Technical requirements specification for the 1992 Tube Stock Grab pole refurbishment

PVEC3149-LU-RSK-SAL-SP-0201-00

TfL Engineering on behalf of LU Renewals and Enhancements for Fleet

Central line Improvement Programme (CLIP)

PVEC3149.250 – 92TS saloon design project

Revision v1

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MAYOR OF LONDON

UNDERGROUND TRANSPORT FOR LONDON
EVERY JOURNEY MATTERS

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Foreword

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Interpretation

This document shall be interpreted in accordance with PVEC3149-LU-RSK-CLI-SP-0091-00 ‘Interpretation of documents issued by TfL Engineering on behalf of LU Rolling Stock Renewals’ (1).

Where provisions have been modified, or are new, provision identifiers are prefixed with “F”.

Document history

Revision	Change	Author	Date YYYY-MM-DD
V1	Issue 1	S. Butcher	2021-01-29

List of changes to requirements

Changes to requirements fall into one of the following categories:

- A - Additional data or information
- C - Correction of requirement
- N - New requirement
- R - Change to requirement
- T - Text or formatting change (no change to requirement)
- D - Requirement deleted

Revision X

Req. ID	Change category	Description	Date YYYY-MM-DD

1 Scope

1.1 General

1.1.1 This document specifies the requirements for refurbishment of the passenger grab poles currently installed within the saloon of 1992 Tube Stock (92TS) operating on the Central and Waterloo & City lines.

1.1.2 Grab pole refurbishment is required to address the poor state of finish on the existing grab poles. This includes areas where the current coating is worn, discoloured or missing.

1.1.3 A consistent coating finish and specific coating colour are required to comply with the Rail Vehicle Accessibility Regulations (RVAR).

1.1.4 Some grab poles are expected to have damage to the grub screw fixing arrangement and / or are expected to have suffered corrosion damage (the bottom end of the central floor mounted grab poles in particular). This will require repairing as part of the refurbishment.

1.1.5 Due to tolerances and the likelihood of small levels of distortion, the grab poles must be re-fitted in the same location that they were removed from. A method of assigning a unique identifier to each grab pole must therefore be developed.

1.1.6 The grab pole refurbishment work is part of a large programme of works referred to as CLIP. The CLIP programme of works for the Central Line trains takes place on an 8-car train at the Acton Works site, whilst on the Waterloo & City Line trains, the work takes place on a 4-car train at Waterloo Depot.

1.1.7 The refurbishment scope is expected to include, but is not limited to;

- Collection from site
- Removal of the existing coating
- Inspection for damage against agreed criteria
- The repair of any damage in accordance with agreed processes
- The application of a new coating in accordance with agreed processes
- Return to site

1.1.8 All aspects of the refurbishment scope must comply with the requirements of this specification and must be agreed with TfL before implementation.

2 General requirements

2.1 Scope and outputs

Para. Requirement **ID**

2.1.1 The supplier shall refurbish the grab poles listed in Table 2. S001

Name	Installation Drawing	Part Number (BREL)	Car A / E	Car B/C/D F	Train	CL Fleet 175 A car 505 B/C/D	W&C Fleet 10 E / 10 F cars	Notes
Doorway Ceiling Grabrails	111-7123	112-2925-01	2	4	28	140	0	Short spigot variant – first 5 trains only
		112-2925-02	4	4	32	160	0	
		112-2925-03	2	4	28	2230	60	
		112-2925-04	4	4	32	2560	80	
Vestibule End Grab Rails	112-2185	112-2187-01	2	4	28	2370	60	
Commode Rails	112-2186	112-2921-01	6	8	60	5090	140	
		112-2921-02	6	8	60	5090	140	
Grab Poles 6 Seat Bay	112-2685	400-0389-33	2	4	28	2370	60	
		400-0389-34	2	4	28	2370	60	
Grab Poles 6 Seat Bay Cab End	112-2686	400-0389-33	1	0	2	175	10	Same as standard 6 seat bay
		400-0389-34	1	0	2	175	10	
		400-0389-35	1	0	2	175	10	
		400-0389-36	1	0	2	175	10	
Grab Poles 5 Seat Bay	112-2687	400-0389-37	2	2	16	1360	40	
Centre Grab Pole	112-3188	400-0389-27	2	2	16	1360	40	
Total						25800	720	

