

**Dated**                      July                      **2021**

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**LONDON UNDERGROUND LIMITED**                      (1)

**and**

**MANTEC ENGINEERING LTD**                      (2)

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**FRAMEWORK AGREEMENT**  
**for the manufacture, overhaul and repair of**  
**bespoke components and other services**

**FRAMEWORK AGREEMENT REFERENCE**  
**NUMBER: TfL00716**

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**THIS AGREEMENT** is made on  
**BETWEEN:**

23 July

2021

- (1) **London Underground Limited**, a company registered in England and Wales under number 01900907 and having its registered office at 5 Endeavour Square, London E20 1JN (the “**Company**”); and
- (2) **Mantec Engineering Ltd**, a company registered in England and Wales under number 3104036 and having its registered office at Whitworth Street, Openshaw, Manchester M11 2DW (the “**Supplier**”).

## **BACKGROUND**

- (A) The Supplier carries on the business of manufacturing and selling the Goods and providing the Services.
- (B) The Company wishes to buy and the Supplier wishes to supply the Goods and Services subject to, and on, the terms and conditions set out in the Agreement.
- (C) This Agreement may be utilised by the Company or any other member of the TfL Group. The Greater London Authority, any of the London boroughs, the Metropolitan Police Service, or any functional body (as defined in the GLA Act) may, if the Supplier so agrees, contract with the Supplier on the terms set out in this Agreement.
- (D) It is the intention of the parties that neither the Company nor any other member of the TfL Group has any obligation to place Orders or enter into any Contract or Call-Off Contract with the Supplier under this Framework Agreement or at all.

**THIS DEED WITNESSES** as follows:

## **1 Definitions and Interpretation**

- 1.1 In this Agreement and (unless expressly provided otherwise) in each Contract and Call-Off Contract the following definitions shall have the following meanings:

“**Abatement**” means a reduction from the payment due to the Supplier under a Contract and/or Call-Off Contract, calculated in accordance with Schedule 10(a) (Performance Measurement Mechanism) at each payment assessment made by the Company’s Representative.

**“Accounting Period”** means one of the Company’s accounting periods, as notified from time to time by the Company to the Supplier, each such period being of between 25 and 32 days and one of 13 periods during the Company’s financial year.

**“Actual Date(s)”** means one or more of any Order Delivery Date or Order Completion Date, as the context requires.

**“Additional Goods”** means any goods which the Company requests the Supplier to provide in accordance with the terms of the Agreement and each Contract and Call-Off Contract in addition to those set out in the Specification or Contract Specification.

**“Additional Services”** means any services which the Company requests the Supplier to provide in accordance with the terms of the Agreement and each Contract and Call-Off Contract in addition to those set out in the Specification or Contract Specification.

**“Aggregated Annual Spend”** means the total of all sums paid by the Company to the Supplier (exclusive of VAT) pursuant to the terms of all Call-Off Contracts annually calculated in accordance with Clause 9.

**“Agreement”** means these terms and conditions, including the Schedules, as amended, varied or supplemented from time to time.

**“Applicable Laws”** means, depending on the context, all or any laws, statutes, proclamations, recommendations, codes of practice, by-laws, directives, Regulations, statutory instruments, rules, orders, rules of court, delegated or subordinate legislation, rules of common law or any European Union legislation (including any declarations of conformity), retained or modified by or under the EUWA, at any time or from time to time in force in the whole or any part of the United Kingdom and which are or may become applicable to the Agreement and each Contract and Call-Off Contract, any agreement or document referred to in the Agreement and each Contract and Call-Off Contract, or the Goods and Services.

**“BAFO”** means ‘best and final offer’.

**“Below Requirements”** has, in respect of each KPI, the meaning given to it in respect of that KPI in Appendix 1 to Schedule 10(a) (Performance Measurement Mechanism).

**“CCSL”** means the Centre for Civil Society Limited or any relevant replacement organisation as notified by the Company from time to time.

**“Call-Off Contract”** has the meaning given in Clause 3.1(c).

**“Cessation Plan”** means a plan agreed between the parties or determined by the Company in accordance with Clause 50.1 to give effect to a Declaration of Ineffectiveness or a Public Procurement Termination Event.

**“Commencement Date”** means the date specified as such in Schedule 1.

**“Company’s Representative”** means the person(s) appointed by the Company and named or defined in Schedule 1 (Detailed Terms).

**“CompeteFor”** has the meaning given to that term in Clause 51.

**“Confidential Information”** means any information given orally or in writing which is a trade or business secret or method; technical know how; personal data which relates to a living individual who can be identified from that information; information relating to any crime, breach of statutory duty or criminal investigations; information relating to the protection of prominent persons, national security, counter-terrorism or other information relating to the provision of police services for any national or international purpose; information relating to the Company’s obligations in accordance with sections 118 to 121 of the Railways Act 1993; confidential financial information including but not limited to taxation information and returns to shareholders; and any other information that a party would reasonably expect to be able to protect by virtue of business confidentiality provisions.

**“Consequential Loss”** means in relation to a breach of this Agreement or any Contract or any Call-Off Contract or other circumstances in which a party is entitled to recover any costs, expenses or liabilities suffered or incurred, loss of profit, loss of revenue, loss of contract, loss of goodwill and/or other financial loss resulting from such breach and whether or not the party committing the breach knew, or ought to have known, that such loss would be likely to be suffered as a result of such breach.

**“Contract”** means a contract as defined in Clause 3.1.

**“Contract Award Criteria”** means the award criteria for Goods and/or Services as set out by the Company in a Request Form including the use of any Reverse Auction.

**“Contract Information”** means (i) each Contract, Call-Off Contract and Agreement in its entirety (including from time to time agreed changes to any Contract, Call-Off Contract and/or Agreement) and (ii) data extracted from the invoices submitted pursuant to Clauses 9.1 and 9.2 which shall consist of the Supplier’s name, the expenditure account code, the expenditure account code description, the document number, the clearing date and the invoice amount.

**“Contract Material Data Sheet” or “CMD Sheet”** means the contract material data sheet agreed by the parties to apply to any Contract.

**“Contract Pricing”** means the rates and prices applying to a particular Contract which shall be fixed for that Contract unless the Company states (in a particular Order) that indexation will apply to the Contract Pricing in respect of a particular Order Price, in which case the rates and prices will be subject to indexation to reflect any percentage increase or decrease in the CPI during the previous 12-month period.

**“Contract Quality Plan”** means the quality plan agreed by the parties to apply to any Contract.

**“Contract Reference Number”** means the number shown on the front page of this Agreement.

**“Contract Specification”** means the description of and requirement for Goods and/or Services under any Contract.

**“Contract Variation Procedure”** means the procedure set out in Schedule 5.

**“Contractual Documentation”** means all documentation and information agreed to be delivered by the Supplier in accordance with each Contract or Call-Off Contract including without limitation records, reports, documents, papers, unpatented designs, drawings, data specifications, manufacturing or work processes, testing procedures, relevant computer data and all other technical business and similar information originated by or on behalf of the Supplier in accordance with each Contract or Call-Off Contract as applicable.

**“Control”** means, in relation to a body corporate, the ability of a person (or any persons acting together) to ensure that the activities and business of that body corporate are conducted in accordance with the wishes of that person (or those persons), and a person (or persons) shall be deemed to have Control of a body corporate (amongst other things) if, directly or indirectly, that person possesses or is entitled to acquire (or those persons possess or are entitled to acquire): (i) the majority of the issued share capital in that body corporate; or (ii) the majority of the voting rights in that body corporate; or (iii) the right to receive the majority of the income of that body corporate on any distribution by it of all of its income or the majority of its assets on a winding-up; or (iv) the right to appoint a majority of the directors to the board of that body corporate, and “Controlling”, “Controlled” and “Controller” shall be construed accordingly.

**“CPI”** means the Consumer Prices Index published by the Office for National Statistics or failing such publication or in the event of a fundamental change to the index, such other index as the parties may agree, or such adjustments to the index as the parties may agree (in each case with the intention of putting the parties in a no better or worse position than they would have been had the index not ceased to be published or the relevant fundamental change not been made) or, in the event that no such agreement is reached, as may be determined in accordance with the provisions of Clause 39 (Dispute Resolution).

**“Data Protection Legislation”** means:



- (i) any legislation in force from time to time in the United Kingdom relating to privacy and/or the Processing of Personal Data, including but not limited to the Data Protection Act 2018;
- (ii) any statutory codes of practice issued by the Information Commissioner in relation to such legislation; and
- (iii) the Privacy and Electronic Communications (EC Directive) Regulations 2003.

**“Declaration of Conformity”** means a statement by the Supplier in compliance with Standard BS EN ISO/IEC 17050-1, noting that the Company and TfL Group may also refer to such a statement as a “certificate of conformity”.

**“Declaration of Ineffectiveness”** means a declaration of ineffectiveness in relation to any contract made by a court of competent jurisdiction in accordance with Regulation 98 of the Public Contracts Regulations 2015 (as amended) or Regulation 113(2)(a) or Regulation 118(3) of the Utilities Contracts Regulations 2016 (as amended).

**“Defect”** means that the Goods or any part of them do not comply with the requirements of any Contract or Call-Off Contract, or are of unsatisfactory quality whether in consequence of faulty design, faulty materials, negligence, bad workmanship or in consequence of any other reason attributable to the Supplier or its suppliers or the employees of any of them. For the avoidance of doubt, this shall include damage which occurs during transit from the Supplier to the Company.

**“Delivery Address”** means the address at which the Supplier shall deliver the Goods or Serviced Goods to the Company and which is set out in the Order or such other destination as may be notified by the Company to the Supplier.

**“Delivery Note”** has the meaning given to that term in Clause 10.5.

**“Dispute”** has the meaning given to that term in Clause 39.1.

**“Documentation”** means all documents, items of information, data, reports, drawings, specifications, plans, software, designs, inventions and/or other material produced or supplied by or on behalf of the Supplier in the performance of each Contract or Call-Off Contract and whether in paper form or stored electronically.

**“EDI Action Plan”** means the strategic equality, diversity and inclusion action plan as produced by the Supplier in accordance with Schedule 8 by the parties and attached at Appendix 2 of Schedule 8.

**“EDI Policy”** means a written policy provided by the Supplier setting out how it will promote equality, diversity and inclusion.

**"Equality Statement"** means a short written statement setting out how the Supplier will embed equality, diversity and inclusion in its performance of the Agreement, Contracts and Call-Off Contracts.

**"Equipment"** means equipment (not being Free Issue Materials) supplied or loaned by the Company to the Supplier without charge and intended for use by the Supplier exclusively in the supply of Goods or Services under a Contract or Call-Off Contract.

**"Escalation Procedure"** means the escalation procedure in respect of the Supplier's performance under the Agreement, Contracts and/or Call-Off Contracts set out at paragraph 4 of Schedule 10(a) (Performance Measurement Mechanism).

**"EUWA"** means the European Union (Withdrawal) Act 2018

**"Excepted Liabilities"** means the liability of the Supplier for:

- (i) any abatements for performance levied in accordance with Clause 11.5 and Schedule 10(a) (Performance Measurement Mechanism) or any Contract or Call-Off Contract;
- (ii) Losses against which the Supplier is entitled to an indemnity under any policy of insurance (or would have been entitled but for any breach or failure to maintain such insurance);
- (iii) Losses caused by fraudulent acts or acts of a criminal nature; and
- (iv) Losses caused by the Supplier committing a Prohibited Act or Safety Breach.

**"Excess Costs"** has the meaning given to that term in Clause 20.6.

**"Existing Contracts"** means any and all contracts, whether current, expired or terminated, pursuant to which goods and/or the services have been supplied and/or provided by the Supplier (in the capacity of contractor or subcontractor) to the Company and/or any other member of the TfL Group.

**"Expected Date(s)"** means one or more of any Expected Order Delivery Date or Expected Order Completion Date, as the context requires.

**"Expected Order Delivery Date"** means the date set out in each Order upon which the Goods or any part of them are to be delivered by the Supplier to the Company.

**"Expected Order Completion Date"** means the date set out in each Order by which the Services or any part of them are to be performed as specified as such in each Order (including

the date for delivery of any Serviced Goods) or such other date as may be agreed between the parties in accordance with the terms of each Contract.

**“Financial Year”** means the 12-month period from and including 1 April in any year up to and including the following 31 March, or any other 12-month period as notified by the Company to the Supplier.

**“First Financial Year”** means the period commencing on and including the Commencement Date and ending at the end of the following 31 March.

**“Force Majeure Event”** means any of the following (or any circumstances arising as a consequence of any of the following) if and only to the extent that such event or circumstances is or are not caused by, and their effects are beyond the reasonable control of, a party affected by such an event or circumstances and which have an adverse effect on the party affected by such an event or circumstances and such party’s ability to perform its obligations under the Agreement or any Contract or Call-Off Contract and is not an event or circumstances (i) whose effect the party affected by such an event is otherwise required to avoid or provide against (other than by way of insurance) under the Agreement or any Contract or Call-Off Contract or (ii) which the party affected by such an event could reasonably have avoided or provided against:

- (i) war, invasions, acts of foreign enemies, hostilities (whether war be declared or undeclared), civil war, rebellion, revolutions, insurrection, military or usurped power, confiscation, or requisition by or under the order of any government or public or local authority;
- (ii) civil unrest;
- (iii) any act of terrorism or a specific threat of terrorism which results in the partial or total, temporary or long term closure of the Underground Network or TfL Network;
- (iv) lightning, earthquake or subject to (vi) below, extraordinary storm;
- (v) fire;
- (vi) flooding, other than flooding caused by rising water table or by weather conditions (including extraordinary storm);
- (vii) tunnel collapse;
- (viii) compliance with the provision of sections 118 to 121 of the Railways Act 1993;

- (ix) nuclear, chemical or biological contamination including ionizing radiation or contamination by radioactivity from any nuclear fuel or nuclear waste from the combustion of nuclear fuel or radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof;
- (x) the discovery of fossils, antiquities or other material which in each case is required to be exhumed or unexploded bombs; and
- (xi) strikes, lock outs or other industrial action being in each case industry-wide.

**“Framework Suppliers”** means the Supplier and other suppliers appointed as framework suppliers under framework agreements which are on substantially the same terms as the Agreement.

**“Free Issue Materials”** means materials, apparatus and components supplied by the Company to the Supplier without charge and intended for use by the Supplier exclusively in the provision of Services under each Contract or Call-Off Contract, as applicable.

**“Goods”** means the goods stated in the Specification or Contract Specification as applicable to be supplied by the Supplier and any Additional Goods which the Company has agreed that it may buy under Clause 7.

**“Greater London”** has the meaning ascribed to it in the GLA Act.

**“Greater London Authority Act”** or **“GLA Act”** means the Greater London Authority Act 1999 relating to the formation of the Greater London Authority.

**“Infrastructure Manager”** has the meaning ascribed to it in the Railways and Other Guided Transport Systems (Safety) Regulations 2006.

**“Intellectual Property Rights”** means any intellectual property rights in any part of the world and includes but is not limited to all rights to, and interests in, any patents (including supplementary protection certificates), designs, trade-marks, service marks, trade and business names and get up, moral rights, domain names, copyright and neighbouring rights, databases, semi-conductors, know how, knowledge, trade secrets and any other proprietary rights or forms of intellectual property (protectable by registration or not) whether registered or not in respect of any technology, technique, concept, idea, style, scheme, formula, system, logo, mark or other matter or thing, existing or conceived, used, developed or produced by any person, together with all applications and rights to apply for registration or protection of such rights, Confidential Information relating to those rights, material embodying those rights and in each case rights of a similar or corresponding character.

**“Key Performance Indicator”** or **“KPI”** means any or all, as the case may be, of the performance measurements set out in paragraph 2 of Schedule 10(a) (Performance Measurement Mechanism) which are applicable to the Agreement, Contracts and/or Call-Off Contracts.

**“Level 1 Non-Conformance”** means the Supplier's performance in respect of any KPI being assessed by the Company as:

- (i) “Below Requirements” on four or more occasions in any twelve (12) month rolling period;  
or
- (ii) “Unsatisfactory” on any occasion;

**“Level 1 Non-Conformance Report”** has the meaning given to it in paragraph 4.4(A) of Schedule 10(a) (Performance Measurement Mechanism);

**“Level 1 Rectification Period”** has the meaning given to it in paragraph 4.4(A)(3) of Schedule 10(a) (Performance Measurement Mechanism);

**“Level 1 Required Action”** has the meaning given to it in paragraph 4.4(A)(2) of Schedule 10(a) (Performance Measurement Mechanism);

**“Level 2 Non-Conformance”** shall mean any of the following:

- (i) the Company determines that a Level 1 Non Conformance should be treated as a Level 2 Non Conformance, for any reason, including failure of the Supplier's Representative and the Company's Representative to agree any or all of the Level 1 Required Action, the Level 1 Rectification Period and whether the Level 1 Required Action has been completed within the Level 1 Rectification Period;
- (ii) the Supplier fails to make available to the Company a Level 1 Non Conformance Report within five (5) Working Days of service by the Company of the notice referred to in paragraph 4.4(A) of Schedule 10(a) (Performance Measurement Mechanism);
- (iii) the Supplier fails in the Company's opinion to undertake the Level 1 Required Action within the Level 1 Rectification Period;
- (iv) the Supplier fails in the Company's opinion to complete the Level 1 Required Action within the Level 1 Rectification Period;

**“Level 2 Non-Conformance Report”** has the meaning given to it in paragraph 4.5(A) of Schedule 10(a) (Performance Measurement Mechanism);

**“Level 2 Rectification Period”** has the meaning given to it in paragraph 4.5(A)(3) of Schedule 10(a) (Performance Measurement Mechanism).

**“Level 2 Required Action”** has the meaning given to it in paragraph 4.5(A)(2) of Schedule 10(a) (Performance Measurement Mechanism).

**“Level 3 Non-Conformance”** shall mean any of the following:

- (i) the Company determines that a Level 2 Non Conformance should be treated as a Level 3 Non Conformance for any reason, including the gravity of the Non Conformance or the failure of the Company’s Representative and the Supplier’s Representative to agree any or all of the Level 2 Required Action, the Level 2 Rectification Period and whether the Level 2 Required Action has been completed within the Level 2 Rectification Period;
- (ii) the Supplier fails to make available to the Company a Level 2 Non Conformance Report within five (5) Working Days of service by the Company of the notice referred to in paragraph 4.5(A) of Schedule 10(a) (Performance Measurement Mechanism);
- (iii) the Supplier fails in the Company’s opinion to undertake the Level 2 Required Action within the Level 2 Rectification Period;
- (iv) the Supplier fails in the Company’s opinion to rectify the Level 2 Non Conformance within the Level 2 Rectification Period;

**“Level 3 Non-Conformance Report”** has the meaning given to it in paragraph 4.6(B)(1) of Schedule 10(a) (Performance Measurement Mechanism);

**“Level 3 Rectification Period”** has the meaning given to it in paragraph 4.6(B)(2) of Schedule 10(a) (Performance Measurement Mechanism).

**“Level 3 Required Action”** has the meaning given to it in paragraph 4.6(B)(1) of Schedule 10(a) (Performance Measurement Mechanism).

**“Level 4 Non Conformance”** shall mean any of the following:

- (i) the Company determines that a Level 3 Non Conformance should be treated as a Level 4 Non Conformance, for any reason, including the gravity of the Non Conformance or the failure of the Company’s Representative and Supplier’s Representative to agree or determine any or all of the Level 3 Required Action, the Level 3 Rectification Period and whether the Level 3 Required Action has been completed within the Level 3 Rectification Period;

- (ii) the Supplier fails to make available to the Company a Level 3 Non Conformance Report by the deadline notified under paragraph 4.6(B)(1) of Schedule 10(a) (Performance Measurement Mechanism);
- (iii) the Supplier fails in the Company's opinion to undertake the Level 3 Required Action within the Level 3 Rectification Period;
- (iv) the Supplier fails in the Company's opinion to rectify the Level 3 Non Conformance within the Level 3 Rectification Period;

**“London Living Wage”** the London rate for the basic hourly wage as updated and published annually by the CCSL (or any relevant replacement organisation) on its website ([www.livingwage.org.uk](http://www.livingwage.org.uk));

**“Losses”** means any expense, liability, loss, claims, fines, damages, costs (including reasonable legal and other professional fees and disbursements), penalties, settlements and judgments incurred by the Company, its employees or agents (which, for the avoidance of doubt, shall include a Replacement Employer).

**“Mayor”** means the person from time to time holding the office of Mayor of London as established by the GLA Act.

**“Mini-Competition”** means a competitive process which the Company may from time to time utilise to select a Framework Supplier to provide certain Goods and Services.

**“Mini-Competition Documents”** means the template documents in Schedule 4 for use in a Mini-Competition.

**“Minimum Records”** means all information relating to the Supplier's performance of and compliance with Clause 50.7 and Schedule 8 and the adoption and implementation of an EDI Action Plan by each subcontractor of the Supplier and, where applicable, subject to paragraph 1 of Part B, Schedule 8 (*Equality, Diversity and Inclusion*), any subcontractors of any tier of the Supplier.

**“No Entry Confirmation”** has the meaning given to that term in Schedule 4 Part A.

**“Nominated Representatives”** has the meaning given to that term in Clause 39.2.

**“Non Conformance”** shall mean any of a Level 1 Non Conformance, a Level 2 Non Conformance, a Level 3 Non Conformance or a Level 4 Non Conformance.

**“Notice to Proceed”** has the meaning given to that term in Clause 20.7(b).

**“Notified Sum”** has the meaning given to that term in Clause 9.7.

**“Operator”** means a person with statutory duties to provide or secure the provision for Greater London of public passenger services by railway or a person who secures the provision of such services through appropriate contractual arrangements.

**“Order”** means an order which, unless the parties agree otherwise, shall be substantially in the form set out in Schedule 4 Part C, entered into by the Company and the Supplier and which may also be referred to by the Company (whether in correspondence, on its electronic ordering system or otherwise) as a delivery request, and references to, and defined terms including, “Order” shall be construed accordingly.

**“Order Completion Date”** means the date when the Services have been performed as specified.

**“Order Delivery Date”** means the date upon which the Goods or any part of them are actually delivered to the Delivery Address by the Supplier to the Company.

**“Order Price”** means the amount stated under the heading “Order Price” in the relevant Order (which may also be referred to as the “Total Cost”).

**“Order Programme”** means the programme of work set out in each Order for the provision of the Services which has been submitted by the Supplier and approved by the Company. The programme may be varied from time to time subject to the terms and conditions of the relevant Contract or otherwise by agreement in writing between the Supplier and the Company.

**“Organisational Chart”** means the chart of Supplier Personnel, including as a minimum the Supplier’s Representative, the relevant manager for the purpose of the Escalation Process, a managing director or a CEO (chief executive officer).

**“Payment Application”** has the meaning given to that term in Clause 9.1.

**“Performance Scorecard”** means the report to be produced every Accounting Period for review by the Company pursuant to paragraph 3 of Schedule 10(a) (Performance Measurement Mechanism).

**“Periodic Contract Review Meeting”** has the meaning given to it in Table 3 of Schedule 10(b) (Contract Management and Reporting).

**“Personal Data”** has the meaning given to it in the Data Protection Legislation.

**“Policies”** means the policies set out in Clause 29.3.

**“Prescribed Period”** has the meaning given to that term in Clause 9.8.

**“Processing”** or **“processing”** has the meaning given to it in the Data Protection Legislation.



**“Prohibited Act”** means:

- (i) offering or agreeing to give to any servant, employee, officer or agent of the Company any gift or consideration of any kind as an inducement or reward:
  - (a) for doing or not doing (or having done or not having done) any act in relation to the obtaining or performance of the Agreement or any Contract or any Call-Off Contract or any other contract with the Company; or
  - (b) for showing or not showing favour or disfavour to any person in relation to the Agreement or any Contract or Call-Off Contract or any other contract with the Company; or
- (ii) entering into the Agreement or any Contract or any Call-Off Contract or any other contract with the Company with which commission has been paid or has been agreed to be paid by the Supplier or on its behalf or to its knowledge unless, before such Agreement, Contracts, Call-Off Contracts or contract were entered into, particulars of any such commission and of the terms and conditions of any such contract for the payment thereof have been disclosed in writing to the Company; or
- (iii) committing an offence:
  - (a) under the Bribery Act 2010;
  - (b) under legislation creating offences in respect of fraudulent acts; or
  - (c) at common law in respect of fraudulent acts,in relation to the Agreement or any Contract or Call-Off Contract or any other contract with the Company; or
- (iv) defrauding or attempting to defraud the Company.

**“Proposal”** means the Supplier’s offer to provide any Goods and/or Services in the form set out in Schedule 4 Part A Section 2 in response to a Request Form.

**“Public Procurement Termination Event”** means:

- (a) the Agreement or any Contract or Call-Off Contract has been subject to any substantial modification which would require a new procurement procedure in accordance with Regulation 72(9) of the Public Contracts Regulations 2015 or Regulation 88(8) of the Utilities Contracts Regulations 2016; or

(b) if the Company determines that the Agreement or any Contract or Call-Off Contract should not have been awarded to the Supplier in view of a serious infringement of the obligations contained under the EU Treaties as retained by the EUWA and applicable procurement regulations.

**“Quality Plan”** means the Supplier’s quality plan set out in Schedule 6 as the parties may agree will be amended from time to time.

**“Quarter”** means respectively any of Periods 1 to 4, 5 to 7, 8 to 10 and 11 to 13 in any Financial Year, and “Quarterly” will be construed accordingly.

**“Regulation”** includes any regulation, rule, official directive, request or guideline (whether or not having the force of law) of any governmental, intergovernmental or supranational body, agency, department or regulatory, self-regulatory or other authority or organisation.

**“Rejected Goods”** has the meaning given to that term in Clause 17.2.

**“Rejection Notice”** has the meaning given to that term in Clause 17.2.

**“Request Form”** means the request form produced by the Company detailing the Company’s requirements for one Proposal, or more than one Proposal, from the relevant Supplier in the form set out in Schedule 4 Part A.

**“Responsible Procurement Policy”** means the policy document entitled the “GLA Group Responsible Procurement Policy” dated June 2017 and as may be amended.

**“Reverse Auction”** means the process set out in paragraph 3.4 of Schedule 4 Part A.

**“Safety Breach”** means a material breach of any obligation under any Contract or Call-Off Contract caused by the gross incompetence of or wilful default by the Supplier (or anyone employed by or acting on behalf of the Supplier) or any of its agents which has materially affected the safe operation of the Underground Network or TfL Network or the safety of the Company’s customers, staff or any other person.

**“Services”** means the services stated in the Specification or any Contract Specification, as applicable, to be performed by the Supplier and any Additional Services.

**“Serviced Goods”** means items in respect of which the Supplier has carried, or will carry, out any Services.

**“Specification”** means the description of and requirements for the Goods and Services set out in Schedule 3 to be provided by the Supplier in accordance with the Agreement and described more particularly in the applicable Contract Specification.

**“Standards”** means the Category 1 and 2 Standards and Draft Category 1 and 2 Standards and such European, British and International Standards and associated Codes of Practice required by the Company for the Supplier to supply the Goods in accordance with good industry practice. A full set of current Standards is available for the Supplier’s use on-line at the LU Standards e-library or as notified to the Supplier.

**“Supplier Personnel”** means all employees, agents or consultants of the Supplier and the Supplier’s subcontractors from time to time.

**“Supplier’s Representative”** means the person(s) appointed by the Supplier and named or defined in Schedule 1 (Detailed Terms).

**“Term”** means the period specified as such in Schedule 1 to this Agreement, as may be extended in accordance with Clause 2.3.

**“TfL”** or **“Transport for London”** means Transport for London, a statutory body set up by the Greater London Authority Act.

**“TfL Group”** means Transport for London and all of its subsidiaries and their subsidiaries (as defined in Section 1159 of the Companies Act 2006) from time to time, together with Crossrail Limited (company number 04212657) and reference to any **“member of the TfL Group”** refers to TfL or any such subsidiary.

**“TfL Network”** means the assets owned, or used by, and/or the services provided by or on behalf of, any member of the TfL Group.

**“Transparency Commitment”** means TfL’s commitment (applying to TfL, the Company and the rest of the TfL Group) to publish contracts, tender documents and data from invoices received in accordance with the Local Government Transparency Code 2015 and TfL’s own published transparency commitments.

**“Underground Network”** means the stations and depots (wherever situate), assets, systems, track and other buildings which are used in the maintenance and provision of the underground service known as “London Underground”.

**“Unsatisfactory”** has, in respect of each KPI, the meaning given to it in respect of that KPI in Appendix 1 to Schedule 10(a) (Performance Measurement Mechanism).

**“Variation Order”** means the written authorisation from the Company to a Variation Proposal in accordance with the Contract Variation Procedure.

**“Variation Proposal”** means the written proposal put by the Company or the Supplier to vary any Contract, Call-Off Contract and/or this Agreement in accordance with the Contract Variation Procedure in substantially the form set out in Appendix 1 to Schedule 5.

**“VAT”** means value added tax as provided for in the Value Added Tax Act 1994 and legislation (whether delegated or otherwise) supplemental thereto and any tax replacing, or adding to, the same or of a similar nature.

**“Volume Discount”** is the figure calculated annually in accordance with Clause 9.14.

**“Volume Discount Percentage”** is the volume discount percentage set out in Schedule 1 to the Agreement.

**“Warranty Period”** the period specified as such in Schedule 1.

**“Working Day”** means any day of the week (other than Saturday or Sunday) which is not an English bank holiday, or public holiday.

- 1.2 The headings in the Agreement, each Contract and Call-Off Contract are only for convenience and shall not affect its interpretation.
- 1.3 Where appropriate, the singular includes the plural and vice versa.
- 1.4 A reference to a Clause or a Schedule shall be to a Clause of or, as the case may be, a Schedule to, the Agreement, Contract or Call-Off Contract and references to the Agreement, Contract and Call-Off Contract include its and their recitals and Schedules (and any appendices) as applicable.
- 1.5 References to (or to any specified provision of) the Agreement, a Contract and Call-Off Contract or any other document shall be construed as references to the Agreement and each Contract, that provision or that document as in force for the time being and as from time to time amended in accordance with the terms of the Agreement and each Contract.
- 1.6 Reference to any Applicable Laws includes a reference to the Applicable Laws as from time to time amended, extended or re-enacted. Reference to any Standard shall, except where otherwise specified in a particular Contract Specification, refer to the revision of that Standard applying in force at the date of award of the relevant Contract.
- 1.7 References to the **“Company”** shall include its successors, transferees and assignees and the Supplier acknowledges and agrees that the Company has entered into the Agreement in its own name and for the benefit of the TfL Group. The Agreement may therefore be utilised by (and any Contract or Call-Off Contract entered into by) the Company or any other member of the TfL Group, or other entities as contemplated by Recital (C) above, and references to the Company shall be construed accordingly.

- 1.8 References to a person, firm or company includes any individual company, unincorporated association or body (including a partnership or joint venture) or other entity whether or not having a separate legal personality.
- 1.9 Any obligation on a party to do or not do any act, matter or thing includes an obligation to procure that it is done or not done (as the case may be).
- 1.10 Words preceding the words “include”, “includes”, “including” and “included” shall be construed without limitation by the words which follow those words.
- 1.11 Any reference to the “electronic contract management system” or similar term shall be to the system used by the Company at any time, which at the Commencement Date is PROACTIS ProContract (any change to which will be notified to the Supplier by the Company).
- 1.12 In the event that a conflict, ambiguity or inconsistency exists between the documents comprising the Agreement and each Contract and Call-Off Contract, the order of priority for the purpose of construction in descending order is:
- (a) the Clauses of the Agreement and each Contract and Call-Off Contract;
  - (b) the Schedules to the Agreement and each Contract and Call-Off Contract (equal priority but subject to Clause 1.13; and
  - (c) any other document referred to in, or incorporated by reference into, the Agreement and each Contract and Call-Off Contract.
- 1.13 The documents that make up the Schedules shall be taken as being mutually explanatory of one another. In the event of any conflict between any provision of the clauses of the Agreement and each Contract and Call-Off Contract and a provision of any other Schedule then the clauses of the Agreement and each Contract and Call-Off Contract will take precedence except where the conflicting part of the other Schedule is explicitly expressed to take precedence over any specific part of the Clauses of the Agreement and each Contract and Call-Off Contract.

## **2 Duration and Option to Extend**

- 2.1 The Agreement shall commence on the Commencement Date and continue in force for the Term unless terminated earlier in accordance with this Agreement and subject to Clause 2.3.
- 2.2 Expiry or termination of the Agreement shall not, in and of itself give rise to an expiry or termination of any Contract or Call-Off Contract and each Contract and Call-Off Contract shall continue for the term set out in the relevant Contract or Call-Off Contract (in which case the provisions of the Agreement shall survive beyond the Term if and to the extent such provisions are relevant to the relevant Contract or Call-Off Contract).

- 2.3 The Company shall at its own discretion be entitled at any time prior to the expiry of the Term to inform the Supplier of its intention to extend the Term of the Agreement by a period of up to four (4) years, subject to a maximum of two extensions and an aggregate Term of eight (8) years from and including the Commencement Date. The provisions of the Agreement shall continue to apply mutatis mutandis to any such extension of the Term (other than this Clause 2.3 containing the option to extend as applicable, once the maximum aggregate Term has been reached). On receipt of such notice from the Company by the Supplier, the Agreement (but not any Contract then in place unless the Company exercises any right under that Contract) shall be deemed extended accordingly.

### 3 Supplier's Primary Obligations

- 3.1 The Supplier shall supply the Goods and Services to the Company and perform the Agreement and any Contract and Call-Off Contract in accordance with:
- (a) the terms set out in the Agreement (including the Schedules);
  - (b) the terms of any agreement which may from time to time be entered into by the Company and the Supplier following a Mini-Competition or direct award in accordance with Clause 4.1, in the format set out in Schedule 4 (Part B) (Template Contract) (unless the parties agree otherwise), each agreement together with the terms of the Agreement comprising a separate and distinct contract and herein referred to as a **"Contract"** ; and
  - (c) the terms of the Orders which may from time to time be entered into by the Company and the Supplier (who may be referred to as a "Vendor" in the Order) pursuant to a Contract, each Order together with the terms of the Agreement and relevant Contract comprising a separate and distinct contract and herein referred to as a **"Call-Off Contract"**.
- 3.2 When Goods and Services are required by the Company pursuant to a Contract, the Company shall give the Supplier an Order for the Goods to be delivered and Services to be supplied and each Order so given shall be final, unless varied in accordance with the Contract Variation Procedure.
- 3.3 The Supplier shall ensure and warrants to the Company that the Goods and its performance of this Agreement and any Contract and Call-Off Contract will:
- (a) conform in all respects with the Specification and any applicable Contract Specification and the other provisions of each Contract and Call-Off Contract including, without limitation, specifications as to quantity, quality and description;
  - (b) be of satisfactory quality;

- (c) comply with all Applicable Laws (including but not limited to any law and regulations applicable to the Company or the Underground Network);
  - (d) comply with all Standards and any additional standards listed in the Contract Specification;
  - (e) comply with the requirements of the Company set out in each Contract and Call-Off Contract and all lawful and reasonable directions of the Company;
  - (f) have a rate of deterioration no more than is reasonably to be expected of high quality, reliable, well designed and engineered, materials, goods and equipment.
- 3.4 The Supplier shall be responsible for obsolescence management of the Goods and Additional Goods throughout the Term in accordance with the Specification and, if applicable, the relevant Contract Specification.
- 3.5 The Supplier shall ensure and warrants to the Company that the Services and its performance of the Agreement and any Contract and Call-Off Contract will:
- (a) be performed by appropriately qualified and trained personnel exercising the highest standard of diligence, care and skill;
  - (b) be performed in accordance with any applicable Order Programme;
  - (c) conform to all Applicable Laws (including but not limited to any law and regulations applicable to the Company or the Underground Network);
  - (d) comply with all Standards and any additional standards listed in the Contract Specification; and
  - (e) comply with the requirements of the Company set out in the Agreement and each Contract and Call-Off Contract and all lawful and reasonable directions of the Company.
- 3.6 The Supplier warrants and undertakes that the Supplier has entered into and executed this Agreement and any Contract and Call-Off Contract by the Supplier's duly authorised representative in accordance with all procedures required by its governing laws and contractual documents.
- 3.7 The Supplier warrants to the Company that, as at the date of this Agreement and of each Contract and Call-Off Contract, it has not been in any of the situations referred to in Regulation 57(1) of the Public Contracts Regulations 2015 and should therefore have been excluded from the procurement procedure in accordance with those Regulations or Regulation 80(2) of the Utilities Contracts Regulations 2016.

- 3.8 It shall be the responsibility of the Supplier to obtain, at its cost, all necessary approvals, licences, permits and consents in relation to the performance of this Agreement and the Services and the Goods and their delivery, including, but not limited to, those required by any Applicable Laws and Standards.
- 3.9 Unless otherwise stated in any Contract or Call-Off Contract, the Supplier shall provide all equipment, support services and other facilities necessary for the performance of its obligations under each Contract and Call-Off Contract.
- 3.10 For the avoidance of doubt, neither a communication from the Company nor the review or acceptance of the Goods or the Services waives limits or amends in any way any warranties, liabilities or responsibilities of the Supplier under this Agreement or any Contract or Call-Off Contract.
- 3.11 The Supplier shall be responsible for the accuracy of all Contractual Documentation and shall pay the Company any extra costs occasioned by any discrepancies, errors or omissions therein. The Supplier shall at its own expense carry out any alterations or remedial work necessitated by such errors, omissions or discrepancies and modify the relevant documents or information accordingly.
- 3.12 The Supplier warrants to the Company that it has the right to grant to the Company and any member of the TfL Group all licences (including without limitation all rights to sub-license) of all and any Intellectual Property Rights as contemplated in this Agreement (and including any Contract and Call-Off Contract).
- 3.13 Design
- (a) The Supplier shall carry out his design, if any, in accordance with the Specification, unless the Contract Specification requires otherwise (in which case in accordance with the Specification and/or Contract Specification as applicable), and the terms of the Agreement.
  - (b) The Supplier shall submit the particulars of any design which the Specification (and/or Contract Specification, if applicable) requires to the Company's Representative for acceptance. The Supplier shall not proceed with the supply of Goods and/or Services until the Company's Representative has accepted his design. Reasons for not accepting the Supplier's design shall include (without limitation):
    - (i) it does not comply with the Specification, and/or Contract Specification if applicable, or any other part of the Agreement;
    - (ii) it does not comply with Applicable Laws and Standards;
    - (iii) it is not integrated and coordinated with the designs of others where the Supplier is required by the Specification and/or Contract Specification or instructions of the



Company's Representative to do so or such integration is necessary for the Supplier to supply the Goods and/or Services;

- (iv) it is not in a format which is accepted for use by the Company's Representative.
- (c) The Supplier shall not be entitled to any changes to any Order Price or Expected Date by reason of anything in this Clause 3.13.
- (d) The Supplier may submit his design for acceptance in parts if the design of each part can be assessed fully.
- (e) The Supplier in designing and specifying the Goods and/or Services which he is required to design and specify, warrants, undertakes and represents to the Company that the design:
  - (i) is in accordance with the Specification and/or Contract Specification and any other performance or output
  - (ii) or requirements contained or referred to in the Agreement and each Contract and Call-Off Contract;
  - (iii) complies with all Applicable Laws and Standards; and
  - (iv) is fit for the purpose defined in the Contract Specification or where not so defined the purpose defined in the relevant Order or Call-Off Contract.
- (f) The Supplier accepts entire responsibility for the design and specification of the Goods and/or Services which he is required to design and specify and for any mistake, inaccuracy, ambiguity, inconsistency or omission in or between his design and specification of the Goods and/or Services and the documents which are part of the Agreement and Contract and Call-Off Contract.

#### 3.14 Stock holding

- (a) The Company may require the Supplier to maintain specified stock levels for certain Goods. The relevant Contract will, as applicable, stipulate any Company stock holding requirements relating to the Contract Goods (reflecting the applicable terms of the relevant Mini-Competition and Request Form.
- (b) Storage of Goods being held pursuant to Clause 3.14(a) shall be at the Supplier's own cost and risk.
- (c) Save on termination of the Agreement or any Contract or Call-Off Contract under Clause 20.1, and without prejudice to Clause 20.4, on expiry or termination of this Agreement or the earlier termination of any Contract if applicable, the Company shall place

an Order for the stock being held pursuant to Clause 3.14(a) for delivery to the Delivery Address(es) notified by the Company to the Supplier.

