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King's Cross Package 6

WRB Roof Repair and Renovation

					Acceptance on behalf of Network Rail		
Rev	Prepared by	Date	Approved by	Date	Required Y/N	Accepted by	Date
00	**Iain Morrison**	**27.05.09**		28-5-09.			26/6/09

Comments and observations

Please note this document has been prepared to describe the Works for the sole purpose to satisfy Town and Country Planning Act and is NOT for use by a contractor for repair in restoration. Please refer to the case specific Work Package Plan submitted under separate cover.

Condition to be discharged;

Consent 2006/3394/L **Condition 20 B** requires: **"all works of repair** to the historic fabric, to inc specifications, schedules of work, and method statements" for **i. Brickwork and v. Roofing materials** to inc slate, lead".

Lit of Abbreviations

Documents

LBMS:	Listed Building Method Statement
WPP:	Work Package Plan

Locations

MTS:	Main Train Shed
WCC:	Western Concourse
WRB:	Western Range Buildings

Organisations

EH:	English Heritage
JMP:	John McAslan and Partners
LBoC:	London Borough of Camden
MoLAS:	Museum of London Archaeology Service
NGB:	NG Bailey
NR:	Network Rail
TGP:	Tony Gee and Partners
TW:	Taylor Woodrow

1 Introduction

NR is in the process of redeveloping the Grade 1 Listed Kings Cross Station. Planning and Listed Building Consent were approved by LBoC in November 2007, subject to a Section 106 Legal Agreement. This document is submitted to allow discharge of the following conditions from the Listed Building Consent:

- Consent 2006/3394/L **Condition 11** requires: "all new external" "works of making good to the retained fabric, shall match the existing adjacent work with regard to the methods used and to material, colour, texture and profile, unless otherwise on the drawings."
- Consent 2006/3394/L **Condition 20 B** requires: "all works of repair to the historic fabric, to include specifications, schedules of work, and method statements" for i. Brickwork and v. Roofing materials to include slate, lead".

1.1 Reference Documents

- Listed Building Consent
  2006/3394/L
- JMP Repair Schedule – Roof Repairs
  ENG-SCH-G5-OAP-KX6-CBSA-4057
- Civil Specification Volume 11: Anchorages to Concrete and Masonry
  ENG-SPE-G5-OAP-KX6-CSTR-1049
- Architectural Specification H62: Natural Slating
  ENG-SPE-G5-OAP-KX6-CBSA-1035
- Architectural Specification H71: Lead Sheet Coverings/Flashings
  ENG-SPE-G5-OAP-KX6-CBSA-1036
- Architectural Specification L71: Repairing / Renovation / Conserving Masonry
  ENG-SPE-G5-OAP-KX6-CBSA-1063
- Architectural Specification N25: Permanent Access and Safety Equipment

ENG-SPE-G5-OAP-KX6-CBSA-1086

- Architectural Specification C62: Slate Roof Repair and Renovation
  ENG-SPE-G5-OAP-KX6-CBSA-1151
- JMP Salvage Strategy
  ENG-REP-JMP-G5-PA-SWNS-0006
- BS 7913:1998, The principles of conservation of historic buildings
- TW Proposal for Labelling and Protection of Heritage Items
  KXP6/N374/WPP/LBMS/WRB/00005

2 Scope of Works

This LBMS describes the roof repairs and renovations proposed for the Grade 1 Listed WRB. The specific methods of working and control measure detailed in this document are intended to minimise the disruption to the historic fabric of the WRB and comply with best practice. Repairs and Renovations will be undertaken in accordance with the accepted documents and drawings listed in Appendix A of this LBMS.

All areas identified on the contract documents as new roof will be constructed with minimal disruption to the existing structure and comply with best practice.

2.1 Identification of Structural Zones

The works are split into five structural zones as defined on the plan in Appendix C.

Zone 1 (W41-W32) consists of the Northern Building. The roof renovation here consists of the installation of a new lead roof system in place of the current felt one. New roof lights are also to be formed.

