divided by additional options with that category:

- Discounted
- Do minimum
- Improve

Small Project Medium Project Large project

Do Minimum: This option involved general maintenance tasks across the existing roofscape, including reactive repairs as and when a problem arises. The repairs are generally temporary in nature.

Small Project Option 1: This option was typically isolated to the Station Building Ticketing Hall roof only.

Small Project Option 2: This option focused on the Station Building south, east and west slopes, including guttering to valley gutters and parapets only.

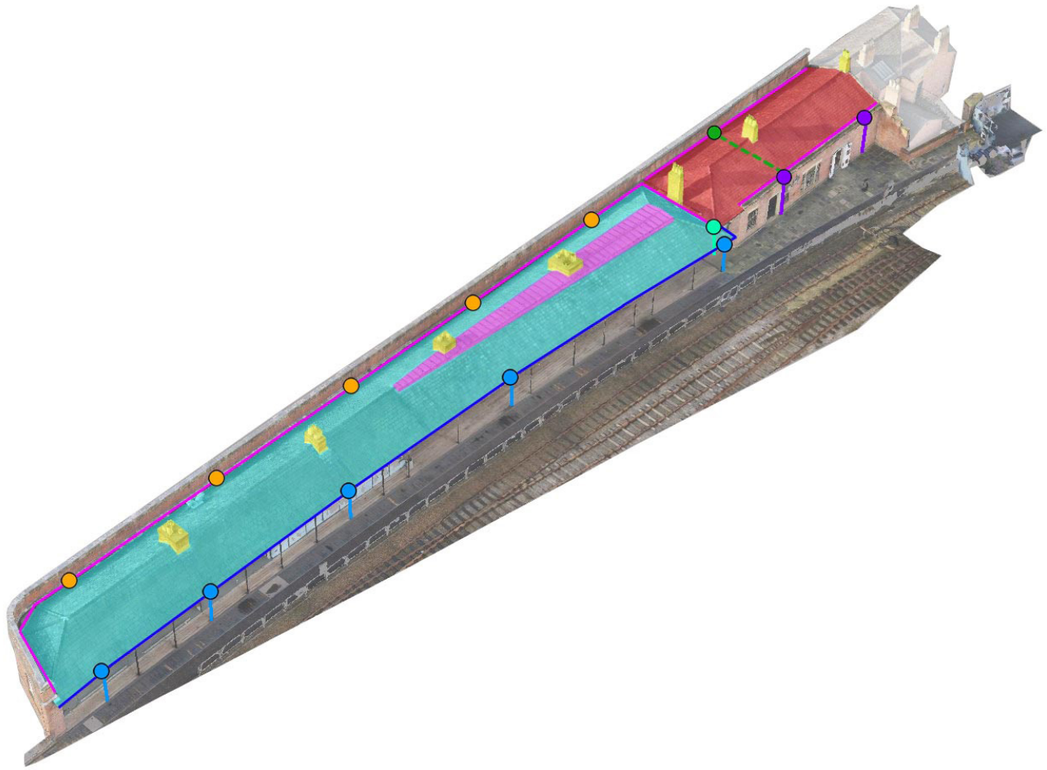
Medium Project Option 1: This project included undertaking both Small Project options 1 and 2 concurrently within a single medium sized phase.

Medium Project Option 2: This project included undertaking both Small Project options 1 and 2 concurrently within a single phase, with the additional inclusion of the lead lined flat roof to the Station Building Platform roof.

Medium Project Option 3: This project included undertaking the re-roofing works to the Station Platform roof only, no works to Ticketing Hall roof.

Medium Project Option 3+: This project included undertaking the re-roofing works to the Station Platform roof, including improvement work to the internal outlet system to the Ticketing Hall roof.

Large Project This project highlighted all the works required extending across the entire roofscape of the Station Building to provide a wind and watertight envelope at roof level.



The Science Museum Groups preferred approach was to proceed with a wholesale large re-roofing project across the Station Building roofscape, presented graphically on the diagram to the side.

The Large Project will provide the client with a fully wind and watertight external envelope at roof level across the whole asset and will allow for all necessary alterations, improvements and upgrades to be undertaken across all of the variant outlet types and rainwater disposal system as a whole.

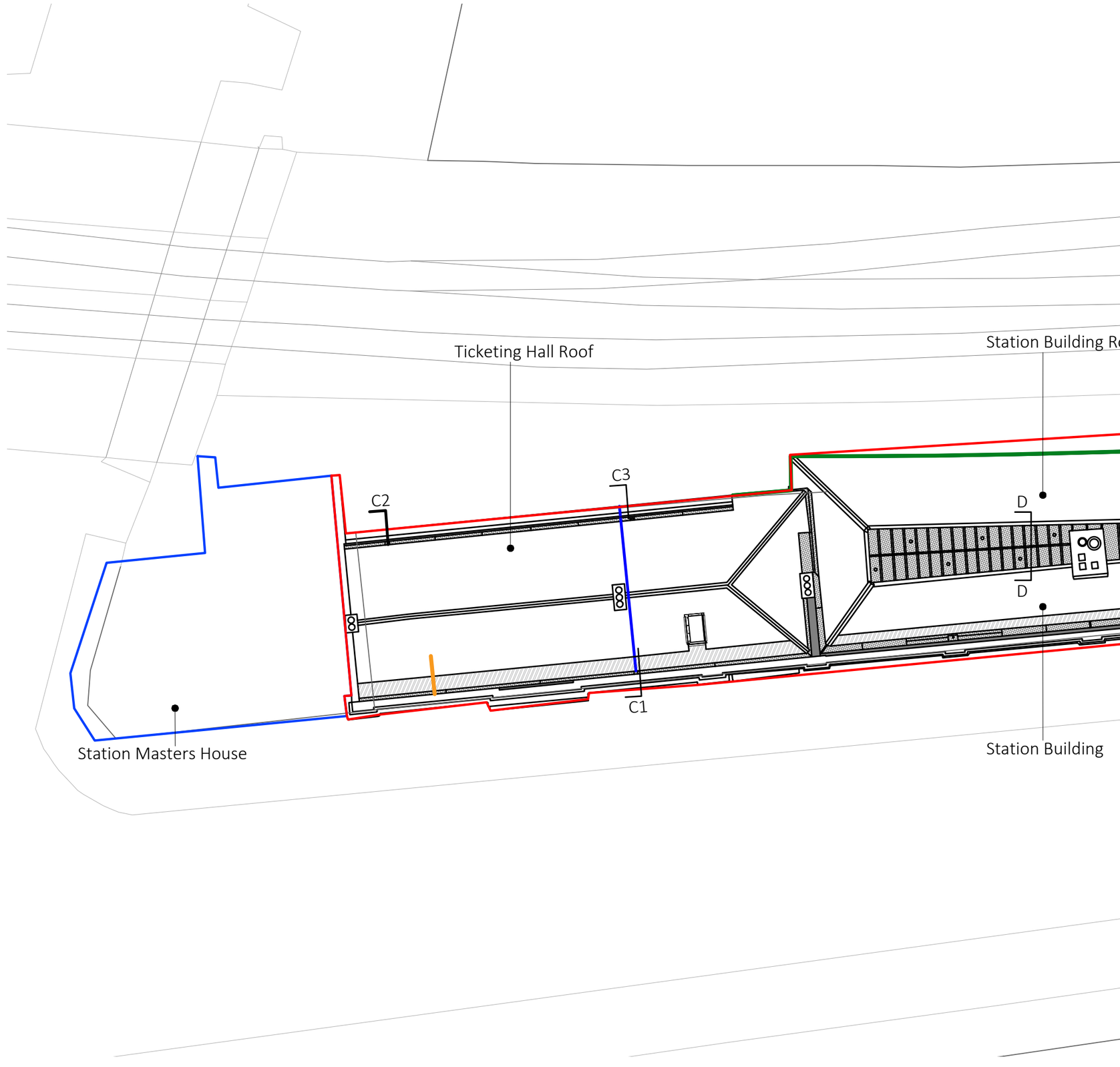
The roofscape has been broken down into a series of headings on an element by element basis, as follows:

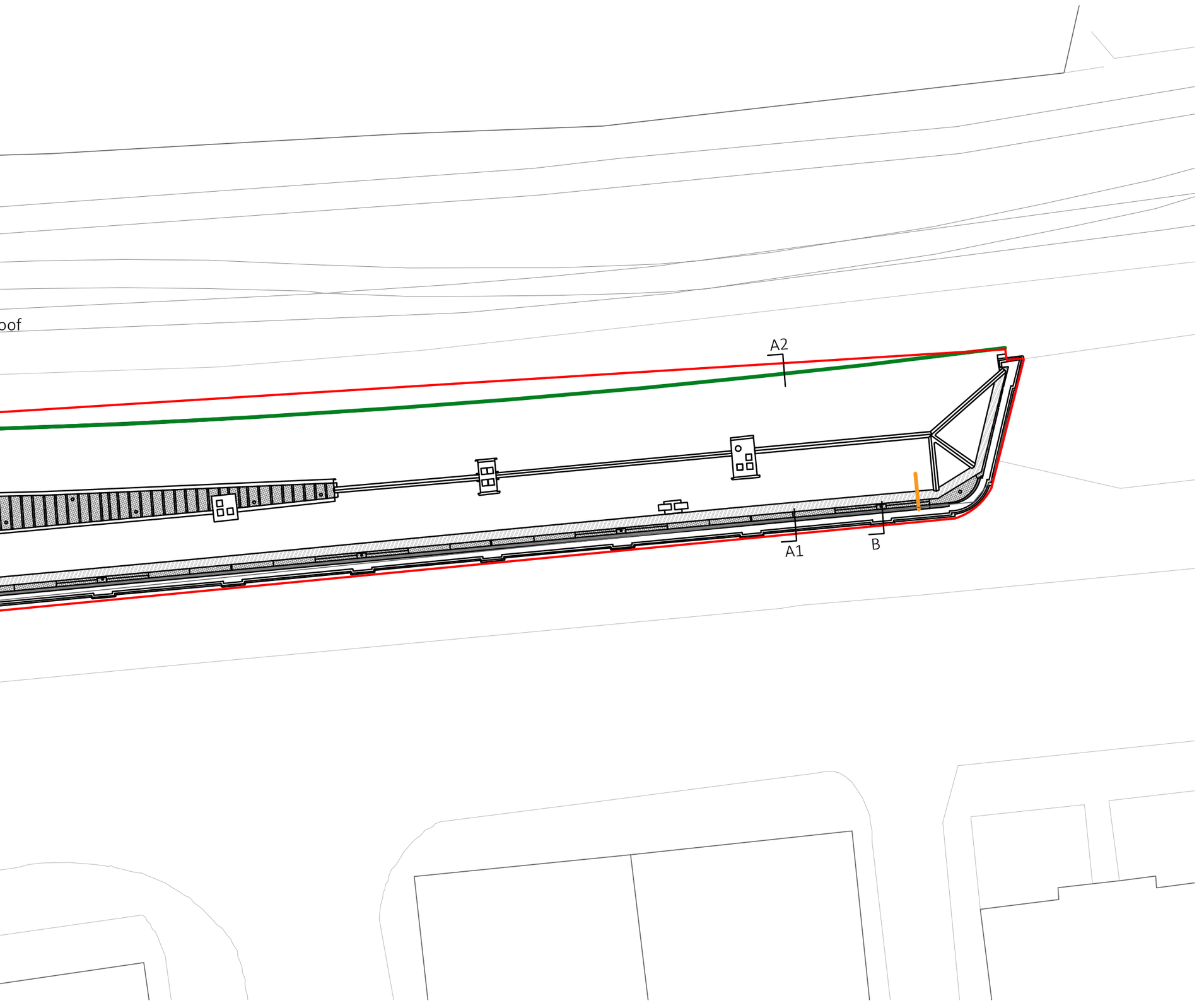
- Rainwater outlets
- Guttering
- Roof coverings

Introduction

Following further investigation the design proposals of the Large project, have been developed into a detailed drawing package.

4.2 Proposed Roof Plan



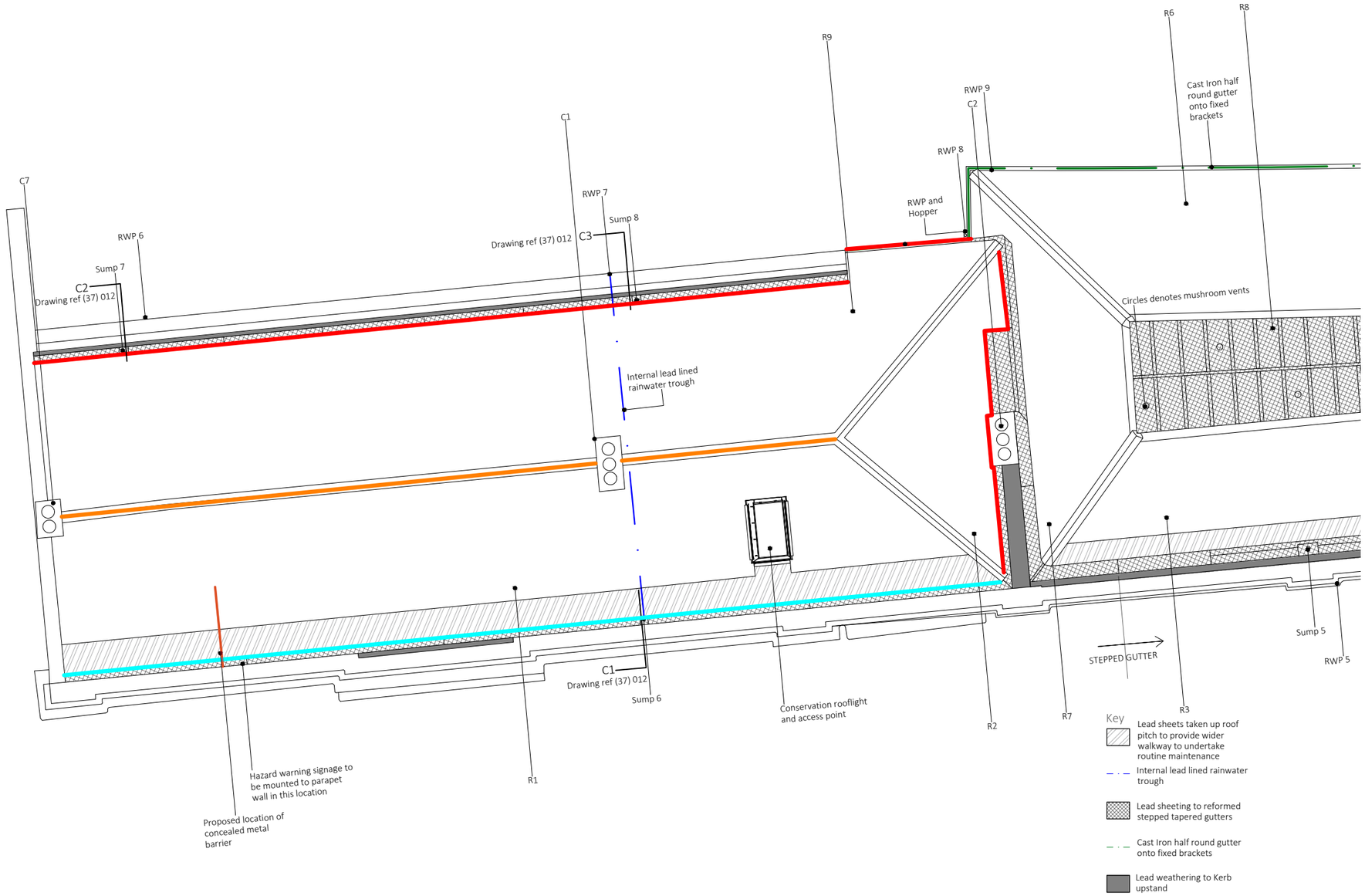

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4.3 Proposed Part Ortho Plan 3