## **4 Mini-Competition**

- 4.1 At any time during the Term, the Company may identify the Goods and/or Services which at its sole discretion it wishes to let under the terms of the Agreement. Any decision by the Company to place a Contract under the terms of the Agreement will be preceded by a Mini-Competition save where the Company, having considered the Applicable Laws and Standards (including the Utilities Contracts Regulations 2016), considers it appropriate to issue a Contract to one or more Suppliers without holding a Mini-Competition. The Request Form and terms of the Mini-Competition (to be reflected in any Contract placed as a result) will specify whether the Company anticipates a likely volume or scope of Goods and/or Services, or requires a Contract of a particular duration or whether, once the Company enters into a Contract with a Framework Supplier for the supply of particular Goods and/or Services, no further Mini-Competitions shall be held in respect of those Goods and/or Services during a specified term (unless the relevant Contract is suspended or terminated, before expiry or earlier termination of the Agreement) and any Orders for the Goods and/or Services will be issued under such Contract for the specified term.
- 4.2 If pursuant to Clause 4.1 the Company conducts a Mini-Competition, it will issue to the Framework Suppliers a Request Form, specifying the Goods and/or Services it requires.
- 4.3 On receipt of the Request Form, the Supplier shall:
- (a) if it does not intend to submit a Proposal, notify the Company of this no later than five (5) Working Days after the date of issue of the relevant Request Form, providing details of the reason(s) why it does not intend to submit a Proposal (and provide such further information as the Company may require in this regard), or
  - (b) by the date specified in the relevant Request Form (or, if no date is specified, no later than ten (10) Working Days after the date of issue of such relevant Request Form) or by such other date agreed in writing between the Company and the relevant Supplier complete and submit to the Company a Proposal which shall include in full the information requested by the Company in the relevant Request Form and full details of the basis on which the prices have been calculated.
- 4.4 The Supplier acknowledges and agrees that a Proposal remains valid for at least six (6) months (or such longer period as may be specified in the relevant Request Form) from the date such Proposal is submitted to the Company.

- 4.5 The Company shall apply the Contract Award Criteria (including any Reverse Auction process) to any compliant Proposal submitted to the Company.
- 4.6 Subject to Clause 4.7, if the Company accepts a Proposal issued pursuant to Clause 4.3(b) it shall notify the successful Framework Supplier of its intention to enter into a Contract for the Goods and/or Services to be delivered and each Contract so entered into shall be final.
- 4.7 A Request Form and anything prepared or discussed by the Company constitutes an invitation to treat and does not constitute an offer capable of acceptance by the relevant Framework Supplier. The Company is not obliged to consider or accept any Proposal submitted by the Supplier. The Company may, if it wishes, seek clarifications (including in relation to any abnormally low price) from, and/or enter into negotiations with, one or more Framework Suppliers with regard to their Mini-Competition proposals.
- 4.8 The Agreement does not oblige the Company to place an Order or enter into any Contract or Call-Off Contract with the Supplier or any other Framework Supplier.
- 4.9 Unless otherwise expressly agreed in writing with the Company, the Supplier shall not charge under the Agreement for any work involved in receipt and/or confirmation of any Request Form, and/or any response to any Request Form as contemplated in this Clause 4.
- 4.10 The Supplier is responsible for all and any costs, charges and expenses arising from or associated with the procurement process in this Clause 4 (the **"Procurement Process"**), and the Company shall not be liable for any costs, charges or expenses borne by or on behalf of the Supplier whether or not the Supplier is awarded a Contract (which for the avoidance of doubt includes any costs, charges and expenses arising from or associated with an abortive or cancelled Procurement Process).

## **5 Records and Audit**

- 5.1 The Supplier shall, and shall procure that its subcontractors shall, maintain a true and correct set of records including personnel records relating to all aspects of their performance of the Agreement and each Contract and Call-Off Contract and all transactions related to the Agreement and each Contract and Call-Off Contract. For the avoidance of doubt, such records shall include but are not limited to:
- (a) all necessary information for the evaluation of claims or variations;
  - (b) management accounts, information from management information systems and any other management records;
  - (c) accounting records (in hard copy as well as computer readable data);

- (d) subcontract files (including proposals of successful and unsuccessful bidders, bids, rebids etc);
- (e) original estimates;
- (f) estimating worksheets;
- (g) correspondence;
- (h) variation and claims files (including documentation covering negotiated settlements);
- (i) general ledger entries detailing cash and trade discounts and rebates;
- (j) commitments (agreements and leases) greater than £5,000;
- (k) detailed inspection records; and
- (l) such materials prepared in relation to the invitation to tender and subsequent tendering process relating to cost breakdowns, reconciliations against BAFO pricing and project plans, in each case which have not already been provided to the Company.

5.2 The Supplier agrees, and shall procure that its subcontractors agree, to retain all such records in such a manner as the Company may reasonably instruct for a period of not less than twelve (12) years after the later of (i) expiry or termination of the Agreement and (ii) completion of performance under each Contract and Call-Off Contract placed under it. In the absence of specific instructions as to the method of storage, the Supplier shall retain its records in an orderly and logical fashion.

5.3 The Company and its authorised representatives and any party legally authorised to inspect any part of the Underground Network or TfL Network shall have the right to inspect and audit any of the records referred to in Clause 5.1 at any time during the period referred to in Clause 5.2 5.2.

5.4 The Supplier shall promptly provide all reasonable co-operation in relation to any audit or check including, to the extent reasonably possible in each particular circumstance (and references to Contracts below shall include all Call-Off Contracts placed under them):

- (a) granting or procuring the grant of access to any premises used in performance of each Contract, whether the Supplier's own premises or otherwise;
- (b) granting or procuring the grant of access to any equipment (including all computer hardware, software and databases, machinery, tools, measuring equipment and consumables) used (whether exclusively or non-exclusively) in the performance of the Supplier's obligations under each Contract, wherever situated and whether the Supplier's own equipment or otherwise;

- (c) making any contracts and other documents and records required to be maintained under each Contract available for inspection;
  - (d) providing a reasonable number of copies of any contracts and other documents or records reasonably required by the Company's auditor and/or granting copying facilities to the Company's auditor for the purposes of making such copies; and
  - (e) complying with the Company's reasonable requests for access to personnel engaged in the Supplier's performance of each Contract.
- 5.5 The Supplier shall maintain an effective and economical programme for monitoring and maintaining product quality, planned and developed in conjunction with any other functions of the Supplier necessary to satisfy each Contract's and Call-Off Contract's requirements.
- 5.6 The Supplier shall permit the Company's authorised representatives, access and facilities (as required and when notified) for the purpose of systems and product quality audits including but not limited to access to documentation showing results of testing and inspection, declarations of conformity and safety-related documents. The Supplier shall provide the Company with a copy of any or all of the records listed in Clause 5.1, free of charge within thirty (30) days of the Company's request for the same.
- 5.7 Without prejudice to the generality of this Clause 5, the Company anticipates that, within twelve (12) months of the Commencement Date, it will carry out an inspection and audit of the premises and manufacturing operations of the Supplier and of its subcontractors (of any tier) relevant to the Agreement and potential Goods and Services, including with regard to assessing conformity to the Quality Plan, and the Supplier shall (and shall procure that its subcontractors of any tier shall) cooperate fully with such inspection and audit and provide the Company with all access, documentation and assistance required. The Supplier shall (and shall procure that its subcontractors of any tier shall) take any action necessary to address any non-conformance with the Quality Plan and provide evidence or other supporting documentation in this regard to the satisfaction of the Company (which may require further information or undertake any further inspection or audit as it considers necessary). The Company reserves the right to suspend the Supplier's participation in any Mini-Competition until all non-conformances have been addressed to its satisfaction.
- 5.8 The Supplier shall and shall ensure that any sub-contractor or sub-supplier shall ensure that appropriate security systems are in place to prevent unauthorised access to, extraction of and/or alteration to data during the audit undertaken pursuant to the Agreement and any Contract and any Call-Off Contract.

## **6 Company's Obligations**

- 6.1 The Company shall pay the Supplier the Order Price for the Goods and Services in accordance with the terms of the relevant Contract and Call-Off Contract.
- 6.2 Payment of the Order Price shall not affect any claims or rights which the Company may have against the Supplier and shall not be an admission by the Company that the Supplier has performed its obligations under the relevant Contract or Call-Off Contract properly.
- 6.3 The Agreement is not an exclusive arrangement and nothing in the Agreement or any Contract or Call-Off Contract operates to prevent the Company from engaging any other organisation or person to supply goods and services similar to or the same as the Goods and Services.
- 6.4 The Agreement does not oblige the Company to place an Order or enter into any Contract or Call-Off Contract with the Supplier.

## **7 Additional Goods and Services**

- 7.1 The Company may, at any time during the term of any Call-Off Contract or Contract, request the Supplier to provide a quotation for the supply of Additional Goods and/or Additional Services in accordance with the Contract Variation Procedure. If a Variation Order is made in respect of such Additional Goods and/or Additional Services, the relevant Call-Off Contract or Contract shall be amended to include such Additional Goods and/or Additional Services, the Expected Order Delivery Date and/or the Expected Order Completion Date and the Order Price.

## **8 Variation**

- 8.1 Unless the parties agree otherwise in writing, any variation to the Agreement or any Contract or Call-Off Contract shall be made under the Contract Variation Procedure.
- 8.2 The Supplier shall not proceed to implement any variation unless a Variation Order has been entered into in respect of such variation.

## **9 Price and Payment**

- 9.1 The Supplier shall submit an application for payment to the Company's Representative in accordance with the applicable Contract Pricing for the relevant portion of the Order Price (a "**Payment Application**") in respect of the Goods after the Order Delivery Date of such Goods. If (as the case may be) the Goods are to be delivered in instalments, the Supplier shall submit a Payment Application for the relevant portion of the Order Price to the Company's Representative after the Order Delivery Date of each instalment.
- 9.2 The Supplier shall submit a Payment Application for the relevant portion of the Order Price in

respect of the Services in accordance with the applicable Contract Pricing to the Company's Representative following the completion of the Services (including delivery of any Serviced Goods) to the satisfaction of the Company.

9.3 Each Payment Application shall specify the sum that the Supplier considers will become due on the payment due date and the basis upon which that sum is calculated. The Supplier shall submit any supporting documents that are reasonably necessary to enable the Company's Representative to assess and verify the Payment Application.

9.4 The Company's Representative shall assess and verify the Payment Application in a timely manner. The Company's Representative shall notify the Supplier in writing not later than seven (7) days after the date of receiving the Payment Application of:

(a) the amount (if any) the Company's Representative considers to be due at the payment due date (which amount shall be net of any discount to which the Company is entitled); and

(b) the basis on which the amount was calculated,

a "**Payment Certification**". It is immaterial for the purposes of this Clause 9.4 that the amounts referred to in Clauses 9.4(a) or 9.4(b) may be zero. Where the Company fails to comply with its obligations under this Clause 9.4 and there is an undue delay in assessing and verifying the Payment Application, the Payment Certification shall be regarded as issued for the purposes of Clause 9.7 after a reasonable time has passed.

9.5 Within six (6) days of receipt of a Payment Certification the Supplier shall issue a VAT invoice for the amount stated in that Payment Certification to the Company. The Supplier may submit any VAT invoice as an electronic invoice and, if done so, the Supplier shall ensure that it complies with the relevant European Standard and any of the syntaxes published in Commission Implementing Decision (EU) 2017/1870 as retained by the EUWA and amended by the Public Procurement (Amendment etc.) (EU Exit) Regulations 2020.

9.6 The final date for payment ("**Final Date for Payment**") shall be ten (10) days after the date on which the Company's Representative received the applicable VAT invoice.

9.7 Subject to Clause 9.8, the Company shall pay the Supplier the sum referred to in the Company's Representative's Payment Certification pursuant to Clause 9.4 (the "**Notified Sum**") on or before the Final Date for Payment.

9.8 If the Company intends to pay less than the Notified Sum the Company or the Company's Representative (as the case may be) should notify the Supplier in writing not later than one (1) day (the "**Prescribed Period**") prior to the Final Date for Payment of:

- (a) the amount (if any) that it considers to be due on the date the notice is served and the basis upon which that sum is calculated; or
- (b) if there is more than one basis, each basis and the amount attributable to it.

It is immaterial for the purposes of this Clause 9.8 that the amounts referred to in Clause 9.8(a) or Clause 9.8(b) may be zero. Where a notice is given under this Clause 9.8, the Company's obligation to pay the Notified Sum under Clause 9.7 applies only in respect of the sum specified pursuant to this Clause 9.8.

9.9 The Order Price shall be fixed and inclusive of all expenses and disbursements including, but not limited to, the costs incurred in supplying the Goods (or Serviced Goods) to the Delivery Address. The Order Price for the Goods and/or Services shall only be changed in accordance with the Contract Variation Procedure.

9.10 The Order Price shall not include VAT and, to the extent that such VAT is properly chargeable, it shall be charged at the rate in force on the date of the Payment Application and will be shown as a separate item on all such Payment Applications.

9.11 In addition to any other rights of the Company whether at law or equity under this Agreement or any Contract or Call-Off Contract, whenever under or arising out of this Agreement or any Contract or Call-Off Contract between the Company and the Supplier:

- (a) any sum of money is recoverable from or payable by the Supplier; or
- (b) any Losses are reasonably and properly owed to, or incurred by, the Company, or any member of the TfL Group

then the same may be set-off against and/or deducted and/or withheld from any sum then due or which at any time thereafter may become due to the Supplier under this Agreement or any Contract or Call-Off Contract.

9.12 Payment Applications shall be submitted separately for each Call-Off Contract and all such Payment Applications shall clearly show the Call-Off Contract Reference Number, the Order number (as indicated on the relevant Order), the date of the Order, the Order Price and any associated Variation Order. Supporting documentary information shall be submitted to the Company's Representative for all Payment Applications submitted by the Supplier. The Company's Representative shall from time to time agree with the Supplier the detailed information required in relation to all such Payment Applications and the Supplier shall provide such information as is reasonably required.

9.13 All sums payable to the Company by the Supplier under each Call-Off Contract shall be paid in full, free of any present or future taxes, levies, duties, charges, fees or withholdings and without



any deduction, restriction, conditions, withholding, set-off or counterclaim whatsoever; and if the Supplier is compelled by law to make any deduction or withholding, the Supplier shall gross up the payment so that the net sum received by the Company will be equal to the full amount which the Company would have received had no such deduction or withholding been made.

9.14 The Company calculates the Volume Discount annually by applying the relevant Volume Discount Percentage to the Aggregated Annual Spend. The Company issues an invoice to the Supplier for the Volume Discount. The Supplier pays the Volume Discount to the Company within 30 days of receipt of the invoice.

9.15 No payment made by the Company will indicate or be taken to indicate the Company's acceptance or approval of any part of the Goods delivered or any Services performed or of any act or omission of the Supplier or will absolve the Supplier from any obligation or liability imposed upon the Supplier by any provision of the Agreement and any Contract or Call-Off Contract or otherwise.

## **10 Delivery of Goods and Serviced Goods**

10.1 The Goods and Serviced Goods shall be delivered by the Supplier to the Company on the Expected Date and on the times stated in the Order and at the Delivery Address. The Supplier shall be responsible for, and shall comply with all reasonable instructions of the Company with regard to, the unloading of the Goods and Serviced Goods at the Delivery Address. The Company shall be under no obligation to accept partial delivery of an Order.

10.2 The time of delivery of the Goods and Serviced Goods shall be of the essence in respect of each Call-Off Contract.

10.3 The Supplier shall inspect the Goods and Serviced Goods before packing and transporting to confirm that they comply with the requirements of the Agreement and relevant Contract and Call-Off Contract and provide evidence of this inspection with the Declaration of Conformity.

10.4 The Goods and Serviced Goods shall be properly packed and secured in such a manner as to reach the Delivery Address in good condition and otherwise in a condition which fully complies with the requirements of the Agreement and each Contract and Call-Off Contract.

10.5 The Supplier shall provide a detailed delivery note stating the relevant Contract Reference Number, Order number (given on the relevant Order) and giving full particulars of the Goods or Serviced Goods to be supplied or delivered (the "**Delivery Note**"). A copy of the Declaration of Conformity together with a copy of the Delivery Note shall be delivered with the Goods or Serviced Goods and be sent via the electronic contract management system to the Company on the Order Delivery Date in accordance with Clause 38.

- 10.6 If for any reason the Company is unable to accept delivery of the Goods or Serviced Goods on or after the Expected Date, the Supplier shall store the Goods or Serviced Goods, safeguard them and take all reasonable steps to prevent their deterioration until the Actual Date, and the Company shall be liable to the Supplier for the reasonable cost (including insurance) of its so doing.
- 10.7 The Supplier will not, and will ensure that neither its subcontractors, suppliers nor any other person will have, a lien, charge or encumbrance on or over any of the Goods which are vested in the Company under Clause 16.2 for any sum due to the Supplier or its subcontractors, suppliers or other persons and the Supplier shall take all reasonable steps as may be necessary to ensure that the title of the Company and the exclusion of any such lien charge or encumbrance are brought to the notice of subcontractors and other persons dealing with any such Goods.
- 10.8 The Company shall be under no obligation to accept or pay for any Goods delivered in excess of the quantity ordered. If the Company elects not to accept such over-delivered Goods it shall be entitled to give notice in writing to the Supplier to remove them. Within 7 days of receipt by the Supplier of such notice the Supplier shall remove the excess and refund to the Company any expenses incurred by the Company as a result of such over-delivery (including but not limited to the costs of moving and storing them) failing which the Company shall be entitled to dispose of such Goods and to charge the Supplier for the costs of such disposal. The risk in any over-delivered Goods shall remain with the Supplier until they are collected by or on behalf of the Supplier or disposed of or purchased by the Company, as appropriate
- 10.9 Notwithstanding Clause 10.5 the Company may revise the Delivery Note by providing the Supplier with not less than one (1) day's notice of the revised Expected Date (the "**Revised Delivery Note**").

## **11 Co-operation, Early Warning and Supplier Performance**

- 11.1 The Company and the Supplier shall co-operate with one another and act reasonably in and about the performance of their respective obligations and their respective rights under the Agreement and each Contract and Call-Off Contract.
- 11.2 During the Term, the Supplier shall co-operate with (and shall ensure that its subcontractors, affiliates and all Supplier Personnel co-operate with) any third party engaged to supply goods or services to the Company or the TfL Group (at any location) so as to integrate (where reasonably required by the Company) other goods, services, materials or equipment supplied by the Company or any third party with the Goods or Services (including any Serviced Goods). Such co-operation shall include, where appropriate, the provision of information and provision of access to the Supplier's and any Supplier subcontractor's operations.

11.3 The Supplier shall give an early warning by notifying the relevant Company Representative as soon as it becomes aware of any matter (each “an early warning matter”) that could:

- (a) give rise to a variation under the Contract Variation Procedure,
- (b) delay the delivery of Goods to be delivered or performance of Services (including delivery of any Serviced Goods) pursuant to a Call-Off Contract,
- (c) constitute a Defect,
- (d) increase the Contract Pricing or any Order Price (where these are not a fixed amount).
- (e) prevent the Supplier from performing its obligations under the Agreement and/or any Contract or Call-Off Contract.
- (f) adversely affect the Company,
- (g) cause the Supplier to be in breach of the Agreement or any Contract or Call-Off Contract or sub-contract,
- (h) lead to the Supplier terminating or suspending any subcontract, or
- (i) cause a breach of any Applicable Laws and Standards.

11.4 The Company assesses the Supplier’s performance under the Agreement and each Contract and Call-Off Contract in accordance with Schedule 10.

11.5 The Company shall have the right to:

- (a) abate the Supplier for failure to meet the Key Performance Indicators stated in Schedule 10(a) (Performance Measurement Mechanism); and
- (b) use the escalation process and exercise any other rights stated in Schedule 10(a) (Performance Measurement Mechanism) to rectify and address any unsatisfactory performance by the Supplier in its performance of the Agreement and any Contract and Call-Off Contract or any failure by the Supplier to meet the performance standards set out in Schedule 10.

## **12 Failure to Perform the Services**

12.1 If the Supplier has not performed the Services in accordance with the terms of any Contract or Call-Off Contract, without prejudice to any other rights the Company shall have under such Contract or Call-Off Contract, the Company shall be entitled to require the Supplier to carry out

such work as is necessary to rectify its non-performance which where necessary shall include re-performing the Services within the time period that the Company shall specify.

12.2 Without limiting any other remedy, if the Supplier fails to comply with the requirements of Clause 12.1, the Company shall be entitled to perform or procure the performance of the Services or part thereof itself or from a third party including another Framework Supplier. Without prejudice to any other right or remedy of the Company hereunder or under the general law, all expenditure properly incurred by the Company exercising its rights under this Clause 12.2 is recoverable by the Company from the Supplier and the Company shall be entitled to deduct such amounts from any amount due or to become due to the Supplier under the Agreement (including any Contract or Call-Off Contract).

12.3 For the purposes of Clause 12.2 the Supplier hereby grants to the Company and any third party the right to use any Intellectual Property Rights, Documentation, goods, materials and spares belonging to the Supplier or used by the Supplier in connection with the Agreement and any Contract or Call-Off Contract as may be required by the Company to exercise its rights under Clause 12.2 and the Supplier shall provide all such co-operation and assistance as may be required by the Company to enable the Company to exercise its rights under Clause 12.2.

12.4 The Supplier shall ensure that the Services are satisfactorily completed by the Expected Order Completion Date (including delivery of any Serviced Goods). The time for performance of the Services shall be of the essence in respect of each Call-Off Contract.

## **13 Personnel and Work on Company's Sites**

13.1 During the term of each Contract and Call-Off Contract, the Supplier shall:

- (a) ensure the personnel used in the provision of the Services are competent, properly trained and supervised and hold appropriate qualifications or certifications in accordance with any Applicable Laws and Standards;
- (b) ensure that all employees and agents of the Supplier including any of the Supplier's subcontractors working on the Company's or third parties' sites comply with the sites' local safety arrangements and undergo any relevant induction or training necessary and comply with all reasonable instructions of the Company or third party; and
- (c) accept full responsibility for its subcontractors and ensure that such subcontractors adhere to the terms and conditions of each Contract and Call-Off Contract.

## **14 Free Issue Materials and Equipment**

14.1 In the event of the Company supplying Free Issue Materials or Equipment to the Supplier under any Call-Off Contract (whether agreed at Contract level or for the particular Call-Off Contract) the cost of which has been included in calculating the Order Price, the Order Price shall be reduced by the amount included in the Order Price for the materials which have been replaced by such Free Issue Materials and Equipment.

14.2 Any Free Issue Materials and Equipment supplied by the Company to the Supplier shall remain the property of the Company and the Supplier shall ensure that all Free Issue Materials and Equipment are properly labelled as the property of the Company and are kept separate from and not mixed with any materials owned or in the possession of the Supplier or with any materials supplied to it by third parties.

14.3 The Supplier shall properly store all Free Issue Materials and Equipment and other property of the Company whilst the same are in the Supplier's possession (or of its supply chain) and protect the same from damage by exposure to the weather and shall take every reasonable precaution against accident or damage to the same from any cause. The Supplier shall be liable for all loss thereof or damage to such Free Issue Materials and Equipment and other property of the Company whilst the same are or ought to be in the Supplier's possession or in the possession of any subcontractor of the Supplier except where such loss or damage is solely due to any negligent act or omission of the Company or its employees.

14.4 The Supplier shall maintain the Equipment in good working order for the duration of the relevant Contract or Call-Off Contract as applicable, including replacement of the Equipment where repair is uneconomic. At the Company's option, at any time during, and in any event on completion or termination or expiry of, the relevant Contract or Call-Off Contract and on receipt of an instruction from the Company, the Supplier shall return to the Company's Representative Free Issue Materials and/or Equipment provided to the Supplier in accordance with Clause 14 (Free Issue Materials and Equipment) of this Agreement, and shall provide replacement Equipment to the Company where such Equipment does not meet the required standard for return.

## **15 Failure to Supply the Goods**

15.1 Without prejudice to any other right or remedy of the Company under this Agreement and each Contract, and its rights under Clause 20, if the Supplier fails to supply the Goods or any part to the Company's satisfaction the Company may give the Supplier at least seven (7) days' notice in writing (except in an emergency when no notice need be given) requiring the Supplier to remedy such failure. If the Supplier fails to comply with the requirements of the Company specified in such notice the Company shall be entitled to perform or procure the supply of the Goods or part

thereof itself or from a third party. Without prejudice to any other right or remedy of the Company hereunder or under the general law, all expenditure properly incurred by the Company exercising its rights under this Clause 15 is recoverable by the Company from the Supplier and the Company shall be entitled to deduct such amounts from any amount due or to become due to the Supplier under the Agreement (including any Contract or Call-Off Contract).

15.2 For the purposes of Clause 15.1 the Supplier hereby grants to the Company and any third party the right to use any Intellectual Property Rights, Documentation, goods, materials and spares belonging to the Supplier or used by the Supplier in connection with the Agreement and any Contract or Call-Off Contract as may be required by the Company to exercise its rights under Clause 15.1 and the Supplier shall provide all such co-operation and assistance as may be required by the Company to enable the Company to exercise its rights under Clause 15.1.

## **16 Risk and Ownership**

16.1 Risk of damage to, or loss of, items in respect of which Services are to be performed and Serviced Goods shall, as applicable, pass to the Supplier on collection from the Company or its nominee and remain with the Supplier until delivery in accordance with the Agreement. Risk of damage to, or loss of, the Goods and Serviced Goods shall pass to the Company upon counter-signature by the Company of the Delivery Note. If the Company serves a Rejection Notice under Clause 17.2, risk of damage to and loss of the Goods or Serviced Goods shall pass to the Supplier on the earlier of the date that the Supplier removes the Goods or Serviced Goods from the Delivery Address (or such other address as the Company shall specify under Clause 17.3) or the date falling three (3) days after the receipt by the Supplier of the Rejection Notice.

16.2 The Supplier shall, without further act, pass title to the Goods, with full title guarantee to the Company, upon the Order Delivery Date. Title to Serviced Goods (and any items intended to be Serviced Goods) shall remain always with the Company and the Supplier shall ensure that all items comprising (or to comprise) Serviced Goods are properly labelled as the property of the Company and are kept separate from and not mixed with any materials owned or in the possession of the Supplier or with any materials supplied to it by third parties. The Supplier shall properly store all such items and Serviced Goods whilst the same are in the Supplier's possession (including its supply chain) and protect the same from damage by exposure to the weather and shall take every reasonable precaution against accident or damage to the same from any cause. The Supplier shall be liable for all loss thereof or damage to such items and Serviced Goods and other property of the Company whilst the same are or ought to be in the Supplier's possession or in the possession of any subcontractor of the Supplier except where such loss or damage is solely due to any negligent act or omission of the Company or its employees.

## 17 Inspection of the Goods and Serviced Goods

- 17.1 After the Goods and Serviced Goods have been delivered in accordance with Clause 10, the Company may inspect the Goods and Serviced Goods delivered in accordance with the Specification or Contract Specification as applicable.
- 17.2 If, following any inspection referred to in Clause 17.1, the Goods or Serviced Goods do not comply with the terms of the relevant Contract and Call-Off Contract, including but not limited to, conforming to the Specification or Contract Specification and, where applicable, being fit for the purpose for which they are intended, without prejudice to any rights or remedies the Company may have against the Supplier, whether under the relevant Contract or otherwise, the Company may by notice in writing (the “**Rejection Notice**”) to the Supplier reject all or any part of the Goods or Serviced Goods (the “**Rejected Goods**”).
- 17.3 The Rejection Notice shall specify the reason for the rejection of the Rejected Goods. The Rejection Notice shall specify an amount of time (in Working Days) during which the Supplier must remove such Rejected Goods from the Delivery Address. If the amount of time is not specified in the Rejection Notice, it shall be five (5) Working Days from receipt of the Rejection Notice. At its own risk and expense the Supplier shall remove such Rejected Goods from the Delivery Address, or such other address as the Company shall specify in the Rejection Notice, and shall at the Company’s option:
- (a) replace such Rejected Goods with Goods that conform in all respects with the relevant Contract or Call-Off Contract, or, as applicable, properly perform the Services on the relevant Company goods, within five (5) Working Days from the date such Rejected Goods were removed from the Delivery Address; or
  - (b) if an application for payment has been submitted or payment made for the Rejected Goods, issue a credit note in respect of that application or refund the payment (as applicable); and
  - (c) pay the Company’s Losses resulting from the Supplier’s delivery of Goods or Serviced Goods that were not in conformity with the terms of the relevant Contract and Call-Off Contract.
- 17.4 The Company’s rights and remedies under this Clause 17 are in addition to the rights and remedies available to it in respect of the statutory conditions relating to description, quality, fitness for purpose and correspondence with sample implied into the relevant Contract and Call-Off Contract by the Sale of Goods Act 1979.
- 17.5 If the Supplier fails to promptly replace Rejected Goods in accordance with Clause 17.3(a), the Company may, without affecting its rights under Clause 17.3(c), obtain substitute goods from a

third party supplier, or have the Rejected Goods repaired by a third party, and the Supplier shall promptly reimburse the Company for the costs it incurs in doing so.

## **18 Warranty**

18.1 Without prejudice to any rights or remedies the Company may have against the Supplier whether under the Agreement, each Contract, Call-Off Contract or otherwise, the Supplier shall without delay, upon a request by the Company to do so, replace or (at the Company's option) repair all Goods in which a Defect has occurred or is likely to occur in the reasonable opinion of the Company, provided that such request is made during the Warranty Period. Any replacement Goods shall comply in all respects with the terms of the Agreement, relevant Contract and Call-Off Contract and shall conform to the Specification and Contract Specification and, where relevant, shall be fit for the purpose for which they are intended.

18.2 For the avoidance of doubt, where Goods are replaced or repaired in accordance with this Clause 18, such repaired Goods or replacement Goods shall be re-delivered to the Company in accordance with the terms of the Agreement and relevant Contract or Call-Off Contract and the provisions of Clauses 10, 16 and 17 shall apply to such re-delivered Goods. The Warranty Period for these purposes shall commence on the date that the Supplier delivers the Goods in accordance with Clause 10 or, where applicable, re-delivers the Goods in accordance with this Clause 18.

18.3 The Supplier shall use all reasonable endeavours to procure for the Company the benefit of such warranties and other rights as are conferred on the Supplier in relation to Defects in such part or parts of the Goods which are not manufactured by the Supplier.

## **19 Intellectual Property Rights**

### **19.1 Existing Contracts**

The Agreement is entirely without prejudice to, and nothing in it is intended to, nor shall, in any way prejudice the rights of any member of the TfL Group in relation to intellectual property under or pursuant to Existing Contracts.

### **19.2 Vesting of Intellectual Property Rights created under this Agreement or any Contract or Call-Off Contract**

All Intellectual Property Rights created wholly or mainly in connection with the performance of, or in order to perform, the Agreement and each Contract and Call-Off Contract shall vest in the Company. The Supplier shall procure that each of its subcontractors (of any tier) or other third party shall assign such Intellectual Property Rights to the Company.



### 19.3 Ownership of the Supplier's Intellectual Property Rights

Without prejudice to Clause 19.2, all Intellectual Property Rights owned by the Supplier or its subcontractors (of any tier) or other third party and which are not assigned to, or vested in, the Company pursuant to Clause 19.2 shall remain or be vested in the Supplier, its subcontractors (of any tier) or other third party (as the case may be).

### 19.4 Company's Licence to use the Supplier's Intellectual Property Rights

The Company shall have and the Supplier hereby grants and procures that its subcontractors (of any tier) or other third party grant, to the Company a worldwide, royalty-free, perpetual, irrevocable, non-exclusive licence (with the right to sub-license such rights to any third party) to use and copy the Intellectual Property Rights referred to in Clause 19.3 for the purposes of:

- (a) understanding the Goods and Services;
- (b) operating, maintaining, repairing, modifying, altering, enhancing, re-figuring, correcting, replacing, re-procuring and re-tendering the Goods and Services;
- (c) extending, interfacing with, integrating with, connecting into and adjusting the Goods and Services;
- (d) enabling the Company to carry out the operation, maintenance, repair, renewal and enhancement of the Underground Network or TfL Network;
- (e) executing and completing the provision of the Goods and Services; and
- (f) enabling the Company to perform its function and duties as Infrastructure Manager and Operator of the Underground Network or and as applicable, where another TfL Group member utilises this Agreement, the TfL Network.

### 19.5 Provision of Supporting Documentation and Other Materials

The Supplier shall:

- (a) promptly, and in any event by no later than such date as the Company may notify to the Supplier, provide at no charge to the Company, copies of any materials and items (including, without limitation, Documentation) in the Supplier's or subcontractor's (of any tier) or other third party's possession or control (or which ought reasonably to be in the Supplier's or subcontractor's (of any tier) or other third party's possession or control) which are referred to or relied upon in using and copying, or required in any way for the use and copying of, the Intellectual Property Rights referred to in Clauses 19.2, 19.3 and 19.4 above; and

- (b) keep copies of such materials, items and Documentation in a secure place where they will not deteriorate and undertake regular (and in any event not less than every three months) integrity testing of the same and provide written evidence of such testing to the Company at regular intervals and in any event upon the Company's request.

#### 19.6 Company's Rights of Retention

If the Supplier has not complied with its obligations under Clause 19.5(a), the Company shall be entitled to retain one quarter of the sums that would otherwise be due to the Supplier under each Contract until the Supplier has complied with its obligations under Clause 19.5(a).

#### 19.7 Company's Rights to the Software

If the Supplier or any of its subcontractors providing software for incorporation into or operation of the Goods, and/or as part of the Services stops trading, is subject to an insolvency event equivalent to any of those events set out in Clause 20.1 (including their equivalent in any jurisdiction to which the Supplier or any of its subcontractors is subject), makes known its intention to withdraw support of that software or fails to support that software in accordance with the terms of the Agreement and each Contract and Call-Off Contract then the Supplier, at no charge to the Company, shall use its best endeavours to transfer or procure the transfer to the Company of all Intellectual Property Rights in that software.

#### 19.8 Company's Rights in relation to Other Procurement Activities

For the avoidance of doubt, the Company shall be entitled to use and copy the materials, items and Documentation referred to in Clause 19.5 above and anything in which the Intellectual Property Rights referred to in Clauses 19.2, 19.3 and 19.4 subsist for the purposes of inviting tenders or of procuring goods and/or services the same as or similar to the Goods and/or Services for the carrying out of any activities in connection with the licence under Clause 19.4 subject always to the Company's requirements for tenderers to treat the same in the strictest confidence.

#### 19.9 Supplier's Indemnity against Third Party Intellectual Property Rights Infringement

- (a) The Supplier shall indemnify and hold harmless the Company and any member of the TfL Group against any actions, claims, losses, demands, costs, charges or expenses that arise from or are incurred by reason of any infringement or alleged infringement of any Intellectual Property Rights belonging to any subcontractor (of any tier) or other third party and against all costs and damages of any kind which the Company may incur in connection with any actual or threatened proceedings before any court or arbitrator or any other dispute resolution forum. If required by the Company the Supplier shall conduct negotiations with

any subcontractor (of any tier) or other third party and/or a defence in relation to any action, claim or demand referred to herein on behalf of the Company.

- (b) In the event of a claim of infringement of any Intellectual Property Rights the Supplier shall use all reasonable endeavours to make such alterations or adjustment to the Goods as may be necessary to ensure that the use and provision of the Goods continues in spite of such claim.

#### 19.10 Ownership of the Company's Intellectual Property Rights

Intellectual Property Rights in all documentation and in all other material and items supplied by the Company to the Supplier in connection with the Agreement and each Contract and Call-Off Contract shall remain vested in the Company or the person owning such rights at the time the documentation, material or items were supplied. The Supplier shall, if so requested, at any time, execute such documents and perform such acts as may be required fully and effectively to assure to the Company the rights referred to in this Clause.

#### 19.11 Supplier's licence to the Company's Intellectual Property Rights

The Company hereby grants the Supplier a non-exclusive, non-transferable licence to use all the Intellectual Property Rights owned or capable of being so licensed by the Company which are required by the Supplier for the purposes of providing the Goods and Services. Such licence is granted for the duration of the Agreement (or relevant Contract or Call-Off Contract if longer) solely to enable the Supplier to comply with its obligations under the Agreement (Contract or Call-Off Contract if applicable) and is conditional upon the Supplier using such Intellectual Property Rights in accordance with Applicable Laws and Standards and such other quality standards as the Company may from time to time notify. No Intellectual Property Rights owned or capable of being so licensed by the Company may be used in conjunction with any other trade marks without the prior written consent of the Company.

## 20 Termination and Suspension

20.1 The Company may terminate the Agreement and/or any individual Contract or Call-Off Contract (in which case, where the Agreement is not terminated, any remaining outstanding Contracts or Call-Off Contracts, as applicable, shall survive) immediately by notice in writing (or on such period of notice as the Company may in its sole discretion decide) to the Supplier if:

- (a) the Supplier commits a breach of the Agreement and/or any Contract or Call-Off Contract which in the case of a breach capable of remedy has not been remedied within five (5) Working Days, or such other period as may be agreed between the Supplier and the Company, of the Company serving notice on the Supplier requiring such remedy;

- (b) the Supplier or anyone employed by or acting on behalf of the Supplier (whether or not acting independently of the Supplier when committing any breach) commits a Safety Breach or Prohibited Act;
- (c) the Supplier enters into compulsory or voluntary liquidation (other than for the purpose of effecting a solvent reconstruction or amalgamation provided that if the company resulting from such reconstruction or amalgamation is a different legal entity it shall agree to be bound by and assume the obligations of the Supplier under the Agreement and each Contract or Call-Off Contract) or is deemed unable to pay its debts as they fall due in accordance with Section 123(1) of the Insolvency Act 1986, or a meeting of its shareholders or directors is convened to consider any resolution for (or petition or file documents with the courts for) its administration or an administrative receiver, manager, administrator, liquidator, trustee or other similar officer is appointed or notice is given to appoint the same;
- (d) a breach of the Supplier's obligations under Clause 28, Clause 45 or Clause 50.8; or
- (e) the Supplier has, at the date of this Agreement or of any Contract or Call-Off Contract, been in one of the situations referred to in Regulation 57(1) of the Public Contracts Regulations 2015 and should therefore have been excluded from the procurement procedure in accordance with those Regulations or Regulation 80(2) of the Utilities Contracts Regulations 2016 (without prejudice to the Company's rights of termination implied into the Agreement and each Contract by Regulation 73(3) of the Public Contracts Regulations 2015 or Regulation 89(3) of the Utilities Contracts Regulations 2016);
- (f) the Supplier fails to comply in the provision of the Goods and/ or Services with legal obligations in the fields of environmental, social or labour law, or
- (g) the Company becomes entitled to terminate in accordance with the escalation procedure set out in Schedule 10(a) (Performance Measurement Mechanism).

20.2 Without prejudice to Clause 20.1 and paragraphs 1.5, 4.7, and 5 of Schedule 10(a) (Performance Measurement Mechanism) the Company shall have the right:

- (a) to terminate the Agreement and/or any individual Contract or individual Call-Off Contract (in which case, where the Agreement is not terminated, any remaining outstanding Contracts or Call-Off Contracts as applicable shall survive) at any time by giving notice of not less than thirty (30) days to the Supplier in writing; or
- (b) at any time to require the Supplier to suspend the provision of any or all of the Goods and/or Services by giving notice in writing (a "**Suspension Notice**") to the Supplier.

20.3 Without prejudice to the Company's right to terminate the Agreement and each Contract and Call-Off Contract under Clauses 20.1 or 20.2 or at common law, the Company may terminate the Agreement or any Contract and Call-Off Contract at any time following a Declaration of Ineffectiveness or a Public Procurement Termination Event in accordance with the provisions of Clause 50.1.

20.4 In the event that the Company terminates the Agreement and/or any Contract or Call-Off Contract for any reason under this Clause 20, the Supplier shall, without prejudice to any other rights or remedies which the Company may have under the Agreement and such Contract and Call-Off Contract or under general law, at the Company's option:

- (a) permit the Company to enter the Supplier's premises and take possession of any equipment, goods or documentation which are the property of the Company; and
- (b) permit the Company to place an order for the remaining Goods (or equivalent goods) and Services with any other person or persons or complete the provision of such Services by its own workmen; and
- (c) promptly return to the Company any equipment, goods or documentation which are the property of the Company and of which the Supplier or any of its subcontractors have possession.

In either such case, the Company shall be entitled to retain those Goods and the benefit of any part of the Services already provided by the Supplier in accordance with the Agreement and the relevant Contract or Call-Off Contract, at the material time.

20.5 In the event that the Agreement and/or any Contract or Call-Off Contract is terminated, and subject to Clause 3.14(c), the liability of the Company shall be limited to payment to the Supplier for those Goods and Services provided in accordance with the Agreement and such Contract and Call-Off Contract up until the date of such termination.