Table 1: Grab pole types and quantities

2.1.2 For the Central Line trains, the refurbishment process; from collection from the TfL site to return to the TfL site (Acton Works), shall take 25 working days or less. For the Waterloo & City Line trains, the refurbishment process; from collection from the TfL site to return to the TfL site (Waterloo Depot), shall take less than 7 calendar days. S002

Para.	Requirement	ID
2.1.3	The supplier shall develop a process for labelling each grab pole with a unique identifier at the time of removal from the train and packaging the grab poles in a suitable manner to enable transport to the supplier. NOTE: Grab pole removal and packaging ready for transport to the supplier will be undertaken by TfL in accordance with the agreed process.	S003
2.1.4	The supplier shall provide all materials required to label and pack each grab pole in accordance with the agreed process.	S004
2.1.5	The supplier shall collect the packaged grab poles from the TfL site.	S005
2.1.6	The supplier shall develop and implement a process for delivering refurbished handrails back to the TfL site, each with the unique identifier intact such that the grab poles can be easily installed onto the train. **NOTE:** Grab pole unpacking and installation at the TfL site will be undertaken by TfL.	S006
2.1.7	The supplier shall develop and implement a process to ensure the refurbishment of first-offs are fully compliant and that subsequent grab poles are refurbished and delivered in a fully compliant, reliable and repeatable manner.	S007
2.1.8	The supplier shall consider the risks associated with delivering non-compliant, damaged or otherwise defective refurbished grab poles to the TfL site, and shall mitigate delays to the CLIP programme of works as a result.	S008

2.2 Existing coating removal, grab pole inspection and repair

Para.	Requirement	ID
2.2.1	The supplier shall develop and implement a process to remove the existing coating without affecting the integrity of the underlying grab pole.	S009
2.2.2	The supplier shall develop and implement a process to assess the condition of all threaded holes within the grab poles.	S010
2.2.3	The supplier shall develop and, where the results of the assessment require it, implement a process to repair the threaded holes within the grab poles.	S011
2.2.4	The supplier shall develop and implement a process to assess the damage caused by corrosion to the grab poles.	S012
2.2.5	The supplier shall develop and, where the results of the assessment requires it, implement a process to remove all corrosion and repair any damage caused by the corrosion.	S013
2.2.6	The supplier shall develop and implement a process to assess the grab poles for any other damage.	S014

Para.	Requirement	ID
2.2.7	The supplier shall develop and, where the results of the assessment requires it, implement a process to repair any other damage to the grab pole.	S015

2.3 Coating

2.3.1	The supplier shall develop and implement a process to coat the grab poles.	S016
2.3.2	On the Central line fleet (A, B and C cars), the colour of the coating on all grab poles shall be NCS S 1085-Y80R - Red.	S017
2.3.3	On the Waterloo & City line fleet (E and F cars), the colour of the coating on all commode rails (112-2186) shall be NCS S 0520-B70G. On all other grab poles the coating colour shall be NCS S 1050-B80G.	
2.3.4	The coating shall have gloss level of 30+/-3 GU measured in accordance with BS EN ISO 2813 using 60° geometry.	S018
2.3.5	The coating process shall include all necessary preparation activities, including surface preparation and any necessary primers / base coats.	S019
2.3.6	The coating shall be resistant to damage that can be caused by: (a) ‘Cleaning’ products and processes (b) Graffiti and gum removal products and processes (c) Maintenance products and processes (d) Other substances that may be found on the LU railway (e) Vandalism	S020