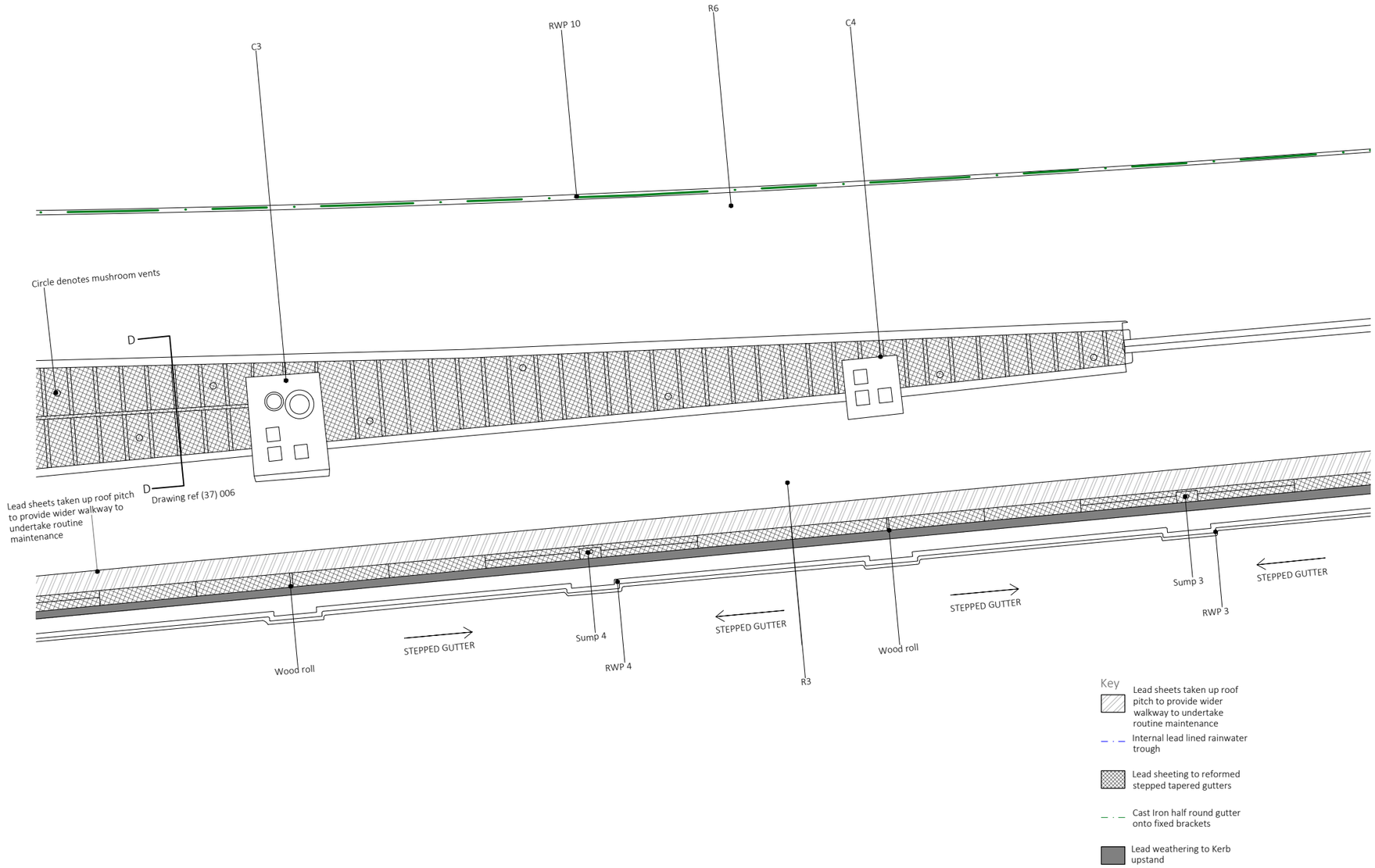
Layboard Ventilator

Pitched eaves ventilator

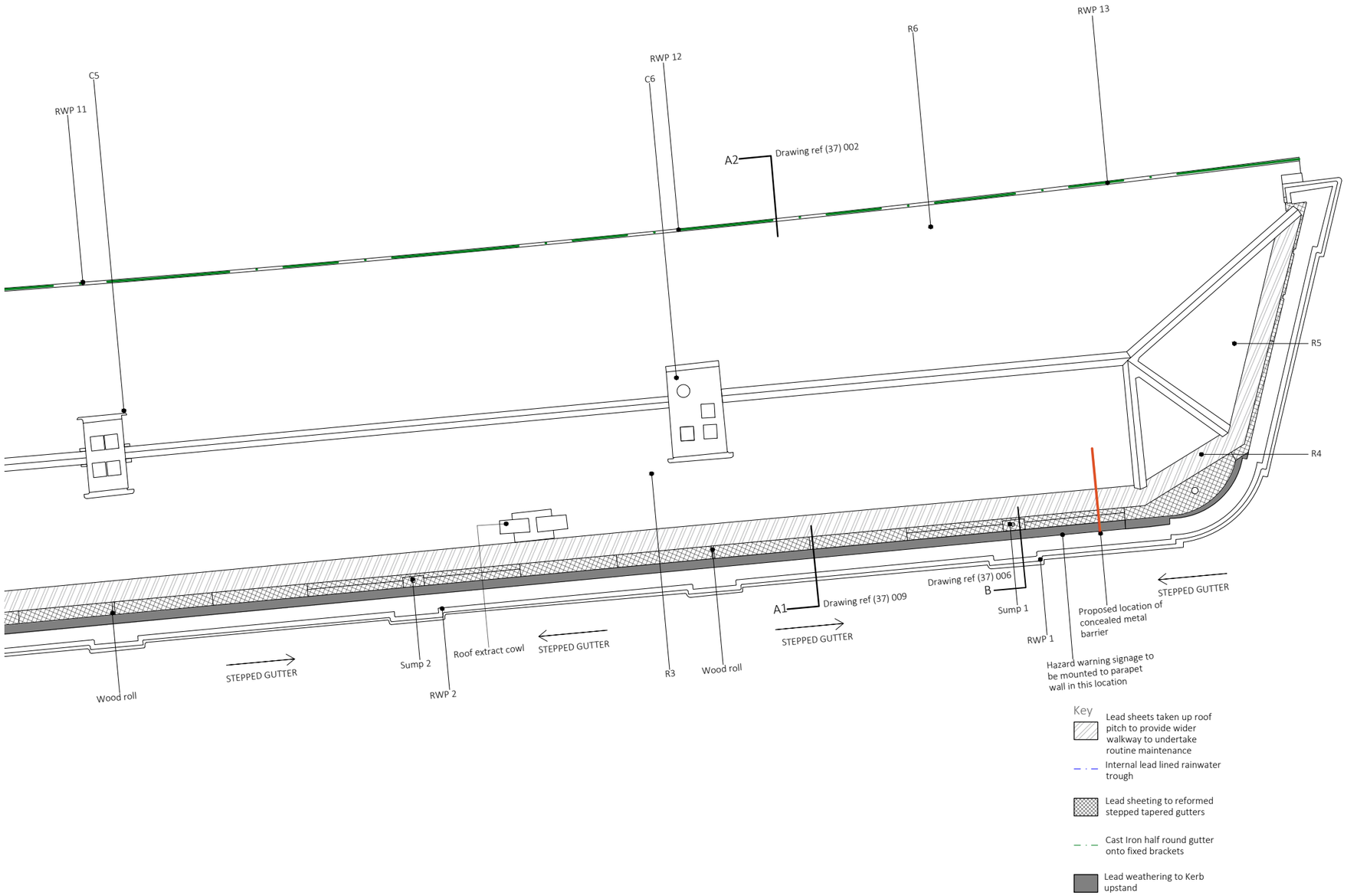
Ridge ventilator



4.4 Proposed Part Ortho Plan 2



4.5 Proposed Part Ortho Plan 1



4.6 Roof Coverings

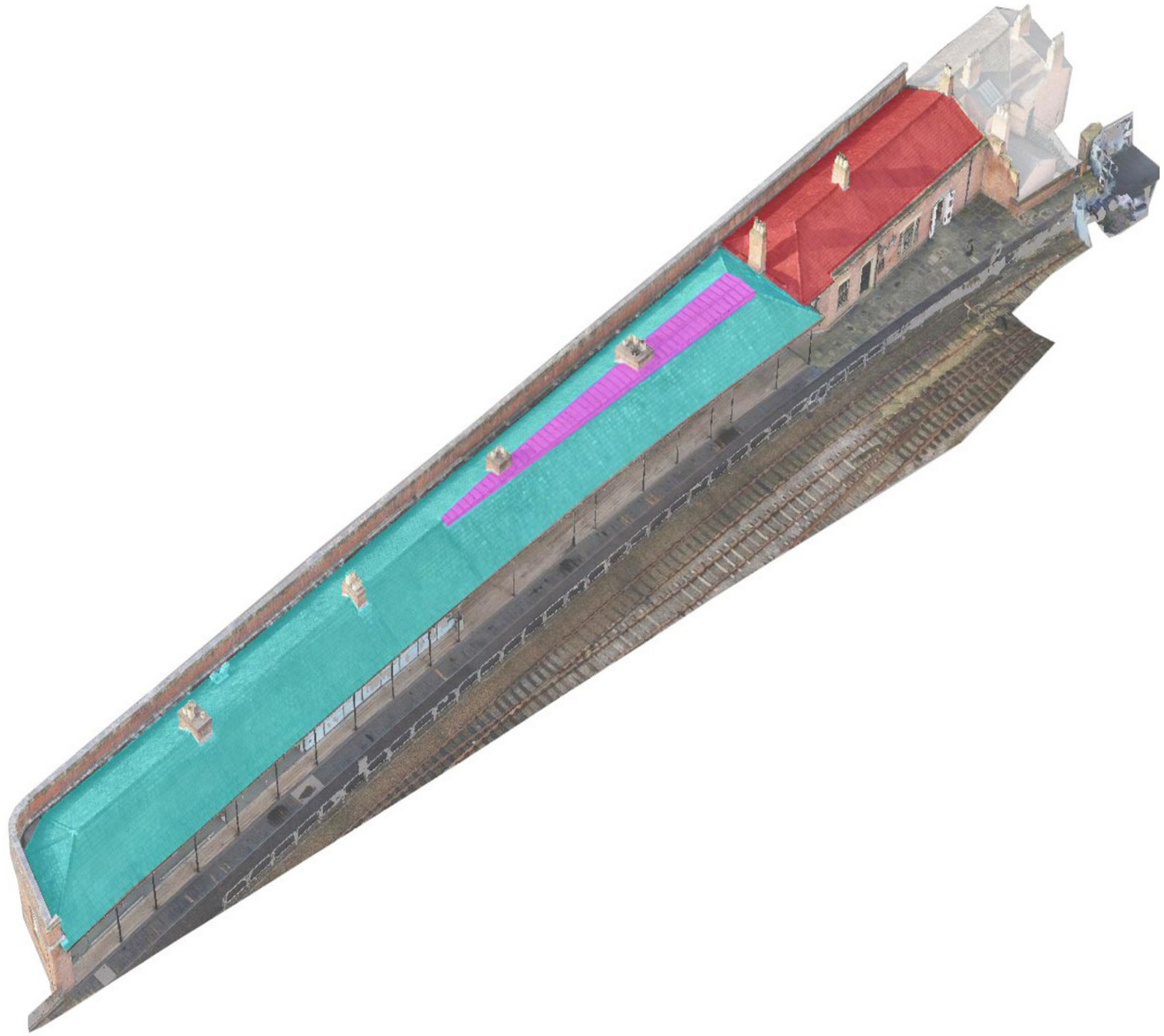
The roof is split into two distinct areas, separated by a lead lined valley gutter. The area shaded red is referred to as the 'ticketing hall' and the area shaded cyan extends across the remaining Station platform. The roofs are slate pitched with hips and ridge tiles.

Proposal – slate roof coverings (cyan and red shaded)

- Re-roofing across all slated slopes including a 25% allowance for new replacement slates
- Renewal of all lead stepped / cover flashings at abutment with chimneystacks.
- Re-bedding of ridge tiles.
- Introduction of lightning protection.
- Introduction of trace heating within parapet guttering.
- Introduction of rainwater sensors within parapet outlet locations.
- Confirmation of insulation within roof structure is to be confirmed. Archive material makes reference to insulation having been previously specified.

Proposal – lead flat roof coverings (pink shaded)

- Existing triangular lead lined flat roof with solid wood rolls is to be wholesale replaced with lead to match original arrangement with solid wood rolls.
- Renew all flashings at abutments with pitched slate roof and masonry chimneystacks.
- Introduce lead mushroom vents within assumed concealed / hidden void to introduce appropriate air flow.





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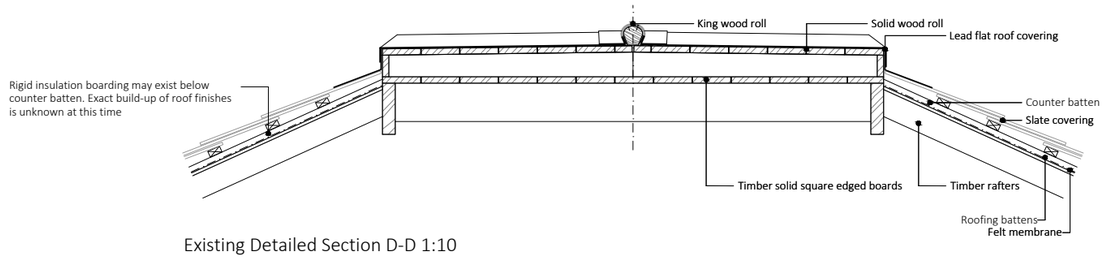
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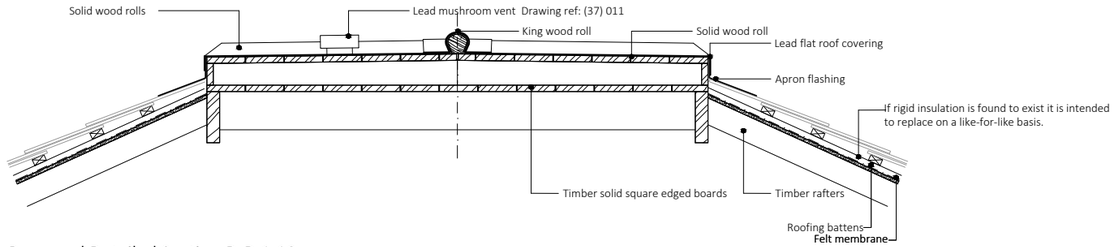
4.7 Typical Flat Lead Roof Details

Fig. 1 : Drawing Sheet (37) 006 - Existing Typical Lead Roof 1:10
Fig. 2 : Drawing Sheet (37) 006 - Proposed Typical Lead Sheet Detail 1:10
Fig. 3: Drawing Sheet (37) 011 - Typical Flat Lead Roof Details 1:2
Fig 4: Typical Lead Mushroom Vent Details 1:2



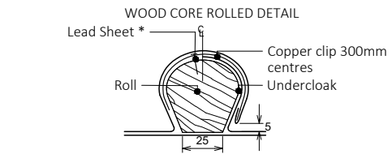
Existing Detailed Section D-D 1:10

Figure 1 :Existing Typical Lead Roof 1:10 on Drawing Sheet

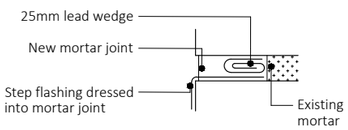


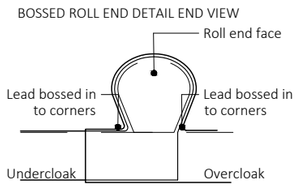
Proposed Detailed Section D-D 1:10

Figure 2 :Proposed Typical Lead Roof 1:10 on Drawing Sheet



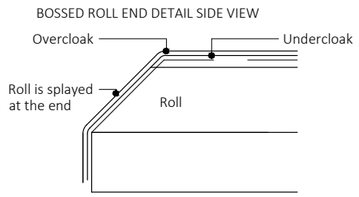
Roll overall size 45x45mm.
Undercloak stops on top of the roll
Copper nails to copper clip behind undercloak to avoid penetration and retain thermal movement

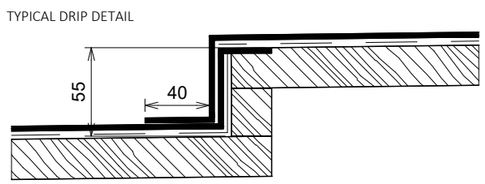




Undercloak is bossed onto the splayed face of the roll end and trimmed to fit. Overcloak is then dressed over the roll and bossed in on the other side of the roll.

To avoid risks with condensation leadwork should be laid on ventilated roof constrcution which conforms to current Building Regulations and the recommendations in British Standards 5250 and 6229.





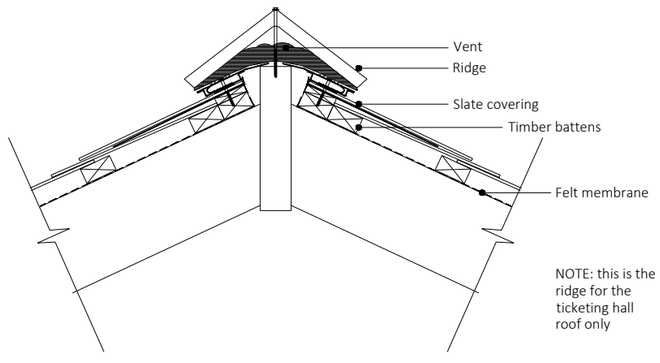
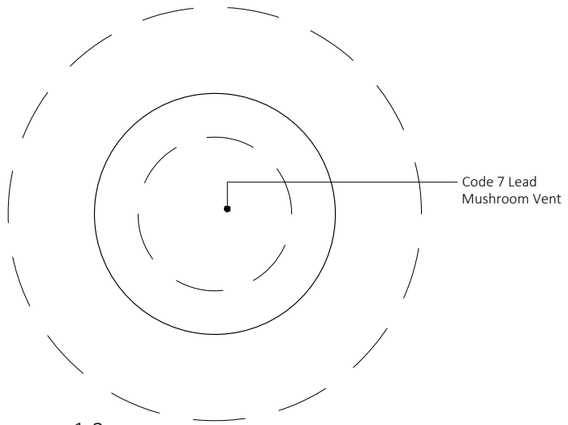


Figure 3: Typical Lead Sheet Details 1:2 on Drawing Sheet



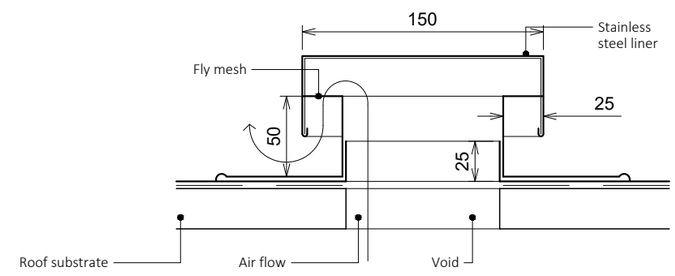


Figure 4: Typical Lead Mushroom Plan and details 1:2 on Drawing Sheet

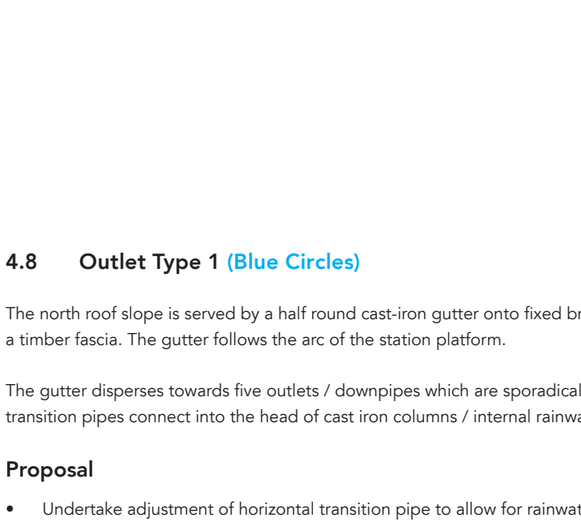
4.8 Outlet Type 1 (Blue Circles)

The north roof slope is served by a half round cast-iron gutter onto fixed bracketing, fixed back to a timber fascia. The gutter follows the arc of the station platform.