20.6 Following a termination in accordance with Clause 20.1 (but not a termination in accordance with Clause 20.2(a) or Clause 20.1(e)) the Supplier shall be liable to the Company for

- (a) any Losses of whatever nature arising out of or in connection with the relevant breach; and
- (b) where the Company exercises its rights under Clause 20.4(b) and in so doing incurs costs which are in excess of those which would have been incurred in relation to the due provision of the Goods and Services under the Agreement and the relevant Contract and Call-Off Contract by the Supplier ("**Excess Costs**"), such Excess Costs.

20.7 In the event that the Agreement and/or any Contract or Call-Off Contract is suspended in accordance with Clause 20.2(b) (but not where suspension is pursuant to paragraph 1.5, 4.7, or 5 of Schedule 10(a) (Performance Measurement Mechanism)), the Supplier shall:

- (a) issue to the Company an application for payment in respect of those Goods and Services provided to the Company in accordance with the Agreement and the relevant Contract or Call-Off Contract up until the date of such suspension; and
- (b) not carry out any further work in connection with the provision of the Goods and Services until such time as the Company issues a notice lifting the suspension (a **"Notice to Proceed"**).

20.8 In the event that the Agreement and/or any Contract or Call-Off Contract is suspended in accordance with Clause 20.2(b) (but not in the event of suspension pursuant to paragraph 1.5, 4.7, or 5 of Schedule 10(a) (Performance Measurement Mechanism)), and such suspension continues for a period of twenty-eight (28) days, the Supplier shall be entitled to request that the Company serve a Notice to Proceed. In the event that no Notice to Proceed is issued by the Company within a further fourteen (14) days from such request of the Supplier, the Supplier shall be entitled to approach the Company with a request for a variation, in accordance with the Contract Variation Procedure.

20.9 In the event that the parties are unable to agree upon the variation requested under Clause 20.8, then a Dispute shall be deemed to have arisen and the matter shall be referred for resolution in accordance with Clause 39.

20.10 Termination of the Agreement and/or any Contract or Call-Off Contract for whatever reason shall not affect the accrued rights of the parties arising in any way out of the Agreement and the relevant Contract or Call-Off Contract as at the date of termination and in particular but without limitation the right to recover damages against the other party.

20.11 If anyone employed by the Supplier, acting independently of the Supplier, commits a Safety Breach or Prohibited Act, then the Company may require the Supplier to exclude that individual from the provision of the Goods and Services with immediate effect and that individual may only resume the provision of the Goods and Services at the Company's absolute discretion.

## **21 Cooperation in Handover**

21.1 The Supplier shall provide at no cost such reasonable assistance to the Company and to any third party nominated by the Company as the Company may require during the last six (6) months of the Agreement (or any Contract or Call-Off Contract, to the extent it continues beyond expiry of the Term or earlier termination) and in the three (3) months after the expiry of the Term (or, in the case of earlier termination for any reason, the period of three (3) months from the

effective Agreement or Contract or Call-Off Contract termination date) to facilitate the engagement of a successor supplier and/or the resumption by the Company of the supply of the Goods and Services and in such a manner so as not to unduly disrupt or hinder the Company's business.

21.2 Without prejudice to the generality of Clause 21.1 above, the Supplier shall on or prior to the expiry of the Term or termination of any Contract or Call-Off Contract transfer to the Company such Documentation relating to the Goods or full copies thereof as the Company may request.

## **22 Indemnity and Insurance**

22.1 The Supplier shall be liable for, and shall indemnify the Company, including any of its employees, servants, agents, subcontractors, directors and officers and members of the TfL Group on an after-tax basis against all Losses suffered or incurred by the Company or relevant member of the TfL Group, arising from or in connection with the performance or non-performance of the Supplier under the Agreement and each Contract and Call-Off Contract:

- (a) in respect of death or personal injury to any person;
- (b) in respect of loss of or damage to any property (including the Underground Network and any other property belonging to the Company or for which it is responsible);
- (c) arising out of or in the course of or by reason of any act, omission, negligence or breach of contract or breach of statutory duty, wilful misconduct of the Supplier, its employees, agents or subcontractors; and
- (d) arising under the Company's contracts with third parties,

and shall, at its own cost on the Company's request, defend the Company in any proceedings involving the same.

22.2 The Supplier shall not be liable to indemnify the Company or any member of the TfL Group under the indemnity in Clause 22.1 to the extent Losses are solely due to the negligence, breach of duty or breach of contract of the Company.

22.3 The Supplier's indemnity under Clause 22.1 and all other indemnities under the Agreement and each Contract and Call-Off Contract shall remain in force for the duration of the Agreement and each Contract and Call-Off Contract and for the period of twelve (12) years after the Order Delivery Date and/or Order Completion Date or earlier termination of the Agreement and each Contract and Call-Off Contract.

22.4 The Company may withhold from any sum due or which may become due to the Supplier any sum due to the Company as a result of the operation of Clause 22.1.

22.5 Other than in respect of the Losses (i) described in Clauses 22.1(a) and 22.1(d) above and (ii) Excepted Liabilities, neither party shall have any liability to the other for any Consequential Loss arising out of the performance of its obligations under or in connection with the Agreement and each Contract and Call-Off Contract. Each party respectively undertakes not to sue the other party, TfL or any member of the TfL Group in respect of Consequential Loss.

22.6 Without prejudice to the obligation to indemnify the Company set out in Clause 22.1, the Supplier undertakes to:

- (a) maintain at its own cost insurance which complies with the Employers' Liability (Compulsory Insurance) Act 1969 and any statutory orders made under such Act or any amendment or re-enactment thereof;
- (b) maintain at its own cost an adequate level of public liability insurance in respect of the Supplier's liability for death or injury to any person and loss of or damage to property and being not less than £10,000,000 (ten million pounds) per occurrence;
- (c) maintain at its own cost an adequate level of professional indemnity insurance commensurate with the risk and, where appropriate, being not less than £1,000,000 (one million pounds) per occurrence;
- (d) maintain at its own cost an adequate level of "goods in transit" insurance commensurate with the risk and, where appropriate, being not less than £50,000 (fifty thousand pounds) per occurrence, in respect of the Supplier's liability for theft, loss or damage to property, Goods and goods which are the subject of Services (including Serviced Goods) while in transit from one place to another or being stored during a journey.
- (e) maintain at its own cost product liability insurance in respect of the Supplier's liability for death or injury to any person, or loss or damage to any property arising out of its performance of any Contract in an amount not less than £10,000,000 (ten million pounds), for any one occurrence;
- (f) ensure that the foregoing insurance policy or policies shall be or are effected with a reputable insurer. Such insurance shall be on terms approved by the Company (such approval not to be unreasonably withheld or delayed) and shall be maintained in force for a period not less than twelve (12) years after the delivery of the Goods and completion of the Services (whichever is the later);
- (g) ensure that any subcontractors also maintain adequate insurance having regard to the obligations under the contract which they are contracted to fulfil; and



- (h) produce within seven (7) days of any reasonable request by the Company and in any event before the commencement of the Services or the provision of any of the Goods by the Supplier under any Contract or Call-Off Contract satisfactory evidence in the form of a broker's letter or similar, confirming the existence of insurance in accordance with the terms of this Clause 22.6.

22.7 The Supplier's liabilities under each Contract and Call-Off Contract shall not be deemed to be released or limited by the Supplier taking out the insurance policies referred to in Clause 22.6.

22.8 If the Supplier fails to maintain the insurance policies as provided in this Clause 22, the Company may effect and keep in force any such insurance and pay such premium or premiums at commercially competitive rates as may be necessary for that purpose and from time to time deduct the amount so paid from any monies due or which become due to the Supplier or recover the same as a debt due from the Supplier.

22.9 The Supplier's total liability to the Company for all matters arising under or in connection with the Agreement, other than the excluded matters, is limited to the amount specified in Schedule 1 and applies in contract, tort and otherwise to the extent allowed under the law of the Agreement. The excluded matters are amounts payable by the Supplier as stated in the Agreement for:

- (a) Excepted Liabilities,
- (b) loss of or damage to the Company's property,
- (c) any Losses against which the Company is indemnified under Clause 26 (Supplier Personnel), or
- (d) any Losses against which the Company is indemnified under Clause 19.9 (Intellectual Property Rights).

## **23 Force Majeure and Permitted Delay events**

### **Force Majeure**

23.1 Neither party shall be in breach of its obligations under any Contract or Call-Off Contract if there is any total or partial failure of performance by it of its duties and obligations under that Contract or Call-Off Contract occasioned by any Force Majeure Event. If either party is unable to perform its duties and obligations under the Agreement or any Contract or Call-Off Contract as a direct result of a Force Majeure Event, that party shall within one (1) Working Day of such event taking place give written notice to the other party specifying the event and the steps taken by it to minimise or overcome the effects of such event. The operation of the relevant Contract or Call-Off Contract shall be suspended during the period (and only during the period) in which the Force

Majeure Event continues and the Company shall be under no obligation to make any payments to the Supplier in respect of any Goods or Services where delivery or performance is affected by the Force Majeure Event. Without delay upon the Force Majeure Event ceasing to exist, the party relying upon it shall give written notice to the other of this fact. If the Force Majeure Event continues for a period of more than twenty-eight (28) days and substantially affects the abilities of the Supplier to perform its obligations under the relevant Contract or Call-Off Contract, the Company shall have the right (at any time after that twenty-eight (28) day period if the Force Majeure Event continues) to terminate the relevant Contract and/or Call-Off Contract immediately upon giving written notice of such termination to the Supplier.

### **Permitted Delay Events**

23.2 If delay is caused or either party can reasonably foresee delay occurring by reason of a Permitted Delay Event then the Supplier shall give notice to the Company's Representative of the same and any claim for an extension of time to the Expected Order Delivery Date and/or Expected Order Completion Date, within seven (7) days after the cause of any delay has arisen.

23.3 For the purposes of this Agreement or any Contract or Call-Off Contract, the occurrence of one or more of the following shall constitute a "Permitted Delay Event":

- (a) any act of prevention, omission, default or neglect or breach by the Company of an express obligation under this Agreement or any Contract or Call-Off Contract; or
- (b) any variation of the Agreement or any Contract or Call-Off Contract under Clause 8; or
- (c) the suspension of this Agreement or any Contract or Call-Off Contract in accordance with Clause 20 (other than where the suspension is necessary by reason of default by the Supplier).

23.4 Where any delay in achieving the Expected Order Delivery Date and/or Expected Order Completion Date arises, the Supplier shall be entitled to an extension to such Expected Order Delivery Date and/or Expected Order Completion Date (either prospectively or retrospectively) but only to the extent that such delay is directly caused by a Permitted Delay Event that has a direct and material adverse effect on the Supplier's ability to provide the Goods and/or Services by the Expected Order Delivery Date and/or Expected Order Completion Date and provided that the Supplier:

- (a) notifies the Company of the Permitted Delay Event in accordance with Clause 23.2 and subsequently provides such further information as the Company may reasonably require regarding the nature and likely duration of such event;

- (b) provides the Company with reasonable access to the Supplier's premises or of its subcontractors for investigating the validity of the potential Permitted Delay Event;
- (c) uses its reasonable endeavours to mitigate the delay to the relevant Expected Order Delivery Date and/or Expected Order Completion Date; and
- (d) shall not be entitled to an extension of time to the extent that the Permitted Delay Event was caused by or resulted from any act, omission, neglect, default or breach of this Agreement by the Supplier, its subcontractors and/or employees.

## **24 Safety**

- 24.1 The Supplier shall not endanger in any manner the health and safety of, or unreasonably interfere with the proper performance of the duties of, the Company's employees or third parties or otherwise expose the Company to liability under any Applicable Laws and Standards, including (without limitation) the Health and Safety at Work etc. Act 1974, the Transport and Works Act 1992, or any statutory modifications or re-enactments thereof.
- 24.2 The Supplier shall act in accordance with the health and safety regulations and requirements stated in the Specification.
- 24.3 The Company's Standards S1251 "Alcohol and work" and S1257 "Drugs and work" shall apply to the Agreement and each Contract and Call-Off Contract as if the term "LU Premises" means any of the Company's property and/or where the Services are carried out and as if references to "LU" are references to the Company.
- 24.4 The Company may at its discretion carry out on the Supplier's behalf any testing of the Supplier's employees, subcontractors or agents for drugs or alcohol which each Contract or Call-Off Contract requires the Supplier to carry out. The reasonable cost to the Company of carrying out the testing shall be paid by the Supplier.

## **25 Independent Supplier**

- 25.1 The Supplier is an independent supplier and is not and shall not hold itself out as, and shall procure that none of the Supplier's employees or subcontractors or their employees hold themselves out as, an agent of the Company. All personnel used by the Supplier in the performance of its obligations under each Contract and Call-Off Contract shall be employees of the Supplier, or any subcontractor or agent of the Supplier.

## **26 Supplier Personnel**

- 26.1 For the purposes of this Clause 26:

**“Current Service Provider”** means any person, company or other legal entity which on or before the Commencement Date was the employer of any of the Transferring Employees, and which (for the avoidance of doubt) may include the Company;

**“Replacement Employer”** means any person to whom a Subsequent Relevant Employee may or does transfer under the Transfer Regulations on expiry or termination of the Agreement (or part of it) or any Contract or Call-Off Contract;

**“Relevant Claims and Liabilities”** means all liabilities, obligations, proceedings, court or tribunal orders, losses, fines and penalties, damages, expenses, costs (including reasonable legal costs and disbursements) actions, claims and demands;

**“Subsequent Transfer Date”** means the time and date on which a Subsequent Relevant Employee transfers to a Replacement Employer by virtue of the Transfer Regulations;

**“Subsequent Relevant Employee”** means a person employed or engaged by the Supplier or relevant subcontractor from time to time in respect of any part of the supply of Goods and/or Services who would transfer to a Replacement Employer by virtue of the Transfer Regulations on the expiry or termination of the Agreement (or part of it) or any Contract or Call-Off Contract;

**“Transfer Regulations”** means all or any of the following: the Transfer of Undertakings (Protection of Employment) Regulations 2006; the Transfer of Employment (Pension Protection) Regulations 2005; any other or further regulations, order or statutory instrument which apply or are capable of applying to a person to whom section 257 of the Pensions Act 2004 applies, as amended, replaced or extended from time to time and including any regulations or other legislation which (either with or without modification) re-enacts, adopts, consolidates or enacts in rewritten form any such regulations; and

**“Transferring Employees”** means those employees of or those engaged by the Current Service Provider who transfer or have the right to transfer to the Supplier under the Transfer Regulations.

26.2 The Supplier will comply and procure that its sub-contractors comply with any obligations which may arise out of a transfer to the Company or another person under the Transfer Regulations upon the expiry of the Term or earlier termination of the Agreement or any Contract or Call-Off Contract.

26.3 At any time during the last twelve (12) months of the Agreement (and any Contract or Call-Off Contract, if different) and/or during any period of notice terminating the Agreement and/or during any Contract or Call-Off Contract, the Company may require the Supplier to provide, within a specified period of being requested, to the Company (or to any other person or persons

nominated by the Company) such information as is reasonably required by the Company or such other persons relevant to the potential liabilities of the Company or any other person arising under the Transfer Regulations including but not limited to information on the following:

- (a) the names of employees (of the Supplier or its subcontractors) engaged in supplying the Goods and/or Services, their salaries and other conditions of employment, ages and length of service;
- (b) the method of organisation of the employees (of the Supplier or its subcontractors) engaged in supplying the Goods and/or Services and documentary evidence relating to such organisation;
- (c) the proposals for informing and consulting with affected employees;
- (d) details of collective agreements and union recognition agreements; and
- (e) any other employee liability information within the meaning of the Transfer Regulations,
- (f) and will in addition provide copies to the Company upon request of any communication with any potential or intended new consultant or the Supplier's employees or their representatives relating to the effect on such employees of the expiry or termination of the Agreement, Contract or Call-Off Contract.

26.4 The Supplier will provide the Company upon request with the name and address of a person within its organisation to whom all queries and requests for information under this Clause 26 may be addressed. The Supplier will if required by the Company warrant that any information provided under Clause 26 is accurate, complete and not misleading, including any information supplied in relation to its subcontractors.

26.5 The Supplier will not and will procure that its subcontractors will not in the six (6) months prior to the expiry or termination of the Agreement or Contract or Call-Off Contract if different (or, where notice of termination is given of less than six (6) months, during any such period of notice) or any Contract or Call-Off Contract without the Company's prior written consent:

- (a) re-organise or substantially alter the number or method of organisation or identity of the employees engaged in the provision of the Goods and/or Services, except to the extent that any such change is the result of a bona fide business reorganisation of the Supplier or the relevant subcontractor which is not related or confined to the employees engaged in supplying the Goods and/or Services or to the expected expiry of the Term or termination of the Agreement, Contract or Call-Off Contract if different, or
- (b) make any increase to the salaries or any significant change to the terms and conditions of employment of the employees engaged in the provision of the Goods, except where such

increases or changes would have arisen in the ordinary course of the Supplier's or the relevant sub-contractor's business and are not related to the expiry of the Term or termination of the Agreement, Contract or Call-Off Contract (either because they are applied to all of the Supplier's or the relevant sub-contractor's employees, whether or not engaged in providing the Goods or otherwise) or are the result of a bona fide business reorganisation of the Supplier or the relevant sub-contractor which is not related or confined to the employees engaged in supplying the Goods or to the expiry of the Term or termination of the Agreement, Contract or Call-Off Contract.

26.6 The Supplier shall indemnify the Company against all Relevant Claims and Liabilities arising from or incurred by reason of any act or omission of the Supplier, its servants or agents in connection with or arising from or incurred by reason of the employment of the Transferring Employees, including but not limited to any claim against the Company or any other person for damages for breach of contract, or for compensation for unfair or wrongful dismissal or redundancy, or failure to provide comparable pension rates, or failure to provide information, or failure to inform or consult Transferring Employees, or in respect of death or personal injury, breach of statutory duty or any other claim in tort by a Transferring Employee, or by a person who would be a Transferring Employee but for any act or omission (including dismissal or constructive dismissal) of the Supplier, arising from the operation (or alleged operation) of the Transfer Regulations in relation to the Goods and/or Services.

26.7 The Supplier shall indemnify the Company and all Replacement Employers against all Relevant Claims and Liabilities arising from or related to:

- (a) any claim by a Subsequent Relevant Employee in respect of any default, failure or omission (or alleged default, failure or omission) by any person whatsoever concerning or arising from employment before a Subsequent Transfer Date in respect of which the Company or the Replacement Employer incurs liability cost or expense by reason of the operation (or alleged operation) of the Transfer Regulations; and
- (b) any claim by any former or existing employee of the Supplier or relevant Subcontractor (other than a Subsequent Relevant Employee) in respect of which the Company or a Replacement Employer incurs liability cost or expense by reason of the operation (or alleged operation) of the Transfer Regulations.

In this Clause 26.7 "Relevant Claims and Liabilities" include those incurred by the Company by reason of any contract term between the Company and a Replacement Employer provided always that in relation to Relevant Claims and Liabilities which the Company may incur to a Replacement Employer, the Supplier shall not be required to indemnify the Company for more than or with a greater scope than it would if such Relevant Claims and Liabilities were made

against or incurred by the Company in providing an indemnity to the Replacement Supplier on the same terms set out in sub-clauses (a) and (b) above.

26.8 The provisions of this Clause 26 are without prejudice to the Transfer Regulations. For the avoidance of doubt, any remedies available to the Company for any breach by the Supplier of any provision of this Clause 26 shall be in addition to and not in substitution for any remedies available to the Company under any provision of the Transfer Regulations.

## **27 Confidentiality**

27.1 The Supplier undertakes to keep confidential and not to disclose to any third party (without the prior written consent of the Company) any Confidential Information supplied by the Company to the Supplier and shall use such information only for the purpose of the performance of its obligations under the Agreement and each Contract or Call-Off Contract as applicable.

27.2 On the Company's request, the Supplier shall, so far as is reasonably possible:

- (a) transfer onto hard copies or other media in industry standard format and programming languages and deliver to the Company any Confidential Information in its possession or control supplied by the Company to the Supplier;
- (b) return to the Company all copies (whether hard copy or other media) of such Confidential Information; and
- (c) destroy, erase or otherwise expunge from its records, systems, databases or other forms of archive all such Confidential Information save to the extent that information needs to be retained for statutory purposes or tax purposes.

27.3 The Supplier shall ensure that all its subcontractors, suppliers, employees and agents perform its obligations in Clauses 27.1 and 27.2 as if they were the Supplier, and the Supplier shall be responsible to the Company for any act or omission by its subcontractors, suppliers, employees and agents in breach of such obligations.

27.4 The Supplier shall notify the Company promptly if the Supplier becomes aware of any breach of confidence by a subcontractor, supplier, employee or agent and shall give the Company all assistance the Company reasonably requires in connection with any proceedings the Company brings, or other steps the Company takes, against that subcontractor, supplier, employee or agent for such breach of confidence.

27.5 The Supplier shall not, either alone or jointly with others, publish any material relating to the Company, the Company's Representative, the Agreement, any Contract or Call-Off Contract or the Goods and Services without the prior written consent of the Company.

27.6 The Supplier shall not, either alone or jointly with others, make any press, television, radio or other media announcement in connection with the Agreement, any Contract or Call-Off Contract or the Goods and Services, or any Dispute arising under or in connection with the Agreement, or any Contract or Call-Off Contract.

27.7 The provisions of Clauses 27.1 to 27.6 shall not apply:

- (a) to any information which is already in the public domain at the time of its disclosure other than by breach of any Contract or Call-Off Contract or the Agreement; or
- (b) to any information which is required to be disclosed to the extent required by any applicable law, the regulations of any recognised stock exchange, any taxation authorities or by order of a court or other tribunal of competent jurisdiction or any relevant regulatory body.

27.8 The Supplier acknowledges that damages would not be an adequate remedy for any breach of this Clause 27 by the Supplier and that (without prejudice to all other remedies to which the Company may be entitled as a matter of law) the Company shall be entitled to any form of equitable relief to enforce the provisions of this Clause 27.

## **28 London Living Wage**

28.1 For the purposes of this Clause 28, "Sub-contractor" means a sub-contractor (of any tier) of the Supplier and references to any "Contract" shall also refer to any Call-Off Contract.

28.2 The Supplier acknowledges and agrees that the Mayor pursuant to section 155 of the Greater London Authority Act has directed that members of the TfL Group ensure that the London Living Wage be paid to anyone engaged by any member of the TfL Group who is required to discharge contractual obligations (whether as a direct contractor or a sub-contractor (of any tier) of that direct contractor) on the Company's estate in the circumstances set out in Clause 28.3(a).

28.3 Without prejudice to any other provision of this Agreement and any Contract, the Supplier shall:

- (a) ensure that its employees and procure that the employees of its Sub-contractors engaged in the provision of the Goods and Services or performance of this Agreement or any Contract:
  - (i) for two (2) or more hours of work in any given day in a week, for eight (8) or more consecutive weeks in a year; and
  - (ii) on the Company's estate including (without limitation) premises and land owned or occupied by the Company,

be paid an hourly wage (or equivalent of an hourly wage) equivalent to or greater than the London Living Wage;



(b) ensure that none of:

- (i) its employees; nor
- (ii) the employees of its Sub-contractors,

engaged in the provision of the Goods and Services or performance of this Agreement or any Contract be paid less than the amount to which they are entitled in their respective contracts of employment;

(c) provide to the Company such information concerning the London Living Wage as the Company or its nominees may reasonably require from time to time, including (without limitation):

- (i) all information necessary for the Company to confirm that the Supplier is complying with its obligations under Clause 28; and
- (ii) reasonable evidence that Clause 28 has been implemented;

(d) disseminate on behalf of the Company to:

- (i) its employees; and
- (ii) the employees of its Sub-contractors,

engaged in the provision of the Goods and Services or performance of this Agreement or any Contract such perception questionnaires as the Company may reasonably require from time to time and promptly collate and return to the Company responses to such questionnaires; and

(e) cooperate and provide all reasonable assistance in monitoring the effect of the London Living Wage including (without limitation):

- (i) allowing the CCSL to contact and meet with the Supplier's employees and any trade unions representing the Supplier's employees;
- (ii) procuring that the Supplier's Sub-contractors allow the CCSL to contact and meet with the Sub-contractors' employees and any trade unions representing the Sub-contractors' employees,

in order to establish that the obligations in Clause 28.3(a) have been complied with.

28.4 For the avoidance of doubt the Supplier shall:

- (a) implement the annual increase in the rate of the London Living Wage; and

(b) procure that its Sub-contractors implement the annual increase in the rate of the London Living Wage,

on or before 1 April in the year following the publication of the increased rate of the London Living Wage.

28.5 The Company reserves the right to audit (acting by itself or its nominee(s)) the provision of the London Living Wage to the Supplier's staff and the staff of its Sub-contractors.

28.6 Without limiting the Company's rights under any other termination provision in this Agreement or any Contract, the Supplier shall remedy any breach of the provisions of this Clause 28 within four (4) weeks' notice of the same from the Company (the "**Notice Period**"). If the Supplier remains in breach of the provisions of this Clause 28 following the Notice Period, the Company may by written notice to the Supplier immediately terminate this Agreement or any Contract.

## **29 Responsible Procurement**

29.1 The Supplier and the Company acknowledge and agree that the Mayor, in accordance with section 155 of the GLA Act has directed TfL and its subsidiaries (including the Company) to do all things reasonably necessary to comply with (inter alia) the Responsible Procurement Policy in its procurement activities.

29.2 The Supplier shall and shall procure that its subcontractors (of any tier) shall comply with, and shall provide such co-operation and assistance as may be reasonably requested by the Company to enable the Company to comply with the Responsible Procurement Policy.

29.3 The Supplier acknowledges and agrees that the Company is required to develop a policy relating to the promotion of the procurement of goods and services in an ethical manner (the "**Ethical Sourcing Policy**") which shall reflect and be consistent with the relevant principles of the Responsible Procurement Policy, and the Supplier shall and shall procure that all of its subcontractors shall comply with such the Ethical Sourcing Policy to the extent it does not conflict with the Responsible Procurement Policy.

29.4 Where applicable to the Supplier, the Supplier shall comply with the Modern Slavery Act 2015 and any guidance issued by the Secretary of State under it. The Supplier shall implement an Ethical Sourcing and Modern Slavery Action Plan in accordance with Schedule 2 (Ethical Sourcing and Modern Slavery Action Plan).

29.5 The Supplier acknowledges and agrees that it (and its subcontractors) shall be required to comply with any changes to the Responsible Procurement Policy (and any adjustment or amendment to the Ethical Sourcing Policy as a result of such amendment or adjustment to the Responsible Procurement Policy).

29.6 The Supplier shall not be entitled to any addition to the Order Price in the event of any change to the Responsible Procurement Policy (and any change to the Ethical Sourcing Policy as a result of such change to the Responsible Procurement Policy).

29.7 The Supplier shall procure that any subcontractor (of any tier) is required to comply with the provisions of this Clause 29 and the provisions of this Clause 29 are included in any subcontract (of any tier).

29.8 The Supplier shall not, and shall procure that any subcontractor shall not, without the prior written consent of the Company, vary or purport to vary the provisions contained in any contract or subcontract in accordance with the operation of this Clause 29.

### **30 Assignment and Subcontracting**

30.1 The Supplier shall not assign, novate or subcontract any of its rights or obligations under the Agreement or any Contract or Call-Off Contract or any part thereof without the prior written consent of the Company (which may, at the Company's sole discretion, withheld or refused or given with conditions, including in relation to the provision of a collateral warranty in the form set out in Schedule 9).

30.2 The subcontracting of all or any part of the supply of Goods and/or Services to a subcontractor shall not relieve the Supplier of its obligations to supply the Goods and/or Services under the Agreement and each Contract and Call-Off Contract. The Supplier shall be responsible for the acts and omissions of its subcontractors.

30.3 The Company may novate, assign, transfer or subcontract the Agreement and/or any Contract or Call-Off Contract or any part thereof to any person at any time without the consent of the Supplier, provided the Company has given prior written notice to the Supplier.

30.4 Within seven (7) days of any written request by the Company to the Supplier, the Supplier shall execute a deed of novation in the form set out in Schedule 7 in favour of any person to whom the Agreement and/or any Contract or Call-Off Contract is being novated.

30.5 For the purposes of Clauses 30.6 to 30.10:

**"Subcontract"** means a contract between the Supplier and a Subcontractor;

**"Subcontractor"** means a subcontractor to the Supplier, being the counterparty of a contract with the Supplier involved in the supply of goods, facilities or services necessary for or related to the provision of the Goods and Services (or any part of them).

30.6 Subject to the Company's prior written consent pursuant to Clause 30.1, where the Supplier subcontracts any or all of the Goods and Services, the Supplier shall include in each Subcontract

and procure that its Subcontractors (and any of their subcontractors of any tier) include in each of their subcontracts of any tier:

- (a) payment terms substantially similar to those set out in Clause 9, and
- (b) terms entitling the Supplier or (in respect of a subcontract below the first tier) the payer under the relevant subcontract to terminate that subcontract if the relevant subcontractor fails to comply in the performance of its contract with legal obligations in the fields of environmental, social or labour law.

30.7 On or before the Commencement Date or any Contract Commencement Date or the commencement date of any Call-Off Contract (as applicable), the Supplier shall notify the Company in writing of the name, contact details and details of the legal representatives of any Subcontractor, to the extent that such information has not already been provided by the Supplier to the Company. The Supplier shall also immediately provide to the Company in writing the name, contact details and details of the legal representatives of each new Subcontractor which the Supplier subsequently involves in the Goods and Services after the Commencement Date, the relevant Contract Commencement Date or the commencement date of any Call-Off Contract (as applicable).

30.8 The Company reserves the right to verify whether there are any grounds for excluding any Subcontractor under Regulation 57 of the Public Contracts Regulations 2015. Where necessary for the purpose of the Company's exercise of its right under this Clause 30.8, the Company may request that the information provided by the Supplier under Clause 30.7 shall be accompanied by one or more Single Procurement Document(s) (within the meaning of Regulation 59 of the Public Contracts Regulations 2015) in respect of the relevant Subcontractor(s). Further, the Company:

- (a) shall require that the Supplier replace any Subcontractor in respect of which the verification has shown that there are compulsory grounds for exclusion under Regulation 57 of the Public Contracts Regulations 2015; and
- (b) may require that the Supplier replace any Subcontractor in respect of which the verification has shown that there are non-compulsory grounds for exclusion under Regulation 57 of the Public Contracts Regulations 2015.

30.9 The Supplier shall promptly notify the Company of any circumstances from time to time that might give rise to a right of the Company to require replacement of a subcontractor pursuant to Clauses 30.8(a) or 30.8(b).

30.10 The Company shall have no obligation to make any termination or compensation payment in respect of any termination pursuant to Clauses 30.8(a) or 30.8(b).

### **31 Company's and Supplier's Representative**

Each party shall in respect of the Agreement and each Contract and Call-Off Contract appoint one or more representatives to act on its behalf as set out in Schedule 1. Any party may, on giving reasonable notice to the other party, appoint an additional representative or replace an existing representative. Each party shall be responsible for the acts, omissions, neglects and defaults of its representatives as if such acts, omissions, neglects and defaults were its own. Each party will be bound by any decision made or action taken by its representatives.

### **32 Costs**

Except as otherwise agreed, each party shall bear its own costs incurred in connection with the negotiation, preparation and execution of the Agreement and each Contract and Call-Off Contract.

### **33 Severance**

If a provision of the Agreement or any Contract or Call-Off Contract is, or becomes, invalid, unenforceable or illegal, that will not affect the legality, validity or enforceability of any other provision of the Agreement or any Contract or Call-Off Contract, provided that the operation of this Clause 33 would not negate the commercial interest and purpose of the parties under the Agreement or any Contract or Call-Off Contract.

### **34 Publicity**

The text of any press release or other communication to be published by or in the media concerning the subject matter of the Agreement and any Contract or Call-Off Contract shall require the prior written approval of the Company. No interviews concerning the same shall be given by the Supplier with the media without prior written approval from the Company of the content of such an interview.

### **35 Corrupt Gifts and Payments of Commission**

35.1 The Supplier undertakes that it shall not and procures that its subcontractors and suppliers shall not enter into or offer to enter into any business arrangement with any servant, employee, officer or agent of the Company other than as a representative of the Company without the Company's prior written approval.

35.2 The Supplier undertakes that it shall not, and uses reasonable endeavours to procure that its subcontractors and suppliers shall not, commit any Prohibited Acts or cause the Company to commit any equivalent act.

35.3 The Company shall have the right to audit any and all records necessary to confirm compliance with this Clause 35 at any time during performance of the Agreement and each Contract and Call-Off Contract and during the twelve (12) year period following completion of performance.

## **36 No Waiver**

36.1 No failure or delay on the part of either party to exercise any right or remedy under the Agreement or any Contract or Call-Off Contract shall be construed or operate as a waiver thereof nor shall any single or partial exercise of any right or remedy as the case may be. Any waiver shall be in writing and sent to the other party. The rights and remedies provided in the Agreement or any Contract or Call-Off Contract are cumulative and are not exclusive of any rights or remedies provided by law.

36.2 No payment made by the Company shall indicate or be taken to indicate the Company's acceptance or approval of any part of the Goods and/or Services or any act or omission of the Supplier from any obligation or liability imposed upon the Supplier by any provision of the Agreement, any Contract, Call-Off Contract or otherwise.

## **37 Entire Contract**

The Agreement, Contract and Call-Off Contract embodies and sets forth the entire contract and understanding of the parties and shall supersede all prior oral or written contracts understandings or arrangements relating to the subject matter of the Agreement or any Contract or Call-Off Contract. Except in the case of fraud neither party shall be entitled to rely on any contract, understanding or arrangement which is not expressly set forth in the Agreement or any Contract or Call-Off Contract as applicable.

## **38 Notices and Service of Process**

38.1 Any notice or other document given under, or in connection with, the Agreement or any Contract or Call-Off Contract must be in English and in writing and sent by letter, electronically via the electronic contract management system (subject to Clause 38.2 below) or delivered by hand to the other party's representatives in each case to the relevant address set out in Schedule 1. The notice or other document will be effective as follows:

- (a) if the notice or other document is sent by letter, it will be effective when it is delivered (which, if sent by pre-paid first class post, shall be deemed to be at 9.30am on the Working Day after posting);
- (b) if the notice or other document is sent electronically, it will (subject to Clause 38.2) be effective at the time of transmission if sent before 5.30pm on a Working Day (or at 9.30am the next Working Day if applicable); and

- (c) if the notice or other document is delivered by hand to the other party's representative, it will be effective immediately it is delivered.

The address and electronic contact details of the Company and the Supplier are set out in Schedule 1.

If a party's details change, it must notify the other party promptly in writing of any such changes. The parties agree that proceedings arising out of or in connection with the Agreement or any Contract or Call-Off Contract may be served in accordance with this Clause 38.

38.2 Clause 38.1(b) does not apply to the service of notices or other documents contemplated by or relating to the following clauses: Clause 20 (Termination and Suspension), Clause 23 (Force Majeure and Permitted Delay Events), Clause 39 (Dispute Resolution), Clause 45 (Change of Control), Clause 47 (Freedom of Information), Clause 50.1 (Declaration of Ineffectiveness and Public Procurement Termination Event), Clause 50.6 (Conflict of Interest), and equivalent provisions in Schedule 9 (Form of Collateral Warranty). If a party sends any such notice or document via the electronic contract management system, it will only be effective if a copy is sent by post or by hand delivery as provided for by Clause 38.1(a) or 38.1(b).

## **39 Dispute Resolution**

39.1 Any question, dispute, difference or claim (a "**Dispute**") shall be resolved in accordance with this Clause 39.

39.2 The parties shall use their reasonable endeavours to resolve any Dispute by a meeting between the Company's Representative – Framework and the Supplier's Representative – Framework (together the "**Nominated Representatives**") which shall be convened to discuss such Dispute within fourteen (14) days of notification in writing by one party to the other of a matter in dispute.

39.3 If the Dispute has not been resolved within twenty-eight (28) days after the date of a meeting between the Nominated Representatives in accordance with Clause 39.2 (or if no such meeting was convened within twenty-eight (28) days after the date on which notification was served by one party on the other), the Dispute shall be referred as soon as practicable to the Company's Lead Commercial Manager (Rail Operations) and the Supplier's [Managing Director] or in the absence or unavailability of these personnel, persons of similar status deputised to resolve disputes on behalf of their respective companies.

39.4 If the Dispute has not been resolved within twenty-one (21) days of it being referred to the Company's Lead Commercial Manager (Rail Operations) and the Supplier's [Managing Director] or their deputies in accordance with Clause 39.3 either party may refer the matter for resolution in accordance with the provisions of Clause 42.

39.5 Clauses 39.1 to 39.4 are subject to the Supplier's rights (if any) under the HGCRA to refer a Dispute to adjudication at any time. Any such adjudication shall be in accordance with the Company's Adjudication Rules. For the purposes of this Clause 39.5, "**Adjudication Rules**" means the most recent edition of the Company's adjudication rules on the date of the notice referring adjudication.

## **40 Counterparts**

The Agreement and any Contract may be executed in several counterparts each of which shall be deemed an original and all of which shall constitute one and the same document.

## **41 Partnerships and Joint Ventures**

41.1 If the Supplier is a partnership, the rights, obligations and liabilities of the partners in the partnership under and in connection with the Agreement (in this Clause 41 including any Contract and Call-Off Contract) are joint and several. The Agreement and the liabilities of the partners under or in connection with the Agreement shall not automatically terminate upon the death, retirement or resignation of any one or more members of such partnership or upon the admission of additional partner or partners. The partner or partners in the partnership shall use their reasonable endeavours to procure that any additional partner or partners enter into an agreement with the Company confirming his/her acceptance of the rights, obligations and liabilities of the Supplier under and in connection with the Agreement.

41.2 If the Supplier comprises two (2) or more parties in joint venture, the rights, obligations and liabilities of each such party under or in connection with the Agreement are joint and several.

41.3 Nothing in the Agreement or any Contract or Call-Off Contract shall constitute, or shall be deemed to constitute, a partnership between the parties. Except as expressly provided in the Agreement or any Contract or Call-Off Contract, neither party is deemed to be the agent of the other and neither party holds itself out as the agent of the other.

## **42 Governing Law and Jurisdiction**

42.1 This Agreement and each Contract and Call-Off Contract and any dispute or claim arising out of or in connection with it or its subject matter shall be governed by and construed in accordance with the law of England and Wales.

42.2 The Company and the Supplier submit, subject to the provisions of this Agreement and any Contract or Call-Off Contract, to the exclusive jurisdiction of the courts of England and Wales provided that the Company has the right in its absolute discretion to enforce a judgement and/or to take proceedings in any other jurisdiction in which the Supplier is incorporated or in which any asset of the Supplier may be situated.



## **43 Contracts (Rights of Third Parties) Act 1999**

43.1 Subject to the Replacement Employer's rights in accordance with Clause 26, no person except any member of the TfL Group may enforce the Agreement and any Contract and Call-Off Contract by virtue of the Contracts (Rights of Third Parties) Act 1999, but this does not affect any other right or remedy of a third party arising at law.

43.2 Notwithstanding those rights referred to in Clause 43.1, the Company and the Supplier may agree to vary or rescind the Agreement or any Contract or Call-Off Contract without the consent of any third party.

## **44 Collateral Warranties**

44.1 If required by the Company (including as part of the terms of a Mini-Competition), the Supplier shall procure that the terms of any subcontract require (at the option of the Company) the subcontractor, either at the same time as entering the Contract (and as a condition precedent to it coming into effect) or within seven (7) days of a written request by the Company to the subcontractor, to enter into a collateral warranty in the form set out in Schedule 9 in favour of the Company and, if requested by the Company, the Supplier shall require the subcontractor to provide at the same time an accompanying legal opinion completed and signed by a qualified lawyer from the country in which the subcontractor is resident in the form specified by the Company .

44.2 If any warranty required under Clause 44.1 is not delivered to the Company in accordance with Clause 44.1 the applicable Contract shall not come into effect or one quarter of the aggregate of the Order Price relative to the Goods and/or Services provided by the relevant subcontractor shall be retained in assessments of the amount due and is not payable until such warranty has been delivered.

## **45 Change of Control**

45.1 The Supplier shall not without the prior written consent of the Company implement any change of Control of the Supplier. The Supplier shall give the Company no less than three (3) months' notice of any proposed change of Control. The Company may, for any reason, withhold its consent (or may give consent subject to the satisfaction of certain conditions) and any such change of Control without prior written consent (or without satisfaction of the relevant conditions as required by the Company in its sole discretion) shall entitle the Company (at any time after such change) to terminate the Agreement and any Contracts and Call-Off Contracts.