Zone 2 (W32-W23) consists of the North West Building and the Link Building. Three separate roofing activities are to take place here. The first is a new lead roof system as Zone 1. The second is a new slate roof system over the North West building. The third is a repair of the Link building existing slate roof.

Zone 3 (W23-W15) consists of the Northern Wing and the Bomb Gap. This area is predominantly new slate roof construction however there is a small area of existing slate repair adjacent to the link building.

Zone 4 (W15-W10) consists of the Central Block. This involves a new slate roof adjacent to the main train shed roof and a plant slab (discussed in detail in the permanent works LBMS).

Zone 5 (W10-W2) consists of the Southern Wing. Here the scope is to repair and renovate the existing slate roof.

3 Surveys

Prior to commencing repairs and renovations to the roof of the WRB it will be necessary to undertake the following surveys and monitoring activities in accordance with approved documentation and in order to protect the historic fabric of the buildings.

1 Undertake a survey of the condition of the existing structure and submit a survey report to:

   a. Verify assumptions made in the permanent works design (as shown on ENG-DWG-OAP-WRB-CXP-*0101-5* "assumed existing roof structure");

   b. Provide information for use to ensure accurate fabrication (H62.1103, C62.1104, H71.1103);

2 Provide photographic and written recordings to EH requirements:

   a. MoLAS will undertake recording of the existing building prior to commencing permanent works;

   b. A 'watching brief' will be maintained in accordance with Listed Building Consent Condition 3, relating to a programme of building recording;

4 Protection, Labelling and Salvage

Slates that are removed from areas identified for deconstruction shall be checked for soundness and re-used for repairs and new build as detailed in LBMS Labelling and Protection of Heritage Items (KXP6/N374/WPP/LBMS/WRB/00005). Salvaged slates on areas of new build roof must be of a sufficient quantity to be consolidated on a single slope of roof in accordance with the salvage strategy. (Control and Protection matrix ref 4.)

5 Stability

During unloading of the roof in deconstructed areas, and in the North West building, propping will be installed to maintain the stability of the structure as a whole (see LBMS Removals and Demolitions KXP6-N374-WPP-LBMS-WRB-00006 for the specific details). For areas of repair no special measures are anticipated except to carry out the required structural monitoring (see document reference Civil Spec 6: Structural Monitoring ENG-SPE-G5-OAP-KX6-CSTR-1049).

At present TWC are awaiting the completion of the intrusive survey to determine the exact condition of roof trusses and boarding. Localised propping may be required if it is identified that previously obscured trusses require strengthening.

6 Specific areas of work

6.1 Slate Repair and Renovation

The state of slate repair varies over the extent of the WRB. Initial surveys suggest that the higher state of repair on the Southern Wing (Zone 5), for instance, is due to replacement after World War II. A full condition survey will be undertaken to allow a full scope of works and method of works to be put together. This will be submitted to EH and NR to meet the specification requirements (C62.1104).

Slates that are identified to be repaired or replaced are to be carefully removed by hand ensuring minimum disturbance to adjacent areas [C62.3102 (c)]. Material for replacement is to be kept clean and dry until used and must match the existing material. Small areas will be removed at a time to prevent any ingress of water during inclement weather.

Where battens are to be replaced surrounding slates are to be carefully removed, stacked upright and left in a dry location. The replacement batten will have square cut joints, be laid in straight horizontal lines and be no less than 1200mm long (spec ref C62.3102).

All existing features are to be salvaged as part of the Salvage Strategy.

Control measures for this activity are found in Appendix B ref 3.

6.2 Lead Flashing Replacement

Areas of lead flashing to be replaced are identified on the approved contract drawings. The lead will be removed by hand taking care not to damage any surrounding slates or masonry. No hot works will take place on the roof without a hot works permit to work.

The flashing will be released from the existing mortar using non powered hand tools to ensure minimum disruption to the existing masonry and stored as part of the employers requirements. Sections of lead removal will be undertaken in small manageable sections to reduce the risk of damage from inclement weather (spec ref H71.3107).