2.3.7 The durability of the coating shall be in accordance with the test requirements below: S021

Test Parameter	Test Method	Test Requirements
Scratch Resistance (all substrates)	BS EN ISO 1518-1:2011	No penetration of the dry film using a 2.5 Kg load.
Flexibility / Bend Test (Cylindrical Mandrel) (Steel and aluminium substrates only)	BS EN ISO 1519: 2011	No cracking flaking or detachment from the substrate when using a 6mm diameter mandrel.
Adhesion Resistance - Cross Cut (all substrates)	BS EN ISO 2409: 2013	The degree of damage shall not exceed Grade 1 for interior and exterior general purpose and Grade 0 for interior High Durability. For re-coating these grades are 2 and 1 respectively.
Impact Resistance (all substrates)	BS EN ISO 6272-1: 2011	No cracking flaking or detachment from the substrate when a 1 kg weight is dropped from a height of 40 cm.
Abrasion Resistance (all substrates)	BS EN ISO 7784-1: 2006	The weight loss is not to exceed 30 mg after 500 cycles using a CS10 wheel.
Resistance to Humidity	BS EN ISO 6270-1	No softening, swelling, blistering or under-film corrosion after 2000 hours of cycling.
UV Lightfastness (all substrates)	BS EN ISO 11507: 2007 Method A Exposure including condensation	No cracking, flaking, blistering, loss of inter-coat adhesion or change in colour
Chemical Resistance (all substrates)	BS EN ISO 2812-4:2007	Paint system shall suffer no adverse effects after 24 hours exposure to chemical agents
Resistance to corrosion	Part F4 of BS 3900 for a period of 1000 hours.	Two lines approximately 50 mm in length and intersecting at right angles in the centre of the 100 mm x 150 mm panel are cut through the coating to the substrate using a sharp knife. The scribed area shall be subjected to a tape pull-off test, using Scotch 898 or equivalent tape. There shall be no signs of corrosion or blistering on the undamaged portions of the panel. Additionally there shall be no material loss beyond 2mm from the scribed lines.

3 General requirements

Para.	Requirement	ID
3.1.1	The grab pole refurbishment shall comply with all relevant TfL, LU, Railway Group, British, European and international standards, and applicable legislation, so far as is reasonably practicable.	D001
3.1.2	The grab pole refurbishment shall not reduce the strength of the grab pole or the integrity of the attachment to the train brackets.	D002
3.1.3	Where corrosion or other damage reduces the strength of the grab pole or the integrity of the attachment to the train brackets, the strength and integrity shall be restored to a level equivalent to that of an undamaged grab pole.	D003

3.1.4 Materials used in the grab pole refurbishment shall be fit for purpose and suitable for the environment in which they shall be used. D004

NOTE: See the Environmental Context Description document (2).

3.1.5 If welding forms part of the grab pole refurbishment process, it shall comply with BS EN 15085, Parts 1 to 5. D005

3.1.6 The grab pole refurbishment shall fulfil this specification for a minimum design life of 25 years. D006

3.1.7 The grab pole refurbishment shall require no routine maintenance other than cleaning for the design life. D007

3.1.8 Materials used in the grab pole refurbishment shall ensure, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of them. D008

3.1.9 The use of every hazardous material shall be justified to and agreed with TfL. D009

3.1.10 The refurbished grab poles shall achieve the fire safety performance specified in TfL standard S1180 'Rolling stock'. D010

NOTE: The following table summarises the S1180 requirements for large interior surfaces which is applicable to grab poles. Compliance with at least one complete column is required.