## 46 Interest

46.1 If either party fails to pay to the other any amount payable in connection with the Agreement or any Contract or Call-Off Contract on or before the due date for payment, interest shall accrue on the overdue amount from the due date for payment until the date of actual payment (whether before or after judgment) at the interest rate specified in the Late Payment of Commercial Debts (Interest) Act 1998. Any interest accruing under this Clause 46.1 shall be immediately payable by the paying party on demand.

46.2 Interest (if unpaid) arising on an overdue amount will be compounded monthly with the overdue amount but will remain immediately due and payable.

## 47 Freedom of Information

47.1 For the purposes of this Clause 47:

**“FOI Legislation”** means the Freedom of Information Act 2000, all regulations made under it and the Environmental Information Regulations 2004 and any amendment or re-enactment of any of them; and any guidance issued by the Information Commissioner, the Department for Constitutional Affairs, or the Department for Environment Food and Rural Affairs (including in each case its successors or assigns) in relation to such legislation;

**“Information”** means information recorded in any form held by the Company or by the Supplier on behalf of the Company; and

**“Information Request”** means a request for any Information under the FOI Legislation.

47.2 The Supplier acknowledges that the Company:

- (a) is subject to the FOI Legislation and agrees to assist and co-operate with the Company to enable the Company to comply with its obligations under the FOI Legislation; and
- (b) may be obliged under the FOI Legislation to disclose Information without consulting or obtaining consent from the Supplier.

47.3 Without prejudice to the generality of Clause 47.2 the Supplier shall and shall procure that its subcontractors (if any) shall:

- (a) transfer to the Company's Representative (or such other person as may be notified by the Company to the Supplier) each Information Request relevant to the Agreement or any Contract or Call-Off Contract, the supply of Goods and Services or any member of the TfL Group that it or they (as the case may be) receive as soon as practicable and in any event within two (2) Working Days of receiving such Information Request; and

- (b) in relation to Information held by the Supplier on behalf of the Company, provide the Company with details about and/or copies of all such Information that the Company requests and such details and/or copies shall be provided within five (5) Working Days of a request from the Company (or such other period as the Company may reasonably specify), and in such forms as the Company may reasonably specify.

47.4 The Company shall be responsible for determining whether Information is exempt information under the FOI Legislation and for determining what Information will be disclosed in response to an Information Request in accordance with the FOI Legislation. The Supplier shall not itself respond to any person making an Information Request, save to acknowledge receipt, unless expressly authorised to do so by the Company.

## **48 Data Transparency**

48.1 The Supplier acknowledges that the Company is subject to the Transparency Commitment. Accordingly, notwithstanding Clause 27 and Clause 47, the Supplier hereby gives its consent for the Company to publish the Contract Information to the general public.

48.2 The Company may in its absolute discretion redact all or part of the Contract Information prior to its publication. In so doing and in its absolute discretion the Company may take account of the exemptions/exceptions that would be available in relation to information requested under the FOI Legislation. The Company may in its absolute discretion consult with the Supplier regarding any redactions to the Contract Information to be published pursuant to Clause 48.1. The Company shall make the final decision regarding publication and/or redaction of the Contract Information.

## **49 Survival**

49.1 The provisions of [Clauses 5 (Records and Audit), 9.11 (Set-Off), 18 (Warranty), 19 (Intellectual Property Rights), 20 (Termination), 22 (Indemnity and Insurance), 26 (Supplier Personnel), 27 (Confidentiality), 29 (Responsible Procurement), 33 (Severance), 34 (Publicity), 35 (Corrupt Gifts and Payments of Commission), 36 (No Waiver), 37 (Entire Contract), 38 (Notices and Service of Process), 39 (Dispute Resolution), 42 (Governing Law and Jurisdiction), 43 (Contracts (Rights of Third Parties) Act 1999), 47 (Freedom of Information), 48 (Data Transparency), 49 (Survival), 50.1 and 50.5 (Transport for London Group)] will survive the termination or expiry of this Agreement and any Contract and Call-Off Contract and continue in full force and effect, along with any equivalent or related terms in any Contract or Call-Off Contract and any other Clauses or Schedules of this Agreement and any Contract or Call-Off Contract necessary to give effect to them. In addition, any other provision of this Agreement and any Contract and Call-Off Contract which by its nature or implication (including in respect of any accrued rights and liabilities) is required to survive the termination will survive such termination as aforesaid.

## 50 Transport for London Group

### 50.1 Declaration of Ineffectiveness and Public Procurement Termination Event

- (a) Without prejudice to the Company's right to terminate the Agreement and any Contract and Call-Off Contract under Clause 20.1, Clause 20.2(a) or at common law, the Company may terminate the Agreement and any Contract and Call-Off Contract at any time in accordance with the provisions of this Clause 50.1 in the event that:
- (i) there is a Declaration of Ineffectiveness; or
  - (ii) there is a Public Procurement Termination Event (without prejudice to the Company's rights of termination implied into the Agreement and each Contract and Call-Off Contract by Regulation 73(3) of the Public Contracts Regulations 2015 or Regulation 89(3) of the Utilities Contracts Regulations 2016).
- (b) In the event that any court makes a Declaration of Ineffectiveness or a Public Procurement Termination Event, the Company shall notify the Supplier. The parties agree that the provisions of this Clause 50.1 shall apply as from the date of receipt by the Supplier of the notification of a Declaration of Ineffectiveness or a Public Procurement Termination Event. Where there is any conflict or discrepancy between the provisions of Clause 20.1 and this Clause 50.1 or the Cessation Plan, the provisions of this Clause 50.1 and the Cessation Plan prevail.
- (c) The Declaration of Ineffectiveness or the Public Procurement Termination Event shall not prejudice or affect any right, liability or remedy which has accrued or which shall accrue to either party prior to or after such Declaration of Ineffectiveness or Public Procurement Termination Event.
- (d) As from the date of receipt by the Supplier of the notification of the Declaration of Ineffectiveness or the Public Procurement Termination Event, the parties (acting reasonably and in good faith) shall agree or, in the absence of such agreement, the Company shall reasonably determine an appropriate Cessation Plan with the object of achieving:
- (i) an orderly and efficient cessation of the supply of Goods and Services or (at the Company's request) a transition of the supply of Goods and Services to the Company or such other entity as the Company may specify; and
  - (ii) minimal disruption or inconvenience to the Company or to public passenger transport services or facilities, in accordance with the provisions of this Clause 50.1 and to give effect to the terms of the Declaration of Ineffectiveness or the Public Procurement Termination Event.

- (e) Upon agreement, or determination by the Company, of the Cessation Plan the parties shall comply with their respective obligations under the Cessation Plan.
- (f) The Company shall pay the Supplier's reasonable costs in assisting the Company in preparing, agreeing and complying with the Cessation Plan. Such costs shall be based on any comparable costs or charges agreed as part of the Agreement and any Contract or Call-Off Contract or as otherwise reasonably determined by the Company. Provided that the Company shall not be liable to the Supplier for any loss of profit, revenue goodwill or loss of opportunity as a result of the early termination of the Agreement and any Contract or Call-Off Contract in accordance with this Clause 50.1.

## **50.2 Crime and Disorder Act 1998**

The Supplier acknowledges that Transport for London is under a duty under Section 17 of the Crime and Disorder Act 1998 (as amended by the Police and Justice Act 2006 and the Policing and Crime Act 2009) to:

- (a) have due regard to the impact of crime, disorder and community safety in the exercise of TfL's duties;
- (b) where appropriate, identify actions to reduce levels of crime and disorder; and
- (c) without prejudice to any other obligation imposed on the Company, exercise its functions with due regard to the likely effect of the exercise of those functions on, and the need to do all that it reasonably can to prevent in its area;
  - (i) crime and disorder (including anti-social and other behaviour adversely affecting the local environment);
  - (ii) the misuse of drugs, alcohol and other substances; and
  - (iii) re-offending

and in the performance of the Agreement and each Contract and Call-Off Contract, the Supplier shall assist and co-operate with the Company and relevant members of the TfL Group and shall use reasonable endeavours to procure that its subcontractors assist and co-operate, with the Company and relevant members of the TfL Group to enable TfL to satisfy its duty.

## **50.3 The Company's business**

The Supplier acknowledges that it:

- (a) has sufficient information about the Company, the TfL Group and other entities listed in Recital (C) above and the supply of Goods and Services;

- (b) is aware of the Company's processes and business and those of the entities in Recital (C);
- (c) has made all appropriate and necessary enquiries to enable it to carry out the supply of Goods and Services in accordance with the Agreement and each Contract and Call-Off Contract;
- (d) is aware of the purposes for which the supply of Goods and Services are required; and
- (e) shall neither be entitled to any additional payment nor excused from any obligation or liability under the Agreement and each Contract and Call-Off Contract due to any misinterpretation or misunderstanding by it of any fact relating to the supply of Goods and Services.

#### **50.4 Best value**

The Supplier acknowledges that TfL is a best value authority for the purposes of the Local Government Act 1999 and as such the Company is required to make arrangements to secure continuous improvement in the way it exercises its functions, having regard to a combination of economy, efficiency and effectiveness. The Supplier shall assist the Company to discharge TfL's duty where possible, and in doing so, shall carry out any review of the supply of Goods and Services reasonably requested by the Company from time to time. The Supplier shall negotiate in good faith (acting reasonably) with the Company any changes to the Agreement and any Contract and Call-Off Contract in order for the Company to achieve best value.

#### **50.5 Data Protection and Cyber Security**

- (a) The Supplier shall comply with all of its obligations under the Data Protection Legislation.
- (b) The Supplier shall follow the 10 Steps to Cyber Security issued by the National Cyber Security Centre (or equivalent or replacement guidance or requirements in place from time to time).

#### **50.6 Conflict of Interest**

- (a) The Supplier acknowledges and agrees that it does not have any interest in any matter where there is or is reasonably likely to be a conflict of interest with the carrying out of the supply of Goods and Services or with any member of the TfL Group or any of the other entities listed in Recital (C), save to the extent fully disclosed to and approved in writing by the Company.
- (b) The Supplier shall undertake ongoing and regular checks for any conflict of interest throughout the duration of the Agreement and any Contract and Call-Off Contract and in any event not less than once in every six (6) months and shall notify the Company in writing immediately on becoming aware of any actual or potential conflict of interest with the

carrying out of the supply of Goods and Services under the Agreement and any Contract and Call-Off Contract or with any member of the TfL Group or applicable entity referred to in Recital (C) and shall work with the Company to do whatever is necessary (including the separation of staff working on, and data relating to, the supply of Goods and Services from the matter in question) to manage such conflict to the Company's satisfaction, provided that, where the Company is not so satisfied (in its absolute discretion) it shall be entitled to terminate the Agreement and any Contract and Call-Off Contract.

#### 50.7 Equality and Diversity

(a) Without limiting the generality of any other provision of the Agreement and any Contract and Call-Off Contract, the Supplier:

- (i) shall not unlawfully discriminate;
- (ii) shall procure that its employees and agents do not unlawfully discriminate; and
- (iii) shall use reasonable endeavours to procure that its subcontractors do not unlawfully discriminate when providing the supply of the Goods or Services,

within the meaning and scope of the Equality Act 2006, the Equality Act 2010 and any other relevant enactments in force from time to time in relation to discrimination in employment.

(b) The Supplier acknowledges that the Company is under a duty under section 149 of the Equality Act 2010 to have due regard to the need to:

- (i) eliminate unlawful discrimination on the grounds of age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, sex and sexual orientation (all "**Protected Characteristics**") and marriage and civil partnership;
- (ii) advance equality of opportunity between persons who share a Protected Characteristic and persons who do not share it; and
- (iii) foster good relations between persons who share a Protected Characteristic and persons who do not.

In performing the Agreement and each Contract and Call-Off Contract the Supplier shall assist and cooperate with the Company where possible in satisfying this duty.

(c) The Supplier shall ensure that its staff, and those of its subcontractors who are engaged in the performance of the Agreement and each Contract and Call-Off Contract comply with the Company's policies in relation to equal opportunities and diversity, workplace harassment

and drugs and alcohol as may be updated from time to time. Copies of these policies are available from the Company at any time on request.

- (d) To the extent that the Company is required to assist or co-operate with TfL in compliance with its duties under the Equality Act 2010 (Specific Duties) Regulations 2011, the Supplier shall assist and co-operate with the Company where possible.
- (e) Within 3 Working Days after the commencement of the Agreement, the Supplier shall provide to the Company a copy of its EDI Policy (in the form submitted to the Company before the parties entered into the Agreement). The Supplier shall keep its EDI Policy under review for the duration of the Agreement (or, if longer, the duration of any Contract or Call-Off Contract) and shall promptly provide the Company with any revised EDI Policy. The Supplier shall comply with Part A of Schedule 8 (*Equality, Diversity and Inclusion*) for the Term or, if longer, the final Contract Term.
- (f) Where the aggregate value of the price of Call-Off Contracts entered into under the Agreement exceeds £1m, the Supplier shall submit to the Company (within 30 days of the aggregate value being reached), and keep under review, an Equality Statement setting out how the Supplier will embed equality, diversity and inclusion in the supply of the Goods and performance of the Services.
- (g) Where the aggregate value of the price of Call-Off Contracts entered into under the Agreement exceeds £5m, the Supplier shall submit to the Company (within 30 days of the aggregate value being reached) an EDI Action Plan in accordance with Part B of Schedule 8 (*Equality, Diversity and Inclusion*).

#### 50.8 Work Related Road Risk

- (a) For the purposes of Clauses 50.8(b) to 50.8(j) of this Agreement, the following expressions shall have the following meanings:

<b>“Alternative Scheme”</b>	has the meaning given to it in Clause 50.8(b)(i);
<b>“Approved Progressive Driver Training”</b>	an ongoing programme of Drivers’ training to ensure they have the appropriate knowledge, skills and attitude to operate safely on urban roads. This includes the training specific for the urban environment (including on-road experience from a cyclist’s perspective), which is required to be completed at least once every 5 years;



<b>“Car-derived Van”</b>	a vehicle based on a car, but with an interior that has been altered for the purpose of carrying larger amounts of goods and/or equipment;
<b>“Category N2 HGV”</b>	a vehicle designed and constructed for the carriage of goods having a MAM exceeding 3,500 kilograms but not exceeding 12,000 kilograms;
<b>“Category N3 HGV”</b>	a vehicle designed and constructed for the carriage of goods and having a MAM exceeding 12,000 kilograms;
<b>“CLOCS Standard”</b>	means the Construction Logistics and Community Safety standard, which aims to eliminate risk of a collision between heavy goods vehicles servicing the construction sector and vulnerable road users by ensuring effective practice in the management of operations, vehicles, drivers and construction sites; further information can be found at: <a href="http://www.clocs.org.uk">www.clocs.org.uk</a>
<b>“Collision Report”</b>	a report detailing all collisions during the previous twelve (12) months involving injuries to persons or fatalities;
<b>“Delivery and Servicing Vehicle”</b>	a HGV, a Van or a Car-derived Van;
<b>“Direct Vision Standard” or “DVS”</b>	Direct Vision Standard, a performance based assessment and rating tool, as updated from time to time that measures how much direct vision a Driver has from a Category N3 HGV cab in relation to other road users. Further information can be found at: <a href="http://www.tfl.gov.uk">www.tfl.gov.uk</a>
<b>“Driver”</b>	any employee of the Supplier (including an agency or contracted driver), who operates Delivery and Servicing Vehicles on behalf of the Supplier while delivering the Goods and Services;
<b>“DVLA”</b>	Driver and Vehicle Licensing Agency;

<b>“FORS”</b>	the Fleet Operator Recognition Scheme, which is an accreditation scheme for businesses operating commercial vehicles including vans, HGV, coaches and powered two wheelers. It offers impartial, independent advice and guidance to motivate companies to improve their compliance with relevant laws and their environmental, social and economic performance;
<b>“FORS Standard”</b>	the standard setting out the accreditation requirements for the Fleet Operator Recognition Scheme, a copy of which can be found at: <a href="http://www.fors-online.org.uk">www.fors-online.org.uk</a>
<b>“Gold Accreditation”</b>	the highest level of accreditation within the FORS Standard, the requirements of which are more particularly described at: <a href="http://www.fors-online.org.uk">www.fors-online.org.uk</a>
<b>“HGV”</b>	a vehicle with a MAM exceeding 3,500 kilograms;
<b>“MAM”</b>	the maximum authorised mass of a vehicle or trailer including the maximum load that can be carried safely while used on the road;
<b>“Silver Accreditation”</b>	the minimum level of accreditation within the FORS Standard acceptable for the contract schedule, the requirements of which are more particularly described at: <a href="http://www.fors-online.org.uk">www.fors-online.org.uk</a>
<b>“Van”</b>	a vehicle with a MAM not exceeding 3,500 kilograms; and
<b>“WRRR Self-Certification Report”</b>	has the meaning given to it in Clause 50.8(h).

**(b) Fleet Operator Recognition Scheme Accreditation**

Where the Supplier operates Delivery and Servicing Vehicles to provide the Goods and Services, it shall within 90 days of the Commencement Date:

- (i) (unless already registered) register for FORS or a scheme, which in the reasonable opinion of the Company, is an acceptable substitute to FORS (the “Alternative Scheme”); and
- (ii) (unless already accredited) have attained the standard of Silver Accreditation (or higher) or the equivalent within the Alternative Scheme and shall maintain the standard of Silver Accreditation (or equivalent standard within the Alternative Scheme) by way of an annual independent audit in accordance with the FORS

Standard or take such steps as may be required to maintain the equivalent standard within the Alternative Scheme. Alternatively, where the Supplier has attained Gold Accreditation, the maintenance requirements shall be undertaken in accordance with the periods set out in the FORS Standard.

**(c) Safety Features on HGVs**

The Supplier shall ensure that every HGV, which it uses to provide the Goods and Services, shall be fitted with safety features consistent with the FORS Silver Accreditation.

**(d) Construction Logistics and Community Safety (CLOCS)**

Where applicable, for Call-Off Contracts for works exceeding a value of £1m:

- (i) the Supplier shall comply with the CLOCS Standard
- (ii) the Supplier shall ensure that the conditions at all sites and locations where:
- (iii) the Services are being delivered, or
- (iv) in connection with the performance of the Services, any waste is being disposed of or supplies are being delivered to or from,

are appropriate for each Category N3 HGV being used in the provision of the Goods and Services.

**(e) Direct Vision Standard (DVS)**

Where applicable, for Call-Off Contracts exceeding a value of £1m where the duration will exceed 12 months and a significant amount of the work will be conducted within the GLA boundaries:

- (i) The Supplier shall comply with the DVS Schedule attached to this Agreement; and
- (ii) the Supplier shall ensure that:
- (iii) from and including 26 October 2019, all Category N3 HGVs used in the provision of Goods and Services achieve a minimum of a one (1) star Direct Vision Standard rating;
- (iv) from and including 26 October 2023 all Category N3 HGVs used in the provision of the Goods and Services achieve a minimum of three (3) star Direct Vision Standard rating.

**(f) Driver Training**

Where the Supplier operates Delivery and Servicing Vehicles to provide the Goods and Services the Supplier shall ensure that each of its Drivers attends Approved Progressive Driver Training throughout the duration of the Agreement and each relevant Contract and Call-Off Contract.

**(g) Collision Reporting**

Where the Supplier operates Delivery and Servicing Vehicles to deliver the Agreement (and Contracts and Call-Off Contracts entered into pursuant to it), the Supplier shall:

- (i) within 15 days of the Commencement Date, provide to the Company a Collision Report. The Supplier shall provide to the Company an updated Collision Report within five Working Days of a written request from the Company at any time.

**(h) Self Certification of Compliance**

Where the Supplier operates Delivery and Servicing Vehicles to provide the Goods and Services, within 90 days of the Commencement Date, the Supplier shall provide a written report to the Company detailing its compliance with Clauses 50.8(b), 50.8(c), 50.8(d), 50.8(e), 50.8(f), 50.8(g) (as applicable) of this Agreement (the "WRRR Self-Certification Report"). The Supplier shall provide updates of the WRRR Self-Certification Report to the Company on each six month anniversary of its submission of the initial WRRR Self-Certification Report.

**(i) Obligations of the Supplier regarding subcontractors**

The Supplier shall ensure that those of its sub-contractors who operate Category N2 HGVs, Category N3 HGVs, Vans and/or Car-derived Vans to provide the Goods and Services shall comply with the corresponding provisions of this Agreement:

- (i) Clauses 50.8(b), 50.8(f), 50.8(g), 50.8(h); and
- (ii) for Category N2 HGVs- Clause 50.8(c); and
- (iii) for Category N3 HGVs- Clauses 50.8(c), and, where applicable 50.8(d), 50.8(e);

as if those sub-contractors were a party to this Agreement.

**(j) Failure to Comply**

Without limiting the effect of any other clause of this Agreement or any Contract or Call-Off Contract relating to termination, if the Supplier fails to comply with any of Clauses 50.8(b),

50.8(c) (where applicable), 50.8(d) (where applicable), 50.8(e) (where applicable), 50.8(f), 50.8(g), 50.8(h), and 50.8(i):

- (i) the Supplier has committed a material breach of this Agreement and any Contract and Call-Off Contract; and
- (ii) the Company may refuse the Supplier, its employees, agents and Delivery and Servicing Vehicles entry onto any property that is owned, occupied or managed by the Company for any purpose (including but not limited to deliveries).

## 51 CompeteFor

51.1 Without prejudice to Clause 30 the Supplier will, on a non-exclusive basis, use the CompeteFor electronic brokerage service (or such alternative web-based tool as the Company may direct from time to time) ("**CompeteFor**") to make available to other suppliers all appropriate opportunities, arising in connection with the Agreement and each Contract and Call-Off Contract, to supply goods, works and services to the Supplier.

51.2 The Supplier will use all reasonable endeavours to ensure that its sub-contractors (for the purposes of this clause, the "**Supplier's Sub-contractors**") use CompeteFor, on a non-exclusive basis, to make available to other sub-contractors all appropriate opportunities, arising in connection with the Agreement and each Contract and Call-Off Contract, to supply goods, works and services to the Supplier's Sub-contractors.

51.3 The Supplier will monitor (and maintain a record of) the number, type and value of opportunities, arising in connection with the Agreement and each Contract and Call-Off Contract, made available to other suppliers via CompeteFor, whether by the Supplier or the Supplier's Sub-contractors, as required by this Clause 51, and will report this information on a quarterly basis by way of email to the Company Representative.

## 52 Criminal Record Declarations

52.1 For the purposes of this Clause 52:

"**Relevant Individual**" means any servant, employee, officer, consultant or agent of either the Supplier or any subcontractor or supplier involved in the provision of, or intended to be involved in provision of, any aspect of the Goods and Services; and

"**Relevant Conviction**" means any unspent criminal conviction relating to actual or potential acts of terrorism or acts which threaten national security.

52.2 The Supplier shall procure from each Relevant Individual (as the case may be) a declaration that he has no Relevant Convictions ("**Declaration**") or disclosure of any Relevant Convictions. A

Declaration shall be procured prior to a Relevant Individual providing any of the Goods and Services. The Supplier shall confirm to the Company in writing on request or in any event not less than once in every year that each Relevant Individual has provided a Declaration. The Supplier shall procure that a Relevant Individual notifies the Supplier immediately if he commits a Relevant Conviction and the Supplier shall notify the Company in writing immediately on becoming aware that a Relevant Individual has committed a Relevant Conviction.

52.3 The Supplier shall not engage or allow to act on behalf of the Supplier or any subcontractor in the performance of any aspect of the Goods and Services any Relevant Individual who has disclosed a Relevant Conviction.

52.4 The Company shall have the right in accordance with the audit rights set out in Clause 5 to audit and inspect the records of the Supplier and its subcontractors and its and their respective employees and agents in order to confirm and monitor compliance with this Clause 52 at any time during performance of the Agreement and each Contract and Call-Off Contract.

52.5 If the Supplier fails to comply with the requirements under Clauses 52.2 and/or 52.3 the Company may, without prejudice to its rights under Clause 20.1, serve notice on the Supplier requiring the Supplier to remove or procure the removal of (as the case may be) any Relevant Individual who has not provided a Declaration from the Agreement and each Contract and Call-Off Contract and/or Company's site with immediate effect and take such steps as are necessary to ensure that such Relevant Individual has no further involvement with the provision of the Goods and Services unless (in the case of non-compliance with Clause 52.2) within seven (7) days of receipt of the notice the Supplier confirms to the Company that he has procured all of the relevant Declarations required under Clause 52.2.

52.6 A persistent breach of Clause 52.2 and/or Clause 52.3 by the Supplier shall entitle the Company to terminate the Agreement and each Contract and Call-Off Contract in whole or in part with immediate effect in accordance with Clause 20.1(a).

52.7 In the event the Company becomes aware that a Relevant Individual has committed a Relevant Conviction, the Supplier shall remove or procure the removal (as the case may be) of such Relevant Individual from the Agreement and each Contract and Call-Off Contract and/or the Company's site with immediate effect and take such steps as are necessary to ensure that such Relevant Individual has no further involvement with the provision of the Goods and Services.

52.8 Nothing in this Clause 52 shall in any way waive, limit or amend any obligation of the Supplier to the Company arising under the Agreement and each Contract and Call-Off Contract and the Supplier's responsibilities in respect of the provision of the Goods and Services remain in full force and effect and the Supplier cannot claim any extra costs or time as a result of any actions under this Clause 52.

## Schedule 1

### Detailed Terms

Commencement Date	05 July 2021
Term	Four (4) years, subject to any extension in accordance with Clause 2.3.
Warranty Period	Two (2) years commencing on the relevant Order Delivery Date
Supplier Address for service of notices (Clause 38): Telephone: Electronic contract management system details:	Whitworth Street, Openshaw, Manchester M11 2DW 0161 223 8166 <a href="https://pro.contract.due-north.com">https://pro.contract.due-north.com</a>
Company Address for service of notices (Clause 38): Telephone: Electronic contract management system details:	5 Endeavour Square, London E20 1JN 0207 918 6505 <a href="https://pro.contract.due-north.com">https://pro.contract.due-north.com</a>
Company Representative: - Framework Agreement - Contracts - Call-Off Contracts/Orders	<div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div> As named in the relevant Order, if different from the Company Representative - Contracts
Supplier Representative: - Framework Agreement - Contracts - Call-Off Contracts/Orders	<div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div> As named in the relevant Order, if different from the Supplier Representative - Contracts
Volume Discount Percentage	<div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div>
Framework Specification	See Schedule 3
The Supplier's total liability for the purpose of Clause 22.9 is	One million pounds sterling (£1,000,000) per annum (commencing on the Commencement Date)

## **Schedule 2**

### **Ethical Sourcing and Modern Slavery Action Plan**

1. The Supplier shall implement an Ethical Sourcing and Modern Slavery Action Plan (“Action Plan”) designed to protect workers from labour exploitations and human rights abuses and ensure compliance with the Modern Slavery Act 2015 and the Responsible Procurement Policy in accordance with Appendix 1 to this Schedule 2.
2. The Supplier will, within 90 days of the Commencement Date produce to the Company an Action Plan identifying the main risks of modern slavery, human trafficking, forced and bonded labour and human rights violations in its supply chain, highlighting the main products and countries involved and the steps to be taken by the Supplier to mitigate the risks in the short, medium and long term.
3. The costs of the creation and implementation of the Action Plan shall be borne by the Supplier.
4. The Supplier will update and provide to the Company the Action Plan annually (within five (5) Working Days of the anniversary of the Commencement Date) for the Term (or any Contract Term if longer). More regular updates will be provided when risks of modern slavery, human trafficking, forced and bonded labour and human rights violations in its supply chain are assessed as imminent by the Supplier or the Company.
5. The Supplier shall, where relevant, train its employees and other personnel and subcontractors to ensure compliance with this Schedule 2. The Supplier shall keep a record of all training completed by its employees and other personnel and subcontractors and shall make a copy of the record available to the Company on request.
6. During the Term (or any Contract Term if longer), if the Company has reasonable cause to believe that the Supplier is not complying with any provision of this Schedule 2 or Clause 29 of the Agreement:
  - a. the Company shall notify the Supplier; and
  - b. the parties shall agree a remediation plan (“Remediation Plan”) with appropriate timeframes for compliance by the Supplier, such Remediation Plan to be agreed by the parties by no later than 30 days from the date of the Company’s notification to the Supplier that remedial action is required or such other period as the parties may otherwise agree in writing (and where the parties fail to agree the plan within such time, the Company shall determine the Remediation Plan).



7. The costs of the creation and implementation of the Remediation Plan shall be borne by the Supplier.
8. Following the agreement or determination of the Remediation Plan, the Company reserves the right to conduct, or require to be conducted, one or more audits, (either itself or via a third party auditor approved by the Company) in relation to compliance by the Supplier with the Remediation Plan.
9. For the avoidance of doubt, the right of audit referred to in paragraph 8 above shall include, without limitation, the right of the Company (or an auditor appointed by the Company) acting reasonably to:
  - a. undertake physical inspections of relevant sites/factories;
  - b. conduct interviews with relevant personnel; and
  - c. inspect relevant documents.
10. The Supplier shall co-operate with the Company and/or the Company's auditor in relation to all aspects of any audit undertaken pursuant to paragraph 8 above.
11. The Supplier shall make the audit reports required pursuant to paragraph 9 above available to the Company through the Supplier's Ethical Data Exchange ("Sedex"), or an equivalent process.

## Appendix 1

1. The Supplier must prepare its Action Plan using the guidance information and template below. The Supplier's Action Plan should be no longer than ten (10) pages in length (excluding relevant policies or similar documents that may be included as appendices) and include:
  - a. the Supplier's ethical sourcing policy, highlighting its key ethical sourcing objectives and the means by which the objectives will be achieved over the Term (or any Contract Term, if longer);
  - b. the Supplier's processes in place to comply with, and any additional processes to be put in place in order to adhere to the principles of the Ethical Trading Initiative (ETI) Base Code, or an equivalent code of conduct;
  - c. identification of the main risks of modern slavery, human trafficking, forced and bonded labour and human rights violations in the Supplier's supply chain, highlighting the main products and source countries involved and the steps the Supplier is taking/will take to mitigate the risks in the short, medium and long term (including appropriate ethical sourcing training for the Supplier's buying staff and other relevant employees);
  - d. the steps the Supplier will take to ensure that its subcontractors implement ethical sourcing policies similar to its own.
  - e. the methods by which the Supplier proposes to monitor and report on the steps it has taken to mitigate risks and their effectiveness; and
  - f. the Supplier's plan may include commissioning on social audit on sites of supply, which may be shared with the Company through Sedex.

<b>ETI Base Code Item (Examples)</b>	<b>Modern Slavery or Other Risk of Human Rights Abuse (Examples)</b>	<b>Mitigating or Capacity Building Action</b>	<b>When</b>	<b>Person Responsible</b>	<b>Resource Implications</b>	<b>Measure of Success</b>

### **Schedule 3**

### **Framework Specification**



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## Foreword

### Protection notice

The reproduction, distribution and utilisation of this document as well as the communication of its contents to others without express authorisation are prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

Refer to ISO 16016 (1) for translations of this protection notice in other languages.

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### Information security

This document is TfL unclassified, as defined by TfL standard S1782 (2).

### Interpretation

This document shall be interpreted in accordance with revision 1 of PVEC3149-LU-RSK-CLI-SP-0091-00 (3), except for defined terms, which are:

- Capitalised if they are defined terms in the framework agreement between the Company and the Supplier regarding procurement TfL-00716 (the Agreement)
- Not emphasised, by single quotation marks or otherwise, if they are defined by this document or the documents cited by the glossary, as per the *Rules for the structure and drafting of UK standards: 2017* (4)

Attention is drawn to the following:

- “shall” indicates a requirement
- “should” indicates a recommendation
- “may” indicates a permission
- “can” indicates a possibility or a capability.
- The use of “... or shall otherwise provide equivalent or better outcomes” permits diverse means of achieving conformity.
- Text prefixed by “NOTE” provides information and/or guidance, and does not form part of the corresponding requirement(s).
- Some requirements are restricted in scope, particularly those applying to rail vehicles (rolling stock), e.g. 3.1.7, 3.7.5 and 3.9.3.

### Citations and cross-references

Citations are indicated by numerals in brackets in accordance with BS ISO 690:2010 (5). Cross-references are hyperlinked to the corresponding item.

### Printing

Please consider the environment before printing this document and be aware that the glossary (section 8) runs from page 71 until the bibliography (section 9), which starts on page 93 and runs until the end of the document on page 124.

## Document history

See TfL-00716-0003-01-BAA (6) for the details of minor revisions.

**Table 1: Document history**

Revision	Change	Author	Date YYYY-MM-DD
1	First major revision for approval.		2021-06-10
2	Second major revision based on feedback from preparation for first Mini-Competition.		2021-06-14
3	Third major revision for execution of the Agreement.		2021-06-22

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## Changes to requirements between major revisions

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

**Table 2: List of changes to requirements**

New revision	Provision	Change category	Description	Date YYYY-MM-DD
2	1.6.1.3	T	For the avoidance of doubt, welding procedure qualification records (WPQRs) and welding procedure specifications (WPSs) have been included in the Contractual Documentation related to quality management. This should happen as a result of the existing welding requirements, so is categorised as a text change.	2021-06-14
2	4.1.1	T	For the avoidance of doubt, the term “maintenance support” has been changed to “maintenance services” (see 8.19.10) to avoid confusion with support services, referred to by a Contract, which are outside the scope of supply, but are nevertheless required to fulfil that Contract.	2021-06-14
3	6.3.2.2	T	TfL procedure PR0190 for signalling equipment with TfL design authority has been included for information.	2021-06-16
3	3.7.11	T	For the avoidance of doubt, BS EN 15085-3 weld performance class has been included in the list of information for confirmation by the Supplier. This should happen as a result of the existing welding requirements, so is categorised as a text change.	2021-06-21
3	3.7.11	T	Note added on BS EN 15085-4:2007 requirement for BS EN ISO 9013 class 33.	2021-06-22

# 1 Scope

## 1.1 General

- 1.1.1 This document specifies the requirements for the supply of bespoke components and related services (the Goods and Services) to Transport for London (TfL) under the Agreement.
- 1.1.2 The Supplier may use external providers to supply the required capabilities, subject to the terms of the Agreement.

NOTE: Section 6.10 of BS ISO 10005:2018 (7) and sections 8.1.1, 8.1.2 and 8.4 of PD ISO/TS 22163:2017 (8) specify guidance and requirements for quality management of externally provided processes, products and services, as required by section 2.5 of this Specification.

## 1.2 Contract Specifications

- 1.2.1 Contracts awarded under the Agreement have Contract Specifications, defined by the corresponding Request Form, which may include more detailed requirements.
- 1.2.2 Contract Specifications may cite technical documentation (8.20.9) of the relevant Goods and/or Serviced Goods, which may include:

- 1.2.2.1 Technical product specifications (8.20.11), usually drawings and computer aided design (CAD) data
- 1.2.2.2 Maintenance documentation, such as equipment overhaul specifications, work instructions (8.19.14), illustrated parts lists (8.19.7) and minimum acceptable condition standards (8.19.11)

NOTE: TfL procedure PR0005 (9), specifies how technical documentation for procurement purposes is validated by TfL Engineering.

- 1.2.3 Contract Specifications may also cite other documented information provided by the Company during the corresponding Mini-Competitions.
- 1.2.4 In the event of a conflict, the order of precedence is:
  - 1.2.4.1 The relevant Contract Specification
  - 1.2.4.2 This Specification
  - 1.2.4.3 The cited information resource(s)

## 1.3 Principal asset groups

- 1.3.1 The principal asset groups for which Contracts are likely to be placed are:
  - 1.3.1.1 London Underground (LU) rolling stock
  - 1.3.1.2 LU signalling
  - 1.3.1.3 LU permanent way, commonly known as “track”

## 1.4 Goods

- 1.4.1 The Goods may relate to any asset (8.2.3) in the TfL Network and include all items required by the relevant Contract Specification, including, but not limited to:
- 1.4.1.1 Bespoke components (8.2.4), which may be parts (8.2.9) or assemblies (8.2.2)
  - 1.4.1.2 Commercial off-the-shelf (8.2.5) products and consumables (8.2.7) that are part of the bespoke components, such as:
    - 1.4.1.2.1 Mechanical fasteners
    - 1.4.1.2.2 Bearings
    - 1.4.1.2.3 Seals
    - 1.4.1.2.4 Sealants
    - 1.4.1.2.5 Pipes, hoses and associated fittings
    - 1.4.1.2.6 Lubricants
    - 1.4.1.2.7 Adhesives
    - 1.4.1.2.8 Coatings
- 1.4.2 Bespoke component parts covered by the Agreement are typically made of metals, such as steels, irons, aluminium alloys and copper alloys, and can be made using a variety of manufacturing processes, such as casting, forming, machining, welding and other joining methods.
- 1.4.3 Some bespoke component parts are made of non-metallic materials, such as machinable plastics and wood.
- 1.4.4 Most bespoke component parts will require surface finishing and/or coating.
- 1.4.5 The Goods include all products and support services required to conform to the Quality Plan and Contract Quality Plans, including, but not limited to preservation products and services, such as packaging and delivery.
- 1.4.6 The transition period for the UK's exit from the EU ended on 31 December 2020. The UK government has issued guidance on how to comply with regulations on manufactured goods placed on the Great British market from 1 January 2021 (10).

## 1.5 Services

- 1.5.1 The Services may relate to any asset in the TfL Network and are divided into two categories and four sub-categories:
- 1.5.1.1 Maintenance Services (8.19.10):
    - 1.5.1.1.1 Overhaul (8.19.11) Services
    - 1.5.1.1.2 Repair (8.19.13) Services

1.5.1.2 Engineering Services (8.20.4), if offered by the Supplier in their bid:

1.5.1.2.1 Technical documentation (8.20.9) Services

1.5.1.2.2 Reverse engineering (8.20.8) Services

1.5.2 The Serviced Goods include all component parts that are required to successfully deliver the Services, including, but not limited to:

1.5.2.1 Spare parts (8.2.12), which may be new, repaired or overhauled, subject to the requirements of the relevant Contract Specification

1.5.2.2 Commercial off-the-shelf products (8.2.5)

1.5.2.3 Consumables (8.2.7)

1.5.3 The Services include all products and support services required to conform to the Quality Plan and Contract Quality Plans, including, but not limited to preservation products and services, such as packaging and delivery.

## 1.6 Contractual Documentation

1.6.1 The Contractual Documentation includes:

1.6.1.1 Order Programmes

1.6.1.2 The Quality Plan and Contract Quality Plans

1.6.1.3 Documented information required by the Quality Plan and Contract Quality Plans, including, but not limited to:

1.6.1.3.1 Declarations of Conformity (DoCs, as defined by the Agreement)

1.6.1.3.2 Documented information (8.5.9) that supports Declarations of Conformity, including quality records, such as those defined by BS EN ISO 3834

NOTE: At the time of writing, section 18 of parts 2, 3 and 4 of BS EN ISO 3834 respectively define comprehensive (11), standard (12) and elementary (13) quality records for fusion welding of metallic materials.

1.6.1.3.3 Paint work specifications (8.17.2)

1.6.1.3.4 Release specifications (8.5.13)

1.6.1.3.5 Preservation specifications (8.5.12)

1.6.1.3.6 Test plans

1.6.1.3.7 Test specifications

1.6.1.4 Maintenance documentation, including, but not limited to written procedures for assembly, disassembly, overhaul and repair

- 1.6.1.5 Outputs of engineering Services that are documented information, including document management plans
- 1.6.1.6 Documented information required by the output acceptance process, including that related to interface management
- 1.6.1.7 Any other documented information required to conform to this Specification and the Contract Specifications

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## 2 General requirements

NOTE: Refer to glossary section 8.2 for terms, definitions and abbreviations.

### 2.1 Inputs

- 2.1.1 The Standards and additional standards, to which the Goods, Services, Serviced Goods and Contractual Documentation shall conform, include all relevant:
- (a) TfL Standards
  - (b) British Standards, including UK implementations of Standards developed by CEN, ISO, IEC, IEEE, ASTM and other standards bodies, i.e. those published by the British Standards Institution (BSI) and prefixed with “BS” for “British Standard”
  - (c) BSI Published Documents, including UK implementations of documents developed by CEN, ISO, IEC, IEEE, ASTM and other standards bodies, i.e. those published by the BSI and prefixed with “PD”
  - (d) British Railway Group Standards and British Rail Industry Standards
  - (e) UIC leaflets and International Railway Solutions

A Standard or additional standard is relevant to a Contract if it is required by the Specification, the Contract Specification, or otherwise necessary for the Goods, Services, Serviced Goods and Contractual Documentation to be fit for purpose.