Replacement flashings will be installed as per the architects specification (see spec ref H71.3100). A comprehensive Inspection and Test Plan will be in place as part of TWC's Quality Management procedure to ensure correct installation and compliance.

Control measures for this activity are found in Appendix B ref 1 and 4.

6.3 Lead guttering

Areas of new lead sheeting to the parapet gutters are identified on the approved contract drawings. All removals of the existing lead and relaying of the new will be done using non powered hand tools. No hot works will take place on the roof without a hot works permit to work.

Where courses of slates are to be removed to allow the installation of the new gutter sheeting the procedure for removal mentioned in 6.1 will be used. The repair/replacement of the substrate will be determined during an intrusive survey to determine the condition and extent of the contract works.

Control measures for this activity are found in Appendix B ref 1 and 4.

6.4 Formation of new Dormers, Louvres and Roof lights

The formation of new pitched openings or dormers in the existing roof will involve removing and salvaging the existing slates and then constructing the frame in timber to the structural Engineer's details. Where an opening already exists the surrounding structure will not be disturbed unless necessary to allow repairs. All formation work will be carried out using non powered hand tools and localised protection of the internal structure will be utilised to prevent water ingress. For the construction of the new framework to support the louvres and roof lights powered hand tools may be used.

Once the opening is formed the appropriate unit (louvre, roof light, Mechanical plant etc) will be installed by competent operatives who have been briefed on the nature of the heritage structure. Slates or lead cladding will then be dressed around it as per the Architect's details.

Control measures for this activity are found in Appendix B ref 2 and 3.

6.5 General Notes

Temporary roofs will be constructed over the Central Block, over gridlines W18-W21 (adjacent to the Bomb Gap) and over the North West Building (see LBMS Removals and Demolitions KXP6-N374-WPP-LBMS-WRB-00006). This will protect the exposed internal structure from any water ingress during new roof construction. For areas being repaired protection will include the following;

- Only small areas of flashing stripped at a time to allow local protection during inclement weather.

- All works planned and coordinated to ensure that no area is left incomplete overnight. Where this is not possible substantial localised protection must be installed to protect the internal structure.

- Limited access during inclement weather for safety of the work force as well as the structure.

The workforce will be briefed at the start of every shift on the nature of the work and the importance of the heritage structure. Competency of the operatives involved will be assessed during the package 6 induction and at this time before being allowed in the work area.

All areas of the work will be carried out in accordance with the architectural specifications (specification references C62.3000 H62.3000 and H72.3000).

It is known that the bitumen based felt is Asbestos containing material (ACM). This will be removed by a licensed and specialised contractor that has been briefed on the nature of the heritage structure.

If there is any change to methodology discussed above due to the discovery of more ACM that is a risk to employee health and safety this will be communicated to NR and EH.

Due to the fact that the work is taking place at height TWC must comply with the Working at Height Regulations 2005. Care will be taken at all times and protection measures put in place to prevent objects or persons falling from or through the existing structure. See item 8 of the protection matrix. If it is not possible for work to be undertaken safely a change in sequence or methodology will be communicated to NR and EH.

Control measures for this activity are found in Appendix B ref 2,3,6,7 and 8.