The gutter disperses towards five outlets / downpipes which are sporadically spaced. The transition pipes connect into the head of cast iron columns / internal rainwater downpipe.

Proposal

- Undertake adjustment of horizontal transition pipe to allow for rainwater to travel toward the outlet.
- Undertake adjustment of gutter to ensure free-flowing drainage.
- Refurbishment of all cast iron rainwater goods including guttering, brackets, transition pipes, clips etc including resealing and renewal of corroding elements.
- Introduce of rodding access point to transition pipe.







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Outlet Type 1 (Blue Circles)

Typical Sump/Chute Overflow Details As Existing

Fig. 1: Drawing Sheet (37) 002 - Typical Sump_Chute Overflow (Existing Sump/Chute Overflow 1:5)

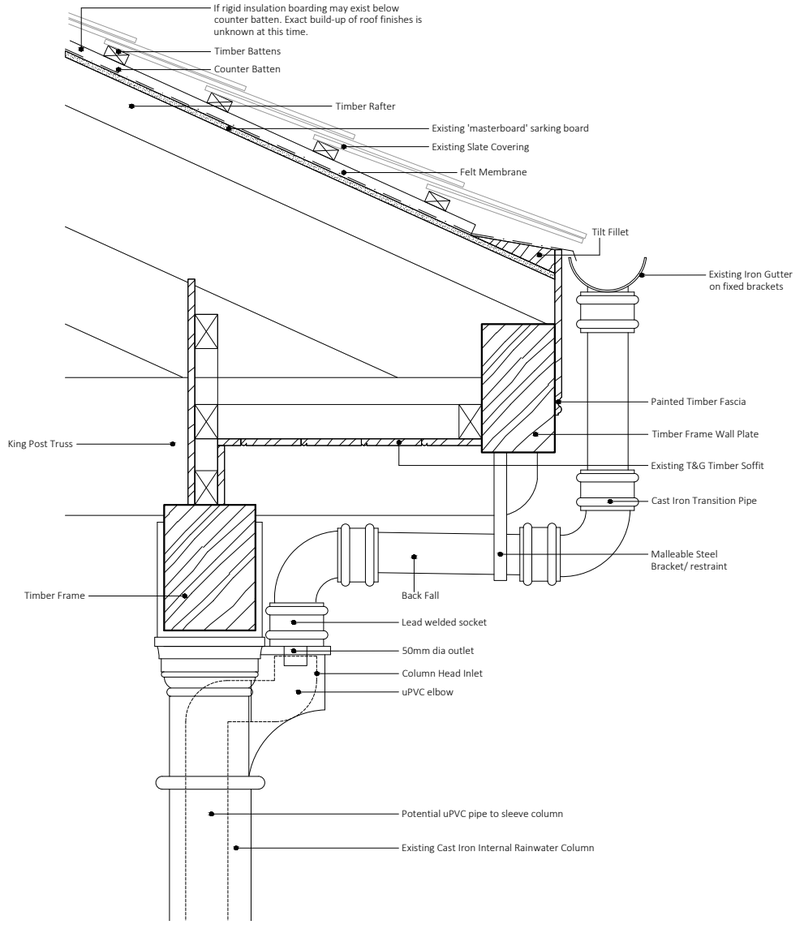


Figure 1 Existing Sump/Chute Overflow Detail 1:5 on Drawing Sheet

Outlet Type 1 (Blue Circles)

Typical Sump/Chute Overflow Details As Proposed

Fig. 1: Drawing Sheet (37) 002 - Typical Sump Chute Overflow (Proposed Sump/Chute Overflow 1:5)

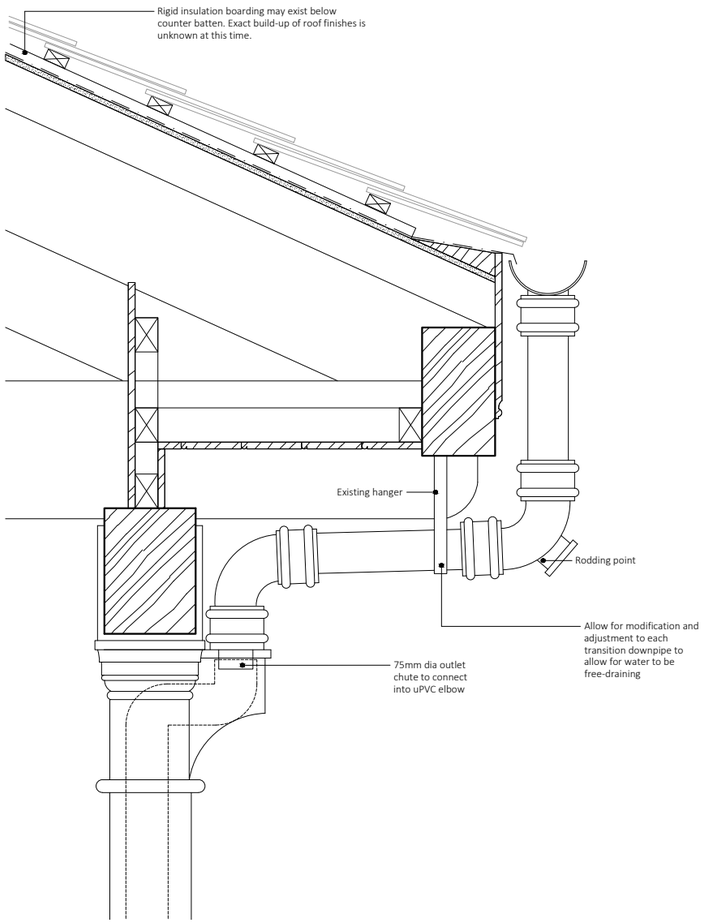


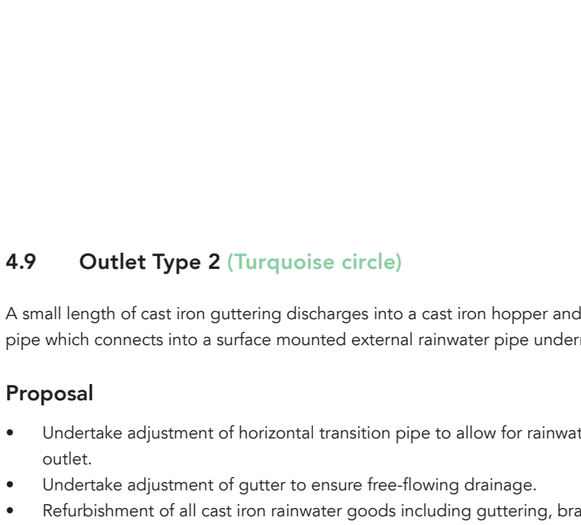
Figure 1 Proposed Sump/Chute Overflow Detail 1:5 on Drawing Sheet

4.9 Outlet Type 2 (Turquoise circle)

A small length of cast iron guttering discharges into a cast iron hopper and horizontal transition pipe which connects into a surface mounted external rainwater pipe underneath the roof canopy.

Proposal

- Undertake adjustment of horizontal transition pipe to allow for rainwater to travel toward the outlet.
- Undertake adjustment of gutter to ensure free-flowing drainage.
- Refurbishment of all cast iron rainwater goods including guttering, brackets, transition pipes, hopper, clips etc including resealing and renewal of corroding elements.
- Introduction of rodding access point to transition pipe.







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4.10 Outlet Type 3 (Purple circle)

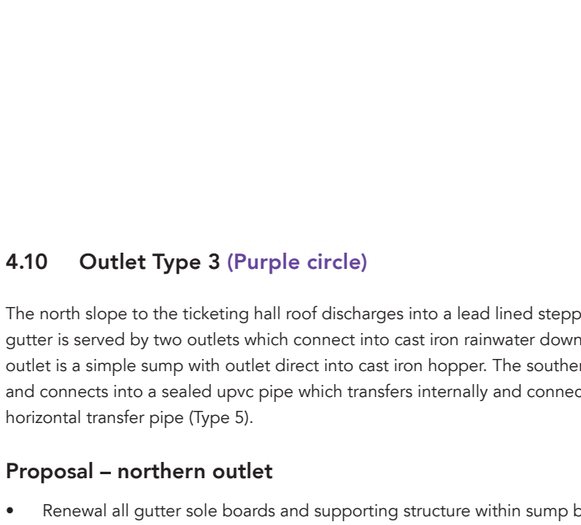
The north slope to the ticketing hall roof discharges into a lead lined stepped parapet gutter. The gutter is served by two outlets which connect into cast iron rainwater downpipes. The northern outlet is a simple sump with outlet direct into cast iron hopper. The southern outlet is sealed and connects into a sealed upvc pipe which transfers internally and connects with the existing horizontal transfer pipe (Type 5).

Proposal – northern outlet

- Renewal all gutter sole boards and supporting structure within sump boxes.
- Renewal of all leadwork.
- Introduction of lead overflow chute.
- Overhaul existing cast iron hopper and downpipe.

Proposal – southern outlet

- Renewal of all gutter sole boards and supporting structure within sump boxes.
- Renewal of all leadwork.
- Renewal of transfer pipe with lead pipe, connected into new lead lined internal trough (Type 5).
- Introduction of lead overflow chute.
- Overhaul existing cast iron hopper and downpipe.







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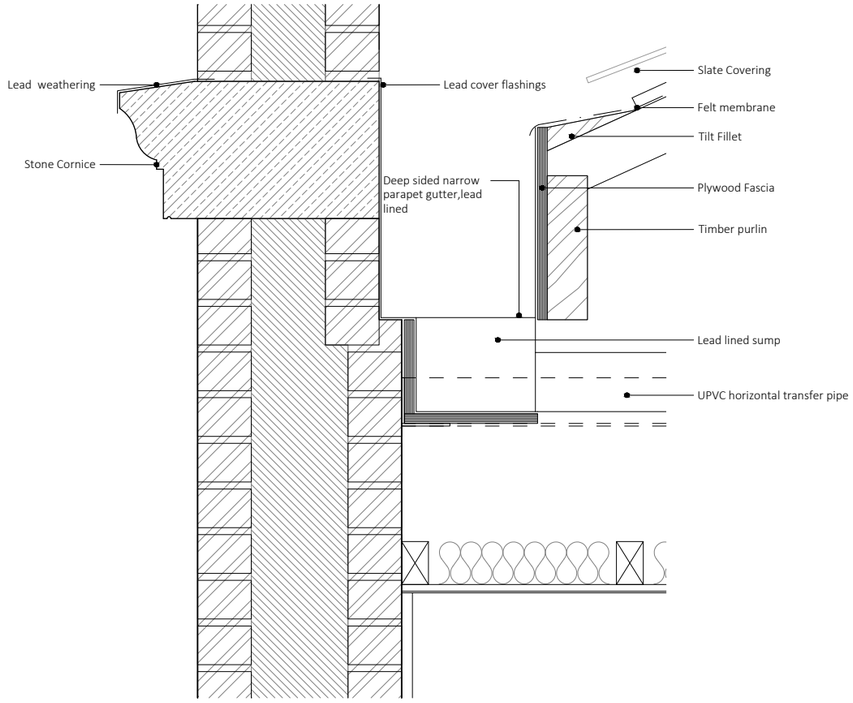


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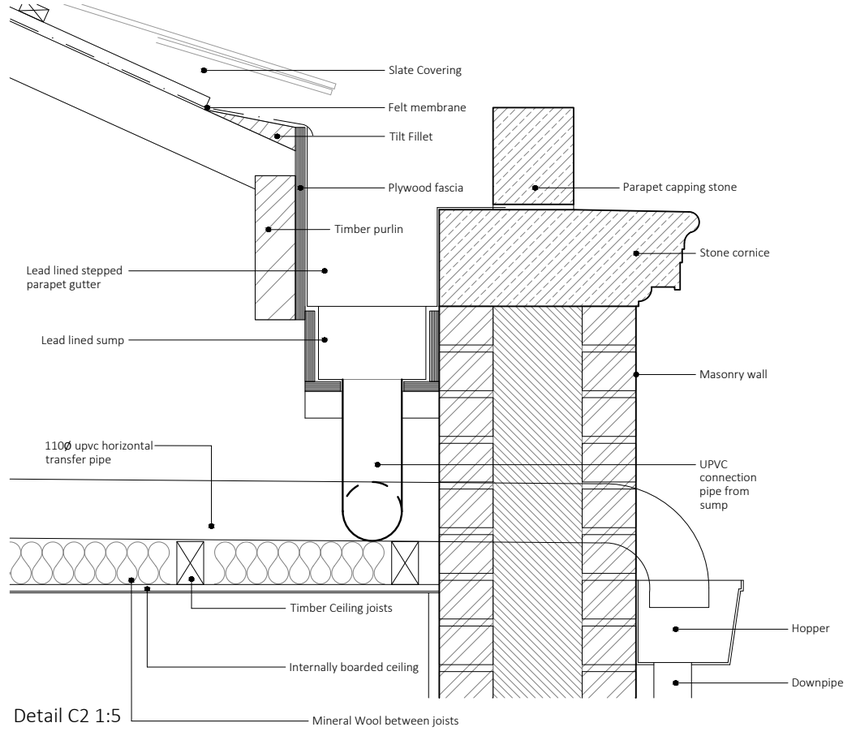
Outlet Type 3 (Purple circle)

Existing and Proposed Typical Parapet Details North and South

Fig 1: Drawing Sheet (37) 005 - Details C1 and C2 1:5
Fig 2: Drawing Sheet (37) 012 - Proposed Details C1, C2 and C3 1:5