NOTE 1: Access to the TfL management system library, which contains all TfL Standards, policies, procedures, guidance and reference documents, can be requested via a TfL Project Sponsor, TfL Project Manager or TfL Commercial Contract Manager, who will need to follow the instructions at:

<https://transportforlondon.sharepoint.com/sites/TMS/SitePages/Request-external-access.aspx>.

NOTE 2: At the time of writing, British Railway Group Standards and British Rail Industry Standards are published at: <https://catalogues.rssb.co.uk/railway-group-standards>.

NOTE 3: At the time of writing, UIC leaflets are gradually being replaced by International Railway Solutions, as described at: <https://uic.org/standardisation/>.

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- 2.1.2 Except where otherwise specified, the revision of any Standard or other information resource that is current on the date of Contract execution shall be the revision of that Standard or other information resource that applies to the Contract.

NOTE 1: Attention is drawn to the distinction between the date the Agreement is executed and the dates on which Contracts are executed under the Agreement as a result of the corresponding Mini-Competitions, the latter dates being the dates of Contract execution.

NOTE 2: Given the duration of the Agreement and that British Standards are reviewed every five years (14), as are TfL Standards, different revisions of the same information resource may apply to different Contracts.

NOTE 3: Cited information resources are current at the time of writing, but may be withdrawn and/or superseded on or before the relevant date of Contract execution.

- 2.1.3 The Supplier shall be responsible for making all enquiries and obtaining all information necessary for them to conform to the Specification and Contract Specifications.

NOTE: Many cited information resources have an access cost. TfL Engineering strongly recommends that the Supplier maintains timely and legal access to the specified information resources.

- 2.1.4 At the start of each Contract, the Supplier shall confirm with the Company, including the TfL Engineer, the information to be supplied by the Company, including any optional information, as specified by the applicable product and constituent product Standards, and other technical documentation.

NOTE: Standards for technical delivery conditions normally specify the mandatory and optional information to be supplied by the purchaser.

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## 2.2 Communication

- 2.2.1 The Supplier shall communicate with the Company in English with at least a proficiency of level C2 in the Common European Framework of Reference for Languages (CEFR).

NOTE 1: At the time of writing, CEFR level C2 is defined as follows:

*“Can understand with ease virtually everything heard or read. Can summarise information from different spoken and written sources, reconstructing arguments and accounts in a coherent presentation. Can express him/herself spontaneously, very fluently and precisely, differentiating finer shades of meaning even in more complex situations.”*

NOTE 2: At the time of writing, information on the CEFR is published at: <https://www.coe.int/en/web/common-european-framework-reference-languages/level-descriptions>.

- 2.2.2 Written text shall conform to British English spelling and grammar, as defined by Oxford University Press.

NOTE: At the time of writing, Oxford University Press publishes free dictionary and grammar content at: <https://www.lexico.com/>.

- 2.2.3 All technical communication with the Company shall include the TfL Engineer.

- 2.2.4 The Supplier shall provide written feedback on technical matters to the Company, as appropriate and as soon as reasonably practicable, including, but not limited to the following circumstances:

- (a) At the request of the Company
- (b) To mitigate a risk
- (c) To take an opportunity
- (d) To notify of and discuss with the Company any contradictions, issues, interfaces, assumptions, dependencies or caveats of which they become aware

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## 2.3 Management of safety, health and environment

NOTE: Refer to glossary section 8.3 for terms, definitions and abbreviations.

- 2.3.1 The Supplier shall support the Company in conforming to TfL Standard S1538 for Contracts in the scope of that Standard.

NOTE 1: TfL Standard S1538, *Assurance* (15), is a fundamental part of LU's safety management system, which is approved by the Office of Rail and Road (ORR, <https://www.orr.gov.uk/>).

NOTE 2: At the time of writing, the *London Underground Safety Certificate and Safety Authorisation*, which describes the LU safety management system, is published at: <https://tfl.gov.uk/corporate/publications-and-reports/underground-safety-certificate>.

NOTE 3: In most circumstances, the support required is the supply of the documented information required by this Specification and the Contract Specifications, particularly in support of the output acceptance process. See sections 6 and 7 of this Specification.

- 2.3.2 Goods and Serviced Goods shall not contain the chemicals listed in the Stockholm Convention on Persistent Organic Pollutants as a component in the production process of the Goods and Serviced Goods, or of their raw materials.

NOTE 1: There is UK legislation regarding the Stockholm Convention, including the Persistent Organic Pollutants Regulations 2007 (as amended).

NOTE 2: At the time of writing, UK government advice on using persistent organic pollutants is published at: <https://www.gov.uk/guidance/using-persistent-organic-pollutants-pops>.

- 2.3.3 Safety data sheets that conform to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) shall be provided by the Supplier for all chemical substances and mixtures in the Goods and Serviced Goods.

NOTE: From 1 January 2021, the European Union (EU) Chemicals classification, labelling and packaging (CLP) Regulation has been replaced in Great Britain by retained EU law called the GB CLP Regulation. The Health and Safety Executive (HSE) is now the GB CLP Agency and, at the time of writing, its guidance is published at: <https://www.hse.gov.uk/brexit/clp.htm>.

- 2.3.4 When supplying Services on LU operational property or other LU premises that affect the operational railway, the Supplier shall conform to the quality, environment, safety and health (QUENSH) requirements in a completed copy of TfL form F0780 that has been agreed with the Company, including the TfL Engineer, for each relevant Contract.

NOTE: TfL form F0780 (16) is used alongside TfL Standard S1552 (17) to define and agree QUENSH requirements for services supplied on LU operational property or other LU premises that affect the operational railway.

2.3.5 The Supplier shall notify the Company as soon as reasonably practicable of any occupational health and safety risks or opportunities related to the Goods, Serviced Goods and Services that are, or might be, relevant to the Company, including, but not limited to, those related to:

- (a) Hazardous substances
- (b) Fire
- (c) Electricity
- (d) Vibration
- (e) Noise
- (f) Artificial optical radiation, e.g. lasers
- (g) Manual handling
- (h) Lifting operations
- (i) Working at height

2.3.6 The Supplier shall consider vulnerable people when notifying the Company of relevant occupational health and safety risks or opportunities, including, but not limited to:

- (a) New and expectant mothers
- (b) Young people
- (c) People with medical conditions

NOTE: Young people between the ages of 13 and 18 may be present on Company premises while on work experience placements.

2.3.7 The Supplier shall notify the Company as soon as reasonably practicable of any environmental risks related to the Goods, Serviced Goods and Services that are, or might be, relevant to the Company, including, but not limited to, those related to:

- (a) Emissions to air
- (b) Releases to water
- (c) Releases to land
- (d) Use of raw materials and natural resources
- (e) Use of energy
- (f) Energy emitted, e.g. heat, radiation, vibration, noise, light
- (g) Generation of waste and/or by-products
- (h) Use of space

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## 2.4 Project management

NOTE: Refer to glossary section 8.4 for terms, definitions and abbreviations.

2.4.1 The Supplier shall establish, implement and maintain project plans for achieving conformity to Contract Specifications and delivering Orders.

2.4.2 The Supplier shall manage projects, including Order Programmes, in accordance with BS 6079, or shall otherwise provide equivalent or better outcomes.

NOTE 1: BS 6079:2019 (18) is current at the time of writing.

NOTE 2: BS ISO 21502:2020 (19) also provides guidance on project management, but does not cover programmes, portfolios, governance, work breakdown structures or earned value management, which are covered by other Standards in the BS ISO 21500 series.

2.4.3 Project gate dates shall be agreed with the Company, including the TfL Engineer.

2.4.4 Project plans and Order Programmes shall integrate with the project plans and programmes of the Company and all other relevant stakeholders.

2.4.5 Project plans shall have work breakdown structures that meet the recommendations and follow the guidance of BS ISO 21511, or shall otherwise provide equivalent or better outcomes.

NOTE: BS ISO 21511:2018 (20) is current at the time of writing.

2.4.6 Work breakdown structures shall include, but not be limited to:

- (a) Project gates
- (b) The preparation, review, approval, release, replacement and withdrawal of Contractual Documentation
- (c) Output acceptance activities, including submissions and reviews
- (d) Interface management activities
- (e) Production activities, including the production of prototypes, production first articles, series production first batches and series production
- (f) Verification and validation activities
- (g) The Supplier's internal reviews

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## 2.5 Quality management

NOTE: Refer to glossary section 8.5 for terms, definitions and abbreviations.

2.5.1 The Supplier shall conform to the Quality Plan and Contract Quality Plans, or shall otherwise provide equivalent or better outcomes.

2.5.2 The Quality Plan and Contract Quality Plans shall meet the recommendations and follow the guidance of BS ISO 10005.

NOTE: Applying a process approach to quality plans enables the creation of a coherent system of interrelated processes between the Supplier, its supply chain and the Company. Annex B of BS ISO 10005:2018 (7) provides a schematic representation of a process approach applied to quality plans.

2.5.3 The requirements of PD ISO/TS 22163 shall be inputs to the Quality Plan and Contract Quality Plans as if they were the management system requirements of the Supplier.

NOTE 1: PD ISO/TS 22163:2017 (8) specifies management system requirements for organisations in the rail sector. It includes all the requirements of BS EN ISO 9001:2015 (21) and supplementary requirements specific to the rail sector.

NOTE 2: Document LU-RSE-CS-0022-00-AQA (22) provides an example quality plan format that references the relevant sections of BS ISO 10005:2018 (7) and PD ISO/TS 22163:2017 (8), alongside supporting information resources. If used by the Supplier, this example should be adapted to the specific case appropriately and with care.

2.5.4 The factors related to risks and opportunities listed by BS 95009 shall be inputs to the Quality Plan and Contract Quality Plans.

NOTE: BS 95009:2019 (23) is current at the time of writing.

2.5.5 The Quality Plan and Contract Quality Plans shall maximise the Supplier's integration with the Company's quality management, including, but not limited to the Company's:

- (a) Systems
- (b) Processes
- (c) Procedures
- (d) Documented information

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2.5.6 Contract Quality Plans shall consider the suitability of each capability proposed for each Contract, including, but not limited to:

- (a) Characteristics in the capability list
- (b) Suitability for component material(s)
- (c) Suitability for component design(s)
- (d) Economic considerations
- (e) Quality issues

NOTE: The following information resources are useful in achieving conformity to this requirement:

- *Manufacturing Process Selection Handbook: From design to manufacture*, by Ken Swift and Julian Booker (24)
- *Fundamentals of Manufacturing, Third Edition*, by Philip Rufe (25)

2.5.7 Competence requirements in the Quality Plan and Contract Quality Plans shall be based on publicly available competence Standards.

NOTE 1: At the time of writing, the National Occupational Standards (NOS) for the UK are published at: <https://www.ukstandards.org.uk/>.

NOTE 2: At the time of writing, the UK Standard of Professional Engineering Competence (UK-SPEC) is published at: <https://www.engc.org.uk/standards-guidance/standards/uk-spec/>.

NOTE 3: At the time of writing, the UK Engineering Council provides an interactive map that describes how engineering competence is regulated in other countries and what degree of equivalence exists between the UK-SPEC and the corresponding standards in other countries at: <https://www.engc.org.uk/international-activity/international-relationships-map/>.

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2.5.8 The Supplier shall have and maintain a list of its capabilities and the characteristics of each capability, including, but not limited to:

- (a) Name
- (b) Description, if the capability does not conform to a term defined by this Specification
- (c) Material(s) to which the capability can be applied
- (d) Workpiece dimension limits
- (e) ISO 2768 tolerance classes that can be achieved
- (f) For welded structures, ISO 13920 tolerance classes that can be achieved
- (g) For castings, ISO 8062-3 and ISO 8062-4 tolerance classes that can be achieved, which should be detailed in annexes to the list due to their complexity
- (h) ISO 1302 surface textures that can be achieved
- (i) Maximum throughput that can be achieved in workpieces per unit of time, e.g. workpieces per hour
- (j) Typical lead time from receipt of Order
- (k) Origin (internal or external to the Supplier)
- (l) Quality management system certification
- (m) Remarks

The list shall be provided in a format agreed with the Company and shall be included as an annex to the Quality Plan.

NOTE 1: BS EN 22768-1:1993 (26) covers general tolerances for linear and angular dimensions, is current at the time of writing and identical to ISO 2768-1:1989 (27).

NOTE 2: BS EN 22768-2:1993 (28) is identical to ISO 2768-2:1989 (29) and covers general geometrical tolerances. It was superseded on 22 February 2021 by BS EN ISO 22081:2021 (30), which specifies rules for the definition and interpretation of general geometrical specifications and general size specifications. ISO 22081 does not specify tolerance classes, so technical product specifications that previously applied ISO 2768 geometrical tolerance classes should now include general tolerance tables that conform to ISO 22081.

NOTE 3: BS EN ISO 13920:1997 (31) is current at the time of writing.

NOTE 4: BS EN ISO 8062-3:2007 (32) defines dimensional and geometrical tolerances, and machining allowance grades, for castings. Attention is drawn to the introduction to BS ISO 8062-4:2017 (33), which discusses various issues with BS EN ISO 8062-3:2007 (32).

NOTE 5: BS EN ISO 8062-4:2017 (33) defines general geometrical tolerances using surface profile tolerances related to a general datum system that remains on the final part. It also specifies machining allowances and draft angles (tapers) for castings.

NOTE 6: BS EN ISO 1302:2002 (34) specifies rules for the indication of surface texture by means of:

- (a) Profile parameters according to ISO 4287 (35)
- (b) Motif parameters according to ISO 12085 (36)

- (c) Parameters related to the material ratio curve according to ISO 13565-2 (37) and ISO 13565-3 (38)

NOTE 7: At the time of writing, aside from those specified by BS ISO 10791-7:2020 (39) and BS ISO 13041-6:2009 (40), there are no standard workpieces that can be used to benchmark throughput and lead time, so the assumptions for these characteristics should be described in the remarks. If throughput and lead time are too variable to indicate, this should be stated in the remarks.

- 2.5.9 The Supplier shall manage product fraud risk in accordance with BS ISO 22380, or shall otherwise provide equivalent or better outcomes.

NOTE: BS ISO 22380:2018 (41) is current at the time of writing.

- 2.5.10 The Supplier shall manage obsolescence in accordance with BS EN IEC 62402, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN IEC 62402:2019 (42) is current at the time of writing.

- 2.5.11 The Supplier shall manage obsolescence of chemical products in accordance with BS EN 9278, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN 9278:2018 (43) is current at the time of writing.

- 2.5.12 The Supplier shall undertake root cause analysis and problem solving in accordance with BS EN 9136, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN 9136:2018 (44) is current at the time of writing.

- 2.5.13 The Supplier shall treat the following as special processes:

- (a) Adhesive bonding
- (b) Sealing
- (c) Casting
- (d) Crimping
- (e) Heat treatment
- (f) Riveting
- (g) Installation of threaded inserts
- (h) Surface treatment, including painting and coating
- (i) Torque tightening
- (j) Welding

NOTE 1: Attention is drawn to the definition of a special process (8.5.15).

NOTE 2: PD ISO/TS 22163:20017 (8) specifies requirements for special processes.

- 2.5.14 The Supplier shall undertake first article inspection (FAI) in accordance with BS EN 9102, or shall otherwise provide equivalent or better outcomes.

NOTE 1: BS EN 9102:2015 (45) is current at the time of writing.

NOTE 2: TfL procedure PR0004 (46) is the principal source of requirements for FAI undertaken by the Company.

NOTE 3: TfL guidance document G1061 (47) provides additional guidance for FAI of track components undertaken by the Company.

- 2.5.15 All supporting documentation necessary to substantiate a Declaration of Conformity shall be provided with that Declaration of Conformity and shall conform to BS EN ISO/IEC 17050-2.

NOTE 1: The Agreement defines Declarations of Conformity.

NOTE 2: BS EN ISO/IEC 17050-1:2010 (48) specifies requirements for supplier declarations of conformity.

NOTE: BS EN ISO/IEC 17050-2:2004 (49) specifies requirements for supporting documentation of supplier declarations of conformity.

- 2.5.16 Supporting documentation for Declarations of Conformity of Goods made of metal shall include BS EN 10204 type 2.2, 3.1 or 3.2 inspection documents for the raw materials and semi-finished constituent products. BS ISO 10474 type 2.2, 3.1 or 3.2 inspection documents are acceptable alternatives for steel products covered by BS ISO 404 and BS ISO 4990.

NOTE 1: BS EN 10204:2004 (50) defines types of inspection documents for metallic products.

NOTE 2: BS ISO 10474:2013 (51) defines types of inspection documents for steel products.

NOTE 3: At the time of writing, BS ISO 404:2013 (52) specifies the general technical delivery requirements for steel products covered by ISO 6929:2013 (53), with the exception of steel castings and powder metallurgical products, which are covered by BS ISO 4990:2015 (54).

- 2.5.17 Supporting documentation for Declarations of Conformity shall include declarations of conformity and supporting documentation for any relevant externally provided process, product or service. For the avoidance of doubt, this applies to all tiers of the supply chain, i.e. the Supplier shall procure declarations of conformity for relevant processes, products or services that are external to its external providers.

- 2.5.18 Test specifications and test reports that support Declarations of Conformity shall conform to BS EN ISO/IEC 17025.

NOTE: Section 7.8 of BS EN ISO/IEC 17025:2017 (55) specifies requirements for test reports.



- 2.5.19 The decision rules for verifying conformity or nonconformity of workpieces with their specifications shall be specified by BS EN ISO 14253-1.

NOTE: BS EN ISO 14253-1:2017 (56) explains how to define default acceptance and rejection zones (i.e. decision rules), particularly when a measured value falls close to the upper or lower specification limit.

- 2.5.20 Agreements between the Supplier and the Company on disputed measurement uncertainty statements regulated in accordance with BS EN ISO 14253-1 shall be reached by following the guidance and procedures defined by BS EN ISO 14253-3.

NOTE: The procedures in BS EN ISO 14253-3:2011 (57) are intended to avoid costly and time-consuming disputes.

- 2.5.21 The Supplier shall establish, implement and maintain release specifications for the Goods and Serviced Goods, which shall include, but not be limited to:

- (a) Requirements specified by PD ISO/TS 22163 for the release of products
- (b) Permissible surface and edge imperfections
- (c) Cleanliness

- 2.5.22 Goods and Serviced Goods shall have intact surfaces and edges and shall be free of burrs consistent with the method of manufacture. Any burr that negatively influences the performance of the item or interfacing systems, or that would be a safety hazard when handled, shall be removed.

- 2.5.23 Goods and Serviced Goods shall be delivered in a clean condition.

NOTE 1: BS EN ISO 12944-4:2017 (58) specifies cleaning and other surface preparation methods for carbon and low alloy steel structures prior to painting.

NOTE 2: BS EN 13887:2003 (59) specifies cleaning and other surface preparation methods for metals and plastics prior to adhesive bonding.

NOTE 3: Fine bubble technology can be used to remove salt and oil contamination and can lead to improvements in the sustainability and safety of cleaning. See PD ISO/TS 21256-1:2020 (60), BS ISO 21256-2:2020 (61) and PD ISO/TR 24217-2:2021 (62).

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2.5.24 Cleanliness specifications shall include, but not be limited to, the cleanliness levels of the following contaminants:

- (a) Corrosion
- (b) Mill scale
- (c) Salts
- (d) Particulates
- (e) Oils
- (f) Greases

NOTE: Oils, greases and other chemical products that would otherwise be contaminants may have a functional purpose, in which case they may be tolerable above the cleanliness level that would normally be expected. For example, uncoated steel items may be lightly oiled to prevent corrosion, whereas oil should normally be removed so far as is reasonably practicable from coated steel items.

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2.5.25 The Supplier shall establish, implement and maintain preservation specifications for the Goods and Serviced Goods, which shall include, but not be limited to, requirements for:

- (a) Marking and labelling for identification
- (b) Integration with the Company's material management system
- (c) Manual handling
- (d) Control of substances hazardous to health
- (e) Classification of acceptable environments
- (f) In-storage cleaning and maintenance requirements
- (g) Packaging, including its sustainability
- (h) Transport providers

NOTE 1: At the time of writing, the UK Health and Safety Executive guidance on manual handling is published at:

<http://www.hse.gov.uk/msd/manualhandling.htm>.

NOTE 2: PD ISO/TR 12295:2014 (63) provides guidance on the use of the ISO 11228 series of Standards, which address manual handling.

NOTE 3: At the time of writing, the UK Health and Safety Executive guidance on control of substances hazardous to health (COSHH) is published at:

<http://www.hse.gov.uk/coshh/>.

NOTE 4: BS EN IEC 60721-3 defines classes of environmental parameters and their severities, and may be used for defining the maximum short-term environmental stresses on a product. The parts of BS EN IEC 60721-3 that are current at the time of writing are:

- 0: Introduction (64)
- 1: Storage (65)
- 2: Transportation and handling (66)
- 3: Stationary use at weather protected locations (67)
- 4: Stationary use at non-weather protected locations (68)
- 5: Ground vehicle installations (69)
- 6: Ship environment (70)
- 7: Portable and non-stationary use (71)
- 9: Microclimates inside products (72)

NOTE 5: BS 1133 is the British Standard packaging code and has the following parts that are current at the time of writing:

- 7.6: Moulded pulp packaging (73)
- 8: Wooden boxes, cases and crates (74)
- 10.1: Tins and cans (75)
- 15: Tensional strapping (76)
- 19: Use of desiccants in packaging (77)
- 21: Films and foils (78)
- 22: Packaging in plastics containers (79)

NOTE 6: BS EN 13876:2002 (80) provides guidance for the effective and efficient management of customer's cargo throughout the transport process.

- 2.5.26 The position, content and application of the Supplier's and manufacturer's marks on the Goods and Serviced Goods shall be subject to the acceptance of the Company, including the TfL Engineer.

NOTE: The manufacturer's mark should include at least:

- (a) Identification of the manufacturer
- (b) Traceability reference that identifies the production batch and any specific inspection undertaken
- (c) Material designation

- 2.5.27 Except where otherwise specified, certification of products, processes and services shall be by a certification body accredited as conforming to BS EN ISO/IEC 17065 by an accreditation body member of the International Accreditation Forum (IAF).

NOTE 1: Certification is not normally required, the exception being certification of special processes, such as welding (section 3.7) and adhesive bonding (section 3.9).

NOTE 2: BS EN ISO/IEC 17065:2012 (81) is current at the time of writing.

NOTE 3: At the time of writing, a list of the accreditation body members of the IAF is published at:

[https://www.iaf.nu/articles/IAF\\_MEMBERS\\_SIGNATORIES/4](https://www.iaf.nu/articles/IAF_MEMBERS_SIGNATORIES/4)

NOTE 4: The UK Accreditation Service (UKAS, <https://www.ukas.com/>) is the UK member of the IAF.

- 2.5.28 Conversion of hardness values shall conform to BS EN ISO 18265.

NOTE: BS EN ISO 18265:2013 (82) specifies the principles of the conversion of hardness values to equivalent values in other hardness scales and to estimates of tensile strength. Attention is drawn to the guidance in the national foreword to this Standard.

- 2.5.29 Conversion of inch and metric sizes shall conform to BS 2856.

NOTE: BS 2856:1973 (83) provides a procedure for conversion of inch and metric sizes that will give the accuracy required for precise dimensional interchangeability.

- 2.5.30 Except where otherwise specified, conversion of measurement units shall conform to BS 350.

NOTE: BS 350:2004 (84) is current at the time of writing.

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- 2.5.31 Material concessions submitted to the Company that cover threaded components shall consider the risks of mismatched thread forms and diameters.

**WARNING:** Any incorrect assembly involving thread forms or diameters is potentially hazardous and might result in a loss of strength in the threaded connection of over 50 %. Depending on the function of the threaded connection and the presence of any secondary security, consequent failure can lead to material damage, injury or death.

NOTE 1: PD 6494:1980 (85) draws attention to the danger that can arise from the mismatch of different thread forms and sizes, and lists examples of mismatches that can be incorrectly assembled.

NOTE 2: The danger of mismatched threaded assemblies is not limited to fasteners, but includes pipe threads in pressure systems, as demonstrated by a December 2020 bulletin from the UK Health and Safety Executive at: <https://www.hse.gov.uk/diving/cylinder-threads.htm>.

- 2.5.32 Material concessions submitted to the Company that cover fasteners shall list all the technical characteristics of the specified fasteners alongside the same characteristics of the proposed fasteners, and shall consider at least the following failure modes:

- (a) Thread stripping or fracture due to:
  - i. Mismatched thread forms and diameters
  - ii. Insufficient thread engagement, including inadequate nut height
  - iii. Inadequate mechanical properties
- (b) Material yield due to reduction in annular bearing area
- (c) Material yield due to reduction in overlap between fasteners and holes or slots
- (d) Rounding of driving features due to use of incorrect tools to drive fasteners, e.g. a 19 mm across flats 12-point socket can drive an 18 mm across-flats external hexagon drive fastener, but will round the fastener at high torques
- (e) Interference of fasteners with surrounding components
- (f) Interference of tooling with surrounding components

NOTE: Fasteners that conform to different Standards may appear interchangeable, but detailed assessment often reveals that they are not. See requirement 2.5.31 for material concessions covering threaded components in general.

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2.5.33 Material concessions submitted to the Company that propose substitute steel specifications shall use:

- (a) Appendix D of BS 970-1:1983 to translate from BS 970:1955 and earlier En designations (e.g. En 8) to the later BS 970 seven-digit designations (e.g. 080M40)
- (b) Annex A of PD 970:2005 to translate between BS 970 seven-digit designations (e.g. 080M40) and BS EN Standard steel names (e.g. C40E)
- (c) The relevant annexes of BS EN ISO 683 (all parts) to translate between BS EN 10083 designations and BS EN ISO 683 designations

NOTE 1: BS 970-1:1983 (86) was superseded by BS 970-1:1991 (87), but Appendix D was not retained because it “...*no longer reflects the current situation on steel grades.*” Nevertheless, it is still of use in proposing substitutes to BS 970:1955 and earlier En material specifications.

NOTE 2: Appendix D of BS 970-1:1983 (86) is complementary to PD 6474:1976 (88).

NOTE 3: At the time of writing, PD 970:2005 (89) is under review by BSI committee ISE/105.

NOTE 4: Annex C of each of the following parts of BS EN ISO 683 lists comparable grades in various designation systems, including the BS EN system, ASTM A 830/UNS system, the Japanese Industrial Standard (JIS) system and the Chinese National Standard system:

- 1: Non-alloy steels for quenching and tempering (90)
- 2: Alloy steels for quenching and tempering (91)
- 3: Case-hardening steels (92)
- 4: Free-cutting steels (93)

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## 2.6 Contractual Documentation

NOTE: Refer to glossary section 8.6 for terms, definitions and abbreviations.

- 2.6.1 Contractual Documentation shall not refer to information to which the Company does not have rights and access equivalent to or better than its rights and access to British Standards.

NOTE: The intent of this requirement is to prevent Contractual Documentation from citing proprietary information to which the Company is unable to gain access.

- 2.6.2 Except where otherwise agreed by the Company, including the TfL Engineer, the ability of the Company to exercise its rights over Contractual Documentation shall not be restricted by effective technological measures or otherwise.

NOTE 1: Effective technological measures (8.6.1) include password protection and digital rights management technology.

NOTE 2: The intent of this requirement is to allow the Company to exercise its rights over Contractual Documentation in an efficient and timely manner.

NOTE 3: TfL policy P116 (94) protects the integrity, availability and confidentiality of all information held by the Company.

- 2.6.3 The Supplier shall maximise the Company's ability to exercise its rights over Contractual Documentation. Where the Company has the right to do so, Contractual Documentation shall permit at least the following:

- (a) Digital copying of text letter by letter
- (b) Digital copying of individual images
- (c) Access to and editing of individual features in Computer Aided Design (CAD) files

- 2.6.4 Document management of Contractual Documentation shall conform to BS EN ISO 11442, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN ISO 11442:2006 (95) is current at the time of writing.

- 2.6.5 Written procedures shall conform to BS EN IEC/IEEE 82079-1, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN IEC/IEEE 82079-1:2020 (96) is current at the time of writing.

- 2.6.6 Maintenance documentation shall conform to BS EN 13460, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN 13460:2009 (97) is current at the time of writing.

- 2.6.7 Technical product specifications (TPSs) and maintenance documentation for LU rolling stock shall conform to LU-RSE-CS-0023-00-BEC.

NOTE: LU-RSE-CS-0023-00-BEC revision 0.3 (98) is current at the time of writing.

- 2.6.8 Two-dimensional technical product specifications shall conform to TfL Standard S1036.

NOTE: S1036 issue A1 (99) is current at the time of writing.

- 2.6.9 Computer aided design (CAD) shall conform to TfL Standard S1037.

NOTE: S1037 issue A4 (100) is current at the time of writing.

- 2.6.10 Content for TfL work instructions shall conform to TfL work instruction W0007.

NOTE: W0007 issue A8 (101) is current at the time of writing.

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## 3 Manufacturing requirements

### 3.1 Constituent products

NOTE: Refer to glossary section 8.7 for terms, definitions and abbreviations.

- 3.1.1 The technical delivery conditions for steel constituent products covered by BS EN 10079, except castings and powder metallurgical products, shall conform to BS EN 10021.

NOTE 1: BS EN 10079:2007 (102) defines terms for steel products based on:

- Shape and dimensions e.g. flat products, long products, heavy sections
- Appearance and surface condition e.g. coated flat products, bright products.

NOTE 2: BS EN 10021:2006 (103) specifies the general technical delivery conditions for all steel products covered by EN 10079.

- 3.1.2 Inspection documents for steel constituent products covered by BS EN 10079 shall conform to BS EN 10168.

NOTE: BS EN 10168:2004 (104) lists the information that may be included in EN 10204 inspection documents.

- 3.1.3 The technical delivery conditions for steel constituent products covered by ISO 6929, except castings and powder metallurgical products, shall conform to BS ISO 404.

NOTE 1: BS ISO 404:2013 (52) specifies the general technical delivery requirements for all steel products covered by ISO 6929, except for steel castings and powder metallurgical products.

NOTE 2: ISO 6929:2013 (53) does not have a UK implementation. It defines terms for steel products based on:

- Stage of manufacture
- Shape and dimensions
- Appearance.

- 3.1.4 The technical delivery conditions for continuously hot-dip zinc coated steel flat products for cold forming shall conform to BS EN 10346.

NOTE: BS EN 10346:2015 (105) is current at the time of writing.

- 3.1.5 Inspection documents for steel constituent products covered by ISO 6929 shall conform to BS ISO 10474.

NOTE: BS ISO 10474:2013 defines the different types of inspection documents for steel and steel products delivered to ISO 404 and for steel castings delivered to ISO 4990.

3.1.6 The technical conditions for inspection and delivery of aluminium and aluminium alloy constituent products shall conform to the following Standards:

- (a) BS EN 485-1 for sheet, strip and plate
- (b) BS EN 754-1 for cold drawn rods, bars and tubes
- (c) BS EN 755-1 for extruded rods, bars, tubes and profiles
- (d) BS EN 12020-1 for precision extruded profiles
- (e) BS EN 1301-1 for drawn wire

NOTE 1: Only some parts of ISO 6361 and ISO 6362 have UK implementations, so the BS EN Standards for technical conditions for inspection and delivery have been specified.

NOTE 2: The revisions of the specified Standards that are current at the time of writing are:

- BS EN 485-1:2016 (106)
- BS EN 754-1:2016 (107)
- BS EN 755-1:2016 (108)
- BS EN 12020-1:2008 (109)
- BS EN 1301-1:2008 (110)

3.1.7 Aluminium products that contribute to the structural properties of rail vehicles shall conform to BS EN 13981.

NOTE: The parts of BS EN 13981 that are current at the time of writing are:

- 1: Extruded products (rod, bar, tube, profiles) (111)
- 2: Rolled products (plate and sheet) (112)
- 3: Castings (113)
- 4: Forgings (114)

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3.1.8 The technical conditions for inspection and delivery of copper and copper alloy constituent products shall conform to the following Standards:

- (a) BS EN 12163 for rod for general purposes
- (b) BS EN 12164 for rod for free machining purposes
- (c) BS EN 12165 for wrought and unwrought forging stock
- (d) BS EN 12166 for wire for general purposes
- (e) BS EN 12167 for profiles and bars for general purposes
- (f) BS EN 12168 for hollow rod for free machining purposes
- (g) BS EN 13347 for rod and wire for welding and braze welding
- (h) BS EN 13601 for rod, bar and wire for general electrical purposes
- (i) BS EN 13602 for drawn round wire for the manufacture of electrical conductors
- (j) BS EN 13605 for profiles and profiled wires for electrical purposes

NOTE 1: BSI published document PD CEN/TS 13388:2020 (115) provides a summary of material designations, compositions and the product forms in which they are available, for coppers and copper alloys.

NOTE 2: The revisions of the specified Standards that are current at the time of writing are:

- BS EN 12163:2016 (116)
- BS EN 12164:2016 (117)
- BS EN 12165:2016 (118)
- BS EN 12166:2016 (119)
- BS EN 12167:2016 (120)
- BS EN 12168:2016 (121)
- BS EN 13347:2002 (122)
- BS EN 13601:2013 (123)
- BS EN 13602:2013 (124)
- BS EN 13605:2013 (125)

3.1.9 Thermoplastic semi-finished products for machining shall conform to BS EN 15860.

NOTE: BS EN 15860:2018 (126) specifies requirements and test methods for semi-finished thermoplastic products, such as rods, hollow bars and plates, which are machined into finished parts.

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- 3.1.10 Laminated sheets for electrical purposes based on thermosetting resins shall conform to BS 2572 or BS EN 60893.

NOTE 1: BS 2572:1990 (127) was confirmed as current on 1 October 2016, but is under review at the time of writing.

NOTE 2: The parts of BS EN 60893 that are current at the time of writing are:

- 1: Terms, definitions and general requirements (128)
- 2: Test methods (129)
- 3-1: Types of sheet (130)
- 3-2: Epoxy resin sheets (131)
- 3-3: Melamine resin sheets (132)
- 3-4: Phenolic resin sheets (133)
- 3-5: Polyester resin sheets (134)
- 3-6: Silicone resin sheets (135)
- 3-7: Polyimide resin sheets (136)
- PD IEC/TR 60893-4:2014+A1:2017 (137), which gives typical values

- 3.1.11 Consumables and commercial-off-the-shelf (COTS) products shall be in established ranges and in series production.

NOTE: Attention is drawn to the definitions of COTS (8.2.5), established range (8.7.2) and series production (8.7.3).

- 3.1.12 Rolling bearings shall only be manufactured by companies recommended by the World Bearing Association.

NOTE: At the time of writing, the list of manufacturers recommended by the World Bearing Association is published at:

<https://www.stopfakebearings.com/#buysafely>.

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## 3.2 Casting

NOTE: Refer to glossary section 8.8 for terms, definitions and abbreviations.

3.2.1 The Supplier shall have the following casting capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Sand casting
- (b) Permanent mould casting
- (c) Die casting
- (d) Investment casting

3.2.2 The Supplier shall be capable of casting at least the following materials:

- (a) Steels
- (b) Irons
- (c) Aluminium and aluminium alloys
- (d) Copper and copper alloys, e.g. brasses, bronzes and gun metal

3.2.3 The technical delivery conditions for metallic castings, except copper alloy castings, shall conform to BS EN 1559. The technical delivery conditions for steel castings may alternatively or additionally conform to BS ISO 4990.

NOTE 1: The parts of BS EN 1559 that are current at the time of writing are:

- 1: General technical delivery conditions for metallic castings (138)
- 2: Cast steel (139)
- 3: Cast iron (140)
- 4: Cast aluminium (141)
- 5: Cast magnesium (142)
- 6: Cast zinc (143)

NOTE 2: BS ISO 4990:2015 (54) is current at the time of writing.

NOTE 3: Requirement 3.1.7 applies to aluminium castings that contribute to the structural properties of rail vehicles.

3.2.4 Steel castings shall conform to BS EN 10293.

NOTE: BS EN 10293:2015 (144) is aligned to the structure of BS EN 1559-2:2014 (139).

3.2.5 The technical delivery conditions for copper alloy castings shall conform to BS EN 1982.

NOTE: BS EN 1982:2017 (145) specifies the characteristics of copper alloy castings that are intended for use without subsequent working, other than machining.

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### 3.3 Forming

NOTE: Refer to glossary section 8.9 for terms, definitions and abbreviations.

3.3.1 The Supplier shall have the following forming capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Cold working
- (b) Hot working
- (c) Sheet metal working
- (d) Thread rolling
- (e) Hand forging
- (f) Die forging
- (g) Near net-shape forging

3.3.2 The Supplier shall be capable of forming at least the following materials:

- (a) Steels
- (b) Aluminium and aluminium alloys
- (c) Copper and copper alloys, e.g. brasses, bronzes and gun metal

3.3.3 Working of steel shall conform to BS EN 1090-2.

NOTE: BS EN 1090-2:2018 (146) refers to working as shaping.

3.3.4 Working of aluminium and aluminium alloys shall conform to BS EN 1090-3.

NOTE: BS EN 1090-3:2019 (147) refers to working as forming.

3.3.5 Fabrication and installation of piping in the scope of BS EN 13480-1 shall conform to BS EN 13480-4.

NOTE 1: BS EN 13480-1:2017+A1:2019 (148) specifies requirements for industrial piping systems made of metallic materials.

NOTE 2: BS EN 13480-4:2017 (149) specifies requirements for fabrication and installation of piping systems designed in accordance with EN 13480-3 (150).

3.3.6 Fabrication and installation of copper and copper alloy pressure piping systems shall conform to BS 1306.

NOTE: BS 1306:1975 (151) specifies requirements for the design, manufacture, installation and inspection of copper and copper alloy pipework subject to internal pressure for industrial and marine systems. It was confirmed current on 1 May 2017.

- 3.3.7 The general technical delivery conditions of open die steel forgings shall conform to BS EN 10250.

NOTE: The parts of BS EN 10250 that are current at the time of writing are:

- 1: General requirements (152)
- 2: Non-alloy quality and special steels (153)
- 3: Alloy special steels (154)
- 4: Stainless steels (155)

- 3.3.8 The general technical delivery conditions of closed die steel forgings shall conform to BS EN 10254.

NOTE: BS EN 10254:1999 (156) is current at the time of writing.

- 3.3.9 Aluminium and aluminium alloy forgings shall conform to BS EN 586.

NOTE: The parts of BS EN 586 that are current at the time of writing are:

- 1: Technical delivery conditions (157)
- 2: Properties (158)
- 3: Tolerances (159)

- 3.3.10 The technical conditions for inspection and delivery of copper and copper alloy forgings shall conform to BS EN 12420.

NOTE: BS EN 12420:2014 (160) is current at the time of writing.

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### 3.4 Machining

NOTE: Refer to glossary section 8.10 for terms, definitions and abbreviations.

3.4.1 The Supplier shall have at least the following machining capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Turning
- (b) Drilling
- (c) Reaming
- (d) Milling
- (e) Sawing
- (f) Grinding
- (g) Boring
- (h) Surface broaching
- (i) Internal broaching
- (j) Thread cutting
- (k) Waterjet machining
- (l) Laser beam machining

3.4.2 The Supplier shall be capable of machining at least the following materials to a linear and angular tolerance of ISO 2768-f or better and a geometrical tolerance of ISO 2768-H or better:

- (a) Steels
- (b) Irons
- (c) Aluminium and aluminium alloys
- (d) Copper and copper alloys, e.g. brasses, bronzes and gun metal
- (e) Nickel and nickel alloys
- (f) Silver

NOTE: See the notes to requirement 2.5.8 for citations.

3.4.3 The Supplier shall be capable of machining the thermoplastic materials listed by BS EN 15860.

NOTE: BS EN 15860:2018 (126) lists 30 machinable thermoplastics, including ABS, several polyamides, polycarbonate, three densities of polyethylene, polypropylene and three types of PVC.

3.4.4 The Supplier shall be capable of machining laminated sheets based on thermosetting resins that conform to BS 2572 and BS EN 60893.

NOTE: See the notes to requirement 3.1.10 for citations.

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- 3.4.5 The Supplier shall be capable of achieving at least the surface roughness values and lay characteristics specified by BS 2634-1 using the corresponding machining methods specified by that Standard.

NOTE: BS 2634-1:2010 (161) specifies the characteristics of roughness comparison specimens of turned, ground, bored, milled, shaped and planed surfaces.

- 3.4.6 Roughness comparison specimens that conform to BS 2634-1 shall be used for tactile and visual comparison with workpiece surfaces of similar lay that have been produced by similar machining methods.

NOTE: Alternative methods for establishing surface roughness, e.g. measurement, may be used.

- 3.4.7 Jig and fixture components shall conform to BS 5078, BS 1098-1 and BS 1098-2, or shall otherwise provide equivalent or better outcomes.