7 Appendices

Appendix A Document and Drawing List

Appendix B Protection and Control Matrix

Appendix C Location Plan Drawing

7.1 Appendix A Document and Drawing List

Appendix A for Roof repairs and renovation

Specifications Standards & Reports

Section	Document Reference	Document Title	By
Civil	ENG-SPE-G5-OAP-006-CSTR-013	Structural Survey Specification	ARUP
Civil Volume 6	ENG-SPE-G5-OAP-KX6-CSTR-1049	Structural Monitoring	ARUP
	ENG-SPE-G5-OAP-KX6-CBSA-1000	General Requirements	ARUP
	ENG-SPE-G5-OAP-KX6-CBSA-1005	Technical Reference Sheet	ARUP
C62	ENG-SPE-G5-OAP-KX6-CBSA-1151	Slate Roof Repair and Renovation	ARUP
H62	ENG-SPE-G5-OAP-KX6-CBSA-1035	Natural Slating	ARUP
H71	ENG-SPE-G5-OAP-KX6-CBSA-1036	Lead Sheet Coverings/Flashings	ARUP
L31	ENG-SPE-G5-OAP-KX6-CBSA-1063	Architectural/Sundry Metalwork	ARUP
N25	ENG-SPE-G5-OAP-KX6-CBSA-1086	Permanent Access and Safety Equipment	ARUP
Civil Volume 11	ENG-SPE-G5-OAP-006-CSTR-0155	Anchorages to concrete and masonry	ARUP
	ENG-SCH-G5-OAP-KX6-CBSA-4057	Repair Schedule – Roof Repairs	ARUP
	ENG-REP-JMP-G5-PA-SWNS-0006	Salvage Strategy	JMP
Volume 2	ENG-SCH-G5-OAP-KX6-CBSA-4057	Roof Repair Schedule	JMP

Employers Drawings

Zone	Building	Drawing Number
1	Northern Building	ENG-DWG-OAP-WRB-CAP-0346
2	Northern Building	ENG-DWG-OAP-WRB-CAP-0347
3	North West Building	ENG-DWG-OAP-WRB-CAP-0348
4	Link Building	ENG-DWG-OAP-WRB-CAP-0349
5	Northern Wing	ENG-DWG-OAP-WRB-CAP-0350
1	Bomb Gap	ENG-DWG-OAP-WRB-CAP-0351
3	Central Block	ENG-DWG-OAP-WRB-CAP-0352
5	Southern Wing	ENG-DWG-OAP-WRB-CAP-0353
1	Southern Wing	ENG-DWG-OAP-WRB-CAP-0354
2	Southern Wing	ENG-DWG-OAP-WRB-CAS-0601
3	Southern Wing	ENG-DWG-OAP-WRB-CAS-0602
4	Central Block	ENG-DWG-OAP-WRB-CAS-0606
5	Central Block	ENG-DWG-OAP-WRB-CAS-0608
1	Northern Wing Building	ENG-DWG-OAP-WRB-CAS-0610

Assumed Existing Structure

Document Title	By
Roof Plan Northern Building – North Area	ARUP
Roof Plan Northern Building – South Area	ARUP
Roof Plan North West Building	ARUP
Roof Plan Link Building	ARUP
Roof Plan Northern Wing	ARUP
Roof Plan Bomb Gap	ARUP
Roof Plan Central Block	ARUP
Roof Plan Southern Wing - North Area	ARUP
Roof Plan Southern Wing - South Area	ARUP
Southern Wing Section W6-W5	ARUP
Southern Wing Section W3-W4	ARUP
Central Block Section W14-W15	ARUP
Central Block Section W16-W17	ARUP
Northern Wing Section W12-22	ARUP

2	North West Building	ENG-DWG-OAP-WRB-CAS-0612	North West Building Section WF-WG	ARUP
3	North West Building	ENG-DWG-OAP-WRB-CAS-0613	Pub Atrium North West Building Section W28-W29	ARUP
4	Northern Wing	ENG-DWG-OAP-WRB-CAS-0616	North Wing WH-WG	ARUP
5		ENG-DWG-OAP-WRB-CAS-0620	Recessed Roof Louvres – Typical Details	ARUP
4		ENG-DWG-OAP-WRB-CAD-5000	Roof Details	ARUP
1	Southern Wing	ENG-DWG-OAP-WRB-CAD-5001	Southern Wing Roof Details	ARUP
2	Central Block	ENG-DWG-OAP-WRB-CAD-5003	Central Block Parapet Flashing and Roof details	ARUP
3	Bomb Gap	ENG-DWG-OAP-WRB-CAD-5005	Bomb Gap Roof Details	ARUP
4	North Wing	ENG-DWG-OAP-WRB-CAD-5007	North Wing Roof Details	ARUP
5	North Wing/Link Building	ENG-DWG-OAP-WRB-CAD-5008	North Wing and Link Building Roof Details	ARUP
2	North West Building	ENG-DWG-OAP-WRB-CAD-5009	North West Building Roof Details	ARUP
2	Northern Building	ENG-DWG-OAP-WRB-CAD-5013	Northern Building Roof Details	ARUP
3		ENG-DWG-OAP-WRB-CAD-5017	Roof Lights Details	ARUP
4	Bomb Gap	ENG-DWG-OAP-WRB-CAD-5018	Bomb Gap WH-WG	ARUP
1	Northern Building	123345-00-WRB-CXP-00101	Assumed Existing Structure Roof Plan	ARUP
2	North West Bld./Link Building	123345-00-WRB-CXP-00102	Assumed Existing Structure Roof Plan	ARUP
3	Northern Wing/Bomb Gap	123345-00-WRB-CXP-00103	Assumed Existing Structure Roof Plan	ARUP