Reaction to fire	BS EN 45545-2 Hazard Level 3 (HL3)	BS 6853:1999 Category 1a
Flammability, flame spread and heat release	SO5658-2 CFE>20 kWm-2 + ISO5660-1 (50kWm2) MARHE < 60 R1	Table 2
Smoke emission	SO5659-2 (50kWm2) VOF4 <300; Ds(4) < 150 R1	Table 2
Toxic fume emission	ISO5659-2 (50kWm-2) with FTIR CIT at 8 mins <0.75 R1	Table 2

3.1.11	Where the toxic fume emission of a flat surface is tested in accordance with test B2 in BS 6853:1999 Annex B, the mass of combustible material, as opposed to inert substrate, shall be at least 5 g, or, if this mass is impractical, scaled by mass from a B1 test, the latter including sampling of the toxicity of the gases liberated.	D011
3.1.12	Fire test specimens shall be representative assemblies of a refurbished grab pole	D012
3.1.13	Fire tests shall be conducted by laboratories accredited by signatories to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA). **NOTE 1:** See: http://ilac.org/signatory-search/. **NOTE 2:** The UK Accreditation Service (UKAS) is the signatory to the ILAC MRA for the UK.	D013
3.1.14	Material Safety Data Sheets that comply with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) shall be supplied for all chemical substances and mixtures. **NOTE:** Attention is drawn to European Regulation (EC) No. 1272/2008 on classification, labelling and packaging (CLP) of substances and mixtures, known as the CLP Regulation. See: http://www.hse.gov.uk/chemical-classification/legal/clp-regulation.htm.	D014
3.1.15	The refurbished grab poles shall not contain the chemicals listed in the Stockholm Convention on Persistent Organic Pollutants as a component in the production process of the refurbishment process or as a component of its raw materials. **NOTE:** Attention is drawn to the UK legislation regarding the Stockholm Convention, particularly the Persistent Organic Pollutants Regulations 2007, as amended. See: https://www.gov.uk/guidance/using-persistent-organic-pollutants-pops	D015

3.1.16 Emission of volatile organic compounds (VOCs) from each product in the grab pole refurbishment process shall be determined in accordance with BS EN 16516 and classified in accordance with the following table. Lower VOC emission class products are preferred and products that exceed the class 3 limit values are not permitted. D016

Parameter	VOC emission limit values (µg/m³ except where otherwise stated)			
	Class 0	Class 1	Class 2	Class 3
TVOC after 3 days	≤ 750	≤ 1 000	≤ 3 000	≤ 10 000
TVOC after 28 days	≤ 60	≤ 100	≤ 300	≤ 1 000
TSVOC after 28 days	≤ 40	≤ 50	≤ 100	≤ 100
R value based on the latest agreed EU-LCI values after 28 days (dimensionless)	1	1	1	1
VOC without EU-LCI values	Sum ≤ 40	Sum ≤ 100	Sum ≤ 100	Sum ≤ 100
Formaldehyde	≤ 50 after 3 days	≤ 50 after 3 days	≤ 50 after 3 days	≤ 100 after 28 days
Acetaldehyde	≤ 50 after 3 days	≤ 50 after 3 days	≤ 50 after 3 days	≤ 1200 after 28 days
Sum of formaldehyde and acetaldehyde	≤ 0.05 ppm	≤ 0.05 ppm	≤ 0.05 ppm	Unspecified
Carc. 1A and 1B VOCs after 3 days	Sum ≤ 10	Sum ≤ 10	Sum ≤ 10	Each VOC ≤ 'determination limit'
Carc. 1A and 1B VOCs after 28 days	Each ≤ 1	Each ≤ 1	Each ≤ 1	Each ≤ 1

NOTE 1: The latest agreed EU-LCI values are available at: http://ec.europa.eu/growth/sectors/construction/eu-lci/values_en.

NOTE 2: Attention is drawn to the UK legislation regarding the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), particularly the UK REACH Enforcement Regulations 2008, as amended (http://www.hse.gov.uk/reach/index.htm).