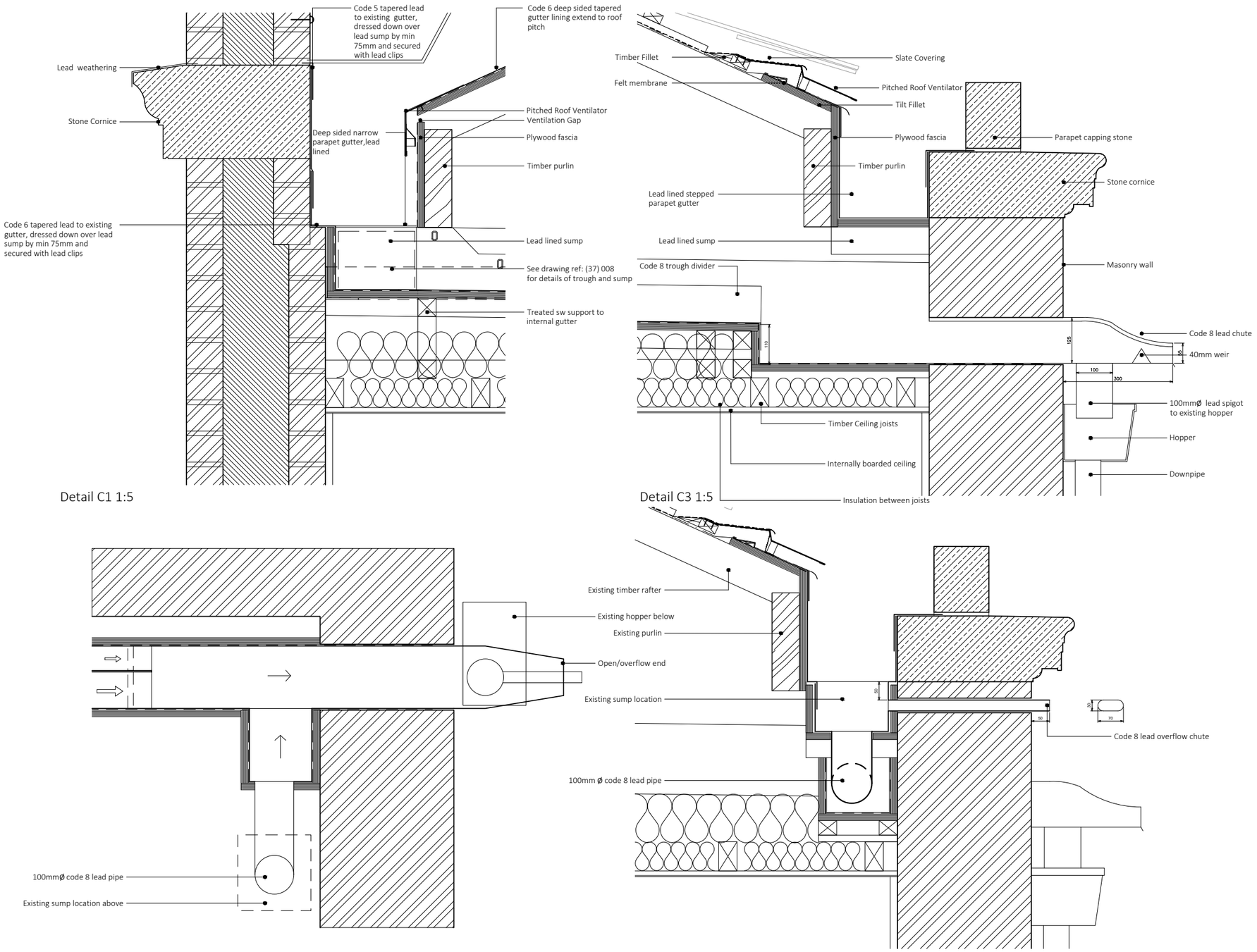


Detail C1 1:5



Detail C2 1:5

Figure 1 Detail C1 and C2 1:5 on Drawing sheet



Detail C1 1:5

Detail C3 1:5

Plan Detail C3 1:5

Detail C2 1:5

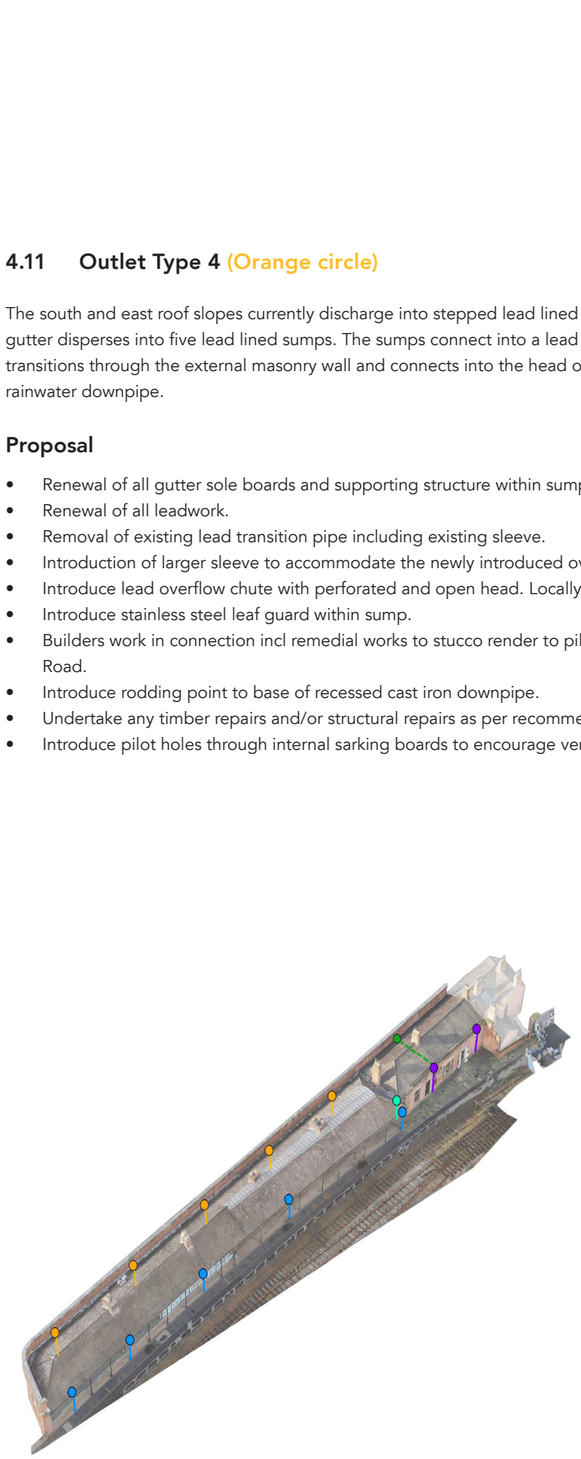
Figure 2 Proposed Detail C1, C2 and C3 1:5 on Drawing sheet

4.11 Outlet Type 4 (Orange circle)

The south and east roof slopes currently discharge into stepped lead lined parapet gutters. The gutter disperses into five lead lined sumps. The sumps connect into a lead downpipe which transitions through the external masonry wall and connects into the head of a recessed cast iron rainwater downpipe.

Proposal

- Renewal of all gutter sole boards and supporting structure within sump boxes.
- Renewal of all leadwork.
- Removal of existing lead transition pipe including existing sleeve.
- Introduction of larger sleeve to accommodate the newly introduced overflow chute.
- Introduce lead overflow chute with perforated and open head. Locally trim out wall plate.
- Introduce stainless steel leaf guard within sump.
- Builders work in connection incl remedial works to stucco render to pilaster to Liverpool Road.
- Introduce rodding point to base of recessed cast iron downpipe.
- Undertake any timber repairs and/or structural repairs as per recommendations.
- Introduce pilot holes through internal sarking boards to encourage ventilation







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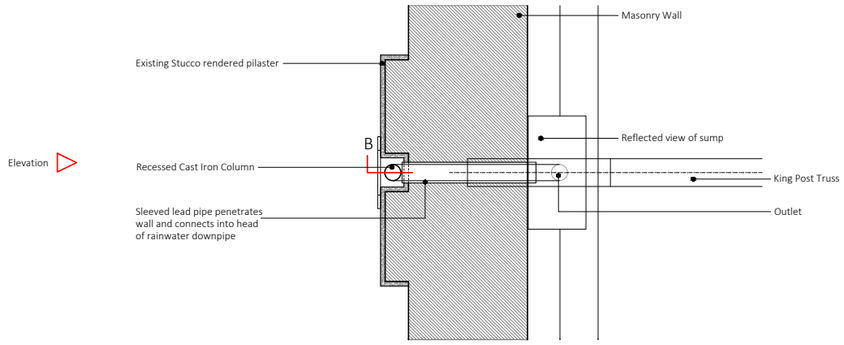


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Outlet Type 4 (Orange circle)

Typical Parapet Gutter Details As Existing

Fig. 1: Drawing Sheet (37) 004 - Typical Parapet Gutter Detail 1:5 and 1:10



Existing Typical Parapet Sump Plan 1:10

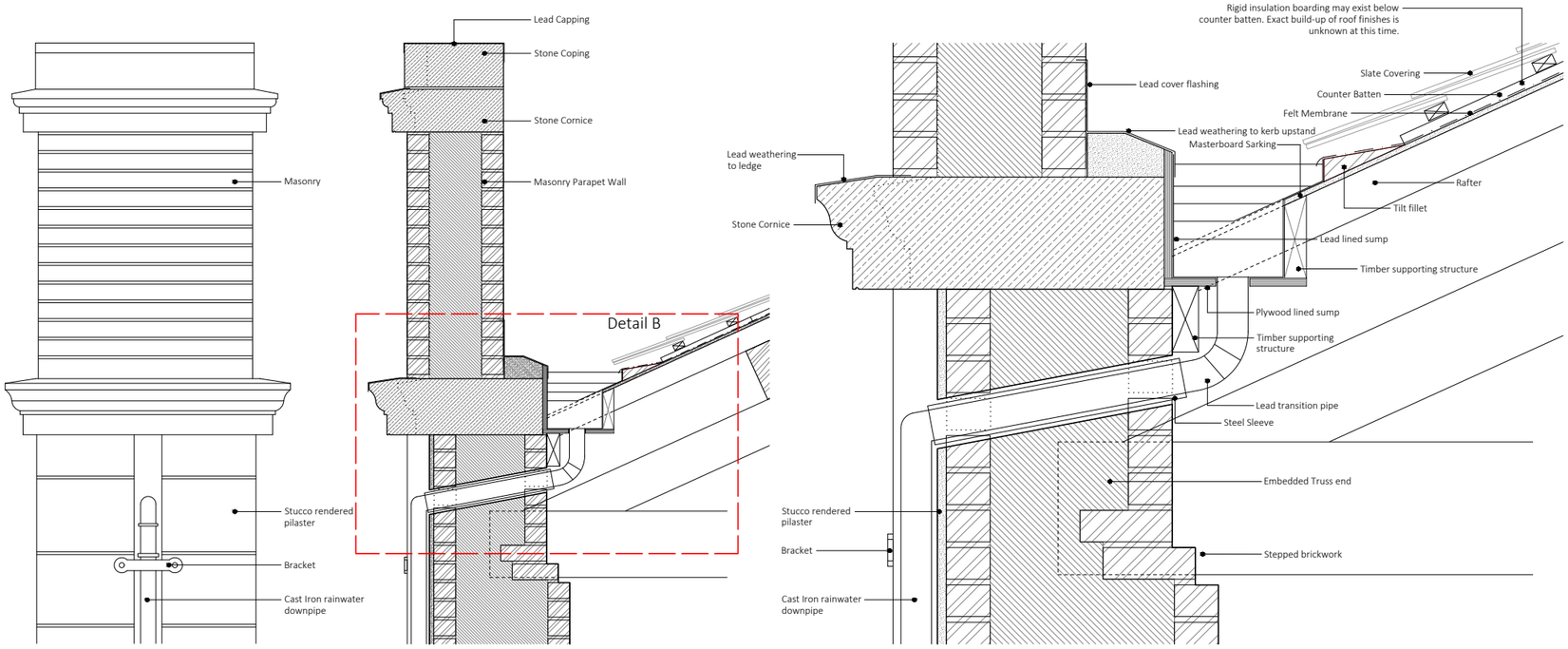
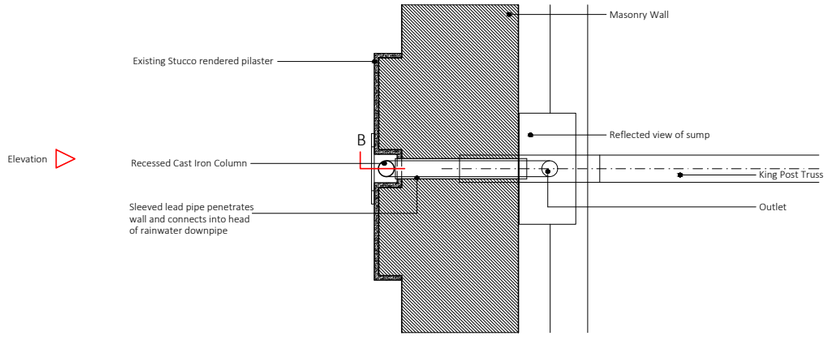


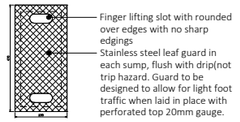
Figure 1 Typical Parapet Gutter Detail 1:5 and 1:10 on drawing

Outlet Type 4 (Orange circle)

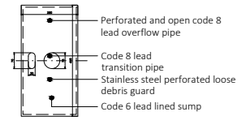
Typical Parapet Gutter Details As Proposed

Fig. 1: Drawing Sheet (37) 010 - Proposed Typical Parapet Gutter Detail 1:5 and 1:10

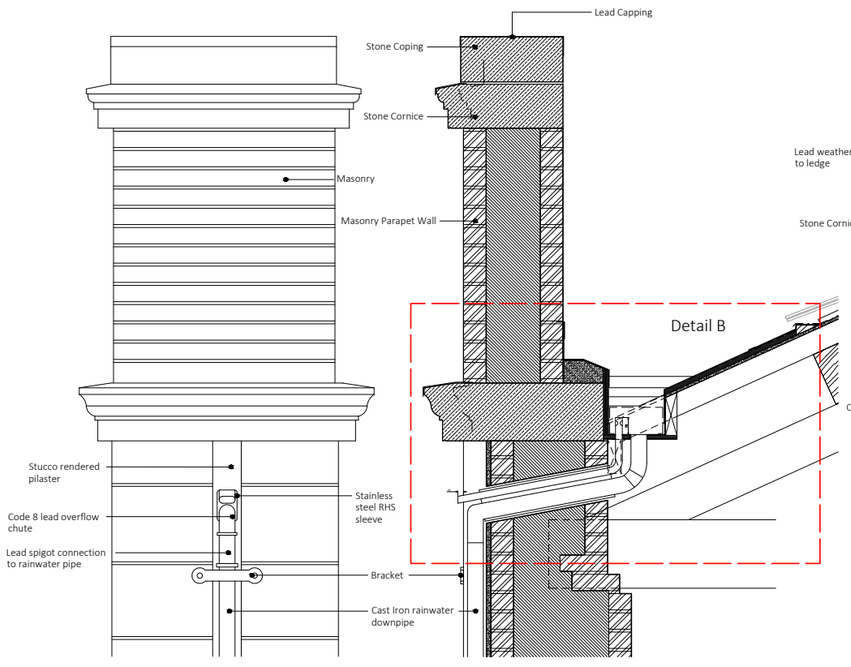




Leaf Guard Plan

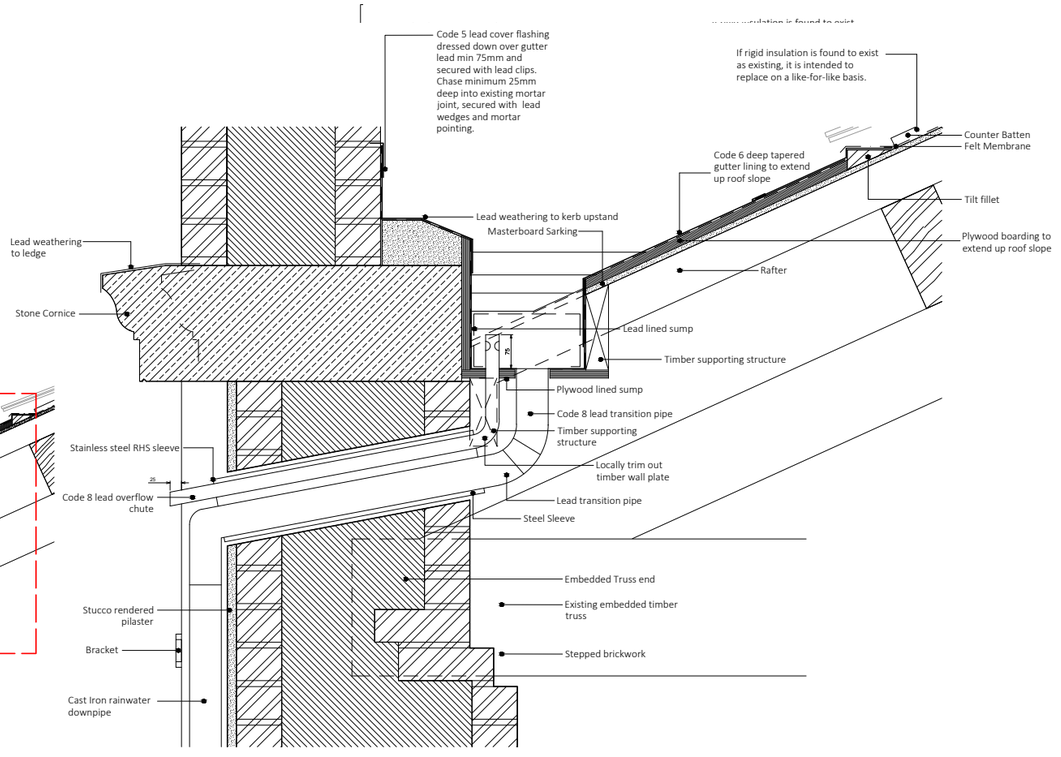


Sump and Outlet Plan



Proposed Typical Parapet Gutter Outlet

Existing Typical Parapet Outlet



Detail B 1:5

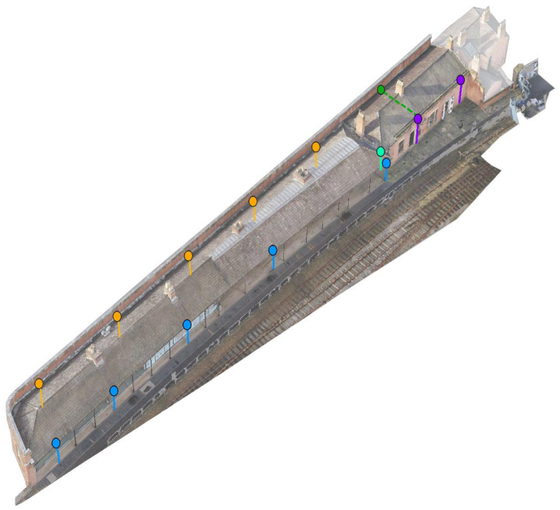
Figure 1 Typical Parapet Gutter Detail 1:5 and 1:10 on drawing

4.12 Outlet Type 5 (Green circle)

The south slope to the ticketing hall roof is currently served by single outlet from a stepped lead lined gutter which is difficult to access due to the gutter width being incredibly narrow. Rainwater discharges into a small sump which transfer rainwater horizontally through a sealed upvc pipe.