4	Central Block/Old Ticket Hall	123345-00-WRB-CXP-00104	Assumed Existing Structure Roof Plan	ARUP
5	Southern Wing	123345-00-WRB-CXP-00105	Assumed Existing Structure Roof Plan	ARUP
2	North West Bld./Link Building	123345-00-WRB-CAP-0047	Roof Plan - Demolition	ARUP
3	Northern Wing/Bomb Gap	123345-00-WRB-CAP-0048	Roof Plan - Demolition	ARUP
4	Central Block/Old Ticket Hall	123345-00-WRB-CAP-0049	Roof Plan - Demolition	ARUP

7.2 Appendix B Protection and Control Matrix

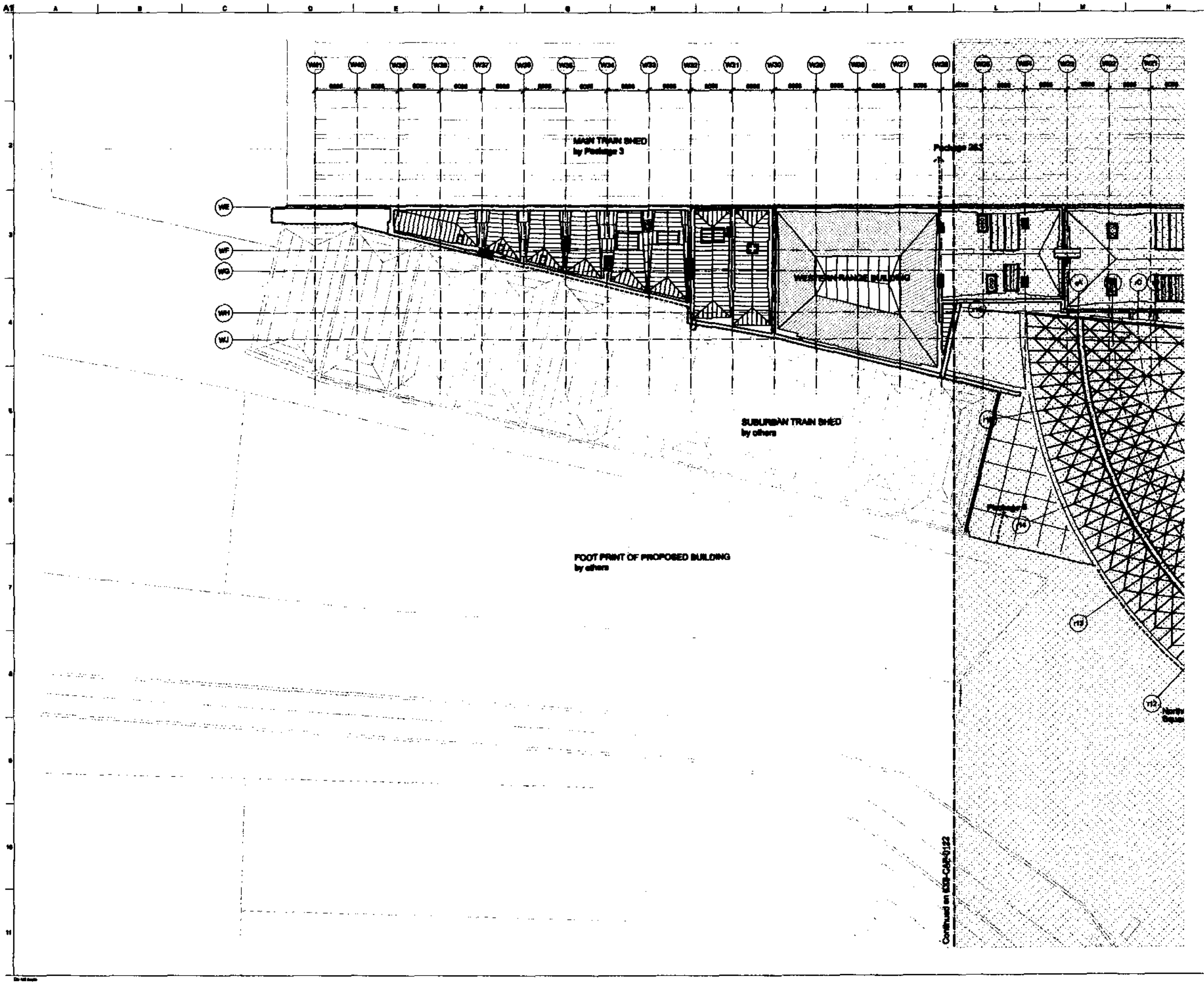
Reference	Hazards/Risk to heritage structure	Risk	Activities	Control Measure	Relevant Documents
1	Fire	Damage to heritage structure from fire. Damage to heritage structure from smoke. Original untreated timber potentially extremely flammable	• Lead Removal • Lead Replacement	• No Hot Works on the Roof • Fire alarm system throughout western range	• Site Induction
2	Inclement Weather	Damage from precipitation to internal heritage structure. Damage to internal heritage structure – internal exposed to external environment. Windblown material off the roof	• Slate removal (including lead) • Lead sheeting	• Temporary roof • Small sections of lead removed at a time while area protected. • No work in high winds • Physical barriers	
3	Accidental Damage	Poor handling of heritage items. Impact and/or abrasion to in-situ items during construction activities.	• All repairs and replacements	• Training and competent workforce • Restrictions on access to work areas • Protection to items once removed	