3.1.17	Grab pole repair procedures shall not result in sharp edges being generated in the exterior surface of the grab pole, either initially or during the design life of the grab pole.	D017

3.2 Design approach

Para.	Requirement	ID
3.2.1	The process acceptance approach described in section 4 of this specification shall be followed.	A001
3.2.2	Unless otherwise agreed, the revision of any standard or other information resource that applies at the date of contract award shall be the revision of that standard or other information resource that is used. **NOTE:** The latest revisions of LU and TfL standards are available at: https://www.ihs.com/permission/lul-standards/index.html.	A002
3.2.3	The supplier shall be responsible for checking the validity of all documentation or information referenced by this specification.	A003
3.2.4	Any supporting documentation or information referred to in this specification is provided for the information and guidance of the supplier only. TfL shall not accept any liability, including delays or costs, resulting from any inaccuracy or omission. **NOTE:** A limited suite of drawings exists for London Underground rolling stock. The drawings are uncontrolled copies, supplied by the London Underground drawing office or the original equipment manufacturers. It is understood that the rolling stock was built according to these drawings, although TfL cannot offer any guarantees as to the degree of compliance with the drawings that has been achieved. Experience indicates that while most information on the drawings appears to be accurate, certain aspects of the rolling stock may differ slightly from that presented in the drawings.	A004
3.2.5	The supplier shall survey the rolling stock to a level of detail agreed with TfL to determine and verify all information required to fulfil this specification.	A005
3.2.6	The supplier shall be responsible for making all necessary enquiries and obtaining all information required to enable it to fulfil the requirements of this specification.	A006

4 Refurbishment process acceptance

4.1 Process development review

4.1.1 The development of the refurbishment process shall take place in three stages as shown in Table 2.

Stage	Review	
Process development - Option evaluation and recommendation	1	Process review and selection
Type Testing and prototyping	2	Prototype review
Process approval	3	Process implementation review

Table 2: Design review process

4.1.2 The supplier shall provide documentary evidence prior to each review stage, as detailed in the section relating to that review, to demonstrate that the developed process will meet requirements of this specification and to facilitate acceptance. These documents form the review submission.

4.1.3 Reviews shall facilitate the raising, discussion and agreed resolution of issues that have arisen during the submission review period.

4.1.4 Each review will be minuted by TfL such that the minutes, once agreed and issued to all parties, and all actions resolved to the satisfaction of TfL, will form the agreed basis for the progression of the project to the next stage.

4.1.5 Other review meetings shall occur as and when necessary. These will be minuted by TfL.

4.2 Process review and selection

4.2.1 The process review and selection shall evaluate, to the satisfaction of TfL, the translation of this specification into the required refurbishment process.

4.2.2 The process review and selection submission shall contain detailed processes, with option evaluation and recommendations as appropriate. In support of this there shall be sufficient evidence to demonstrate that the developed processes meet the requirements of this specification and will be fit for purpose.

4.2.3 The process review and selection submission shall include the following documents:

ID	Document	Paragraph
DD_001	Initial process specification	5.1
DD_002	Initial declaration of design compliance	5.2
DD_003	Type test specifications	5.3

4.3 Type Testing and Prototype Review

4.3.1 The Type Testing and Prototype Review submission shall provide sufficient information to demonstrate that the 'refurbishment process definition is complete, will meet the requirements of this specification and that it will be fit for purpose.

4.3.2 The Type Testing and Prototype Review submission shall include fully documented type test reports, demonstrating the successful completion of all testing required to demonstrate compliance of the refurbishment process.

4.3.3 The Type Testing and Prototype Review shall include successful implementation of the refurbishment process on 1 train-set of grab poles.

4.3.4 The Type Testing and Prototype Review submission shall include the following documents:

ID	Document	Paragraph
DD_001	Updated process specification	5.1
DD_004	Type test reports and certificates	5.4
DD_005	Prototype implementation report	5.5
DD_002	Updated declaration of design compliance	5.2

4.4 Process Implementation Review

4.4.1 The process implementation review shall evaluate, to the satisfaction of TfL, the final refurbishment process incorporating any changes or developments required as a result of prototyping.

4.4.2 Once all actions resulting from the process implementation review are completed to the satisfaction of TfL, the refurbishment process can be implemented.