NOTE 1: BS 5078:1974 (162) specifies dimensions, materials and tolerances for a wide variety of jig and fixture components, including base and jig plates, blanks, bolsters, plates, blocks and fasteners.

NOTE 2: BS 1098-1:1967 (163) specifies jig bushes in inch units.

NOTE 3: BS 1098-2:1977 (164) specifies jig bushes in metric units.

- 3.4.8 The Supplier shall be capable of machining test pieces that conform to BS ISO 10791-7 and BS ISO 13041-6 in at least the following materials:

- (a) Steels
- (b) Aluminium and aluminium alloys
- (c) Copper and copper alloys, e.g. brasses, bronzes and gun metal

NOTE 1: BS ISO 10791-7:2020 (39) specifies tests for machining centres based on five types of test piece in two or three sizes (11 test pieces in total).

NOTE 2: BS ISO 13041-6:2009 (40) specifies tests for turning machines and turning centres based on four types of test piece in three sizes (12 test pieces in total).

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### 3.5 Assembly

NOTE: Refer to glossary section 8.11 for terms, definitions and abbreviations.

3.5.1 The Supplier shall have the following assembly capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Manual assembly in general, including, but not limited to the use of hand-held tools specified by the British Standards in class 25.140 of the International Classification for Standards (ICS)
- (b) Torque tightening of threaded fasteners
- (c) Installation of threaded inserts
- (d) Riveting
- (e) Pinning
- (f) Installation of retaining rings
- (g) Installation of sealing elements, including, but not limited to:
  - i. Gaskets
  - ii. Seals
  - iii. O-rings
  - iv. Sealant
- (h) Assembly of pressure system components
- (i) Marking for item identification and warning against safety hazards
- (j) Electrical assembly in general, including, but not limited to:
  - i. Crimping
  - ii. Soldering
  - iii. Electrical bolted connections
  - iv. Installation of busbars
  - v. Cable installation, including bundling, laying, fixing, splicing and terminating
  - vi. Installation of heat-shrinkable sleeves
  - vii. Installation of cable conduits
- (k) Routine testing, including, but not limited to:
  - i. Measurement
  - ii. Visual inspection
  - iii. Electrical insulation testing

NOTE: ICS, 7<sup>th</sup> edition (165), class 25.140 includes the following sub-classes:

- 25.140.01 Hand-held tools in general
- 25.140.10 Pneumatic tools
- 25.140.20 Electric tools
- 25.140.30 Hand-operated tools
- 25.140.99 Other hand-held tools

3.5.2 Assembly shall conform to written procedures, which shall be subject to the acceptance of the Company, including the TfL Engineer.

NOTE: See Contractual Documentation requirements 2.6.5, 2.6.6 and 2.6.10.

3.5.3 Assembly procedures shall mitigate the risks of the following, so far as is reasonably practicable:

- (a) Components being outside specified tolerances
- (b) Misalignment and maladjustment errors
- (c) Missing features
- (d) Incorrect dimensions
- (e) Inadequate preservation, e.g. transport damage
- (f) Contamination by foreign objects
- (g) Absence of a component due to:
  - i. Inefficient supply from stores
  - ii. Inadequate supply to stores
- (h) Incorrect components due to:
  - i. Incorrect supply
  - ii. Poor or missing instructions
- (i) Inadequate surface preparation of joints

3.5.4 Practices for rubber and plastics hoses and hose assemblies shall meet the recommendations and follow the guidance of PD ISO/TR 17784, or shall otherwise provide equivalent or better outcomes.

NOTE: PD ISO/TR 17784:2003 (166) is current at the time of writing.

3.5.5 Practices for corrugated hose assemblies shall meet the recommendations and follow the guidance of BS 6501-1, or shall otherwise provide equivalent or better outcomes.

NOTE: BS 6501-1:2004 (167) is current at the time of writing.

3.5.6 Installation of valves shall meet the recommendations and follow the guidance of BS 6683, or shall otherwise provide equivalent or better outcomes.

NOTE: BS 6683:1985 (168) is current at the time of writing.

3.5.7 Practices for hydraulic hose assemblies shall meet the recommendations and follow the guidance of PD ISO/TS 17165-2, or shall otherwise provide equivalent or better outcomes.

NOTE: PD ISO/TS 17165-2:2018 (169) is current at the time of writing.

3.5.8 Installation of electrical cabling for rail vehicles and rail vehicle components shall conform to BS EN 50343.

NOTE: BS EN 50343:2014+A1:2017 (170) is current at the time of writing.

## 3.6 Structures

NOTE: Refer to glossary section 8.12 for terms, definitions and abbreviations.

- 3.6.1 The execution of steel structural components and structures shall conform to BS EN 1090-2 and follow the guidance in BS 7608, or shall otherwise provide equivalent or better outcomes.

NOTE 1: BS EN 1090-2:2018 (146) specifies requirements for the execution of structures or structural components made from:

- Hot rolled, structural steel products up to and including grade S700
- Cold formed components and sheeting up to and including grade S700, unless covered by BS EN 1090-4
- Hot finished or cold formed austenitic, austenitic-ferritic and ferritic stainless steel products
- Hot finished or cold formed structural hollow sections
- Rolled products and hollow sections manufactured by welding

NOTE 2: Section 14 of BS 7608:2014+A1:2015 (171) provides guidance for workmanship and inspection, which are focussed on achieving acceptable fatigue performance in steels within the scope of that Standard:

- Wrought steel material products
- Welds in fully machined areas of steel castings, but not steel castings in general
- Ferritic alloy and low alloy steels
- Austenitic and duplex stainless steels
- Unprotected weathering steels
- Threaded fasteners

- 3.6.2 The execution of aluminium and aluminium alloy structural components and structures shall conform to BS EN 1090-3 and follow the guidance of PD 6705-3, or shall otherwise provide equivalent or better outcomes.

NOTE 1: BS EN 1999 parts 1-1, 1-2, 1-3, 1-4 and 1-5, covering the design of aluminium structures, replaced BS 8118-1:1991 (172) in 2010 after a period of coexistence. At the time of writing, the deficiencies of BS EN 1999 detailed by section 4.1 of PD 6705-3:2009 (173) can be addressed by following the guidance provided by PD 6702-1:2009+A1:2019 (174). It is thus essential that the recommendations of PD 6705-3 are followed for execution when the recommendations in PD 6702-1 have been used for design, which should be the case for all aluminium structural components and structures produced for the UK market.

NOTE 2: BS EN 1090-3:2019 (147) specifies requirements for the execution of aluminium structural components and structures made from:

- Rolled sheet, strip and plate
- Extrusions
- Cold drawn rod, bar and tube
- Forgings
- Castings

## 3.7 Welding

NOTE: Refer to glossary section 8.13 for terms, definitions and abbreviations.

3.7.1 The Supplier shall have at least the following BS EN ISO 4063 welding process capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Manual metal arc welding, process 111
- (b) Gas-shielded metal arc welding in general, process 13, including:
  - a. MIG welding with solid wire electrode, process 131
  - b. MAG welding with solid wire electrode, process 135
- (c) TIG welding with solid filler material (wire/rod), process 141
- (d) Resistance welding in general, process 2

NOTE: BS EN ISO 4063:2010 (175) is current at the time of writing.

3.7.2 The Supplier shall be capable of welding the following materials:

- (a) Steels
- (b) Irons
- (c) Aluminium and aluminium alloys

3.7.3 The Supplier shall be capable of manufacturing welded assemblies with linear and angular tolerances of ISO 13920-A or better and geometrical tolerances of ISO 13920-E or better.

NOTE: BS EN ISO 13920:1997 (31) is current at the time of writing.

3.7.4 Certification of welding manufacturers shall be by an International Institute of Welding (IIW) authorised nominated body for companies certification (ANBCC).

NOTE 1: At the time of writing, the IIW list of ANBCCs is published at:  
[https://www.ewf.be/iw\\_man\\_cert\\_anbcc.aspx](https://www.ewf.be/iw_man_cert_anbcc.aspx).

NOTE 2: The IIW does not explicitly authorise ANBCCs to certify welding manufacturers as conforming to EN 15085-2, so the list of ANBCCs for ISO 3834 should be used.

NOTE 3: TWI Certification Ltd is the ANBCC for the UK and maintains registers of certified welding manufacturers at <http://www.en15085.org/> and <http://www.iso3834.org/>.

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- 3.7.5 Welding of rail vehicle components shall be done by a welding manufacturer certified as conforming to EN 15085-2 at the required classification levels and for appropriate types of activity, ISO 4063 welding processes, ISO/TR 15608 material groups and thicknesses of base material.

NOTE 1: The required EN 15085-2 classification level is normally specified by the technical product specification of a component.

NOTE 2: Types of activity include production and maintenance.

NOTE 3: Certification is linked to the welding manufacturer location and the welding coordination personnel at that location.

NOTE 4: BS EN 15085-2:2020 (176) is current at the time of writing.

NOTE 5: BS EN ISO 4063:2010 (175) is current at the time of writing.

NOTE 6: PD CEN ISO/TR 15608:2017 (177) is current at the time of writing.

- 3.7.6 Welding of rail vehicle components shall be subject to the supervision of the Company's Responsible Welding Coordinator, in accordance with BS EN 15085-2, including, but not limited to:

- (a) Supplier selection
- (b) Bid evaluation, including evaluation of Mini-Competition bids
- (c) First article inspection (FAI)
- (d) Periodic audits of welding manufacturers

NOTE: BS EN 15085-2:2020 (176) is current at the time of writing.

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- 3.7.7 Welding of components other than those for rail vehicles shall be carried out by a welding manufacturer certified as conforming to ISO 3834 at the required level of quality and for appropriate products, product Standards, ISO 4063 welding processes and ISO/TR 15608 material groups.

NOTE 1: The required ISO 3834 level of quality is normally specified by the technical product specification of a component.

NOTE 2: Certification is linked to the welding manufacturer location and the welding coordination personnel at that location.

NOTE 3: At the time of writing, the European Federation for Welding, Joining and Cutting (EWF) maintains a register of companies certified to ISO 3834, ISO 14001 and OHSAS 18001 by the ANBCCs, published at:  
<https://www.ewf.be/certification/certification1/ewf-integrated-manufacturers-certification-system-mcs.aspx>.

NOTE 4: At the time of writing, the EWF maintains a register of companies certified to ISO 3834 by the ANBCCs, published at:  
[https://www.ewf.be/home\\_iiw/certificationiiw-iab/iw-iab-manufacturers.aspx](https://www.ewf.be/home_iiw/certificationiiw-iab/iw-iab-manufacturers.aspx).

NOTE 5: The following parts of BS EN ISO 3834 are current at the time of writing:

- 1: Selection of the appropriate level of quality requirements (178)
- 2: Comprehensive quality requirements (11)
- 3: Standard quality requirements (12)
- 4: Elementary quality requirements (13)
- 5: Bibliography for conformity to ISO 3834 (179)
- 6: Guide to implementing ISO 3834 (180)

NOTE 6: BS EN ISO 4063:2010 (175) is current at the time of writing.

NOTE 7: PD CEN ISO/TR 15608:2017 (177) is current at the time of writing.

- 3.7.8 If BS EN ISO 15614-1:2017+A1:2019 is used for qualification of welding procedure specifications, all the requirements of Level 2 shall be applied.

NOTE: The national foreword to BS EN ISO 15614-1:2017+A1:2019 (181) notes that:

- (a) A procedure test carried out to Level 2 automatically qualifies for Level 1 requirements, but not vice-versa.
- (b) Vigilance is required to identify the testing requirements and the range of qualification for the welding procedure test level because the two levels are often specified in the same clause.

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- 3.7.9 Welding shall meet the recommendations and follow the guidance of all parts of BS EN 1011, or shall otherwise provide equivalent or better outcomes.

NOTE 1: The parts of BS EN 1011 that are current at the time of writing are:

- 1: General guidance for arc welding (182)
- 2: Arc welding of ferritic steels (183)
- 3: Arc welding of stainless steels (184)
- 4: Arc welding of aluminium and aluminium alloys (185)
- 5: Welding of clad steel (186)
- 6: Laser beam welding (187)
- 7: Electron beam welding (188)
- 8: Welding of cast iron (189)

NOTE 2: Section 18 of BS EN 1011-2:2001 (183) warns of the risk of delayed cracking in welded steel and recommends a period of at least 16 hours before the final inspection is made of as-welded fabrications. Table 23 of BS EN 1090-2:2018 (146) specifies minimum hold times after welding of steel for non-destructive testing (NDT) and permits hold times of less than 16 hours if specific criteria are met, which can allow increased throughput.

- 3.7.10 Brazing shall meet the recommendations and follow the guidance of BS EN 14324, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN 14324:2004 (190) is current at the time of writing.

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3.7.11 At the start of each Contract involving welding, the Supplier shall confirm the requirements for the following with the Company, including the TfL Engineer:

- (a) Welding manufacturer certification
- (b) EN 15085-3 weld performance class for each rail vehicle weld
- (c) ISO 13920 general tolerance classes
- (d) EN 1993-1-1 execution class for steel structures
- (e) EN 1999-1-1 execution class for aluminium structures
- (f) EN 10163 class and sub-class for hot rolled steel
- (g) ISO 9013 designation for each thermal cut
- (h) Non-destructive testing (NDT) requirements
- (i) Minimum hold time after welding for NDT

NOTE 1: See 3.7.5 for EN 15085-2 certification and 3.7.7 for ISO 3834 certification.

NOTE 2: BS EN 15085-3:2007 (191) is current at the time of writing. Weld performance classes are normally specified by the technical product specification of a component.

NOTE 3: See requirement 3.7.3 for ISO 13920 general tolerance class.

NOTE 4: See requirement 3.6.1 for EN 1993-1-1 execution class

NOTE 5: See requirement 3.6.2 for EN 1999-1-1 execution class

NOTE 6: The surface condition of steel structures and the quality of any thermal cuts influences fatigue resistance, as per the manufacturing requirements in Table 1 of BS 7608:2014+A1:2015 (171), some of which require conformity to BS EN 10163 and BS EN ISO 9013.

NOTE 7: The parts of BS EN 10163 that are current at the time of writing are:

- 1: General requirements (192)
- 2: Plate and wide flats (193)
- 3: Sections (194)

NOTE 8: BS EN ISO 9013:2017 (195) is current at the time of writing.

NOTE 9: BS EN 15085-4:2007 (196) requires the cut surfaces of dynamically loaded components to conform to BS EN ISO 9013 class 33.

NOTE 10: See requirement 3.7.9 for minimum hold time after welding steel for NDT.

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### 3.8 Fasteners

NOTE: Refer to glossary section 8.14 for terms, definitions and abbreviations.

- 3.8.1 Hand torque tools used to tighten threaded fasteners in the Goods and Serviced Goods shall conform to BS EN ISO 6789-1.  
NOTE: BS EN ISO 6789-1:2017 (197) is current at the time of writing.
- 3.8.2 Calibration of hand torque tools used to tighten threaded fasteners in the Goods and Serviced Goods shall conform to BS EN ISO 6789-2.  
NOTE: BS EN ISO 6789-2:2017 (198) is current at the time of writing.
- 3.8.3 Fasteners shall be procured from manufacturers and distributors that have fastener quality assurance systems that conform to BS EN ISO 16426.  
NOTE: BS EN ISO 16426:2002 (199) is current at the time of writing.
- 3.8.4 Fastener inspection documents shall conform to BS EN ISO 16228.  
NOTE: BS EN ISO 16228:2018 (200) is current at the time of writing.
- 3.8.5 Acceptance inspection of fasteners shall conform to BS EN ISO 3269.  
NOTE: BS EN ISO 3269:2019 (201) is current at the time of writing.
- 3.8.6 Acceptance inspection of fasteners for LU rolling stock shall conform to LU-RSE-CS-0032-00-MEC.  
NOTE: LU-RSE-CS-0032-00-MEC (202) requires conformity to BS EN ISO 3269, except for inspection by sampling of bespoke fasteners, for which it requires tighter sampling. It also specifies supplementary requirements.
- 3.8.7 Threads shall be inspected using gauges that conform to BS 8498.  
NOTE: BS 8498:2008 (203) is current at the time of writing.

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3.8.8 ISO metric threaded fasteners shall conform to BS ISO 8992 or BS 3692.

NOTE 1: BS ISO 8992:2005 (204) specifies the general requirements for ISO Standard bolts, screws, studs and nuts, but is also recommended for non-Standard fasteners.

NOTE 2: BS 3692:2014 (205) specifies the general requirements for British Standard precision hexagon bolts, screws and nuts with ISO metric threads.

**WARNING:** Both Standards specify ISO metric threads, so fasteners may at first appear to be interchangeable, but there are significant differences between ISO Standard fasteners and BS 3692 fasteners, including, but not limited to:

- Mechanical properties of steel nuts
- Height of nuts
- Width across flats of certain sizes

These differences can lead to the failure of bolted joints and consequent material damage, personal injury or death, depending on the function of the joint and the presence of any secondary security. See requirements 2.5.31 and 2.5.32 for material concession requirements for fasteners.

3.8.9 ISO metric steel threaded fasteners that conform to BS EN ISO 898-1 shall be mated to nuts in accordance with BS EN ISO 898-2 and mated to washers in accordance with BS EN ISO 898-3.

NOTE 1: BS EN ISO 898-1:2013 (206) specifies the properties of bolts, screws and studs made of steel.

NOTE 2: BS EN ISO 898-2:2012 (207) specifies the properties of nuts made of steel. Table 2 specifies permitted combinations of nuts and screws or bolts based on property class.

NOTE 2: BS EN ISO 898-3:2018 (208) specifies the properties of washers made of steel. Table 1 specifies permitted combinations of washers, nuts and screws or bolts based on property class.

3.8.10 Prevailing torque nuts shall conform to BS EN ISO 2320.

NOTE: Neither BS EN ISO 2320:2015 (209), nor any of the product Standards that cite it, specify the durability of the prevailing torque element, other than to specify the minimum prevailing torque on the fifth removal. Given the long service life and arduous operating environment of TfL assets, all-metal prevailing torque nuts are more likely to survive than nuts with non-metallic prevailing torque elements.

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- 3.8.11 Fasteners that are BS EN ISO 898-1 property class 10.9 and above shall not be subject to acid or electro-deposition processes, such as electroplated coating. If this is unavoidable, heat treatment to remove hydrogen should be carried out effectively.

NOTE 1: This requirement limits the risk of failures due to hydrogen embrittlement and stress corrosion cracking, as per clause 14.3.2.2(e) of BS 7608:2014+A1:2015 (171).

NOTE 2: Annex B of BS EN ISO 4042:2018 (210) provides information on hydrogen embrittlement and how to mitigate against it.

- 3.8.12 Non-electrolytically applied zinc flake coating systems on steel fasteners shall conform to BS EN ISO 10683.

NOTE 1: As per clause 4.4 of BS EN ISO 10683:2018 (211), zinc flake coating systems do not generate hydrogen during the deposition process, although some pre-treatment processes generate hydrogen, e.g. acid cleaning.

NOTE 2: Annex A of BS EN ISO 10683:2018 (211) provides guidance on the selection and assembly of zinc flake coated fasteners.

- 3.8.13 Electroplated coatings and coating systems on steel fasteners shall conform to BS EN ISO 4042, except that:

- (a) Electroplated zinc coatings on metal fasteners may conform to BS 7371-3.
- (b) Electroplated nickel, nickel/chromium and copper/nickel/chromium coatings may conform to BS 7371-4.
- (c) Electroplated coatings on imperial metal fasteners may conform to BS 7371-12.

NOTE 1: Annex A of BS EN ISO 4042:2018 (210) provides guidance on the selection and assembly of electroplated fasteners.

NOTE 2: BS 7371-3:2009 (212) is current at the time of writing.

NOTE 3: BS 7371-4:1994 (213) is current at the time of writing.

NOTE 4: BS 7371-12:2008 (214) is current at the time of writing.

- 3.8.14 Except where otherwise specified, coatings on metal fasteners shall conform to BS 7371.

NOTE: The parts of BS 7371 not cited elsewhere in this Specification that are current at the time of writing are:

- 1: General requirements and guidelines (215)
- 6: Hot dipped galvanized coatings (216)
- 7: Mechanically applied zinc and zinc-based coatings (217)
- 8: Sherardized coatings (218)
- 9: Phosphate and phosphate and oil coatings (219)
- 10: Organic coatings (220)

- 3.8.15 Threaded fasteners shall not be directly inserted into aluminium, aluminium alloys, plastics, composites or any other material with inadequate mechanical properties for use as a threaded component. In such cases, suitable threaded inserts shall be used.

NOTE 1: BS 7751 specifies prevailing torque type wire thread inserts:

- BS 7751-1:1994 (221) covers ISO metric coarse pitch threads
- BS 7751-2:1994 (222) covers ISO metric fine pitch threads

NOTE 2: BS 7752 specifies free running type wire thread inserts:

- BS 7752-1:1994+A1:2008 (223) covers ISO metric coarse pitch threads
- BS 7752-2:1994 (224) covers ISO metric fine pitch threads

NOTE 3: BS 4377:1991 (225) specifies the tapping of holes to receive wire thread inserts for ISO metric threads.

NOTE 4: BS 3409 specifies the tapping of holes to receive wire thread inserts for UNC and UNF threads:

- BS 3409-1:1961 (226) covers diameters of 0.25 inch and over
- BS 3409-2:1966 (227) covers diameters below 0.25 inch

NOTE 5: There are over 30 CEN Standards with UK implementations (BS EN Standards) covering aerospace inserts, which are prepared by BSI committee ACE/12, *Aerospace fasteners and fastening systems*. Given that these are CEN Standards, inserts conforming to them may be more readily available than the older British Standards cited above. These Standards include:

- BS EN 2943:2019 (228) for helical coil inserts
- BS EN 2944:2018 (229) for self-locking helical coil inserts
- BS EN 2945:1998 (230) for the assembly procedure for self-locking helical coil inserts
- BS EN 3044:1998 (231) for the tapping of holes for self-locking helical coil inserts

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3.8.16 The dimensions of internal threads shall conform to PD ISO/TR 16224.

NOTE 1: It is important that over-tightening of a threaded fastener joint results in fracture in the loaded and threaded part of the bolt or screw before the internal thread strips because the former gives an obvious indication of a tightening failure at the time of assembly, whereas the latter may remain unrevealed for several hours due to the gradual progression of thread stripping failures.

NOTE 2: PD ISO/TR 16224:2012 (232) specifies the design criteria for nuts that conform to ISO 898-2 so that, under static tensile overload, the stripping fracture mode is prevented.

**WARNING:** Many LU drawings specify BS 3692 for ISO metric fasteners, the latest revision of which was published in 2014 and confirmed on 7 August 2020. Apart from M12 and M18 nuts, regular nuts to BS 3692 have a minimum height of less than the 0.8D minimum specified by BS EN ISO 898-2. The minimum hardness of BS 3692 nuts is also not specified, being left to be agreed between the purchaser and the supplier, and the minimum proof loads are less than those specified by BS EN ISO 898-2. BS 3692 nuts therefore do not provide enough protection against thread stripping when they are tightened close to the proof load of a matching bolt, so they should not be used for preloaded joints.

3.8.17 At the start of each Contract involving fasteners, the Supplier shall confirm the requirements for the following with the Company, including the TfL Engineer:

- (a) Surface preparation for all joints secured by fasteners
- (b) Tightening torques to be used for all threaded fasteners
- (c) Means of vibration resistance for all threaded fasteners
- (d) Whether or not fasteners are re-usable

NOTE 1: Threaded fastener torques should be calculated in accordance with appropriate Standards, such as:

- BS 3580:1964 (233), Appendix B for general use.
- VDI 2230 for highly stressed bolted joints. There are two parts at the time of writing:
  - VDI 2230-1:2015-11 (234) for joints with one bolt
  - VDI 2230-2:2014-12 (235) for joints with more than one bolt.
- BS EN 1090-2 for high strength structural bolting assemblies (HR, HV and HRC systems) in steel structures. BS EN 1090-2:2018 (146) is current at the time of writing.
- BS EN 1090-3 for bolted joints in aluminium structures. BS EN 1090-3:2019 (147) is current at the time of writing.

NOTE 2: Threaded fasteners in applications exposed to vibration, such as on rail vehicles, should be fitted with a vibration-resistant locking arrangement. In the absence of vibration data for a specific application, a vibration-resistant locking arrangement should be tested in accordance with BS ISO 16130 to ensure that at least 80 % of the fastener clamp force remains after 2 000 load cycles. BS ISO 16130:2015 (236) is current at the time of writing.

### 3.9 Adhesive bonding

NOTE: Refer to glossary section 8.15 for terms, definitions and abbreviations.

3.9.1 The Supplier shall have at least the following adhesive bonding capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Process planning of bonding
- (b) Production of bonding
- (c) Repair of bonding

3.9.2 Surface preparation of metals and plastics prior to adhesive bonding shall conform to BS EN 13887, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN 13887:2003 (59) is current at the time of writing.

3.9.3 Adhesive bonding of rail vehicle components shall be carried out by a manufacturer that is certified as conforming to DIN 6701 at the required class and for appropriate fields of application and areas of validity.

NOTE 1: The parts of DIN 6701 that are current at the time of writing are:

- 2: Manufacturer qualification (237)
- 3: Guidelines for design and verification (238)
- 4: Quality control and assurance (239)

NOTE 2: The required DIN 6701 class is normally specified by the technical product specification of a component.

NOTE 3: Fields of application include:

- (a) Design of bonding
- (b) Process planning of bonding
- (c) Production of bonding
- (d) Repair of bonding
- (e) Purchasing, trading and assembly of work pieces with classified bonding joints
- (f) Third party contracting for bonding

NOTE 4: Areas of validity include:

- (a) Main function of the bonded joints
- (b) Pre-treatment methods
- (c) Production methods
- (d) Test methods
- (e) Degree of mechanisation

NOTE 5: See 2.5.27 for certification requirements.

### 3.10 Surface finishing

NOTE: Refer to glossary section 8.16 for terms, definitions and abbreviations.

3.10.1 The Supplier shall have at least the following surface finishing capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Deburring
- (b) Honing
- (c) Lapping
- (d) Grit blasting
- (e) Shot blasting
- (f) Shot peening
- (g) Mechanical polishing
- (h) Electropolishing

3.10.2 The Supplier shall be capable of achieving at least the surface roughness values and lay characteristics specified by BS 2634-2 using the corresponding manufacturing methods specified by that Standard.

NOTE: BS 2634-2:2010 (240) specifies the characteristics of roughness comparison specimens of spark-eroded, shot-blasted, grit-blasted and polished surfaces.

3.10.3 Shot peening shall conform to BS ISO 12686.

NOTE: BS ISO 12686:1999 (241) is current at the time of writing.

3.10.4 Electropolishing of stainless steel shall conform to BS EN ISO 15730.

NOTE: BS EN ISO 15730:2016 (242) is current at the time of writing.

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### 3.11 Metallic and other inorganic coatings

NOTE: Refer to glossary section 8.16 for terms, definitions and abbreviations.

- 3.11.1 The Supplier shall have at least the following metallic and other inorganic coating capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Hot dip galvanizing
- (b) Sherardizing
- (c) Thermal spraying
- (d) Mechanical plating
- (e) Electrodeposited coating
- (f) Zinc flake coating
- (g) Anodizing

- 3.11.2 Surface preparation of metals before metallic and other inorganic coating shall conform to BS ISO 27831.

NOTE: The parts of BS ISO 27831 that are current at the time of writing are:

- 1: Ferrous metals and alloys (243)
- 2: Non-ferrous metals and alloys (244)

- 3.11.3 Hot dip galvanizing of iron and steel products other than sheet or tube shall conform to BS EN ISO 1461.

NOTE 1: BS EN ISO 1461:2009 (245) is current at the time of writing.

NOTE 2: BS EN ISO 14713-1:2017 (246) provides guidance on design for zinc coating in general and BS EN ISO 14713-2:2020 (247) provides guidance on design for hot-dip galvanizing.

NOTE 3: Hot-dip galvanized sheet is covered by BS EN 10346:2015 (105). See requirement 3.1.4.

- 3.11.4 Hot dip galvanizing of steel tube, including hollow sections, shall conform to BS EN 10240.

NOTE: BS EN 10240:1998 (248) is current at the time of writing.

- 3.11.5 Sherardizing of iron and steel products shall conform to BS EN ISO 17668.

NOTE 1: BS EN ISO 17668:2016 (249) is current at the time of writing.

NOTE 2: BS EN ISO 14713-1:2017 (246) provides guidance on design for zinc coating in general and BS EN ISO 14713-3:2017 (250) provides guidance on design for sherardizing.

- 3.11.6 Thermal spraying shall follow the guidance and meet the recommendations of BS EN ISO 12679, or shall otherwise provide equivalent or better outcomes.

NOTE: BS EN ISO 12679:2015 (251) is current at the time of writing.

- 3.11.7 Mechanical zinc plating of iron and steel products shall conform to BS EN ISO 12683.

NOTE: BS EN ISO 12683:2004 (252) is current at the time of writing.

- 3.11.8 Except for fasteners, electroplated coatings of zinc on iron and steel shall conform to BS EN ISO 2081.

NOTE: BS EN ISO 2081:2018 (253) is current at the time of writing.

- 3.11.9 Decorative and protective anodic oxidation coatings on aluminium and its alloys shall conform to BS EN ISO 7599.

NOTE: BS EN ISO 7599:2018 (254) is current at the time of writing.

- 3.11.10 Hard anodic oxidation coatings on aluminium and its alloys shall conform to BS ISO 10074.

NOTE: BS ISO 10074:2017 (255) is current at the time of writing.

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## 3.12 Non-metallic coatings

NOTE: Refer to glossary section 8.17 for terms, definitions and abbreviations.

3.12.1 The Supplier shall have at least the following non-metallic coating capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Application of liquid paint systems by:
  - i. Brush
  - ii. Roller
  - iii. Conventional, low-pressure air spray
  - iv. Airless spray
  - v. Air-assisted airless spray
  - vi. Electrostatic spray
- (b) Powder coating
- (c) Electrodeposition
- (d) Flow coating

3.12.2 Non-metallic coating systems shall be subject to the acceptance of the Company, including the TfL Engineer, in accordance with TfL Standard S1011.

NOTE 1: TfL Standard S1011:A2 (256) specifies requirements for the acceptance and registration of products by LU.

NOTE 2: The LU Approved Products Register (APR) records product authorisations and related conditions. At the time of writing, the system is under review and its status should be confirmed with the Company, including the TfL Engineer, before use.

NOTE 3: At the time of writing, access to the LU APR can be requested at: <http://lu-apr.co.uk/Pages/Maintenance/Logon/RegisterRequest.aspx>.

NOTE 4: Products on the LU APR are authorised for use in specific asset groups (e.g. rolling stock, track, signalling), each of which has its own product and system breakdown structures. For example, rolling stock paint may be authorised for use in any combination of the following specific applications:

- (a) Exterior underframe
- (b) Exterior car body
- (c) Interior

3.12.3 For each component requiring painting, the Supplier shall propose a paint work specification that conforms to BS EN ISO 12944-8, which shall be subject to the acceptance of the Company, including the TfL Engineer.

NOTE 1: BS EN ISO 12944-8:2017 (257) covers the development of paint work specifications for steel structures, but can be adapted for other materials, if done appropriately and with care.

NOTE 2: Annexes C and D of BS EN ISO 12944-8:2017 (257) contain flowcharts for planning paint work.

3.12.4 Painting of steel shall conform to BS EN ISO 12944.

NOTE 1: The parts of BS EN ISO 12944 that are current at the time of writing and relevant to the Agreement are:

- 1: Scope (258)
- 2: Classification of environments (259)
- 3: Design criteria for steel structures to avoid coating degradation and premature corrosion (260)
- 4: Types of surface and surface preparation grades (58)
- 5: Types of paint and paint system in common use (261)
- 6: Laboratory tests (262)
- 7: Execution and supervision of paint work (263)
- 8: Development of paint work specifications (257)

NOTE 2: Annex A of BS EN ISO 12944-1:2017 (258) provides guidelines for using ISO 12944 for a given project.

3.12.5 Powder coating of aluminium and aluminium alloys shall conform to BS EN 12206-1.

NOTE: BS EN 12206-1:2004 (264) specifies requirements for powder coating of aluminium and its alloys for architectural purposes, i.e. for applications subject to weathering.

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### 3.13 Additive manufacturing

NOTE: Refer to glossary section 8.18 for terms, definitions and abbreviations.

- 3.13.1 The Supplier shall have at least the following additive manufacturing capabilities and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Material extrusion
- (b) Powder bed fusion

NOTE 1: BS EN ISO 17296-2:2016 (265) describes the main Additive Manufacturing (AM) processes.

- 3.13.2 The Supplier shall be capable of material extrusion in at least the following materials:

- (a) Acrylonitrile butadiene styrene (ABS)
- (b) Polyamide
- (c) Polycarbonate (PC)
- (d) Polyurethane (PU)

- 3.13.3 The Supplier shall be capable of powder bed fusion in at least the following materials:

- (a) Polyamide
- (b) Glass-filled polyamide
- (c) Steels
- (d) Aluminium and aluminium alloys

- 3.13.4 Goods made by additive manufacturing shall conform to BS EN ISO/ASTM 52901.

NOTE: BS EN ISO/ASTM 52901:2018 (266) is current at the time of writing.

- 3.13.5 Data exchange for additive manufacturing shall conform to BS EN ISO/ASTM 52950.

NOTE: BS EN ISO/ASTM 52950:2021 (267) is current at the time of writing.

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## 4 Maintenance Services requirements

NOTE: Refer to glossary section 8.19 for terms, definitions and abbreviations.

4.1.1 The Supplier shall have the following maintenance capabilities in the context of repair and overhaul, and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Inspection
- (b) Cleaning
- (c) Measurement
- (d) Assembly and disassembly
- (e) Fault diagnosis
- (f) Fault localisation
- (g) Conformity testing
- (h) Function check-out
- (i) Weld repair of damaged components

4.1.2 Overhaul of signalling equipment shall conform to TfL Standard S1202.

NOTE: TfL Standard S1202 issue A3 (268) is current at the time of writing.

4.1.3 Overhaul and repair Services shall conform to the assembly requirements in this Specification.

NOTE: Section 3.5 contains the assembly requirements in this Specification.

4.1.4 Written overhaul procedures shall conform to the equipment overhaul specifications (EOSs) specified by the Contract Specification.

4.1.5 Personnel who repair and/or overhaul railway signalling equipment shall hold appropriate and valid licences from the Institution of Railway Signalling Engineers (IRSE).

NOTE: Contract Specifications should specify any necessary licences.

4.1.6 Fixed interfaces shall not be disturbed.

NOTE 1: If in doubt, the status of an interface (fixed or movable) should be confirmed with the Company, including the TfL Engineer.

NOTE 2: Attention is drawn to the definitions of fixed interface (8.12.1) and movable interface (8.12.2).

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## 5 Engineering Services requirements

NOTE: Refer to glossary section 8.20 for terms, definitions and abbreviations.

### 5.1 Inputs

- 5.1.1 When supplying engineering Services, the Supplier shall be responsible for checking the validity of all documentation provided by the Company.
- 5.1.2 When supplying engineering Services, the Supplier shall survey the relevant components and interfacing assets to a level of detail agreed with the Company, including the TfL Engineer, to determine and verify all information required to conform to the Specification and Contract Specifications.

### 5.2 Document management

- 5.2.1 The Supplier shall establish, implement and maintain a document management plan for each Contract that includes engineering Services, which shall include, but not be limited to:
  - (a) Structure of the documentation
  - (b) Document types, including templates for each document type
  - (c) Document management rules, including rules for the exchange of data between the Supplier and the Company
  - (d) Metadata requirements
  - (e) File format requirements
  - (f) Symbols
  - (g) Preparation rules
  - (h) Rules for review and approval by the Supplier
  - (i) List of documents to be prepared and/or modified
  - (j) List of modifications to be made to each document

NOTE 1: BS ISO 11005:2010 (269) and BS EN 62023:2012 (270) specify rules for the use of main documents for the clustering of product information.

NOTE 2: BS ISO 29845:2011 (271) defines types of technical product documentation.

NOTE 3: BS EN ISO 11442:2006 (196; 196) and BS EN 82045-1:2001 (272) specify rules for the management of technical documents.

NOTE 4: BS EN 15016-4:2006 (273) specifies rules for the exchange of technical documents for railway applications.

NOTE 5: BS EN 61355-1:2008 (274) specifies rules for the classification and designation of documents and document kinds. At the time of writing, the document kind database is published at:  
<https://std.iec.ch/iec61355/iec61355.nsf>.

NOTE 6: PD ISO/TS 81346-3:2012 (275) specifies rules for the designation of objects within a system.

NOTE 7: The Railway Industry Commodity Classification List (RICCL) specifies a designation system for all products and services that are purchased to support

UK railway operations. At the time of writing, information on RICCL is published at: <https://www.risqs.org/explanation-of-riccl/>.

NOTE 8: TfL Standard S1187 (276) specifies the zone system for TfL rolling stock.

NOTE 9: BS EN 15380 (all parts) specifies designation systems for rolling stock. The parts of BS EN 15380 that are current at the time of writing are:

- 1: General principles (277)
- 2: Product groups (278)
- 3: Designation of train-set positions and installation sites (279)
- 4: Function groups (280)
- 5: System breakdown structure (281)

NOTE 10: BS ISO 14617 (all parts) specifies graphical symbols for use in technical diagrams. BS ISO 14617-1:2002 (282) provides general information and indexes and is current at the time of writing.

NOTE 11: IEC 60617 specifies graphical symbols for use in electrotechnical diagrams. At the time of writing, the graphical symbol database is available by subscription at: <http://std.iec.ch/iec60617>.

NOTE 12: BS EN ISO 2553:2019 (283) specifies rules for symbolic representation of welded joints on technical drawings.

NOTE 13: BS EN 61082-1:2015 (284) specifies rules for the preparation of electrotechnical documents.

NOTE 14: BS ISO 7573 (285), BS EN 62027:2012 (286) and BS EN 15016-2 (287) specify rules for the preparation of parts lists.

## 5.3 Technical documentation Services

5.3.1 If offered as part of their bid, the Supplier shall have the following technical documentation capabilities relevant to the principal asset groups, and enough resources, including competent personnel, to apply these capabilities as necessary to fulfil Orders:

- (a) Preparation and review of combined 2D and 3D technical product specifications (TPSs)
- (b) Preparation and review of maintenance documentation
- (c) Preparation and review of maintenance work instructions
- (d) Document management

NOTE: At the time of writing, TfL uses a combination of Dassault Systèmes SOLIDWORKS, Bentley MicroStation and Autodesk computer aided design (CAD) software applications. Some asset groups use more than one CAD application, such as LU rolling stock, for which the TPSs can be:

- Hand drawn 2D TPSs that have been scanned and are stored as PDFs
- 2D TPSs in Bentley .dgn format
- Combined 2D and 3D TPSs in SOLIDWORKS .sldprt, .sldasm and .slddrw formats (parts, assemblies and drawings respectively).



## 5.4 Reverse engineering

5.4.1 If offered as part of their bid, the Supplier shall be capable of reverse engineering and shall have enough resources, including competent personnel, to apply this capability as necessary to fulfil Orders.

5.4.2 Reverse engineering shall conform to BS EN IEC 62402, or shall otherwise provide equivalent or better outcomes.

NOTE 1: Section 10 of BS EN IEC 62402:2019 (42) covers obsolescence resolutions, including substitutes, emulation, reverse engineering and design change.

NOTE 2: The following information resources are useful in achieving conformity to this requirement:

- Reverse Engineering: Mechanisms, Structures, Systems & Materials, by Robert Messler (288)
- *Reverse Engineering: An Industrial Perspective*, edited by Vinesh Raja and Kiran Fernandes (289)

5.4.3 At the start of each Contract for reverse engineering, the Supplier shall confirm requirements for at least the following with the Company, including the TfL Engineer:

- (a) Outputs, particularly design and documentation outputs
- (b) Interface management process, including management of assumptions, dependencies and caveats
- (c) Output acceptance process
- (d) Design principles
- (e) Product form, fit and function

5.4.4 Reverse engineering shall take account of the uncertainty regarding:

- (a) Which characteristics of the existing component should be measured and defined for a substitute to achieve the form, fit and function of the existing component, or for the existing component to be correctly identified
- (b) The measurements made on samples of the existing component
- (c) How representative the sample population is of the functional population

NOTE: DD CEN ISO/TS 14253-4:2010 (290) outlines the main assumptions behind the theoretically ideal decision rules established in BS EN ISO 14253-1:2017 (56), why these rules must be the default rules and what should be considered before applying different decision rules. Section 5.3 details the limitations of reverse engineering in this context.