Reference	Hazards/Risk to heritage structure	Risk	Activities	Control Measure	Relevant Documents
4	Theft	Heritage items stolen from stores. Heritage items stolen in-situ.	• Slate and lead removal	• Site Security plan and a secure site hoarding • Protection to heritage items once removed • Control of access/egress to site • Access to heritage item store to be restricted to managers	• Site Security Plan • Labelling LBMS • Salvage Strategy
5	Dust	Staining to façade from dust settling and getting wet. Staining to internal heritage structure from settled dust getting damp.	• All activities	• High standard of housekeeping • Damping down • Reduce working heights for collection of demolition waste material • Physical protection to items of heritage value	• TW Environmental Management Plan

Reference	Hazards/Risk to heritage structure	Risk	Activities	Control Measure	Relevant Documents
6	Impact	Plant impact on retained structure. Material impact when removing waste/heritage items.	• Material delivery	• Impose restrictions on movement of site plant • Trained and competent work force • Physical barriers • Minimise the lifting of material over or through the structure	
7	COSHH	Prevention of heritage removal	• All removal activities	• Asbestos and Anthrax survey (Level 3) and management plan • Lead survey and management plan • Trained workforce and management team	• McGee Asbestos and Anthrax survey • Lead Survey • TW Environmental Management Plan
8	Unnecessary Removal	Prosecution for working outside of permitted works on a Grade 1 listed structure.	• All removal activities	• Salvage strategy • Competent management and supervision • Clear identification of items to be removed • Items to be assessed before work starts	• JMP Salvage strategy

Reference	Hazards/Risk to heritage structure	Risk	Activities	Control Measure	Relevant Documents

7.3 Appendix C Location Drawing



ARUP

John McAslan + Partners

Network Rail

King's Cross Station
Redevelopment Programme
Package 6

WRB / STS / NRPR / WCC
Roof Plan (North)