4.4.3 The process implementation review submission shall include the following documents:

ID	Document	Paragraph
DD_001	Final process specification	5.1
DD_002	Final declaration of design compliance	5.2

5 Documentation

5.1 Process specification

5.1.1 The process specification shall define the complete refurbishment process with full details of every activity and every material used.

5.1.2 Where the process specification requires an output from TfL, e.g. packing of grab poles for transport to the supplier, full process instructions shall be provided.

5.2 Declaration of design compliance

5.2.1 The declaration of design compliance shall build on the process specification and shall include sufficient explanation and references to supporting documents, where applicable, to indicate how the requirements of this specification will be met, with individual reference to each of the applicable requirements.

5.2.2 The declaration of design compliance shall include a clear statement that compliance with this specification will be achieved and a clear statement that the proposed design will be fit for purpose.

5.3 Test Specifications

5.3.1 The supplier shall produce a test specification for each test it shall detail the nature of the tests, the pass/fail criteria, and shall be sufficiently detailed such that TfL could perform them without supplier intervention, even if this is not the intention.

5.3.2 Test specifications shall include the following:

- 5.3.2.1 Unique reference number and issue status
- 5.3.2.2 Test location
- 5.3.2.3 Test conditions required
- 5.3.2.4 Test equipment required and the required accuracy of any test equipment
- 5.3.2.5 Personnel and staff qualifications required
- 5.3.2.6 Safety precautions necessary
- 5.3.2.7 Description of test, how it is to be undertaken, how it is measured and recorded, i.e. all the relevant requirements to be verified, all the relevant tests to be undertaken, all the measurements to be made.
- 5.3.2.8 If the test is in accordance, in whole or in part, with a standard, then the standard and the clauses shall be referenced and transcribed into the specification
- 5.3.2.9 How the results will be analysed
- 5.3.2.10 Pass/fail criteria

5.4 Test reports

5.4.1 The supplier shall produce a test report for each test, after the completion of each test. It shall reference the applicable test specification, the result of the test and whether or not the test was passed.

5.4.2 The test reports shall include the following:

5.4.2.1 Unique report reference number, issue number and report title

5.4.2.2 Location and date of test

5.4.2.3 Name(s) of tester(s)

5.4.2.4 Test chamber conditions

5.4.2.5 Ambient conditions for tests not undertaken in a test chamber

5.4.2.6 List of test equipment used including serial numbers and copies or details of calibration certificates

5.4.2.7 Description of test undertaken

5.4.2.8 Test results

5.4.2.9 Analysis including Pass/Fail criteria,

5.4.2.10 Clear statement on whether test was passed or failed and why, including:

- A clear description of any test failures
- The equipment concerned and affected
- The failure mode
- The effect
- Corrective actions arising
- Outcome of re-test

5.5 Prototype implementation report

5.5.1 The supplier shall produce a prototype implementation report detailing the outcomes of the prototype implementation of every stage of the refurbishment process, with a clear statement on whether the implementation was successful or unsuccessful and why, including:

- Where unsuccessful:
  - ♦ A clear description of any unsuccessful processes
  - ♦ The processes affected
  - ♦ The failure mode
  - ♦ The effect
  - ♦ Corrective actions arising
- Where successful:
  - ♦ An assessment of process efficiency, highlighting any opportunities for process improvements

6 Glossary

For the purposes of this specification, the following terms, definitions and abbreviations apply:

Term	Definition	Source	Abbreviation
1992 Tube Stock (92TS)	The fleet of London Underground rolling stock originally built for operation on the Central line by British Rail Engineering Limited (BREL) between 1991 and 1994. Currently operating on the Central line and the Waterloo & City line.		92TS
Carc. 1A and 1B VOCs	Volatile carcinogens of categories Carc. 1A and Carc. 1B according to Regulation (EC) N° 1272/2008.	BS EN 16516:2017 (4) Annex H	
Cleaning	The removal of contamination from a surface and the application of surface treatments to achieve desired properties.		
Central Line Improvement Programme	The programme of works being undertaken on 92TS which grab pole refurbishment forms a part of.		CLIP
design life	The specified life for which all functionality is available as specified in the requirements.		
determination limit	Minimum quantity of a detected substance above which quantification is possible. **NOTE:** BS EN ISO 10580:2012 notes that the determination limit was 10 µg/m^3 for technical reasons at the time of writing, but BS EN 16516:2017 requires measurement of Carc. 1A and 1B VOCs down to 1 µg/m^3, as far as feasible, indicating that detectability has improved since 2012.	BS EN ISO 10580:2012 (6) clause 3.17	
Grab pole	A device attached with the saloon of a vehicle to provide a point at which passengers may steady themselves via the use of the hand. For the purposes of this document, this also covers Commode Handles (grab poles provided adjacent to passenger doorways to aid egress) and grab rails (generally horizontal grab poles secured above head height).		

Term	Definition	Source	Abbreviation
International Laboratory Accreditation Cooperation	ILAC is the international organisation for accreditation bodies operating in accordance with ISO/IEC 17011 and involved in the accreditation of conformity assessment bodies including calibration laboratories (using ISO/IEC 17025), testing laboratories (using ISO/IEC 17025), medical testing laboratories (using ISO 15189) and inspection bodies (using ISO/IEC 17020).		ILAC
maintenance	Combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function, excluding 'cleaning'. **NOTE 1:** For 'floor covering systems', this typically involves the repair of damage by the removing and refitting of sections of 'floor covering' and coving. **NOTE 2:** For LU rolling stock, sub-contractor personnel undertake 'cleaning', whereas London Underground personnel undertake 'maintenance'.	Based on BS EN 13306:2010 (8), clause 2.1	
Material Safety Data Sheet	Document specifying the properties of a substance, its potential hazardous effects for humans and the environment, and the precautions necessary to handle and dispose of the substance safely.	ISO online browsing platform (9)	MSDS
passengers	People on the train for the purposes of travel.		
R value	sum of all R_i values obtained during a given test	BS EN 16516:2017 (4) clause 3.1.3.3	
Rail Vehicle Accessibility (Non-Interoperable Rail System) Regulations 2010	The statutory regulations regarding the accessibility of rail vehicles that are applicable to the London Underground railway.		RVAR

Term	Definition	Source	Abbreviation
routine maintenance	Preventative maintenance and/or inspection tasks that are carried out on the basis of either mileage covered or duration, irrespective of any failure of the equipment.		
Saloon	The whole of the passenger space inside the train, including all seating areas, 'vestibules' and gangways.		
Supplier	The company contracted by TfL to provide the grab pole refurbishment process.		
TfL site	The work site at which the removal and installation of the grab poles on 92TS is carried out.		
Vestibule	An area of the 'saloon' for passenger access, egress, standing and circulation, bounded by 'passenger doorways', 'standbacks' and seating areas, including the gangway through that area.		

7. Referenced documents

1. **Feltham, J.** PVEC3149-LU-RSK-CLI-SP-0091-00 Interpretation of documents issued by TfL Engineering on behalf of LU Rolling Stock Renewals. *Engineering for CLIP and RVAR.* [Online] TfL, 25 January 2018. [Cited: 25 January 2018.] https://sharelondon.tfl.gov.uk/ru/clip/v/PVEC3149-LU-RSK-CLI-SP-0091-00--Interpretation-of-RSR-engineering-documents.docx.

2. **Shemilt, R. M.** PVEC3149-LU-RSK-ACT-RP-0009-00 - A5 - Environmental Context Description (Central line). *Engineering for CLIP and RVAR compliance.* [Online] TfL, 23 October 2017. [Cited: 5 February 2018.] https://sharelondon.tfl.gov.uk/ru/clip/v/PVEC3149-LU-RSK-ACT-RP-0009-00-Environmental-Context-Description-Central-Line.docx.