Proposal

- Remove existing upvc pipework.
- Introduce access deck within attic space.
- Allow for adjustment / amendment of existing steel lattice bracing to south side of roof space.
- Renewal of all gutter sole boards and supporting structure within sump boxes.
- Renewal of all leadwork.
- Introduce new lead lined timber trough with overflow outlet within roof space including supporting structure.
- Introduce stainless steel leaf guard within sump.
- Introduce lead chute outlet in conjunction with Type 3 outlet.





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Outlet Type 5 (Green circle)

Typical Parapet Gutter Details Existing and Proposed

Fig. 1: Drawing Sheet (37) 004 - Existing Typical Parapet Gutter-Section C 1:10
Fig. 1: Drawing Sheet (37) 008 - Proposed Typical Parapet Gutter Section C 1:10

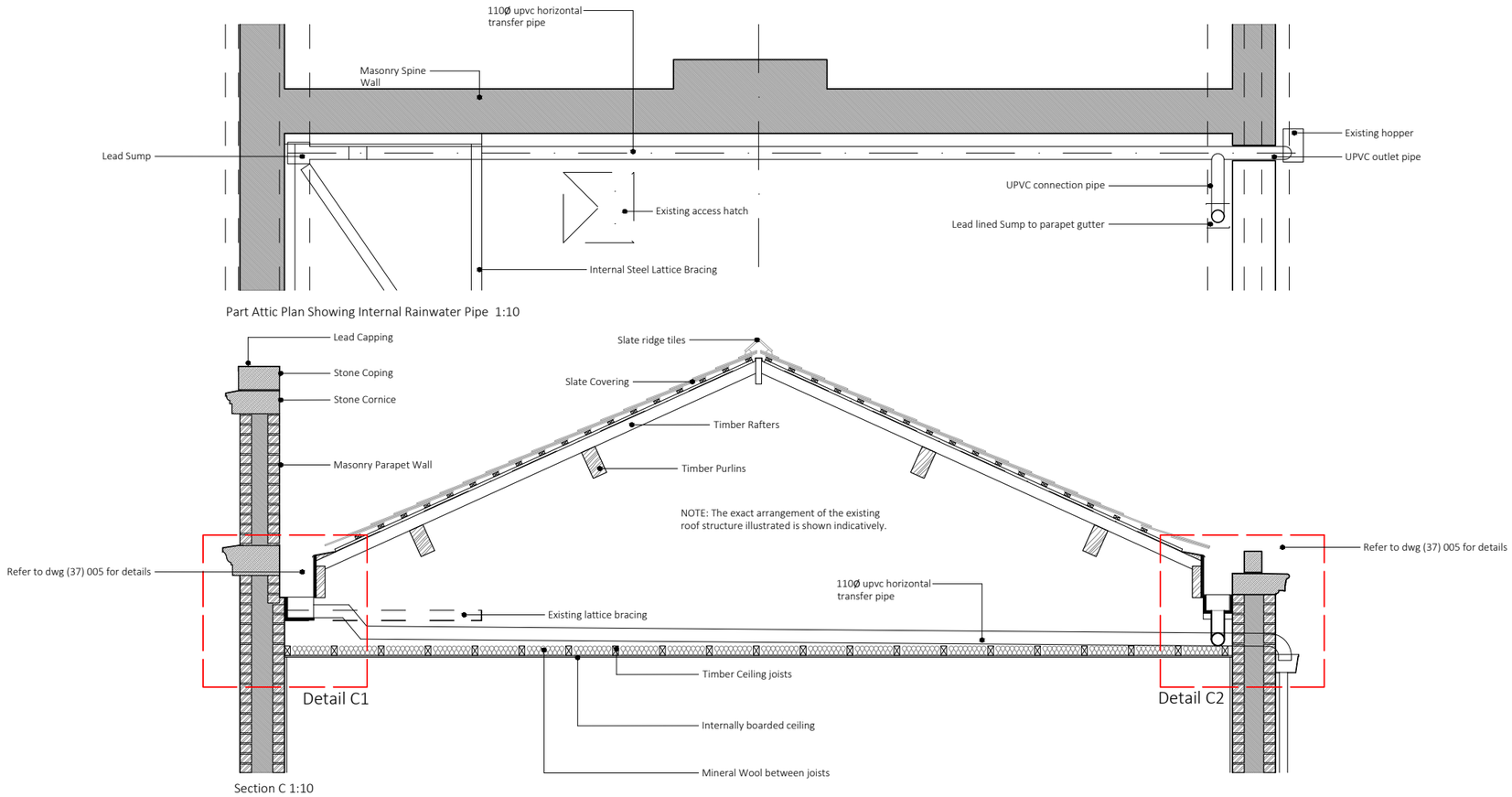
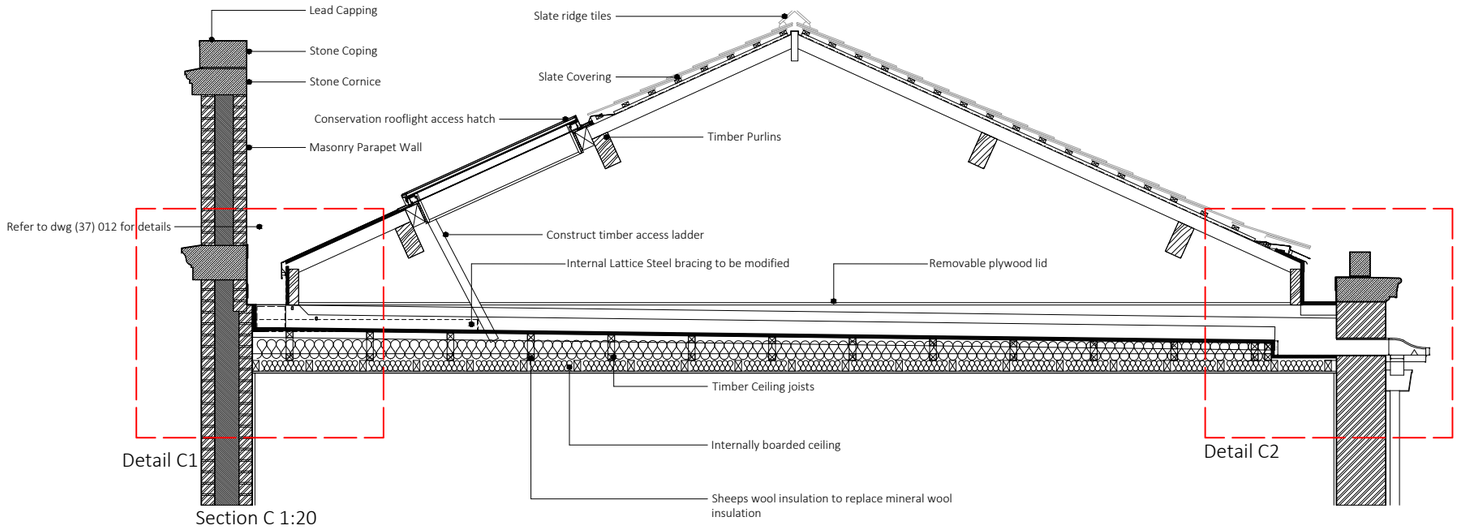
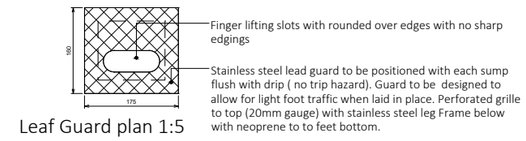
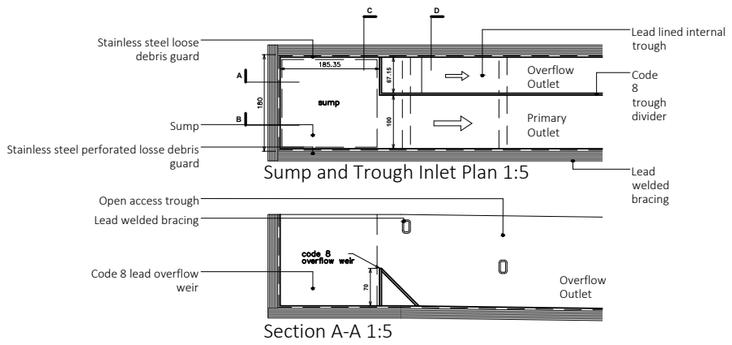


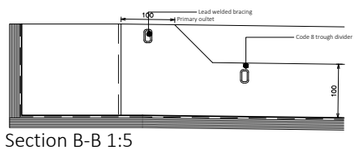
Figure 1 Existing Typical Parapet Details North and South 1:10 on Drawing Sheet

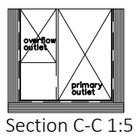


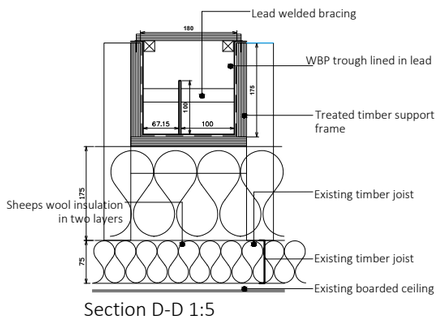
See drawing (37) 014 for proposed attic plan showing trough









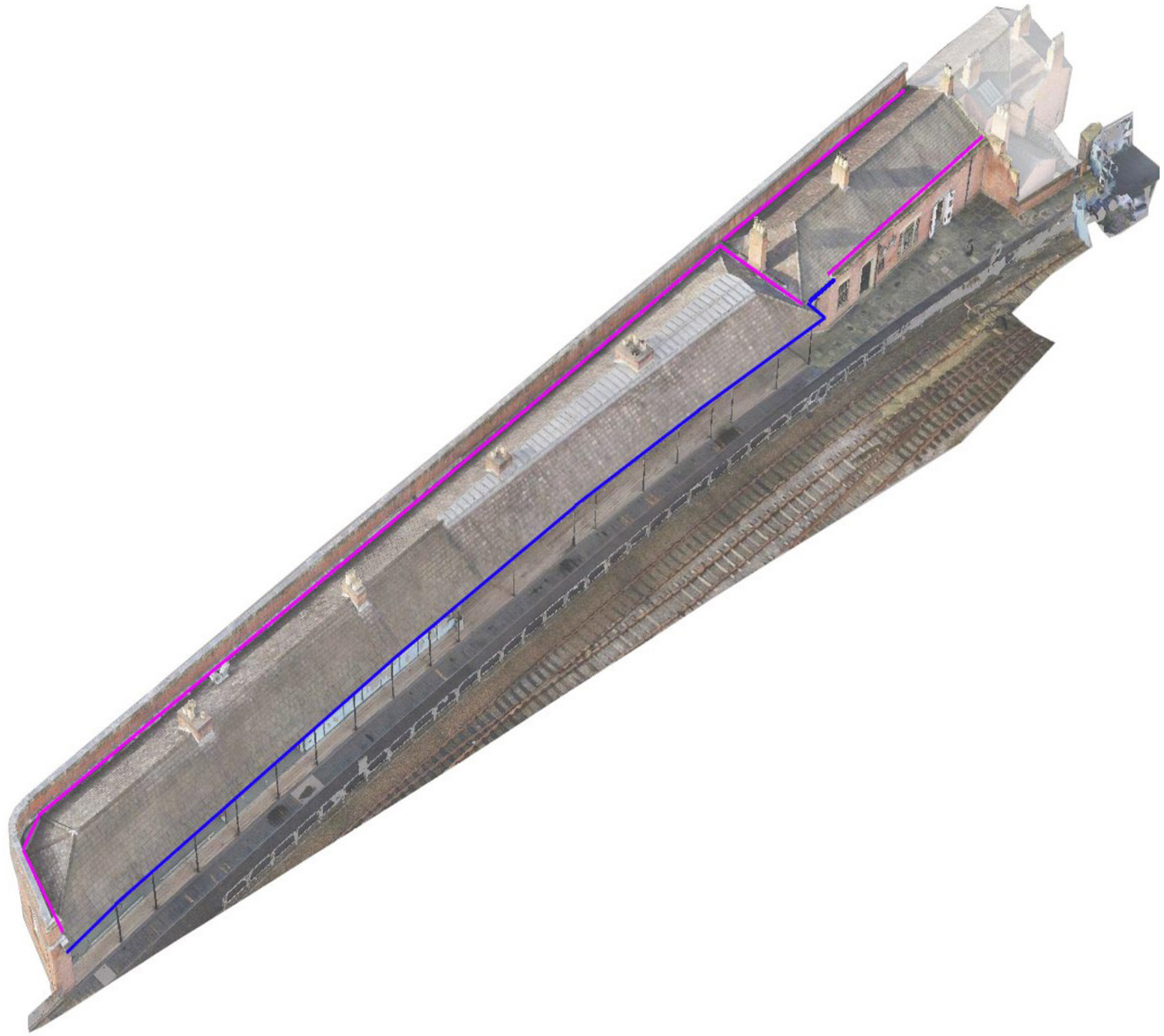


0 2.5m

Figure 2 Proposed Typical Parapet Details North and South 1:10 on Drawing Sheet

4.13 Roofscape Guttering

The Station Building is served by two gutter types, a stepped lead lined parapet gutter (pink line) and cast-iron guttering (blue line).





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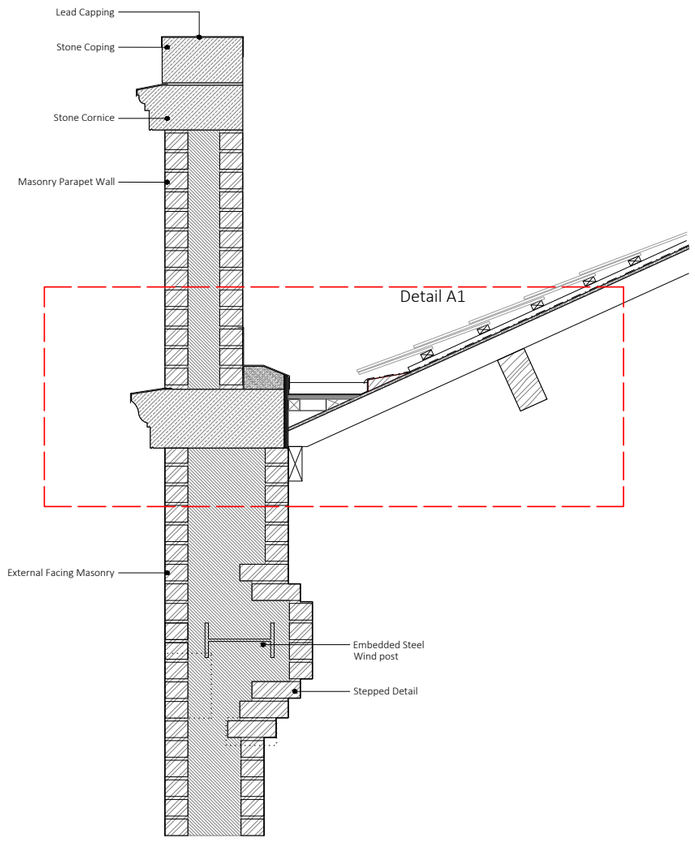
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Typical Parapet Details As Existing