1:200

For Construction

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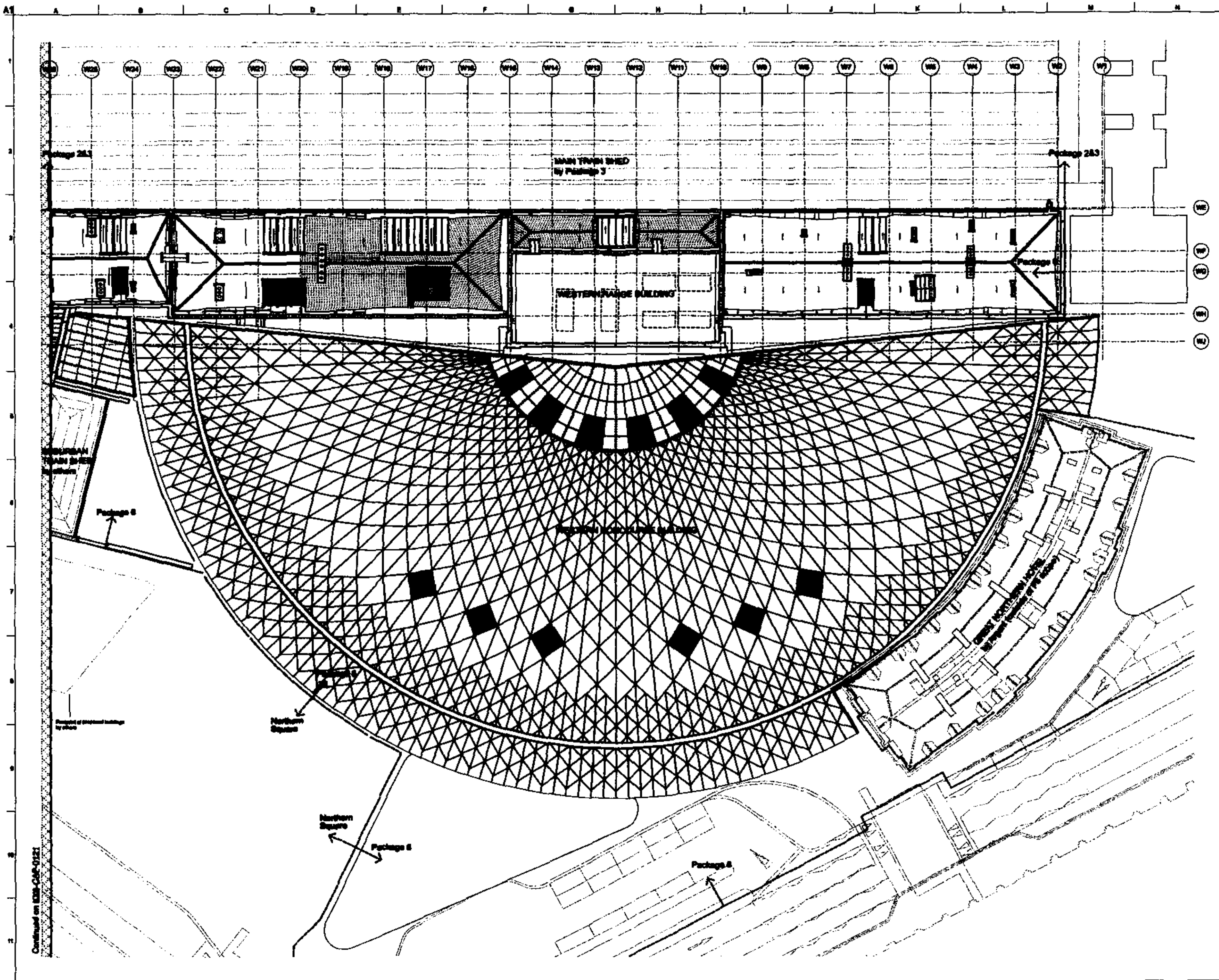

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King's Cross Station
Redevelopment Programme
Package 6

WRB / STS / NRPR / WCC
Roof Plan (South)

For Construction