5.4.5 Substitution of components in electronic equipment shall follow the guidance and meet the recommendations of PD 6614, or shall otherwise provide equivalent or better outcomes.

NOTE: PD 6614:2002 (291) is current at the time of writing.

## 6 Acceptance of Goods and Serviced Goods

### 6.1 General

- 6.1.1 The Company will verify the safety of (assure) the Goods and Serviced Goods in accordance with TfL Standard S1538 (15) with the support of the Supplier, as per requirement 2.3.1.
- 6.1.2 Goods and Serviced Goods require assurance if:
- 6.1.2.1 The Supplier has never supplied them to the Company
  - 6.1.2.2 The Company has no or incomplete records of assurance
  - 6.1.2.3 They are critical risk and there is a change to the Quality Plan or the Contract Quality Plan that requires safety verification, including, but not limited to changes to the:
    - 6.1.2.3.1 Location of manufacture
    - 6.1.2.3.2 Competence management
    - 6.1.2.3.3 Configuration management
    - 6.1.2.3.4 Control of externally provided processes, products and services
    - 6.1.2.3.5 Control of nonconforming outputs
- 6.1.3 The Company will normally use goods inwards inspection, as specified by TfL procedure PR0004 (46), for the acceptance of assured (8.3.3) Goods and Serviced Goods.
- 6.1.4 The Company will normally undertake first article inspection (FAI), as specified by TfL procedure PR0004 (46), on Goods and Serviced Goods that:
- 6.1.4.1 Require assurance
  - 6.1.4.2 Were last delivered two or more years ago
- 6.1.5 Contract Specifications may define more detailed requirements for acceptance and assurance, such as conformity to the iterative output acceptance process specified by section 7.

### 6.2 Assurance in general

- 6.2.1 The safety criticality of the Goods and Serviced Goods determines the selection of assurance process.
- 6.2.2 Safety criticality is classified as follows:
- 6.2.2.1 **Critical risk:** failure would lead to major safety consequences
  - 6.2.2.2 **Medium risk:** likelihood of serious safety consequences is low or safety consequences are minor

6.2.2.3 **Low risk:** minor safety consequences and likelihood medium or low

6.2.3 For rolling stock, safety criticality is determined in accordance with clause 3.4.6 of TfL Standard S1180 (292).

6.2.4 For track, safety criticality is determined in accordance with clause 5.1.4 of TfL Standard S1157 (293).

NOTE: In revision A7 of S1157 (293), clause 5.1.4 is in written notice LU-WN-01493, which is appended to the Standard.

## 6.3 Assurance of critical risk Goods and Serviced Goods

6.3.1 Critical risk Goods and Serviced Goods will be assured using the formal change process that conforms to TfL Standards S1538 (15) and S1011 (256) for the relevant asset group(s). This will result in a formal record of assurance in the Company's safety management system.

NOTE: Further details of LU's safety management system are provided by *London Underground Safety Certificate and Safety Authorisation* (294) on the TfL public website.

6.3.2 The formal change processes for the principal asset groups are:

6.3.2.1 **LU rolling stock:** the change to rolling stock (CRS) process, defined by section 3.4.7 of TfL Standard S1180 (292) and section 3.7 of TfL Standard S1538 (15), with guidance from TfL guide G1100 (295)

6.3.2.2 **LU signalling equipment:**

6.3.2.2.1 TfL procedure PR0635 (296), with guidance from TfL guide G0635 (297) for signalling equipment in general

6.3.2.2.2 TfL procedure PR0190 (298) for signalling equipment with TfL design authority

6.3.2.3 **LU permanent way:** TfL procedure PR0124 (299)

6.3.3 Conformity of first article critical risk Goods and Serviced Goods to the Specification and the Contract Specification will be assessed by a professional engineer who has delegated design authority from the relevant Head of Profession.

6.3.4 For LU rolling stock, delegated design authority is normally by means of a Principles Engineer licence awarded by the TfL Engineering Head of Profession for Vehicles.

## 6.4 Assurance of medium risk Goods and Serviced Goods

6.4.1 The assurance requirements for medium risk Goods and Serviced Goods will be specified by a professional engineer who has delegated design authority from the relevant Head of Profession.

6.4.2 Criteria may include, but are not limited to:

6.4.2.1 Follow the formal change process for the relevant asset group(s)

- 6.4.2.2 Pass first article inspection (FAI) by a professional engineer or engineering technician with specific competence and/or experience
  - 6.4.2.3 Pass FAI by a TfL Quality Inspector
  - 6.4.2.4 Letter of no objection from the design authority based on their review of the FAI report(s)
- 6.4.3 If the formal change process for the relevant asset group(s) is followed, the record of assurance will be in the Company's safety management system.
- 6.4.4 If the formal change process for the relevant asset group(s) is not followed, the record of assurance will be in the Company's materials management system.

## **6.5 Assurance of low risk Goods and Serviced Goods**

- 6.5.1 Low risk Goods or Serviced Goods will be assured if they pass first article inspection (FAI) by a TfL Quality Inspector and are supported by a letter of no objection from the design authority, based on the design authority's review of the FAI report.
- 6.5.2 The record of assurance will be in the Company's material management system.

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## 7 Iterative output acceptance process

### 7.1 General

7.1.1 If Contract Specifications require conformity to this iterative output acceptance process, they should define:

7.1.1.1 The stages by which output acceptance shall take place

NOTE: BS EN 16311:2013 (300) specifies product life cycle stages and sub-stages.

7.1.1.2 Which life cycle stages and sub-stages require output reviews

7.1.1.3 The entry criteria for each output review

7.1.1.4 The objectives of each output review

7.1.1.5 The content of each output review submission

7.1.1.6 Any modifications to the output acceptance and interface management processes

7.1.2 For the avoidance of doubt, reference to the “output acceptance process” is the same as reference to the “iterative output acceptance process”.

### 7.2 Interface management

7.2.1 Interface management shall conform to TfL document LU-RSE-CS-0025-00-BEC.

NOTE: LU-RSE-CS-0025-00-BEC (301) specifies interface management requirements and the interface management process, the outputs from which are subject to the output acceptance process.

7.2.2 Interface management outputs shall be subject to the output acceptance process.

### 7.3 Output reviews

7.3.1 Output reviews are project gates at which one of the following decisions will be made by the Company:

7.3.1.1 Defer the start of the next stage while more information is collected, rework undertaken, or a change is introduced

7.3.1.2 Start the next stage

7.3.1.3 End the project

7.3.2 The objectives of output reviews include, but are not limited to:

7.3.2.1 Assessing conformity of the outputs to this Specification and the Contract Specification

7.3.2.2 Assessing the fitness for purpose of the outputs

- 7.3.2.3 Assessing completeness of the outputs
  - 7.3.2.4 Assessing the interfaces between the outputs and surrounding systems
  - 7.3.2.5 Managing risks and opportunities
  - 7.3.2.6 Discussing outstanding issues and agreeing how to resolve them
  - 7.3.3 All those invited to an output review meeting shall attend and contribute to that meeting to achieve the objectives of the output review.
  - 7.3.4 Delegates may attend output review meetings on behalf of those invited.
  - 7.3.5 Except where otherwise specified, the Supplier shall host each output review meeting.
  - 7.3.6 The host of an output review meeting shall have the following responsibilities for that meeting:
    - 7.3.6.1 Host and attend the output review meeting
    - 7.3.6.2 Invite the Company and any other relevant stakeholders with at least 15 Working Days' notice
    - 7.3.6.3 Distribute an agenda to attendees at least five Working Days before the meeting
    - 7.3.6.4 Take meeting minutes
    - 7.3.6.5 Prepare and issue meeting minutes to attendees for comment within 5 Working Days of the meeting
    - 7.3.6.6 Revise minutes in accordance with attendee feedback and reissue for further review, as necessary to achieve the Company's approval
    - 7.3.6.7 Provide a means of remote attendance that is compatible with the Company's information technology.
- NOTE: At the time of writing, the Company uses Microsoft Teams for remote meetings, which is publicly and freely available at:  
<https://www.microsoft.com/en-gb/microsoft-teams/download-app>.
- 7.3.7 The Company has the following responsibilities for each output review:
    - 7.3.7.1 Chair the output review meeting
    - 7.3.7.2 Record outstanding issues, the actions necessary to resolve them and distribute the issues and actions to attendees as an outstanding issues list (OIL)
  - 7.3.8 The Company has the sole authority for the following for each output review:
    - 7.3.8.1 Decide if each issue is open or closed
    - 7.3.8.2 Decide which of the following status applies to each issue:

7.3.8.2.1 **Critical:** major nonconformity to the Company's requirements

7.3.8.2.2 **Design:** design does not conform to the Company's requirements

7.3.8.2.3 **Documentation:** documentation does not conform to the Company's requirements

7.3.8.2.4 **Comment:** output does not meet the recommendations of the Company or information for reference

7.3.8.3 Decide the actions necessary to resolve outstanding issues

7.3.8.4 Decide if actions have been satisfactorily completed

7.3.8.5 Approve meeting minutes

7.3.8.6 Issue letters of acceptance

7.3.9 Each output review meeting may be held over several consecutive days.

7.3.10 Each output review submission shall:

7.3.10.1 Be received by the Company at least ten Working Days prior to the output review meeting

7.3.10.2 Include a clear description of the scope of the submission

7.3.10.3 Include the documented information required by this Specification and the Contract Specification

7.3.10.4 Demonstrate that project plans, Order Programmes, quality and interfaces will be adequately managed, so that the outputs will be delivered on time and on budget

7.3.11 Except where otherwise specified, the timescales for output reviews shall conform to Table 3.

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**Table 3: Output review timescales (read from top to bottom)**

<b>Company and other stakeholders receive meeting invite</b>
5 Working Days
<b>Company receives submission</b>
5 Working Days
<b>Attendees receive meeting agenda</b>
5 Working Days
<b>Output review meeting</b>
5 Working Days
<b>Supplier issues provisional minutes</b>
Time as required to achieve approved minutes
<b>Company approves minutes</b>

## 7.4 Testing

- 7.4.1 Test plans and test specifications shall be agreed with the Company, including the TfL Engineer, via the output acceptance process.
- 7.4.2 Test specifications shall include the information for agreement between the Supplier and the Company that is specified by each relevant testing Standard.
- 7.4.3 The scopes of test specifications shall include their applicability to prototypes, production first articles, series production first lots and/or series production.
- 7.4.4 Except where otherwise specified, drawing of samples shall conform to BS 6001-1 or ISO 2859-1.

NOTE: BS 6001-1:1999+A1:2011 (302) is identical to ISO 2859-1:1999/Amd.1:2011 (303).

## 7.5 Example: Technical documentation Services

- 7.5.1 The Company requires the update of an old technical drawing to resolve material obsolescence and issues a Contract Specification with the drawing via a Mini-Competition.
- 7.5.2 The Supplier is selected in accordance with the Mini-Competition process.
- 7.5.3 The Supplier proposes a substitute material that conforms to current British Standards, including UK implementations of CEN and ISO Standards, and that is readily and economically available from multiple sources.
- 7.5.4 The Supplier prepares a three-dimensional (3D) digital model of the item, generates a two-dimensional (2D) drawing from this model and provides the complete 2D and



3D technical product specification (drawing and model) to the Company, after it has gone through internal review by the Supplier.

- 7.5.5 TfL Engineering reviews the proposal in accordance with the output acceptance process in the Contract Specification and this Specification, which may involve several iterations of the design until TfL Engineering is satisfied that the design meets all requirements and is safe.

## **7.6 Example: Reverse engineering Services**

- 7.6.1 The Company requires the reverse engineering of a steel casting and issues a Contract Specification with photos and approximate measurements via a Mini-Competition.
- 7.6.2 The Supplier is selected in accordance with the Mini-Competition process.
- 7.6.3 The Supplier measures the geometry of sample items using a laser scanner and a co-ordinate measuring machine, and uses these measurements to generate a 3D digital model.
- 7.6.4 The Supplier analyses the chemical composition and mechanical properties of the sample items to identify the material specification.
- 7.6.5 The Supplier uses additive manufacturing to produce a rapid prototype that is used to prove correct form and fit.
- 7.6.6 The Supplier produces a full prototype to prove correct form, fit and function by type testing.
- 7.6.7 The supplier provides the complete 2D and 3D technical product specification (model and drawing) to the Company, after it has gone through internal review by the Supplier.
- 7.6.8 TfL Engineering reviews the proposal in accordance with the acceptance process in the Contract Specification and the Specification, which may involve several iterations of the design until TfL Engineering is satisfied that the design meets all requirements and is safe.

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## 8 Glossary

### 8.1 Introduction

- 8.1.1 For the purposes of this document, the terms, definitions and abbreviations in this glossary apply.
- 8.1.2 If an information resource contains terms, definitions and abbreviations that apply without modification, the information resource is cited as a vocabulary.
- 8.1.3 Bibliographic references are to the revision of the information resource that is current at the time of writing.
- 8.1.4 Some unmodified terms, definitions and abbreviations are repeated in this glossary for the convenience of the reader.
- 8.1.5 British Standard terms and definitions are copyright BSI Standards Limited © 2021.
- 8.1.6 The source of each term, definition and abbreviation is given at the end of each entry, along with a description of what has been modified, if anything.
- 8.1.7 The ISO and IEC maintain standard glossaries at:
  - 8.1.7.1 ISO online browsing platform: <https://iso.org/obp>
  - 8.1.7.2 IEC Electropedia: <http://www.electropedia.org>
- 8.1.8 TfL maintains a glossary (304) on the TfL management system.

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## 8.2 General

### 8.2.1 Vocabularies

- BS EN 17343, *Railway applications. General terms and definitions* (305)
- BS 6100-4, Building and civil engineering. Vocabulary. Transport (306)

### 8.2.2 assembly

<product> Number of components fitted together to perform a specific function.

[SOURCE: BS EN ISO 10209:2012, 2.7, domain added and “parts” removed]

### 8.2.3 asset

Item, thing or entity that has potential or actual value to an organisation.

NOTE 1: Value can be tangible or intangible, financial or non-financial, and includes consideration of risks and liabilities. It can be positive or negative at different stages of the asset life.

NOTE 2: Physical assets usually refer to equipment, inventory and properties owned by the organisation. Physical assets are the opposite of intangible assets, which are non-physical assets such as leases, brands, digital assets, use rights, licences, intellectual property rights, reputation or agreements.

NOTE 3: A grouping of assets referred to as an asset system could also be considered as an asset.

[SOURCE: BS ISO 55000:2014, 3.2.1]

### 8.2.4 bespoke component

Component that is made for the Company.

EXAMPLE: Rolling stock motor gearcase, typically cast from aluminium and subsequently machined.

### 8.2.5 commercial-off-the-shelf (COTS)

Available for purchase and use without the need to conduct development activities.

[SOURCE: BS ISO/IEC/IEEE 90003:2018, 3.3, modified to have general application]

### 8.2.6 component

Constituent item of equipment that cannot be physically divided into smaller items without losing its character.

NOTE: Components may be assemblies or parts.

[SOURCE: BS EN ISO 10209:2012, 2.14, note added and “part” replaced with “item”]

### 8.2.7 consumable

Item or material which is expendable, may be regularly replaced and generally is not item specific.

NOTE: Generally, consumables are relatively low cost compared to the components and assemblies on which they are used.

[SOURCE: BS EN 13306:2017, 3.4, item removed from term, note clarified]

**8.2.8 equipment**

The necessary items for a particular purpose.

[SOURCE: OED]

**8.2.9 part**

Item that cannot be further disassembled.

[SOURCE: BS EN ISO 10209:2012, 11.117, modified to define the item rather than the drawing of the item]

**8.2.10 passengers**

People on a vehicle for the purposes of travel, other than the vehicle operator.

**8.2.11 piping**

Tubing, fittings, expansion joints, hoses or other pressure-bearing components, intended for the transport of fluid, connected together and integrated into a pressure system.

[SOURCE: BS EN 764-1:2015+A1:2016, 3.1.12]

**8.2.12 spare part**

Item intended to replace a corresponding item to retain or maintain the original required function of the item.

NOTE 1: The original item may be subsequently repaired.

NOTE 2: Any item that is exchangeable with a specific item is often referred to as the replacement item.

[SOURCE: BS EN 13306:2017, 3.5, note 2 clarified]

**8.2.13 TfL Engineer**

The representative of the Company who provides professional engineering services to the Company for a specific Contract under the Agreement.

NOTE 1: There may be more than one TfL Engineer for a Contract.

NOTE 2: The TfL Engineer is likely to vary from Contract to Contract.

NOTE 3: The TfL Engineer is normally a permanent or fixed term contract member of the TfL Engineering directorate, but may be non-permanent labour or a sub-contractor, in which case their @tfl.gov.uk email address will be prefixed by "v\_".

NOTE 4: Design authority is normally only delegated to permanent members of the TfL Engineering directorate.

**8.2.14 workpiece**

Object on which an action is performed, or to be performed, to achieve a desired result.

NOTE: A workpiece can be a component or an assembly.

[SOURCE: PD ISO/TS 13399-2:2014, 3.24, modified to apply in the future (e.g. in the context of design) and not be limited to cutting actions]

[SOURCE: BS 8888:2020, 3.1.1.1, note identical]

## 8.3 Safety, health and environment

### 8.3.1 Vocabularies

- BS ISO 45001, Occupational health and safety management systems — Requirements with guidance for use (307)
- BS EN ISO 14001, Environmental management systems — Requirements with guidance for use (308)

### 8.3.2 assurance

Safety verification.

[SOURCE: The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended) – A Guide to ROGS, April 2018, Office of Road and Rail (ORR)]

### 8.3.3 assured

Status indicating that safety has been verified.

NOTE: TfL's requirements for safety verification are specified by TfL Standard S1538.

### 8.3.4 safety data sheet (SDS)

material safety data sheet (MSDS) [DEPRECATED]

Document that provides information on the properties of hazardous chemicals, how they affect health and safety in the workplace and how to manage the hazardous chemicals in the workplace.

[SOURCE: ISO/IEC Guide 14:2018, 3.17, deprecated term and abbreviation added]

## 8.4 Project management

### 8.4.1 Vocabularies

- BS 6079, Project management – Principles and guidance for the management of projects (18)

### 8.4.2 project gate

Decision point for the formal authorisation to start a new project phase.

NOTE: The purpose of a gate is to ensure that a project progresses through its life cycle in a controlled manner.

[SOURCE: BS 6079:2019+C1:2019, 8.2.3, definition and note extracted from section text]

## 8.5 Quality

### 8.5.1 Vocabularies

- BS EN ISO 9000, *Quality management systems — Fundamentals and vocabulary* (309), except for “documented information” and “quality plan”, which have the definitions given by BS ISO 10005 (7)
- BS ISO 10005, *Quality management — Guidelines for quality plans* (7), section 3

- PD ISO/TS 22163, Railway applications — Quality management system — Business management system requirements for rail organizations: ISO 9001:2015 and particular requirements for application in the rail sector (8), except for “component”, which has the definition given in 8.2.6 of this glossary
- BS EN IEC 62402, *Obsolescence management* (42)

### **8.5.2 alternative item**

Item that provides a limited parametric match and/or similar, but not identical, functionality that, after consultation with the person or organisation responsible for the design, are an acceptable application-specific alternative for the original item.

NOTE 1: Major testing may be required to validate the use of an alternative item.

NOTE 2: Alternative items are sometimes referred to as complex substitutes.

[SOURCE: BS EN IEC 62402:2019, 10.4, clarified]

### **8.5.3 burr**

Roughness caused by not cleanly severing or finishing the material.

[SOURCE: BS EN 71-1:2014+A1:2018, 3.7, comma after “roughness” removed]

### **8.5.4 clean**

State of cleanliness of an item that meets the specified cleanliness level.

[SOURCE: BS ISO 16232:2018, 3.16, “component or fluid” replaced with “item”]

### **8.5.5 cleaning**

Removal of contamination, such as oxides, scales, oil, etc. from a surface.

[SOURCE: BS EN ISO 2080:2009, 3.54, “foreign material” replaced with “contamination” and cross-reference removed]

### **8.5.6 cleanliness**

Condition of an item characterized by the absence of contamination.

[SOURCE: BS ISO 16232:2018, 3.18, “product, surface, device, liquid, etc.” replaced with “item” and “particulate” removed]

### **8.5.7 cleanliness level**

Amount and/or nature of contaminant present on the controlled surfaces and/or in controlled volumes of an item.

NOTE: The term may apply to the presumed, specified or measured extent of contamination.

[SOURCE: BS ISO 16232:2018, 3.20, “component” replaced with “item”]

### **8.5.8 cleanliness specification**

Documentation of permissible contaminant features and quantities for an item.

[SOURCE: BS ISO 16232:2018, 3.21, “particle” replaced with “contaminant” and “component” replaced with “item”]

### **8.5.9 documented information**

Information required to be controlled and maintained by an organisation and the medium on which it is contained.

NOTE 1: Documented information can be in any format and media, and from any source.

NOTE 2: Documented information can refer to:

- Management systems, including related quality plans and processes
- Information created in order for the organisation to operate (documentation)
- Evidence of results achieved

[SOURCE: BS ISO 10005:2018, 3.1]

### **8.5.10 equivalent item**

(like-for-like product)

Item that is functionally, parametrically and technically interchangeable.

NOTE 1: This term is also known as 'form, fit, function and interface' (F3I).

NOTE 2: Minor testing may be required to validate the use of an equivalent item.

NOTE 3: Equivalent items are sometimes referred to as simple substitutes.

[SOURCE: BS EN IEC 62402:2019, 3.1.5, "which" changed to "that" and note 2 replaced with note from 10.4]

### **8.5.11 first article inspection**

Set of inspection and verification activities to validate a production process.

[SOURCE: PD ISO/TS 22163:2017, 3.1.12, "in order" removed]

### **8.5.12 preservation specification**

Document compiled and evaluated with the requirements from the Company, authorities and the Supplier itself for the preservation of the Goods and Serviced Goods during production and service provision, to the extent necessary to ensure conformity to requirements.

NOTE: Preservation can include identification, handling, contamination control, packaging, storage, transmission or transportation, and protection.

[SOURCE: BS EN ISO 10209:2012, 11.135, modified based on BS EN ISO 9001:2015, 8.5.4]

### **8.5.13 release specification**

Document compiled and evaluated with the requirements from the Company, authorities and the Supplier itself for the release of the Goods and Serviced Goods to the Company.

[SOURCE: BS EN ISO 10209:2012, 11.135, modified based on BS EN ISO 9001:2015, 8.6]

### **8.5.14 routine test**

Test carried out to control the manufacturing process.

[SOURCE: ISO 18468:2017, 3.8, note removed]

### 8.5.15 special process

A process where the conformity of the resulting output cannot be readily or economically validated.

[SOURCE: BS EN ISO 9000:2015, 3.4.1, modified from note 5]

### 8.5.16 substitute

An equivalent or alternative item.

[SOURCE: BS EN IEC 62402:2019, 10.4]

### 8.5.17 type test

Conformity test based on one or more specimens of a product representative of the production.

[SOURCE: ISO/IEC Guide 2, 14.5, modified]

### 8.5.18 upgraded item

(improved product)

Substitute with better performance and/or a reduction in obsolescence risk.

[SOURCE: BS EN IEC 62402:2019, 3.1.19, derived definition]

## 8.6 Contractual Documentation

### 8.6.1 effective technological measures

Any technology, device or component that, in the normal course of its operation, is designed to prevent or restrict acts, in respect of works or other subject-matter, through application of an access control or protection process, such as encryption, scrambling or other transformation of the work or other subject-matter or a copy control mechanism.

[SOURCE: EU Directive 2001/29/EC, modified to apply to this Specification]

## 8.7 Constituent products

### 8.7.1 Vocabularies

- BS EN 10020, *Definition and classification of grades of steel* (310)
- BS EN 10079, *Definition of steel products* (102)
- BS EN 12258-1, Aluminium and aluminium alloys — Terms and definitions — General terms (311)
- BS ISO 5593, *Rolling bearings — Vocabulary* (312)
- BS ISO 24393, Rolling bearings — Linear motion rolling bearings — Vocabulary (313)
- BS ISO 1132-1, Rolling bearings — Tolerances — Terms and definitions (314)
- BS ISO 4378-1, Plain bearings — Terms, definitions, classification and symbols — Part 1: Design, bearing materials and their properties (315)
- BS ISO 4378-2, Plain bearings — Terms, definitions, classification and symbols — Part 2: Friction and wear (316)
- BS ISO 4378-3, Plain bearings — Terms, definitions, classification and symbols — Part 3: Lubrication (317)
- BS ISO 6811, *Spherical plain bearings — Vocabulary* (318)



- BS ISO 15243, Rolling bearings — Damage and failures — Terms, characteristics and causes (319)

### 8.7.2 established range

Set of different items of the same general type that is in series production and is in use by many customers.

### 8.7.3 series production

Regularly made to the same specification and can be selected and purchased from standard specification sheets provided by the supplier.

[SOURCE: BS EN ISO 16330:2003, 3.8, modified to have general application]

## 8.8 Casting

### 8.8.1 Vocabularies

- BS ISO 23472-1, *Foundry machinery. Vocabulary. General* (320)
- BS ISO 23472-2, *Foundry machinery. Vocabulary. Molding and coremaking machines and other equipment related to non-permanent mold casting process* (321)
- BS ISO 23472-3, *Foundry machinery. Terminology. Die casting machines and other equipment related to permanent mold casting process*
- BS EN 1559-1, *Founding. Technical conditions of delivery, General* (138)

### 8.8.2 casting

<process> Process in which molten metal is introduced into a mould where it solidifies.

[SOURCE: BS EN 12258-1:2012, 3.1.1, “process” removed from term and added as domain]

### 8.8.3 casting

<product> Workpiece that has been shaped by solidification of a liquid metal or alloy in a mould.

[SOURCE: BS EN 1559-1:2011, 3.3, domain added]

### 8.8.4 die casting

<process> Casting process in which molten metal is injected under substantial pressure, typically above 70 bars, into a metal die and solidifies under this pressure.

NOTE: Die casting process is also referred to as “pressure die casting (process)” or “high pressure die casting (process)”.

[SOURCE: BS EN 12258-1:2012, 3.1.10, “process” removed from term and added as domain]

*[The rest of this page is deliberately blank]*

### 8.8.5 investment casting

<process> Casting process of separate steps comprising:

- (a) Fabrication of a ceramic mould around a wax or thermoplastic pattern with a refractory slurry that sets at room temperature
- (b) Removal of the pattern through the use of heat
- (c) Pouring of metal into this mould and allowing it to solidify

[SOURCE: BS EN 12258-1:2012, 3.1.11, "process" removed from term and added as domain]

### 8.8.6 permanent mould casting

<process> Casting process in which molten metal is introduced by gravity or low pressure into a mould constructed of durable material, typically iron or steel.

NOTE: A permanent mould casting process where the metal solidifies in a metal mould under low pressure (typically less than 1 bar above atmospheric pressure) is also referred to as a "low pressure die casting process".

[SOURCE: BS EN 12258-1:2012, 3.1.9, "process" removed from term and added as domain, alternative term "chill casting process" removed]

### 8.8.7 sand casting

<process> Casting process in which molten metal is poured into a sand mould and solidified.

[SOURCE: BS EN 12258-1:2012, 3.1.8, "process" removed from term and added as domain]

## 8.9 Forming

### 8.9.1 Vocabularies

- BS ISO 21223, *Tools for pressing — Vocabulary* (322)
- BS ISO 8695, *Tools for pressing — Punches — Nomenclature and terminology* (323)
- BS 4184:1994 (ISO 8540:1993), *Glossary for power presses, open front mechanical type* (324)

### 8.9.2 bending

Work a specific angle and shape in a workpiece.

[SOURCE: BS ISO 21223:2019, 3.1.3, modified to define the process rather than a tool]

### 8.9.3 cold working

Forming of a solid metal without preheating.

[SOURCE: BS EN 12258-1:2012, 3.2.4]

### 8.9.4 deep drawing

Forming a deeply recessed part by forcing sheet metal to undergo plastic flow between dies, typically without substantial thinning of the sheet.

[SOURCE: BS EN 12258-1:2012, 3.5.5]

**8.9.5 die forging**

<process> Forging process using closed dies.

[SOURCE: BS EN 12258-1:2012, 2.10.2, modified to define the process rather than the product, domain added]

**8.9.6 flanging**

Raise workpiece edge or work a specific angle of straight flange in a workpiece.

[SOURCE: BS ISO 21223:2019, 3.1.6.2, modified to define the process rather than a tool]

**8.9.7 forging**

<product> Wrought product formed by hammering or pressing, typically when hot, between open dies (hand forging) or closed dies (drop or die forging).

[SOURCE: BS EN 12258-1:2012, 2.10.1, domain added]

**8.9.8 forging**

<process> Forming of a wrought product by hammering or pressing metal, typically when hot, between dies.

[SOURCE: BS EN 12258-1:2012, 2.10.1, modified to define the process rather than the product, domain added]

**8.9.9 forming**

Process by which a metal is transformed into a desired shape without changing its mass.

[SOURCE: BS EN 12258-1:2012, 3.2.1]

**8.9.10 hand forging**

<process> Forging process using open dies.

NOTE: Hand forging is normally used to convert the metallurgical structure of a workpiece from cast to wrought prior to machining into a final part.

[SOURCE: BS EN 12258-1:2012, 2.10.3, modified to define the process rather than the product, domain added, informative text moved to note]

**8.9.11 hemming**

Work a straight flange of 180 degrees or more in a workpiece.

**8.9.12 hot working**

Forming of a solid metal after preheating.

NOTE: Strain hardening might occur during hot working.

[SOURCE: BS EN 12258-1:2012, 3.2.3, note modified]

**8.9.13 near net-shape forging**

(close-to-form forging)

<process> Die forging process of such dimensional accuracy that subsequent machining is eliminated or reduced to a minimum.

[SOURCE: BS EN 12258-1:2012, 3.5.1, modified to define the process rather than the product, domain added]

**8.9.14 rolling**

Forming of solid metal in a gap between rotating cylinders.

[SOURCE: BS EN 12258-1:2012, 3.3.1, number of cylinders removed]

**8.9.15 shearing**

Cutting of metal using a press or guillotine.

[SOURCE: BS EN 12258-1:2012, 3.3.14, simplified]

**8.9.16 sheet**

<aluminium> Rolled product with a rectangular cross-section and a nominal thickness less than 6 mm but not less than 0.20 mm and with slit, sheared or sawed edges.

NOTE 1: A sheet can be supplied in a corrugated, embossed, coated, edge-conditioned or perforated form.

NOTE 2: A sheet between 3 mm and 6 mm is sometimes called "shate".

NOTE 3: In Europe, the term "sheet" is only used for rolled products supplied in straight length; for coiled sheet the term "strip" is used.

[SOURCE: BS EN 12258-1:2012, 2.6.1, domain added, decimal marker changed to full stop, imperial measurements removed]

**8.9.17 sheet**

<steel> Flat rolled product of a thickness less than 3 mm, the edges being allowed to deform freely, supplied flat and generally in square or rectangular shapes with a width of 600 mm or over, but also in any other shape, e.g. circular or according to a design sketch.

[SOURCE: BS EN 10079:2007, 3.3.2.1.2, domain added, plate removed from term, thickness included in definition, notes removed]

**8.9.18 sheet metal**

Metal in a form in which the thickness is substantially less than the width or length.

NOTE: The maximum metal thickness permitted for metal to be considered sheet metal varies between industries and materials. For example, in the automotive industry, sheet metal is 13 mm thick or less, whereas in aerospace, sheet metal is 7 mm thick or less. For aluminium and steel, sheet has BS EN Standard limits on thickness.

[SOURCE: ISO 10303-207:1999, 3.8.13, note modified]

**8.9.19 sheet metal working**

Working of sheet metal, including, but not limited to shearing, bending, flanging, hemming and deep drawing.

**8.9.20 thread rolling**

Forming of threads by rolling.

**8.9.21 working**

Forming of solid metal.

[SOURCE: BS EN 12258-1:2012, 3.2.2]

## 8.10 Machining

### 8.10.1 boring

Machining process in which previously formed holes in a workpiece are finished to size, normally using a rotating single-point tool and a powered axial feed.

[SOURCE: BS EN 13128:2001+A2:2009, 3.5, modified to be consistent with other machining process definitions, "operation" deleted]

### 8.10.2 broach

Cutting tool that has multiple transverse cutting edges each with progressively increased size.

[SOURCE: BS ISO 19744:2020, 3.2]

### 8.10.3 drilling

Machining process in which holes are produced in a workpiece using a rotating cutting tool.

[SOURCE: BS EN 12717:2001+A1:2009, 3.1, modified to define the process rather than the machine]

### 8.10.4 grinding

Removal of material from the surface of a workpiece by means of abrasives contained in, or bonded to, a rigid or flexible holder.

NOTE 1: Grinding is usually the first step in polishing operations.

NOTE 2: Grinding machines can combine different types of grinding methods, e.g. external cylindrical grinding and internal cylindrical grinding.

[SOURCE: BS EN ISO 2080:2009, 3.108, note 1 taken from definition, note 2 from BS EN ISO 16089:2015, 3.1.1]

### 8.10.5 internal broaching

Machining process in which a broach (8.10.2) is pushed or pulled through a hole to remove material by linear cutting.

[SOURCE: BS ISO 6779:2019, 3.1, modified to be consistent with other machining process definitions, "operation" deleted]

### 8.10.6 laser beam machining

Machining process in which a laser provides enough energy/power to melt, evaporate, or cause a phase transition in at least a part of a workpiece.

[SOURCE: BS EN ISO 11553-1:2008, 3.2, modified to define the process rather than the machine]

### 8.10.7 machine tool

Mechanical device which is fixed (i.e. not mobile) and powered (typically by electricity and compressed air), typically used to process workpieces by selective removal/addition of material or mechanical deformation.

NOTE: Machine tool operation can be mechanical, controlled by humans or by computers. Machine tools may have several peripherals used for machine tool cooling/heating,

process conditioning, workpiece and tool handling (workpiece feeding excluded), recyclables and waste handling and other tasks connected to their main activities.

[SOURCE: BS ISO 14955-1:2017, 3.16, minor modifications to note]

### **8.10.8 machining process**

Process that uses a machine tool.

### **8.10.9 milling**

Machining process that uses geometrically defined rotary cutters to remove material to produce plane or formed surfaces on a workpiece while advancing (i.e. feeding) the tool or the workpiece in a certain direction (axis movement) or certain directions (axes movements).

[SOURCE: BS EN ISO 16090-1:2018, 3.1.1, modified to define the process rather than the machine]

### **8.10.10 reaming**

Process in which the accuracy, roundness and surface finish of previously formed holes in a workpiece are improved, normally using a tool with several cutting edges.

[SOURCE: BS EN 13128:2001+A2:2009, 3.5, modified to define reaming rather than boring and scope expanded beyond reaming with a machine tool]

### **8.10.11 sawing**

Process in which a workpiece is cut using a tough blade or band with a hard-toothed edge.

[SOURCE: BS EN ISO 16093:2017, 3.9, modified to define the process rather than the tool]

### **8.10.12 surface broaching**

Machining process in which a broach (8.10.2) is pushed over an external surface to remove material by linear cutting.

NOTE: Principal cutting motion is a relative translation of broach against the non-rotating workpieces and where the cutting energy is brought by the broach or workpiece motion.

[SOURCE: BS ISO 19744:2020, 3.1, modified to be consistent with other machining process definitions, "operation" deleted]

### **8.10.13 thread cutting**

Machining process in which screw threads are cut in a workpiece.

NOTE: Threads may be cut using single-point tools on a lathe or with multiple-tooth cutters that include dies, taps, and milling cutters on various types of machine tools.

### **8.10.14 turning**

Machining process in which the principal movement is the rotation of the workpiece against the stationary cutting tool(s).

[SOURCE: BS EN 23125:2015, 3.1.1, modified to define the process rather than the machine]

### **8.10.15 waterjet machining**

Machining process in which water at high pressure, together with any additive (chemical and/or abrasive), is used to selectively remove material from a workpiece.

NOTE In general, high pressure water jet machines consist of a drive, a pressure generator, pipelines, hose lines, spraying devices, safety devices, control and measurement devices.

[SOURCE: BS EN 1829-1:2010, 3.1, modified to define the process rather than the machine]

## 8.11 Assembly

### 8.11.1 Vocabularies

- BS 6416:1983 (ISO 1703:1983), *Nomenclature for assembly tools for screws and nuts* (325)
- Manufacturing Process Selection Handbook: From design to manufacture, by Ken Swift and Julian Booker (24)

### 8.11.2 assembly

<process> Fitting together of components.

### 8.11.3 manual assembly

Assembly performed by human operators using their inherent dexterity, skill and judgment.

[SOURCE: Swift and Booker, p. 281]

## 8.12 Structures

### 8.12.1 fixed interface

Physical joint between components that is designed to be undisturbed by maintenance.

### 8.12.2 moveable interface

Physical joint between components that is designed to be disturbed by maintenance.

## 8.13 Welding

### 8.13.1 Vocabularies

- PD ISO/TR 25901-1, Welding and allied processes — Vocabulary — Part 1: General terms (326)
- PD ISO/TR 25901-3, Welding and allied processes — Vocabulary — Part 3: Welding processes (327)
- PD ISO/TR 25901-4, Welding and allied processes — Vocabulary — Part 4: Arc welding (328)
- BS EN ISO 6947, Welding and allied processes — Welding positions (329)
- BS EN ISO 4063, Welding and allied processes — Nomenclature of processes *and reference numbers* (175)
- BS EN 14610, Welding and allied processes — Definitions of metal welding processes (330)
- BS EN 1792, Welding — Multilingual list of terms for welding and related processes (331)
- PD CEN/TR 14599, Terms and definitions for welding purposes in relation with EN 1792 (332)
- BS EN ISO 17659, Welding — Multilingual terms for welded joints with illustrations (333)
- BS EN ISO 15296, *Gas welding equipment — Vocabulary* (334)

- BS 499-1, Welding terms and symbols — Part 1: Glossary for welding, brazing and thermal cutting (335)
- BS 499-1:Supplement:1992, Welding terms and symbols — Part 1: Glossary for welding, brazing and thermal cutting — Supplement: Definitions for electric welding equipment (336)
- PD CEN ISO/TR 15608, Welding — Guidelines for a metallic materials grouping system (177)
- PD CEN ISO/TR 20172, Welding — Grouping systems for materials — European materials (337)
- PD CEN ISO/TR 20173, Welding — Grouping systems for materials — American materials (338)
- PD CEN ISO/TR 20174, Welding — Grouping systems for materials — Japanese materials (339)
- BS EN 14324, Brazing — Guidance on the application of brazed joints (340)
- BS ISO 857-2, Welding and allied processes — Vocabulary — Part 2: Soldering and brazing processes (341)
- BS EN ISO 3677, Filler metal for soldering and brazing — Designation (342)
- BS EN ISO 17677-1, Resistance welding — Vocabulary — Part 1: Spot, projection and seam welding (343)

## 8.14 Fasteners

### 8.14.1 Vocabularies

- BS ISO 1891, *Fasteners — Terminology* (344)
- BS EN ISO 1891-2, Fasteners — Terminology — Part 2: Vocabulary and definitions for coatings (345)
- BS EN ISO 1891-4, Fasteners — Vocabulary — Part 4: Control, inspection, delivery, acceptance and quality (346)
- BS EN ISO 14588, *Blind rivets — Terminology and definitions* (347)
- BS 7776, Glossary of torque terminology for threaded fasteners (348)
- BS ISO 5408, *Screw threads – Vocabulary* (349)

## 8.15 Adhesive bonding

### 8.15.1 Vocabularies

- BS EN 923, *Adhesives — Terms and definitions* (350)

### 8.15.2 adherend

Body that is, or is intended to be, held to another body.

[SOURCE: BS EN 923:2015, 2.5.2, note removed for brevity]

### 8.15.3 adhesive

Non-metallic substance capable of joining materials by surface bonding (adhesion), and the bond possessing adequate internal strength (cohesion).

[SOURCE: BS EN 923:2015, 2.1.1]

### 8.15.4 adhesive bonding

The joining of adherends by means of an adhesive.



NOTE: Adhesive bonding includes the application of film adhesives, gap-filling adhesives and sealants.

[SOURCE: BS EN 923:2015, 2.6.2, “adhesive” and note added]

#### **8.15.5 bond**

<noun> Joint between adherends achieved by an adhesive.

[SOURCE: BS EN 923:2015, 2.6.1]

#### **8.15.6 film adhesive**

Adhesive in film form, with or without a carrier.

[SOURCE: BS EN 923:2015, 2.1.14, note removed for brevity]

#### **8.15.7 gap-filling adhesive**

Adhesive designed for filling wider gaps between uneven surfaces.