Fig. 1: Drawing Sheet (37) 001 - Typical Parapet Details 1:10 and 1:5



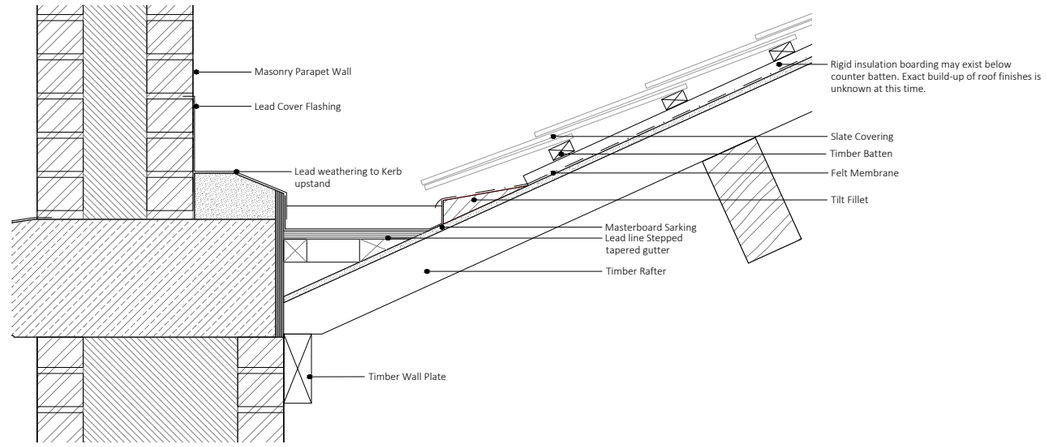


Figure 1 Typical Parapet Details 1:10 and 1:5 on drawing

Typical Parapet Details As Proposed

Fig. 2: Drawing Sheet (37) 009 - Proposed Typical Parapet Details 1:10 and 1:5

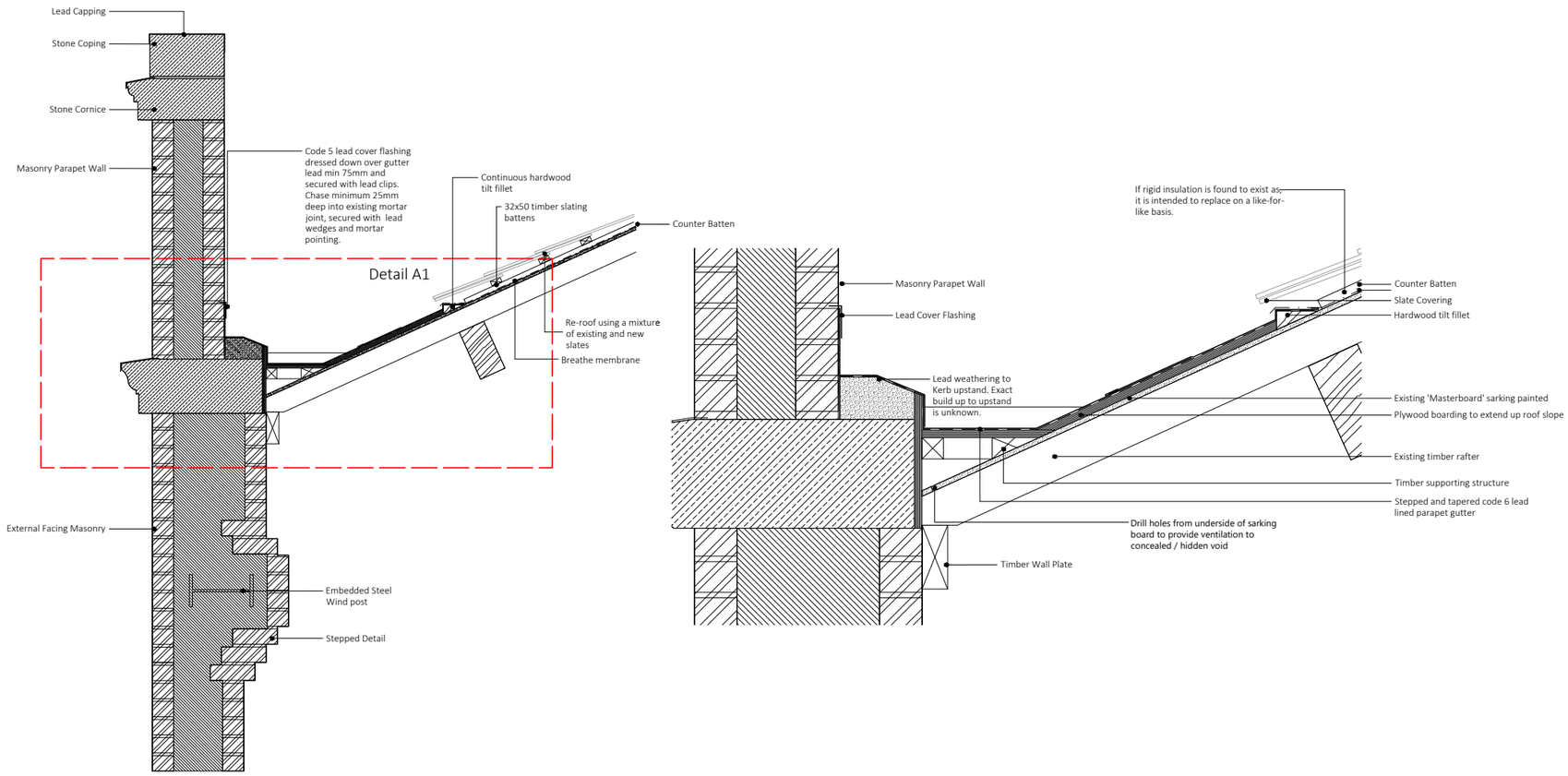


Figure 2 Typical Parapet Details 1:10 and 1:5 on drawing

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Access and Maintenance

5.1 Access and Maintenance

Access Provisions

The current roofscape arrangement does not currently allow for ready access to undertake routine maintenance tasks, checking of roof coverings, removal of silt and debris from gutter outlets for example, which has led to blockages in the past and issues going undetected for extended periods of time.

It is proposed to provide a permanent access point onto the roof, to allow for regular routine maintenance tasks to be undertaken. There is currently a ceiling access hatch located within the first-class ticketing hall at first floor which provides access up and into the roof void as existing. It is proposed to build upon this existing arrangement and provide further access externally.

Roof Access Hatch

The following scope of works are proposed within this area:

1. Provide a safe working access platform across the existing (non-original) ceiling joists, complete with softwood posts and rails, denoting the safe working area.
2. Trimming out of existing rafters to allow for the integration of a conservation access rooflight, side hinged for easy access. Rooflight to sit between existing purlins.
3. The roof coverings within this area are to be stripped, and re-covered with a new roofing membrane and battens, including all necessary weathering's and flashings.
4. Construct a small timber access ladder internally, to provide access up and out of the roof access hatch, including concealed internal grab rails.
5. Lead covering to eaves is to extend up to the underside of the base of the rooflight, to provide improved access and limit footfall across the slated roof.

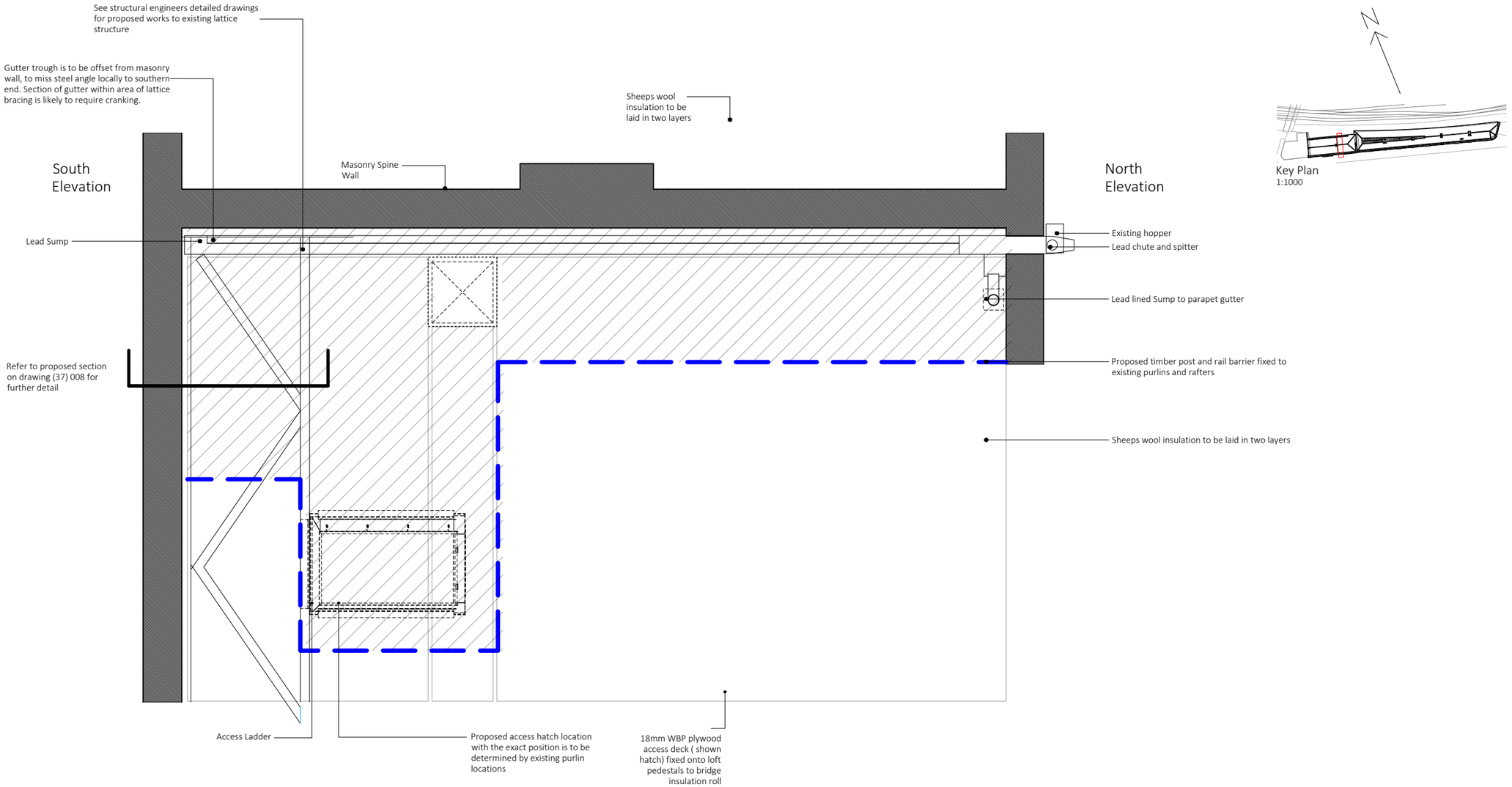
Once the maintenance team has access to the roof, they will have safe access along the entire southern parapet to clear and main coverings and all concealed outlets. The existing brick-built parapet with stone elements extends to circa 1.4-1.5m in height from gutter level. Concealing the rooflight and maintenance team from view.

Roof Barrier

In addition to the access hatch, it is proposed to install two metal barriers, one towards the east and one towards the west end of the parapet, as a means to visually deter individuals accessing and maintaining the roof, from moving past these barriers due to health and safety concerns.

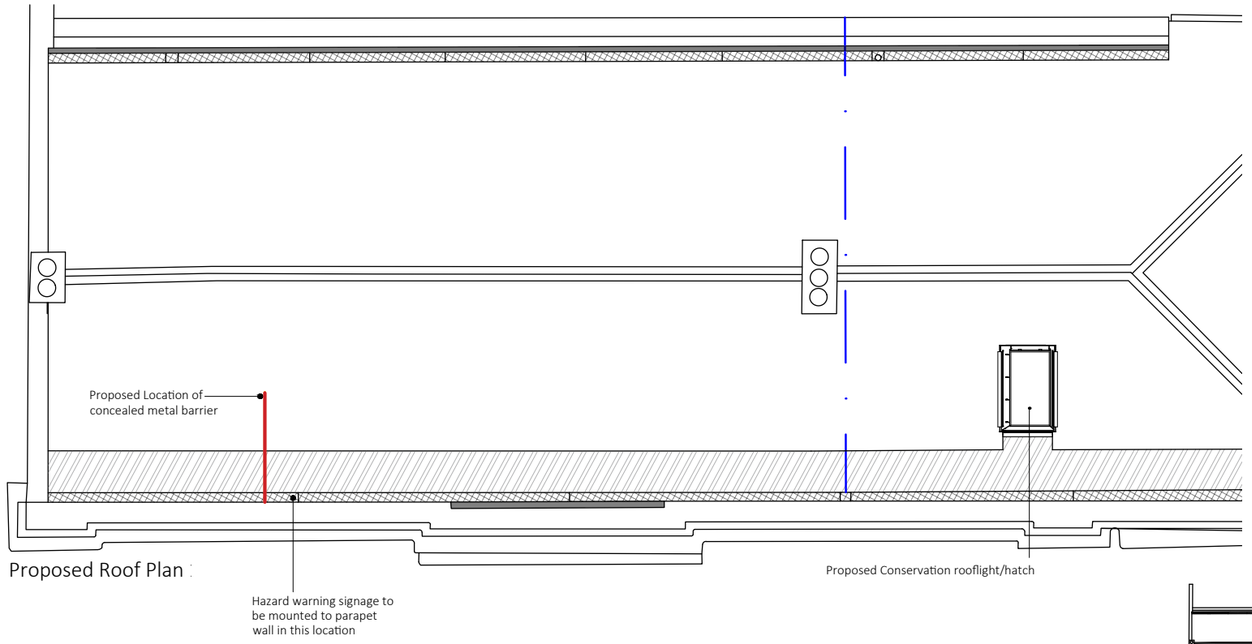
The following scope of works are proposed for the installation of barriers:

1. Construct a metal barrier, sized to act as a visual 'warning' and a deterrent to moving beyond. Barrier to be fixed into the masonry parapet wall.
2. 'warning' signage will then be wall mounted adjacent to each barrier.
3. The barriers are to be well set back from the ends of the parapets to conceal and hide from ground level vistas.

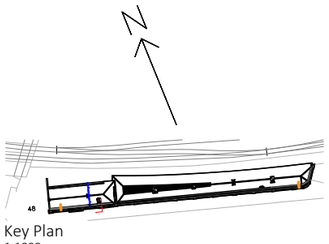


Proposed Part Attic Plan Showing Roof Access Hatch, Rooflight and Secure Internal Platform 1:20

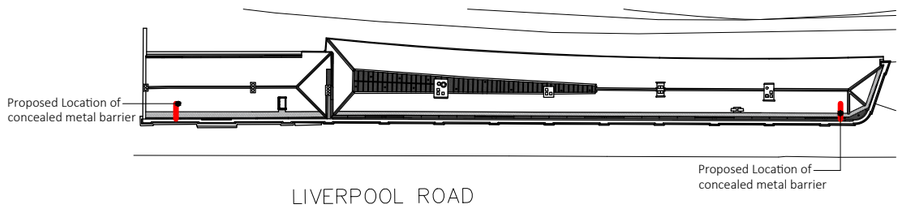
Figure 1 (37) 014 Proposed Part Attic Plan: Details at 1:20 on drawing
Figure 2 (37) 013 Proposed Roof Access: Details at 1:100 & 1:10 on drawing



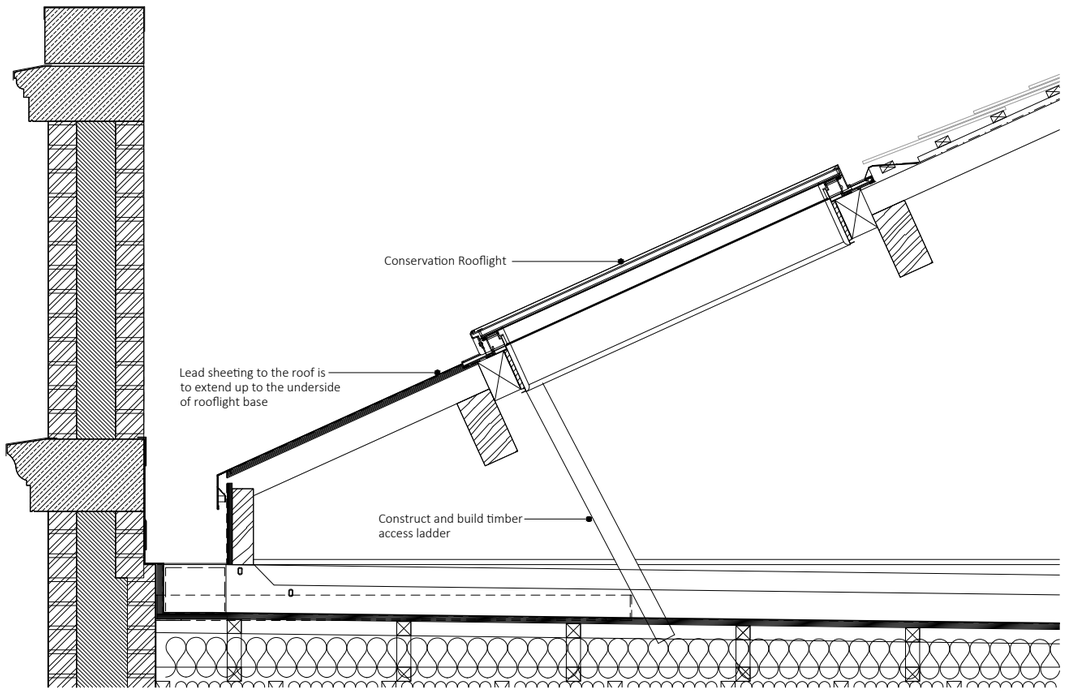
Proposed Roof Plan :



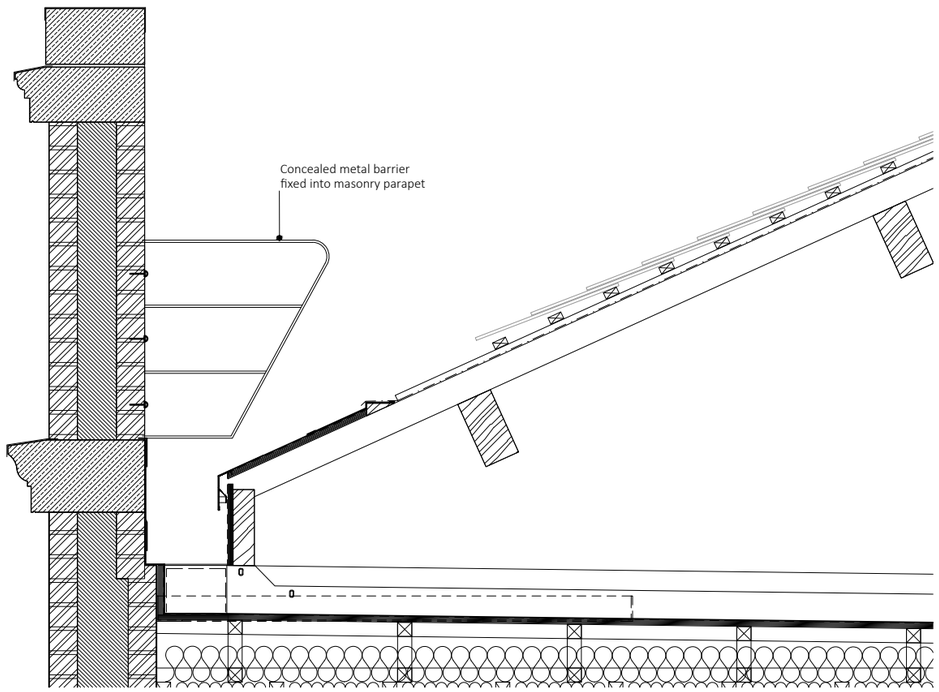
Key Plan
1:1000



Key plan for barrier locations NOT TO SCALE



Proposed Roof Access Detail :



Proposed Roof Barrier Design Intent :

5.0

Summary

6.1 Summary

[10:22 AM] Alex Scrimshaw

Following a detailed feasibility study, the existing rainwater drainage system and roof coverings were found to be poorly arranged with a number of finishes well beyond there serviceable life. Rainwater ingress issues are severe with ongoing degradation across the asset.

The proposed re-roofing works looks to improve upon the existing arrangement and build in provisions for failsafe and overflow measures. New elements have been detailed to be in-keeping with the asset whilst also being designed to be discreet with minimal impact on the original aesthetic.

The roofscape improvement works will also see the introduction of permanent roof access, purposely positioned to be concealed and out of direct sight lines. The roof access works will be supplemented by the introduction of fixed barriers at roof level, as a means to deter professionals from moving beyond into areas deemed unsafe.

The logistics will likely involve a full access scaffold and temporary roof to be erected to provide a safe, wind and watertight enclosure, allowing the interior of the heritage asset to be fully protected for the duration of the contract. The fixing of the scaffold will typically include bracing through existing window and door openings with direct fixings kept to an absolute minimum, if required preferably into mortar joints. If a direct fix is required to be made into the masonry, the holes formed will be neat with all rectification works undertaken during the dismantling of the scaffold. Holes to be filled with a suitable mortar mix.

Overall, the approach detailed proposes minimal impact on the Listed Building as acknowledged within the Heritage Assessment report. The works will be undertaken in-line with best conservation practice and will not affect the overall and long-term significance of the heritage asset. The final completion of the work will have a negligible – minor beneficial impact due to the successful protection of historic fabric. And improvements made to areas of poor-quality detailing undertaken in the 1980s reconstruction.

Materials proposed will be like-for-like, with all replacement and/or new materials selected to match existing, through trial and a robust sampling process.

6.0

Appendices

5.0 Appendices

5.1 Listing Description

Location

Statutory Address:

FORMER LIVERPOOL ROAD RAILWAY STATION, LIVERPOOL ROAD

Statutory Address:

STATION MASTERS HOUSE, LIVERPOOL ROAD

The building or site itself may lie within the boundary of more than one authority.

District:

Manchester (Metropolitan Authority)

National Grid Reference:

SJ 82952 97867

Details

MANCHESTER

SJ8297 LIVERPOOL ROAD 698-1/18/213 (North side) 18/12/63 Former Liverpool Road Railway Station, and Station Master's House

GV I

Also known as: Museum of Science and Industry, Liverpool Road Station LOWER BYROM STREET. Passenger railway station at terminus of Liverpool and Manchester Railway, now part of museum complex. 1830, by George Stephenson for the Liverpool and Manchester Railway Company, with attached house of 1808, formerly occupied by station agent; altered. Red brick, the booking offices faced with sandstone ashlar and stucco; hipped slate roofs. Rectangular plan parallel to street, with house to left and added range of former shops to right. Classical style. The BOOKING OFFICES, which back onto an embankment carrying the railway line at 1st floor level to the rear, have a 2-storey 4-bay facade (2:1:2:1 windows), symmetrical except for the 4th bay, with channelled rustication to the ground floor, panelled pilasters to the upper floor, a moulded cornice and high parapet with cornice and blocking course. The 2nd bay (the centre of the symmetrical portion, containing the entrance to the 1st Class booking hall) breaks forward slightly, has a large square-headed doorway with an architrave of coupled pilasters, moulded cornice and blocking course surmounted by a vase-pedestal sundial, and a recessed panelled door with rectangular overlight; and at 1st floor a tripartite sashed window with a cornice. The flanking bays have 15-pane sashed windows at ground floor flanked by wide segmental-headed tripartite sashed windows with glazing bars, and 12-pane sashes at 1st floor with moulded architraves. The 4th bay, containing the entrance to the 2nd Class booking hall, has a doorway at ground floor similar to the other but with single pilasters, and a 12-pane sash above like the others. Interior: separate booking halls and staircases leading to platform. Rear: 2 doorways to the platform with moulded stone surrounds, a tripartite sashed window to the left of the 1st Class doorway and a one-light sash to the left of the other. To the east, an added hipped-roof platform canopy on slender iron columns (C20 offices with glazed screen wall inserted under this roof). The former HOUSE to the left of the booking offices, 3 storeys and 3 bays to the same height, symmetrical, has a doorway with pedimented stone architrave, sashed windows of 16 panes at ground and 1st floors and 12 panes at 2nd floor, all with raised sills and flat-arched heads, and modillioned eaves; and a double-splayed left corner to the return wall, with sashed and blind windows. To the right of the booking offices is a long 9-bay range, recently rebuilt or restored, formerly with shops at ground floor and a train shed above, which is stuccoed at ground floor, has coupled pilasters, 1st-floor sill-band, moulded cornice and high brick parapet (carried across from the booking offices), and most bays with symmetrical openings including a round-headed doorway at ground floor flanked by windows in segmental-headed blank arches, and 2 windows above. HISTORY: oldest surviving passenger railway station in the world; ceased to handle passenger traffic in 1844 (when Hunt's Bank station was opened, now Victoria Station, q.v.), but continued in use as goods station until 1975. Forms group with Old Warehouse on opposite side of railway track (q.v.).

Listing NGR: SJ8295297867

Legacy

The contents of this record have been generated from a legacy data system.

Legacy System number:

388277

Legacy System:

LBS

Legal

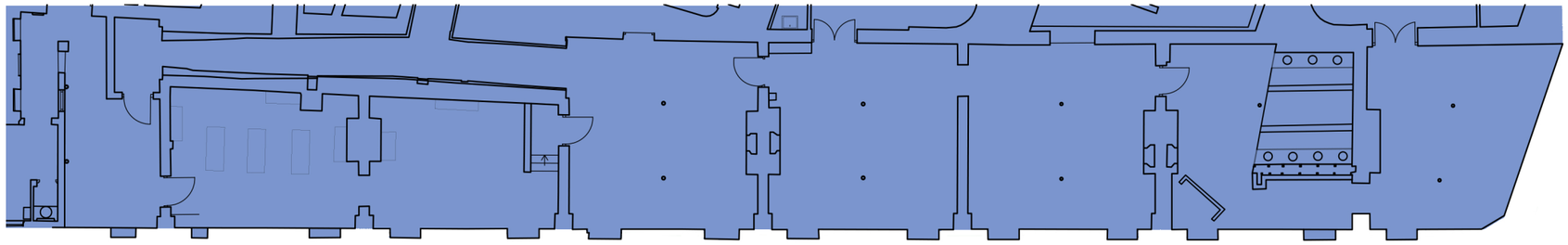
This building is listed under the Planning (Listed Buildings and Conservation Areas) Act 1990 as amended for its special architectural or historic interest.



1. Liverpool Road Station 1956

5.2 Significance Plans and Elevations

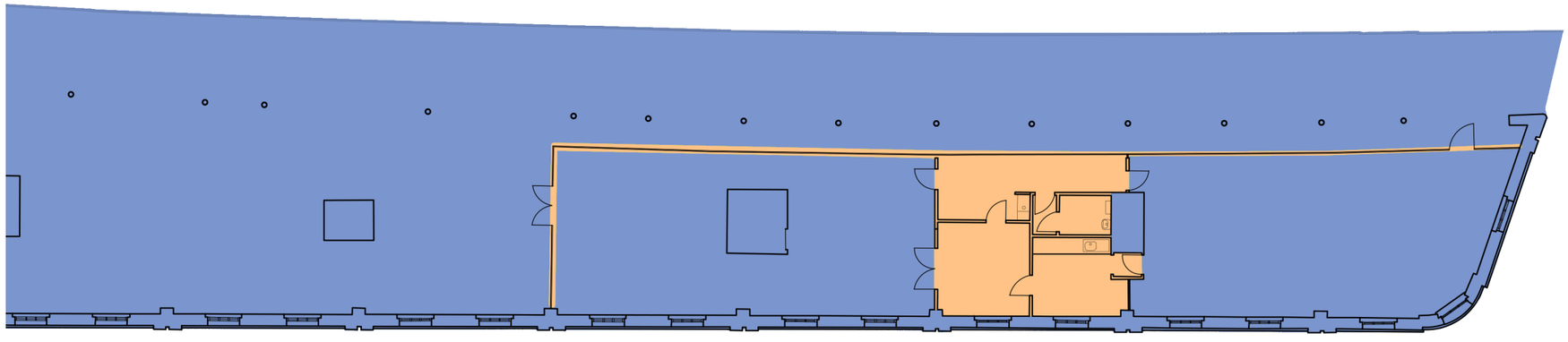
Exceptional
Exceptional historic and architectural interest that is intact and clearly legible. Making an important contribution to the wider significance and understanding of the heritage.
High
High historic interest that is intact and clearly legible. Making an important contribution to the wider significance and understanding of the heritage.
Medium
Less special historic interest, altered, with a less important contribution to the wider significance and understanding of the heritage.
Low
Lost or little special historical interest, significantly altered or largely obscured.
Neutral
Historically unimportant but having negligible impact on the heritage.
Intrusive
Historically unimportant with a harmful impact on the heritage.



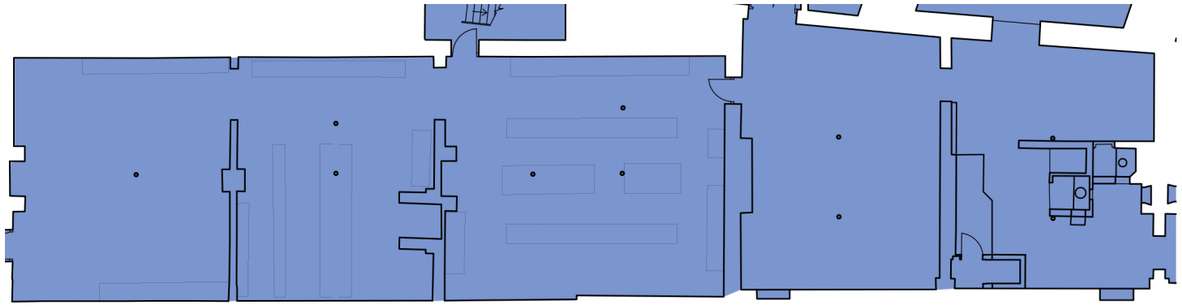
Station Building Basement Plan



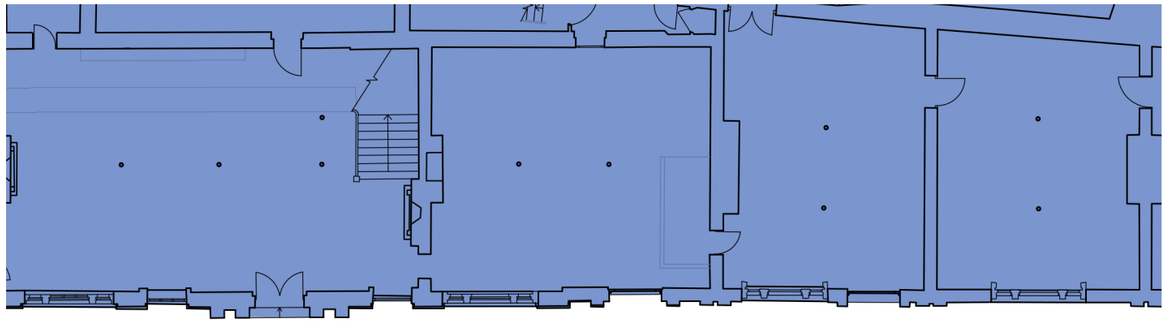
Station Building Ground Floor Plan



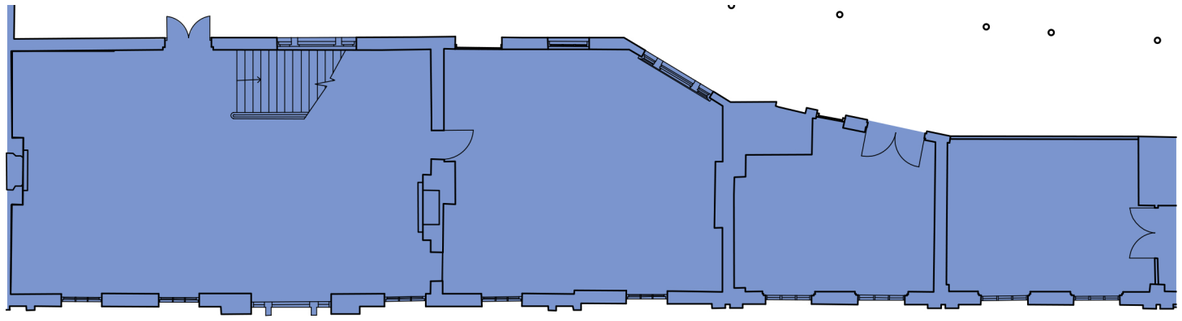
Station Building First Floor Plan



Ticketing Hall Basement Plan



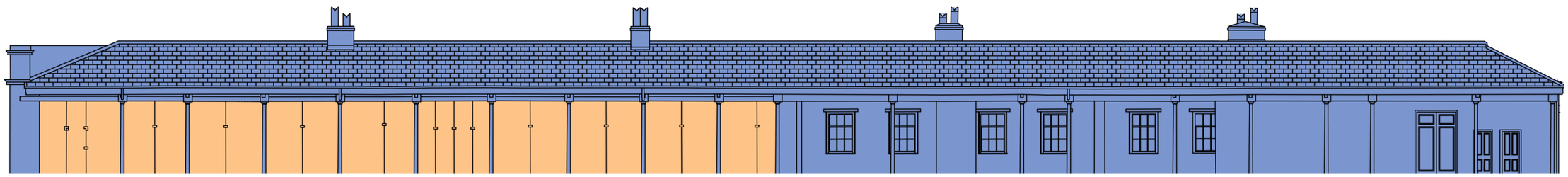
Ticketing Hall Ground Floor Plan



Ticketing Hall First Floor Plan



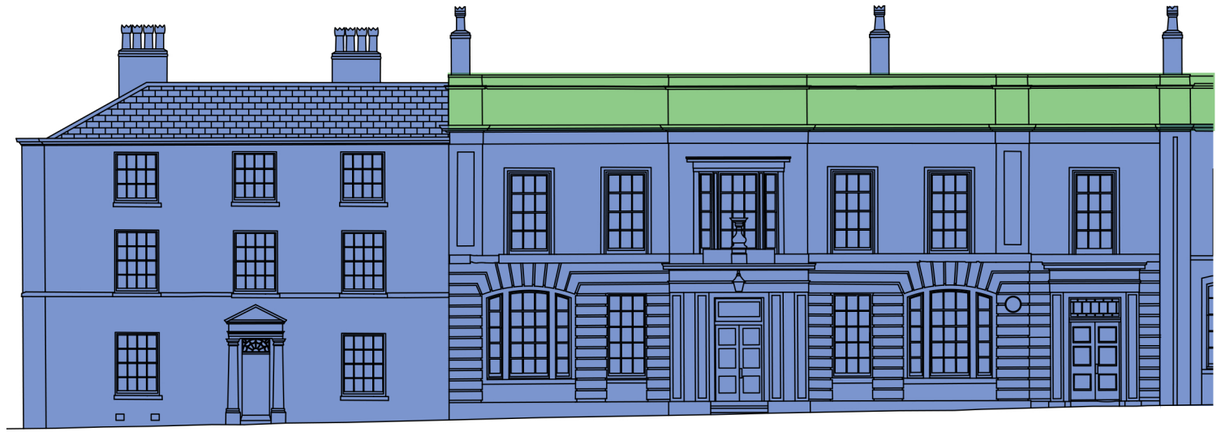
Station Building East Elevation



Station Building North Elevation



Station Building South Elevation



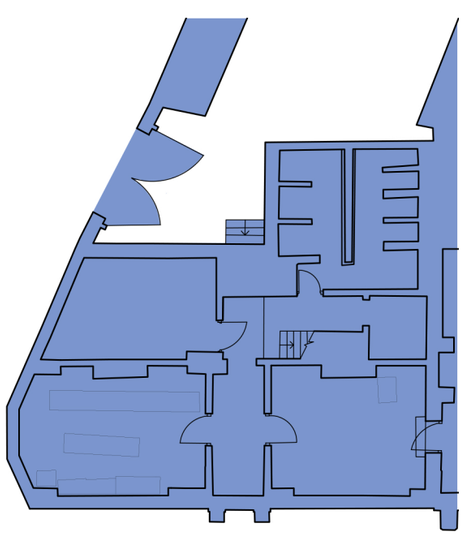
Station Masters House and Ticketing Hall South Elevation



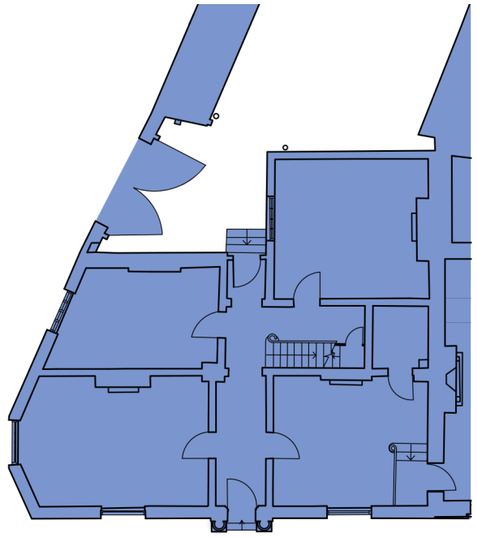
Station Masters House and Ticketing Hall South Elevation



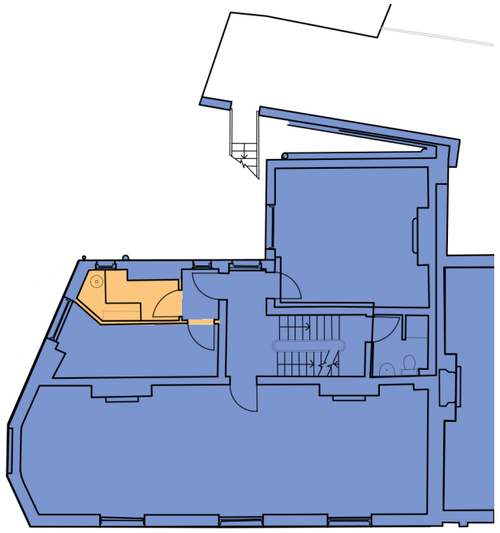
Station Masters House West Elevation



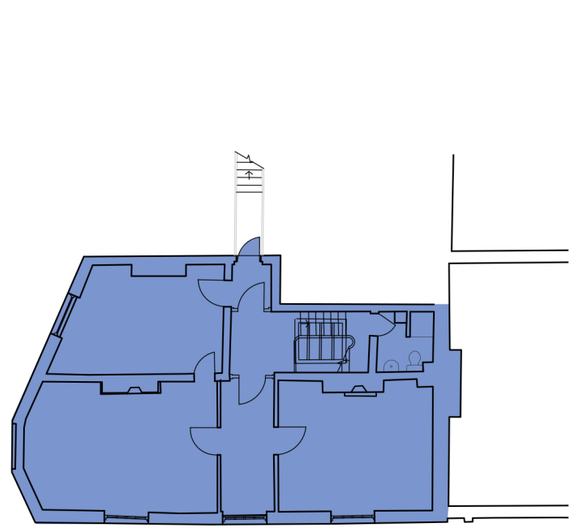
Station Masters House Basement Plan



Station Masters House Ground Floor Plan



Station Masters House First Floor Plan



Station Masters House Second Floor Plan

5.3 Surveys

5.4 Timber and Damp Survey November 2020

This is an extract from Hutton and Rostron's Timber and Damp Survey '210-58 SIM Liverpool Road Railway Station Rpt 091120 CW v2'

2 EXECUTIVE SUMMARY

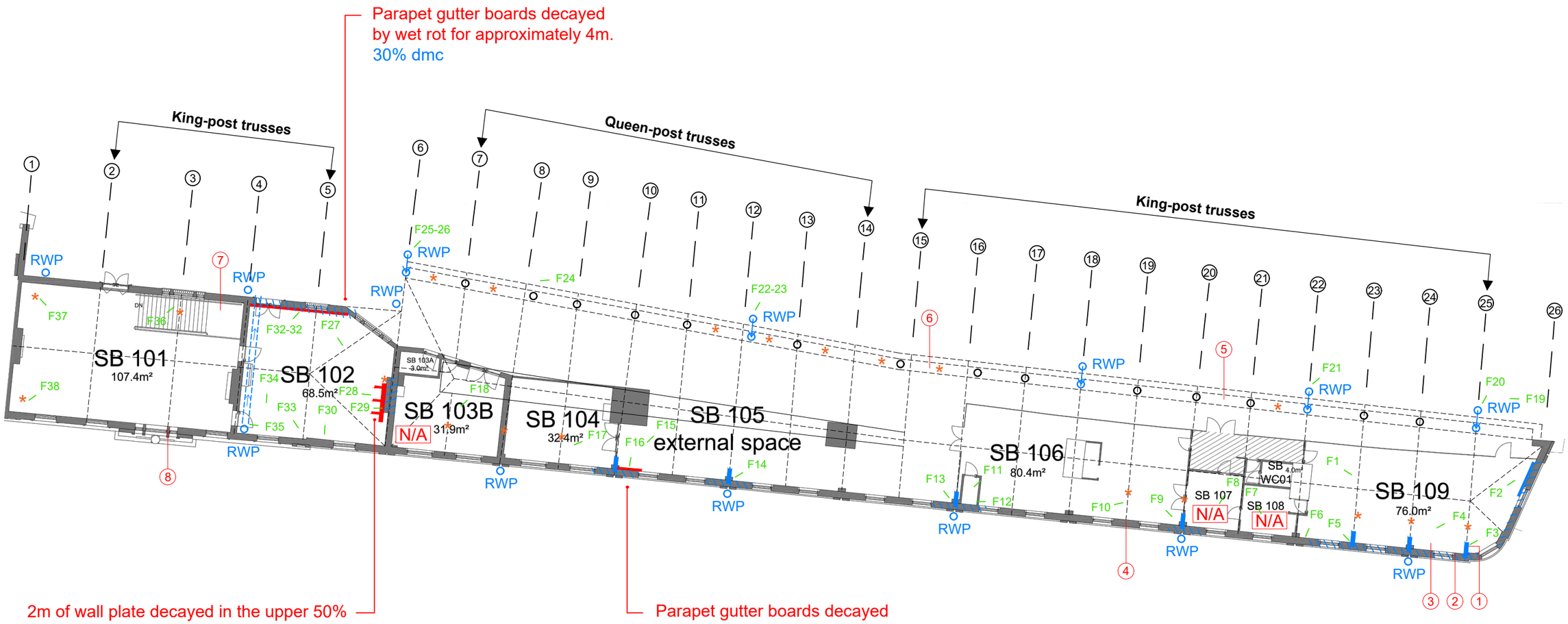
2.1 OBSERVATIONS

All roof timbers were softwood of North American or Northern European origin and all timber species identified may have an achievable strength class of C24. However, this would require confirmation following visual strength grading. Extensive repairs to truss bearings ends, purlins and the wall indicated a history of water ingress related structural repairs

Ongoing water penetration via the southern parapet gutter to the Coach Shed and the northern parapet gutter and valley gutter to the First- and Second-Class facilities was providing the conditions for damp and timber decay. As a result, there were pockets of decay in the gutter timbers and a section of wall plate was structurally decayed directly beneath the valley gutter. In addition, 7 no. trusses were damp at their southern bearing end and there was a significant risk of decay occurring whilst water penetration continued and residual moisture remained within the masonry structures

2.2 RECOMMENDATIONS

Every practical effort should be made to prevent water ingress at the earliest opportunity and H+R would highly recommend that a temporary roof is installed prior to re-roofing. The decayed wall plate should be repaired and allowance should be made for extensive repairs/renewal of the parapet gutter timbers. If water penetration continues, structural repairs in the damp truss ends should also be expected. Roofs should be refurbished as insulated and through-ventilated cold roofs



Key:

- Area subject to water penetration
- Structurally decayed timber element
- Damp timber element at risk of decay
- RWP — Rainwater downpipe
- 1 — Timber species sample location
- dmc — Deep moisture content of timber
- F1 — Photograph location
- * Previous structural timber repair
- Internal rainwater gutter

H+R

Science and Industry Museum, Station Building & 1830 Warehouse - First Floor
DETAILED TIMBER CONDITION INVESTIGATION OF ROOF STRUCTURE
09 November 2020

Hutton + Rostron Environmental Investigations Ltd
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221
210-58 Report -Not to scale- © Copyright Hutton+Rostron 2020

5.5 Structural Analysis

Structural Works

This is an extract from Thomasons report: 10539 21.10.06 Buttress - MSI Station Building

7.0

Recommendations

7.1

We recommend that intrusive investigations are undertaken to various locations in order to establish the full extent of the defects and the source of the water ingress into the structure. The investigations should also confirm whether the structure has been compromised by the water ingress.

7.2

The additional investigations are outlined below.

• Commission a condition survey and CCTV survey of the existing rainwater goods to the north and south elevations.

o Jetting and clearing of debris are required to ensure the CCTV survey can be undertaken without obstructions.

• Expose the drainage channel to the first floor platform to assess the potential drainage defects that may allow water ingress between the viaduct and the rebuilt structure.

• Locally expose the ceiling to the basement and ground floor at the position of local defects in the soffit where water staining is more prominent.

Commission a survey of the existing rainwater goods to the Station Master's House and rectify the means of water ingress into the structure. Once the cause has been addressed the internal decoration and floor works should be undertaken.

• An intrusive investigation of the flooring in the Station Master's House should be undertaken where excessive deflection was recorded. Dependent on the findings in relation to capacity of the floor that is determined from this it may be necessary to reconsider how this space is

utilized in order to reduce the loading to an acceptable level for the historic structure.

7.3

External embedded metal work to the north façade of the Waiting Rooms should be addressed by removing redundant fixings and filling the void with a suitable mortar and by cleaning and treating any fixings to remain.

7.4

The local cracking in the external render is thought to be due to the thermal movement of concrete blockwork substrate. consideration should be given to the introduction of a formal movement joints in the render to allow future movement to occur. Alternatively, the existing cracks can be sealed with a flexible sealant if the existing defect is not considered to detrimental to the aesthetics of the building façade.

7.5

Whilst the recommendations above should be undertaken to assess the full extent of the water ingress and areas affected it is our assessment that the defects pose no immediate structural concerns as those identified appear to be historic and ongoing for a number of years.

5.6 Mechanical & Electrical Analysis

Mechanical Works

Existing M&E Installations

The proposed works to replace the roof covering and guttering systems have a minor effect on the existing building services systems. There is only one penetration of the roof construction in connection with existing building services systems. This is by a galvanised steel ventilation duct which is connected to a fresh air input system which is ducted vertically down the building to outlet grilles at ground floor. The ventilation system, although not in operation at the time of the survey is still operational and should be retained for any future use of the ground floor spaces. It is recommended that the ventilation cowl be retained, set aside and reinstated (or replaced with new) as part of the re-roofing works.

Risk Mitigation, Automatic Monitoring, Early Warning & Alarm Systems

As part of a future risk mitigation plan to monitor and protect the condition of the guttering and roofing systems there are proposals to provide the following:

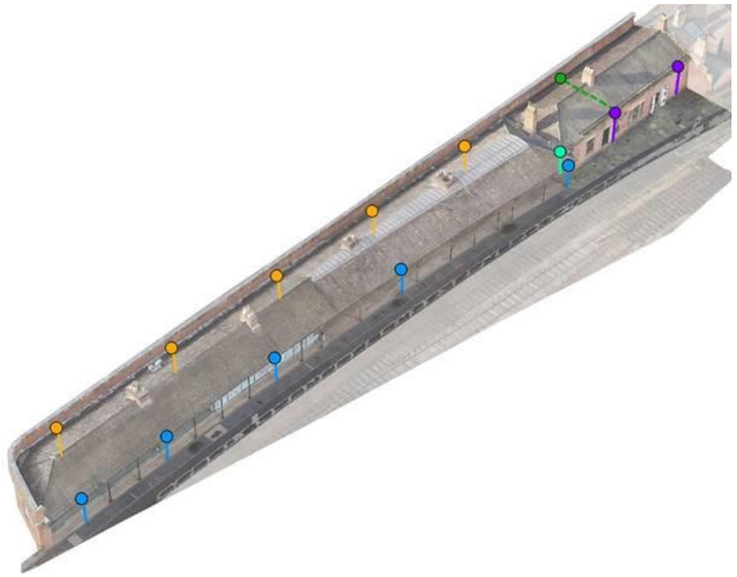
- Gutter Flood Monitoring & Alarm System
- Ice & Snow Melting by Electric Trace Heating

Gutter Flood Monitoring & Alarm System.

A specialist gutter monitoring and alarm system (GutterWatch) has been developed by Hanwell and Hutton & Rostron to provide an early warning of a blocked gutter or downpipe system. The monitoring system is wireless in operation and comprises of a flood sensor located in the guttering system which is pared to a local radio transmitter. The sensor does is not affected by normal rainfall and is only triggered when completely submersed by the failure of the roof drainage system. When the sensor is triggered the base station picks up an alarm signal and automatically send an alert via SMS or message to a desktop email via an internet connection.

The system consists of a controller and sensor unit which is paired to a radio frequency transmitter. The sensor is supplied with a communication cable to the controller. The Multiple sensors can be connected to a single controller; however this may lead to significant cable runs across a building / the roofscape. Controllers operate on AA replaceable batteries which will last 12 months. The controllers incorporate a low power alarm to warn site facilities team to replace the batteries. The RF controllers are connected to a dedicated PC / human interface machine via a base station which is permanently powered and connected to the internet. RF controllers have the ability to transmit for up to 3 miles in open space. The distance reduces in buildings with heavy structures.

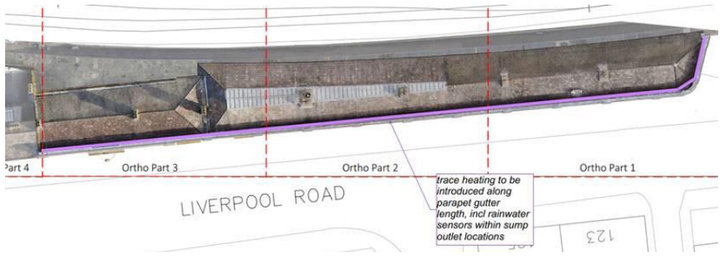
Rainwater sensors to be included where indicated as orange and dark green circle outlet locations (6nr.) Typical costs for the system indicated below would be £11,000.00.



Ice & Snow Melting by Electric Trace Heating

Snow that has built up on a roof will start to melt as a result of either exposure to the sun, or from heat rising from the building below. As the melted snow runs from the roof into cold gutters and drainpipes, it can re-freeze forming layers of ice which can continue to build up until the flow is blocked. This can result in damaged drains and gutters. Water can, in addition, get into the roof and building, leading to expensive structural damage such as broken roof tiles, damaged plaster and facades, etc.

It is proposed to install trace heating along the guttering systems highlighted by the purple marker below:



Electric trace heating is a tried and tested method of keeping gutters and downpipes clear during freezing and snow conditions. The self-regulating characteristics of trace heating heating cable means that the cable can adjust its heat output in accordance with its temperature. It cannot overheat or burnout, even when overlapped, it is inherently safe. Trace heating systems are easy to design and install. The cable is laid along the gutters and in drainpipes to keep water flowing freely.

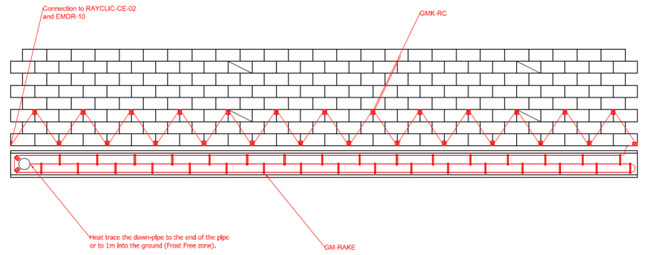
Typically trace heating systems are energised at +5 and deenergised at -15 when there is no possibility of melt water being present. In snow and ice water conditions the cable will operate at full power. As snow begins to melt and after drains away, the heating cable self-regulates to half power. As it gets warmer the heating cable reduces power until it becomes de-energised.

The Design and installation of a system is simple as there are no fixed lengths. The heating tape can be cut to length during installation. During installation, wire is cut from the reel and placed in the gutter. The heating tape is suspended in the downpipe without the need for spacers. All systems - from the simplest, to the most elaborate - use exactly the same components, thereby providing flexibility and ease of design.

The installation of trace heating systems requires 230v electrical power supplies. The current carrying capacity of systems range from 6 to 32 Amps, dependant on the length of the trace heated cable. The maximum length of a trace heated cable is limited to 80 metres at -15 . The trace heating wires are run out from a dedicated control and connection box which is shall be connected to a local distribution board with a suitable overcurrent RCD protective device.

A final design for a system would be based on the roof survey drawing and the position of all downpipes. The design should be carried out in conjunction with the specialist manufacturer and optimised for minimal installation costs. The design should be carried out in accordance with IEC standards IEC 62395 parts 1&2.

A typical arrangement detail of how the system would be applied to the roof is indicated below.



The capital cost of a trace heating system is affected most by the number of heating circuits, which determine the size and cost of control and distribution panels, and the power cable costs

The estimated costs for the installation of a new self-regulating trace heated system, installed at the time of the roofing replacement works be £9,875.00 inclusive of a new power supply to the main control panel.

Lightening Protection

The building has no existing lightening protection installation, a desk top study is to carried out to risk assess the likelihood of a building strike and assess any protection that may be provided by installations on the surrounding buildings which shall form the basis a lightning protection risk assessment to be carried out in accordance with BS EN 62305 – Protection Against Lightning. The proposed new lightning protection system shall be sympathetic to the buildings appearance, structure and finishes and be installed in accordance with the conservation Architect's approval.

The estimated costs for the installation of a new lightening protection system, installed at the time of the roofing replacement works be £4,750.00

Buttress

Architects | Masterplanners | Heritage Consultants