[SOURCE: BS EN 923:2015, 2.1.12, note removed for brevity]

#### **8.15.8 joint**

Junction of two adjacent adherends.

[SOURCE: BS EN 923:2015, 2.6.3]

#### **8.15.9 sealant**

Adhesive material, used to fill gaps where movement can occur in service and which, when set, can accommodate movement.

[SOURCE: BS EN 923:2015, 2.1.13, note removed for brevity]

## **8.16 Surface finishing and metallic and other inorganic coatings**

### **8.16.1 Vocabularies**

- BS EN ISO 2080, Metallic and other inorganic coatings — Surface treatment, metallic and other inorganic coatings — Vocabulary (351)
- BS ISO 7583, Anodizing of aluminium and its alloys — Terms and definitions (352)
- BS EN ISO 16348, Metallic and other inorganic coatings — Definitions and conventions concerning appearance (353)
- BS EN ISO 2064, Metallic and other inorganic coatings — Definitions and conventions concerning the measurement of thickness (354)
- BS EN ISO 14917, *Thermal spraying — Terminology, classification* (355)
- BS EN ISO 19496-1, Vitreous and porcelain enamels — Terminology — Terms and definitions (356)
- BS EN ISO 19496-2:2017, Vitreous and porcelain enamels — Terminology — Visual representations and descriptions (357)

### **8.16.2 abrasive blasting**

Process for cleaning or finishing by means of an abrasive directed at high velocity against the workpiece.

[SOURCE: BS EN ISO 2080:2009, 3.25.1]

**8.16.3 deburring**

Removal of sharp edges and burrs by mechanical, chemical or electrochemical means.

[SOURCE: BS EN ISO 2080:2009, 3.70]

**8.16.4 electropolishing**

Improvement in surface smoothness and brightness of a metal surface by making it anodic in an appropriate solution.

[SOURCE: BS EN ISO 2080:2009, 3.96]

**8.16.5 grit blasting**

Abrasive blasting (8.16.2) with small irregular pieces of steel or malleable cast iron.

NOTE 1: In the UK, this term can also apply to the use of non-metallic particles of similar shape, e.g. silicon carbide or aluminium oxide.

NOTE 2: Blasting with sand is forbidden in most countries for reasons of health and safety.

[SOURCE: BS EN ISO 2080:2009, 3.25.6, cross-references modified]

**8.16.6 honing**

An abrasive machining process that produces a precision surface on a metal workpiece by scrubbing an abrasive stone against it along a controlled path.

NOTE: Honing is primarily used to improve the geometric form of a surface, but may also improve the surface texture.

[SOURCE: BS ISO 603:1999, based on note in section 1]

**8.16.7 lapping**

Rubbing two surfaces together with or without abrasives for the purpose of obtaining extreme dimensional accuracy or superior surface finish.

[SOURCE: BS EN ISO 2080:2009, 3.121]

**8.16.8 mechanical polishing**

Smoothing of a metal surface by means of the action of abrasive particles attached by adhesive to the surface of wheels or endless belts, usually driven at high speeds.

[SOURCE: BS EN ISO 2080:2009, 3.154]

**8.16.9 shot blasting**

Process of modification of a surface by abrasive action of shots of a solid of spherical nature propelled at a relatively high velocity against the workpiece.

[SOURCE: BS EN ISO 2080:2009, 3.25.7, comparisons removed]

**8.16.10 shot peening**

Process in which hard, small spherical objects, for example metal shot or ceramic beads, are propelled against a surface to introduce compressive stresses into the surface or for decorative effects.

[SOURCE: BS EN ISO 2080:2009, 3.171]

## 8.17 Non-metallic coatings

### 8.17.1 Vocabularies

- BS EN ISO 4618, *Paints and varnishes — Terms and definitions* (358)
- BS ISO 22553-1, *Paints and varnishes — Electro-deposition coatings — Part 1: Vocabulary* (359)
- BS EN ISO 8130-14, *Coating powders — Part 14: Vocabulary* (360)

### 8.17.2 paint work specification

Specification that describes the way the coating work is to be carried out, in conformity with the project specification and the protective paint system specification, as well as with the inspection and assessment specification.

[SOURCE: BS EN ISO 12944-8:2017, 3.8.3, cross-references removed]

## 8.18 Additive manufacturing

### 8.18.1 Vocabularies

- BS EN ISO/ASTM 52900, *Additive manufacturing — General principles — Terminology* (361)

### 8.18.2 additive manufacturing (AM)

Process of joining materials to make parts from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing and formative manufacturing methodologies.

NOTE: Refer to Annex A of BS EN ISO/ASTM 52900:2017 for a comparison of formative, subtractive and additive manufacturing methodologies.

[SOURCE: BS EN ISO/ASTM 52900:2017, 2.1.2, notes replaced and cross-references removed]

### 8.18.3 material extrusion

Additive manufacturing process in which material is selectively dispensed through a nozzle or orifice.

[SOURCE: BS EN ISO/ASTM 52900:2017, 2.2.3, cross-references removed]

### 8.18.4 powder bed fusion

Additive manufacturing process in which thermal energy selectively fuses regions of a powder bed.

[SOURCE: BS EN ISO/ASTM 52900:2017, 2.2.5, cross-references removed]

## 8.19 Maintenance Services

### 8.19.1 Vocabularies

- BS EN 13306, *Maintenance — Maintenance terminology* (362)
- BS EN 17018, *Railway applications - Rolling stock maintenance - Terms and definitions* (363)
- BS EN 13460, *Maintenance — Documentation for maintenance* (97)

**8.19.2 conformity testing**

The conducting of tests to show whether a characteristic or a property of an item conforms to the specified requirements.

NOTE: If the result of a test shows conformity, it can be used for purposes of validation.

[SOURCE: BS EN 13306:2017, 8.3, compliance changed to conformity and test changed to testing, notes from BS EN ISO 9000:2015, 3.11.8]

**8.19.3 disassembly**

<process> Taking apart components.

**8.19.4 fault diagnosis**

Actions taken for fault recognition, fault localisation and identification of causes.

[SOURCE: BS EN 13306:2017, 8.7]

**8.19.5 fault localisation**

Actions taken to identify the faulty item at the appropriate indenture level.

NOTE: These actions may include blackbox testing (a means of testing in which tests cases are chosen using only the functional specifications of the item).

[SOURCE: BS EN 13306:2017, 8.8]

**8.19.6 function check-out**

Action taken after maintenance actions to verify that the item can perform as required.

[SOURCE: BS EN 13306:2017, 8.4, simplified, note removed]

**8.19.7 illustrated parts list (IPL)**

illustrated list of parts (ILOPS)

Illustrated list of elements of an object.

[SOURCE: BS EN ISO 10209:2012, 11.120, "illustrated" added]

**8.19.8 inspection**

Examination for conformity by measuring, observing, or testing the relevant characteristics of an item.

NOTE 1: If the result of an inspection shows conformity, it can be used for purposes of verification.

NOTE 2: The result of an inspection can show conformity or nonconformity or a degree of conformity.

[SOURCE: BS EN 13306:2017, 8.1, notes from BS EN ISO 9000:2015, 3.11.7]

**8.19.9 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.

[SOURCE: BS EN 13306:2017, 2.1]

**8.19.10 maintenance services**

Provision of resources, services and management necessary to carry out maintenance.

NOTE 1: The provision may include, for example, personnel, test equipment, workrooms, spare parts, documentation, tools, etc.

NOTE 2: BS EN 60300-3-14:2004 (364) outlines processes and techniques related to maintenance that are necessary to achieve adequate dependability.

[SOURCE: BS EN 13306:2017, 10.1, “support” replaced with “services” to avoid confusion with support services referred to by a Contract that are outside the scope of supply, but are nevertheless required to fulfil that Contract]

**8.19.11 minimum acceptable condition standard (MACS)**

Specification of acceptable and unacceptable levels of degradation of asset components and systems.

[SOURCE: S1180, revision A10, 3.3.8.1]

**8.19.12 overhaul**

Comprehensive set of preventive maintenance actions carried out, in order to maintain the required level of performance of an item.

NOTE 1: Overhaul may be performed at prescribed intervals of time or number of operations.

NOTE 2: Overhaul may require a complete or partial dismantling of the item.

[SOURCE: BS EN 13306:2017, 8.6]

**8.19.13 repair**

Physical action taken to restore the required function of a faulty item.

NOTE 1: Repair includes fault localisation and function checkout.

NOTE 2: Fault correction has the same meaning as repair.

[SOURCE: BS EN 13306:2017, 8.10]

**8.19.14 work instructions**

Detailed descriptions of how to perform and record tasks.

NOTE 1: Work instructions may be documented or not.

NOTE 2: Work Instructions may be, for example, detailed written descriptions, flowcharts, templates, models, technical notes incorporated into drawings, specifications, equipment instruction manuals, pictures, videos, checklists, or combinations thereof. Work instructions should describe any materials, equipment and documentation to be used. When relevant, work instructions include acceptance criteria.

[SOURCE: PD ISO/TR 10013:2001, 3.1]

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## 8.20 Engineering Services

### 8.20.1 Vocabularies

- BS EN 16311, Engineering services — Terminology to describe engineering services for industrial products (300)
- BS 8888, Technical product documentation and specification (365)
- BS EN ISO 10209, Technical product documentation — Vocabulary — Terms relating to technical drawings, product definition and related documentation (366)
- BS EN ISO 14660-1, Geometrical Product Specifications (GPS) — Geometrical features — Part 1: General terms and definitions (367)

### 8.20.2 design life

The period for which an item shall conform to its technical requirements specification.

### 8.20.3 engineering

Intellectual activities necessary to define, design, produce, sustain and recycle a product, a process or a building.

[SOURCE: BS EN 16311:2013, 2.1]

### 8.20.4 engineering services

Intellectual tasks provided during one or all stages of the life cycle of the product, a process or a built asset by specialised (or trained) professionals.

[SOURCE: BS EN 16311:2013, 2.2]

### 8.20.5 life cycle

All stages in the life span of a built asset or product.

[SOURCE: BS EN 16311:2013, 2.4]

### 8.20.6 professional engineer

Incorporated Engineer or Chartered Engineer in accordance with the UK specification for engineering competence (UK-SPEC) of the UK Engineering Council, or a person with equivalent knowledge, skills and experience.

### 8.20.7 professional engineering technician

Engineering Technician in accordance with the UK specification for engineering competence (UK-SPEC) of the UK Engineering Council, or a person with equivalent knowledge, skills and experience.

### 8.20.8 reverse engineering

Design process that consists in analysing the shape, dimensions and function of a finished part or prototype and using this information to produce a similar product.

[SOURCE: DD CEN ISO/TS 14253-4:2010, 3.1]

### 8.20.9 technical documentation

Means of conveying all or part of the information required to be controlled and maintained to support an item throughout its life cycle.

NOTE: Technical documentation related to a product typically includes its technical product specification (TPS), maintenance documentation, operation documentation and disposal documentation.

**8.20.10 technical product documentation (TPD)**

Means of conveying all or part of a design definition or specification of a product.

[SOURCE: BS EN ISO 10209:2012, 11.155]

**8.20.11 technical product specification (TPS)**

Technical product documentation comprising the complete design definition and specification of a product for manufacturing and verification purposes.

NOTE: A TPS (which may contain drawings, 3-D models, parts lists or other documents forming an integral part of the specification, in whatever format they may be presented) may consist of one or more technical product documents.

[SOURCE: BS EN ISO 10209:2012, 11.156]

**8.20.12 technical requirements specification (TRS)**

Document compiled and evaluated with the requirements from the markets (customer), authorities, and the Company itself.

[SOURCE: BS EN ISO 10209:2012, 11.135, “technical” and abbreviation added, company capitalised to align with the Agreement]

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## 9 Bibliography

1. **BSI committee TPR/1.** BS ISO 16016:2016, Technical product documentation - Protection notices for restricting the use of documents and products. *BSOL*. [Online] 30 April 2016. [Cited: 5 February 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030300659>.
2. **Chief Information Security Officer.** S1782 issue A3, Information Security Classification. *TfL management system*. [Online] March 2021. [Cited: 10 May 2021.] <https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1782.pdf>.
3. **LU Rolling Stock Engineering - R&E Fleet.** PVEC3149-LU-RSK-CLI-SP-0091-00 - Revision 1.0 - Interpretation of documents issued by TfL Engineering on behalf of LU Rolling Stock Renewals. *Central line Improvement Programme engineering site*. [Online] 30 April 2018. [Cited: 10 March 2020.] <https://sharelondon.tfl.gov.uk/ru/clip/r/PVEC3149-LU-RSK-CLI-SP-0091-00--R01--Interpretation-of-RSR-engineering-documents.pdf>.
4. **BSI Standards Policy and Strategy Committee.** Rules for the structure and drafting of UK standards:2017. *BSI*. [Online] 30 April 2017. [Cited: 10 March 2020.] <https://www.bsigroup.com/Documents/standards/guide-to-standards/Rules-for-structure-and-drafting-of-UK-standards-2017.pdf>.
5. **BSI committee IDT/2/18.** BS ISO 690:2010, Information and documentation. Guidelines for bibliographic references and citations to information resources. *BSOL*. [Online] 31 July 2010. [Cited: 26 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030147089>.
6. **Commercial Support.** TfL-00716-0003-01-BAA, Document history – Framework specification for the supply of bespoke components and related services. *LU RSE CS*. [Online] 15 March 2021. [Cited: 15 March 2021.] <https://transportforlondon.sharepoint.com/:w:/r/sites/commercial00716/c/TfL-00716-0003-01-BAA--History--Bespoke-components-specification.docx?d=w36c94545663640f3a4990509f0815122&csf=1&web=1&e=yF16UJ>.
7. **BSI committee QS/1/2.** BS ISO 10005:2018, Quality management. Guidelines for quality plans. *BSOL*. [Online] BSI, 21 June 2018. [Cited: 12 May 2020.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030347920>.
8. **BSI committee RAE/1/-/17.** PD ISO/TS 22163:2017, Railway applications — Quality management system — Business management system requirements for rail organizations: ISO 9001:2015 and particular requirements for application in the rail sector. *BSOL*. [Online] BSI, 30 November 2017. [Cited: 30 June 2020.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030357589>.
9. **LU Rolling Stock Engineering Manager.** PR0005 issue A1, Validation of purchase specifications. *TfL management system*. [Online] November 2017. [Cited: 21 December 2020.] <https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/PR0005.pdf>.
10. **Department for Business, Energy & Industrial Strategy.** Placing manufactured goods on the market in Great Britain. *GOV.UK*. [Online] 31 December 2020. [Cited: 8 April 2021.] <https://www.gov.uk/guidance/placing-manufactured-goods-on-the-market-in-great-britain>.



11. **BSI committee WEE/36.** BS EN ISO 3834-2:2021, Quality requirements for fusion welding of metallic materials. Comprehensive quality requirements. *BSOL*. [Online] 4 May 2021. [Cited: 18 June 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030426073>.
12. —. BS EN ISO 3834-3:2021, Quality requirements for fusion welding of metallic materials. Standard quality requirements. *BSOL*. [Online] 4 May 2021. [Cited: 18 June 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030426076>.
13. —. BS EN ISO 3834-4:2021, Quality requirements for fusion welding of metallic materials. Elementary quality requirements. *BSOL*. [Online] 18 May 2021. [Cited: 18 June 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030426079>.
14. **BSI.** Pocket Guide to Standards Development. *BSI Group*. [Online] 2012. [Cited: 8 April 2021.] <https://www.bsigroup.com/Documents/about-bsi/NSB/BSI-pocket-guide-to-standards-development-UK-EN.pdf>.
15. **Head of Safety, Health and Environment.** S1538 issue A16, Assurance. *TfL management system*. [Online] TfL, April 2020. [Cited: 25 April 2021.]  
<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1538.pdf>.
16. —. F0780 issue A18, Contract Menu. *TfL management system*. [Online] November 2016. [Cited: 5 February 2021.]  
<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/F0780.doc>.
17. —. S1552 issue A18, Contract QUENSH Conditions. *TfL management system*. [Online] November 2016. [Cited: 5 February 2021.]  
<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1552.pdf>.
18. **BSI committee MS/2.** BS 6079:2019, Project management. Principles and guidance for the management of projects. *BSOL*. [Online] 25 April 2019. [Cited: 5 February 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030395913>.
19. —. BS ISO 21502:2020, Project, programme and portfolio management. Guidance on project management. *BSOL*. [Online] 6 January 2021. [Cited: 5 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030382826>.
20. —. BS ISO 21511:2018, Work breakdown structures for project and programme management. *BSOL*. [Online] BSI, 30 May 2018. [Cited: 12 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030341017>.
21. **BSI committee QS/1.** BS EN ISO 9001:2015, Quality management systems. Requirements. *BSOL*. [Online] 30 September 2015. [Cited: 6 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030273524>.
22. **Commercial Support, LU Rolling Stock Engineering.** LU-RSE-CS-0022-00-AQA, Example quality plan format. *LU-RSE-CS site*. [Online] 6 November 2020. [Cited: 5 February 2021.] <https://transportforlondon.sharepoint.com/:w:/r/sites/lu-rse-cs/c/LU-RSE-CS-0022-00-AQA--Example-quality-plan-format.docx?d=wf04a64940fad4d02a7bbb3f3c6260078&csf=1&web=1&e=Ydo4kd>.

23. **BSI committee QS/1/2.** BS 95009:2019, Public sector procurement - Generic requirements for organizations providing products and services. *BSOL*. [Online] BSI, 29 May 2019. [Cited: 12 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030383867>.
24. **Swift, K. and Booker, J.** *Manufacturing Process Selection Handbook: From design to manufacture*. [eBook and hardcover] Oxford : Butterworth-Heinemann, 2013. eBook ISBN: 9780080993577; hardcover ISBN: 9780080993607.
25. **Rufe, P.** *Fundamentals of Manufacturing, Third Edition*. [eBook and hardcover] Southfield : Society of Manufacturing Engineers, 2013. eBook ISBN 9781628702002; hardcover ISBN 9780872638709.
26. **BSI committee TPR/1.** BS EN 22768-1:1993, ISO 2768-1:1989, General tolerances - Tolerances for linear and angular dimensions without individual tolerance indications. *BSOL*. [Online] BSI, 15 November 1993. [Cited: 22 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000316586>.
27. **ISO committee ISO/TC 213.** ISO 2768-1:1989, General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications . *ISO online browsing platform*. [Online] November 1989. [Cited: 24 May 2021.]  
<https://www.iso.org/obp/ui/#iso:std:iso:2768:-1:ed-1:v1:en>.
28. **BSI committee TPR/1.** BS EN 22768-2:1993, ISO 2768-2:1989, General tolerances. Geometrical tolerances for features without individual tolerance indications. *BSOL*. [Online] 15 July 1993. [Cited: 22 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000305717>.
29. **ISO committee ISO/TC 213.** ISO 2768-2:1989, General tolerances — Part 2: Geometrical tolerances for features without individual tolerance indications. *ISO online browsing platform*. [Online] November 1989. [Cited: 24 May 2021.]  
<https://www.iso.org/obp/ui/#iso:std:iso:2768:-2:ed-1:v1:en>.
30. **BSI committee TPR/1.** BS EN ISO 22081:2021, Geometrical product specifications (GPS). Geometrical tolerancing. General geometrical specifications and general size specifications. *BSOL*. [Online] 22 February 2021. [Cited: 22 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030369879>.
31. **BSI committee WEE/-/1.** BS EN ISO 13920:1997, Welding. General tolerances for welded constructions. Dimensions for lengths and angles. Shape and position. *BSOL*. [Online] BSI, 15 January 1997. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000886461>.
32. **BSI committee TPR/1.** BS EN ISO 8062-3:2007, Geometrical product specifications (GPS). Dimensional and geometrical tolerances for moulded parts. General dimensional and geometrical tolerances and machining allowances for castings. *BSOL*. [Online] BSI, 31 October 2007. [Cited: 12 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030201794>.
33. —. BS ISO 8062-4:2017, Geometrical product specifications (GPS) — Dimensional and geometrical tolerances for moulded parts. Part 4: General tolerances for castings using profile tolerancing in a general datum system. *BSOL*. [Online] 23 August 2017. [Cited: 15 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030262684>.

34. —. BS EN ISO 1302:2002, Geometrical product specifications (GPS). Indication of surface texture in technical product documentation. *BSOL*. [Online] BSI, 16 May 2002. [Cited: 12 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030015882>.
35. —. BS EN ISO 4287:1998+A1:2009, Geometrical product specification (GPS). Surface texture: Profile method. Terms, definitions and surface texture parameters. *BSOL*. [Online] 15 July 2000. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030167230>.
36. —. BS EN ISO 12085:1997, Geometrical product specification (GPS). Surface texture. Profile method. Motif parameters. *BSOL*. [Online] 15 March 1997. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030192633>.
37. —. BS EN ISO 13565-2:1998, Geometric product specifications (GPS). Surface texture: Profile method. Surfaces having stratified functional properties. Height characterization using the linear material ration curve. *BSOL*. [Online] 15 May 1997. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001414413>.
38. —. BS EN ISO 13565-3:2000, Geometric product specifications (GPS). Surface texture: Profile method. Surfaces having stratified functional properties. Height characterization using the material probability curve. *BSOL*. [Online] 15 September 2000. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030010409>.
39. **BSI committee MTE/1/2**. BS ISO 10791-7:2020, Test conditions for machining centres. Accuracy of finished test pieces. *BSOL*. [Online] 6 February 2020. [Cited: 22 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030361452>.
40. —. BS ISO 13041-6:2009, Test conditions for numerically controlled turning machines and turning centres. Accuracy of a finished test piece. *BSOL*. [Online] 31 August 2009. [Cited: 22 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030172454>.
41. **BSI committee SSM/1/-/1**. BS ISO 22380:2018, Security and resilience. Authenticity, integrity and trust for products and documents. General principles for product fraud risk and countermeasures. *BSOL*. [Online] BSI, 29 August 2019. [Cited: 12 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030361652>.
42. **BSI committee DS/1/2**. BS EN IEC 62402:2019, Obsolescence management. *BSOL*. [Online] BSI, 15 July 2019. [Cited: 12 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030353267>.
43. **BSI committee ACE/1**. BS EN 9278:2018, Aerospace series. General Principles of Obsolescence Management of chemicals, materials and processes. *BSOL*. [Online] BSI, 23 August 2018. [Cited: 12 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030371596>.
44. —. BS EN 9136:2018, Aerospace series. Root cause analysis and problem solving (9S Methodology). *BSOL*. [Online] BSI, 25 May 2018. [Cited: 12 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030290565>.

45. —. BS EN 9102:2015, Aerospace series. Quality systems. First article inspection requirements. *BSOL*. [Online] BSI, 31 January 2016. [Cited: 12 May 2020.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030386462>.
46. **LU Rolling Stock Engineering Manager**. PR0004 issue A1, First article and goods inwards inspections. *TfL management system*. [Online] November 2017. [Cited: 3 May 2021.] <https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/PR0004.pdf>.
47. **LU Track Principal Engineer**. G1061-A1, Track - First Article Inspections. *TfL Management System*. [Online] TfL, February 2019. [Cited: 15 March 2021.] <https://transportforlondon.sharepoint.com/:b:/r/sites/TMSManagementSystem/Management%20System/G1061.pdf?csf=1&web=1&e=60rux7>.
48. **BSI committee CAS/1**. BS EN ISO/IEC 17050-1:2010, Conformity assessment - Suppliers declaration of conformity - General requirements. *BSOL*. [Online] 31 May 2010. [Cited: 5 February 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030214249>.
49. —. BS EN ISO/IEC 17050-2:2004, Conformity assessment - Supplier's declaration of conformity - Supporting documentation. *BSOL*. [Online] BSI, 26 October 2004. [Cited: 12 May 2020.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030095966>.
50. **BSI committee ISE/100**. BS EN 10204:2004, Metallic products - Types of inspection documents. *BSOL*. [Online] BSI, 25 October 2004. [Cited: 12 May 2020.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030027046>.
51. —. BS ISO 10474:2013, Steel and steel products. Inspection documents. *BSOL*. [Online] 31 July 2013. [Cited: 15 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030244861>.
52. —. BS ISO 404:2013, Steel and steel products. General technical delivery requirements. *BSOL*. [Online] 30 June 2013. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030244864>.
53. **ISO committee ISO/TC 17**. ISO 6929:2013, Steel products — Vocabulary. *ISO online browsing platform*. [Online] November 2013. [Cited: 18 March 2021.] <https://www.iso.org/obp/ui/#iso:std:iso:6929:ed-2:v1:en>.
54. **BSI committee ISE/111**. BS ISO 4990:2015, Steel castings. General technical delivery requirements. *BSOL*. [Online] 30 September 2015. [Cited: 15 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030252101>.
55. **BSI committee CAS/1**. BS EN ISO/IEC 17025:2017, General requirements for the competence of testing and calibration laboratories. *BSOL*. [Online] BSI, 31 December 2017. [Cited: 15 May 2020.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030379555>.
56. **BSI committee TPR/1**. BS EN ISO 14253-1:2017, Geometrical product specifications (GPS). Inspection by measurement of workpieces and measuring equipment. Decision rules for verifying conformity or nonconformity with specifications. *BSOL*. [Online] BSI, 7 February 2018. [Cited: 10 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030333695>.

57. —. BS EN ISO 14253-3:2011, Geometrical product specifications (GPS). Inspection by measurement of workpieces and measuring equipment. Guidelines for achieving agreements on measurement uncertainty statements. *BSOL*. [Online] BSI, 31 May 2011. [Cited: 26 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030198171>.
58. **BSI committee STI/21**. BS EN ISO 12944-4:2017, Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Types of surface and surface preparation. *BSOL*. [Online] 31 January 2018. [Cited: 23 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030337297>.
59. **BSI committee PRI/52**. BS EN 13887:2003, Structural adhesives - Guidelines for surface preparation of metals and plastics prior to adhesive bonding. *BSOL*. [Online] BSI, 4 September 2003. [Cited: 24 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030026888>.
60. **BSI committee LBI/50**. PD ISO/TS 21256-1:2020, Fine bubble technology. Cleaning applications. Test method for cleaning salt (NaCl)-stained surfaces. *BSOL*. [Online] 24 March 2020. [Cited: 5 February 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030397082>.
61. —. BS ISO 21256-2:2020, Fine bubble technology. Cleaning applications. Test method for cleaning machine-oil stained surfaces of machined metal parts. *BSOL*. [Online] 23 January 2020. [Cited: 5 February 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030352188>.
62. —. PD ISO/TR 24217-2:2021, Fine bubble technology. Guideline for indicating benefits. Assignment of Sustainable Development Goals (SDGs) to applications of fine bubble technologies. *BSOL*. [Online] 10 May 2021. [Cited: 25 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030414259>.
63. **BSI committee PH/9/-/4**. PD ISO/TR 12295:2014, Ergonomics - Application document for International Standards on manual handling (ISO 11228-1, ISO 11228-2 and ISO 11228-3) and evaluation of static working postures (ISO 11226). *BSOL*. [Online] BSI, 30 April 2014. [Cited: 15 May 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030280205>.
64. **BSI committee GEL/104**. BS EN IEC 60721-3-0:2020, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Introduction. *BSOL*. [Online] 2 July 2020. [Cited: 24 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030373836>.
65. —. BS EN IEC 60721-3-1:2018, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Storage. *BSOL*. [Online] 25 April 2018. [Cited: 24 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030281155>.
66. —. BS EN IEC 60721-3-2:2018, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Transportation and Handling. *BSOL*. [Online] 24 April 2018. [Cited: 24 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030388191>.
67. —. BS EN IEC 60721-3-3:2019, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Stationary use at weatherprotected locations. *BSOL*. [Online] 25 July 2019. [Cited: 24 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030365444>.

68. —. BS EN IEC 60721-3-4:2019, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Stationary use at non-weatherprotected locations. *BSOL*. [Online] 25 July 2019. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030364814>.
69. —. BS EN 60721-3-5:1997, IEC 60721-3-5:1997, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Ground vehicle installations. *BSOL*. [Online] 15 August 1997. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001094683>.
70. —. BS EN 60721-3-6:1993, IEC 60721-3-6:1987, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Ship environment. *BSOL*. [Online] 29 November 1991. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001097792>.
71. —. BS EN 60721-3-7:1996, IEC 60721-3-7:1995, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Portable and non-stationary use. *BSOL*. [Online] 15 February 1996. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001097517>.
72. —. BS EN 60721-3-9:1993, IEC 60721-3-9:1993, Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Microclimates inside products. *BSOL*. [Online] 15 December 1993. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000318431>.
73. **BSI committee PKW/0/-/9**. BS 1133-7.6:1988, Packaging code. Paper and board wrappers, bags and containers. Moulded pulp packaging. *BSOL*. [Online] 30 November 1988. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000187938>.
74. **BSI committee PKW/0**. BS 1133-8:2011+A1:2016, Packaging code. Guidance on wooden boxes, cases and crates. *BSOL*. [Online] BSI, 1 June 2016. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030345603>.
75. **BSI committee PKW/0/-/8**. BS 1133-10.1:1990, Packaging code. Metal containers. Tins and cans. *BSOL*. [Online] 31 December 1990. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000231185>.
76. **BSI committee PKW/0**. BS 1133-15:1991, Packaging code. Tensional strapping. *BSOL*. [Online] 28 June 1991. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000242461>.
77. —. BS 1133-19:1986, Packaging code. Use of desiccants in packaging. *BSOL*. [Online] 31 December 1986. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000163224>.
78. —. BS 1133-21:1991, Packaging code. Regenerated cellulose film, films made of plastics, aluminium foil, flexible multilayer structures and metallized materials. *BSOL*. [Online] 30 August 1991. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000247490>.
79. **BSI committee PKW/0/-/10**. BS 1133-22:1989, Packaging code. Packaging in plastics containers. *BSOL*. [Online] 30 November 1989. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000205462>.

80. **BSI committee SVS/11.** BS EN 13876:2002, Transport - Logistics and services - Goods transport chains - Code of practice for the provision of cargo transport services. *BSOL*. [Online] BSI, 27 August 2004. [Cited: 12 May 2020.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030037424>.
81. **BSI committee CAS/1.** BS EN ISO/IEC 17065:2012, Conformity assessment. Requirements for bodies certifying products, processes and services. *BSOL*. [Online] 31 October 2012. [Cited: 12 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030260760>.
82. **BSI committee ISE/101/5.** BS EN ISO 18265:2013, Metallic materials. Conversion of hardness values. *BSOL*. [Online] 31 October 2013. [Cited: 8 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030210149>.
83. **BSI committee TPR/1.** BS 2856:1973, Precise conversion of inch and metric sizes on engineering drawings. *BSOL*. [Online] 8 October 1973. [Cited: 8 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000099924>.
84. **BSI committee SS/7.** BS 350:2004, Conversion factors for units. *BSOL*. [Online] 25 May 2004. [Cited: 8 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030054558>.
85. **BSI committee FME/9.** PD 6494:1980, Mismatch of screw thread systems. *BSOL*. [Online] 30 June 1980. [Cited: 25 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000065620>.
86. **BSI committee ISE/105.** BS 970-1:1983, Specification for wrought steels for mechanical and allied engineering purposes. General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels. *BSOL*. [Online] 31 May 1983. [Cited: 7 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000010020833>.
87. —. BS 970-1:1991, Specification for wrought steels for mechanical and allied engineering purposes. General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels. *BSOL*. [Online] 29 November 1991. [Cited: 7 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000255642>.
88. —. PD 6474:1976, Two-way index of the designation system used in BS 970:1955 (now obsolete) and later revisions. *BSOL*. [Online] 15 December 1976. [Cited: 7 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000010196626>.
89. —. PD 970:2005, Wrought steels for mechanical and allied engineering purposes. Requirements for carbon, carbon manganese and alloy hot worked or cold finished steels. *BSOL*. [Online] 31 January 2005. [Cited: 7 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030133996>.
90. —. BS EN ISO 683-1:2018, Heat-treatable steels, alloy steels and free-cutting steels. Non-alloy steels for quenching and tempering. *BSOL*. [Online] 20 June 2018. [Cited: 7 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030385773>.
91. —. BS EN ISO 683-2:2018, Heat-treatable steels, alloy steels and free-cutting steels. Alloy steels for quenching and tempering. *BSOL*. [Online] 20 June 2018. [Cited: 7 April 2021.]

2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030353541>.

92. —. BS EN ISO 683-3:2019, Heat-treatable steels, alloy steels and free-cutting steels. Case-hardening steels. *BSOL*. [Online] 23 March 2021. [Cited: 7 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030380055>.

93. —. BS EN ISO 683-4:2018, Heat-treatable steels, alloy steels and free-cutting steels. Free-cutting steels. *BSOL*. [Online] 5 July 2018. [Cited: 7 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030353545>.

94. **Chief Information Security Officer.** P116:A4, Information Security. *TfL management system*. [Online] March 2021. [Cited: 10 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/P116.pdf>.

95. **BSI committee TPR/1.** BS EN ISO 11442:2006, Technical product documentation. Document management. *BSOL*. [Online] 31 August 2007. [Cited: 22 June 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030143896>.

96. **BSI committee GEL/3.** BS EN IEC/IEEE 82079-1:2020, Preparation of information for use (instructions for use) of products. Principles and general requirements. *BSOL*. [Online] 09 April 2020. [Cited: 8 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030298079>.

97. **BSI committee DS/1.** BS EN 13460:2009, Maintenance. Documentation for maintenance. *BSOL*. [Online] BSI, 28 February 2010. [Cited: 10 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030163968>.

98. **Commercial Support, LU Rolling Stock Engineering.** LU-RSE-CS-0023-00-BEC revision 0.3, Product specification and support documentation for LU rolling stock. *LU-RSE-CS site*. [Online] 28 June 2020. [Cited: 10 May 2021.]

<https://transportforlondon.sharepoint.com/:w:/r/sites/lu-rse-cs/c/LU-RSE-CS-0023-00-BEC-Product-specification-and-support-documentation.docx?d=w79303893c3af488283664e68c6325a42&csf=1&web=1&e=yAFPr t>.

99. **Head of Engineering Information.** S1036 issue A1, Presentation of Engineering Drawings. *TfL management system*. [Online] January 2017. [Cited: 10 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1036.pdf>.

100. —. S1037 issue A4, Computer Aided Design (CAD). *TfL management system*. [Online] February 2020. [Cited: 10 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1037.pdf>.

101. **SHE Design and Publishing Team.** W0007 issue A8, Authoring management system work instruction guide. *TfL management system work instructions*. [Online] 14 April 2021. [Cited: 10 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSWorkInstructions/Work%20Instruction/W0007.pdf>.

102. **BSI committee ISE/100.** BS EN 10079:2007, Definition of steel products. *BSOL*. [Online] 30 April 2007. [Cited: 15 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030114971>.



103. —. BS EN 10021:2006, General technical delivery conditions for steel products. *BSOL*. [Online] 31 May 2007. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030038553>.
104. —. BS EN 10168:2004, Steel products. Inspection documents. List of information and description. *BSOL*. [Online] BSI, 24 June 2004. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030027105>.
105. **BSI committee ISE/109**. BS EN 10346:2015, Continuously hot-dip coated steel flat products for cold forming. Technical delivery conditions. *BSOL*. [Online] BSI, 31 July 2015. [Cited: 23 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030280396>.
106. **BSI committee NFE/35**. BS EN 485-1:2016, Aluminium and aluminium alloys. Sheet, strip and plate. Technical conditions for inspection and delivery. *BSOL*. [Online] BSI, 31 August 2016. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030330715>.
107. —. BS EN 754-1:2016, Aluminium and aluminium alloys. Cold drawn rod/bar and tube. Technical conditions for inspection and delivery. *BSOL*. [Online] BSI, 31 March 2016. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030324461>.
108. —. BS EN 755-1:2016, Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Technical conditions for inspection and delivery. *BSOL*. [Online] BSI, 30 June 2016. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030327134>.
109. —. BS EN 12020-1:2008, Aluminium and aluminium alloys. Extruded precision profiles in alloys EN AW-6060 and EN AW-6063. Technical conditions for inspection and delivery. *BSOL*. [Online] BSI, 30 April 2008. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030136242>.
110. —. BS EN 1301-1:2008, Aluminium and aluminium alloys. Drawn wire. Technical conditions for inspection and delivery. *BSOL*. [Online] BSI, 31 October 2008. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030144984>.
111. —. BS EN 13981-1:2003, Aluminium and aluminium alloys. Products for structural railway applications. Technical conditions for inspection and delivery. Extruded products. *BSOL*. [Online] BSI, 19 August 2003. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030034931>.
112. —. BS EN 13981-2:2004, Aluminium and aluminium alloys. Products for structural railway applications. Technical conditions for inspection and delivery. Plates and sheets. *BSOL*. [Online] 4 August 2004. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030016620>.
113. —. BS EN 13981-3:2006, Aluminium and aluminium alloys. Products for structural railway applications. Technical conditions for inspection and delivery. Castings. *BSOL*. [Online] 31 October 2006. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030050374>.
114. —. BS EN 13981-4:2006, Aluminium and aluminium alloys. Products for structural railway applications. Technical conditions for inspection and delivery. Forgings. *BSOL*.

[Online] 29 December 2006. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030050378>.

115. **BSI committee NFE/34.** PD CEN/TS 13388:2020, Copper and copper alloys. Compendium of compositions and products. *BSOL*. [Online] BSI, 15 April 2020. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030423502>.

116. —. BS EN 12163:2016, Copper and copper alloys. Rod for general purposes. *BSOL*. [Online] BSI, 31 August 2016. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030328388>.

117. —. BS EN 12164:2016, Copper and copper alloys. Rod for free machining purposes. *BSOL*. [Online] BSI, 31 July 2016. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030328376>.

118. —. BS EN 12165:2016, Copper and copper alloys. Wrought and unwrought forging stock. *BSOL*. [Online] BSI, 31 July 2016. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030328382>.

119. —. BS EN 12166:2016, Copper and copper alloys. Wire for general purposes. *BSOL*. [Online] BSI, 31 July 2016. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030328391>.

120. —. BS EN 12167:2016, Copper and copper alloys. Profiles and bars for general purposes. *BSOL*. [Online] BSI, 31 July 2016. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030328385>.

121. —. BS EN 12168:2016, Copper and copper alloys. Hollow rod for free machining purposes. *BSOL*. [Online] BSI, 31 July 2016. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030328379>.

122. —. BS EN 13347:2002, Copper and copper alloys. Rod and wire for welding and braze welding. *BSOL*. [Online] BSI, 21 December 2002. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030078492>.

123. —. BS EN 13601:2013, Copper and copper alloys. Copper rod, bar and wire for general electrical purposes. *BSOL*. [Online] BSI, 30 June 2013. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030240457>.

124. —. BS EN 13602:2013, Copper and copper alloys. Drawn, round copper wire for the manufacture of electrical conductors. *BSOL*. [Online] BSI, 31 July 2013. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030240460>.

125. —. BS EN 13605:2013, Copper and copper alloys. Copper profiles and profiled wire for electrical purposes. *BSOL*. [Online] BSI, 30 June 2013. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030240469>.

126. **BSI committee PRI/21.** BS EN 15860:2018, Plastics. Thermoplastic semi-finished products for machining. Requirements and test methods. *BSOL*. [Online] 8 August 2018. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030317349>.

127. **BSI committee GEL/15.** BS 2572:1990, Specification for phenolic laminated sheet and epoxy cotton fabric laminated sheet. *BSOL*. [Online] 30 November 1990. [Cited: 18

March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000228036>.

128. —. BS EN 60893-1:2004, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Definitions, designations and general requirements. *BSOL*. [Online] 12 May 2004. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030012475>.

129. —. BS EN 60893-2:2004, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Methods of test. *BSOL*. [Online] 11 August 2004. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030002826>.

130. —. BS EN 60893-3-1:2012, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Specifications for individual materials. Types of industrial rigid laminated sheets. *BSOL*. [Online] 30 November 2012. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030215989>.

131. —. BS EN 60893-3-2:2004+A1:2011, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Specifications for individual materials. Requirements for rigid laminated sheets based on epoxy resins. *BSOL*. [Online] September 2012. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030177782>.

132. —. BS EN 60893-3-3:2004+A1:2012, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Specifications for individual materials. Requirements for rigid laminated sheets based on melamine resins. *BSOL*. [Online] April 2013. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030177786>.

133. —. BS EN 60893-3-4:2004+A1:2012, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Specifications for individual materials. Requirements for rigid laminated sheets based on phenolic resins. *BSOL*. [Online] April 2014. [Cited: 25 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030300124>.

134. —. BS EN 60893-3-5:2004+A1:2009, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Specifications for individual materials. Requirements for rigid laminated sheets based on polyester resins. *BSOL*. [Online] March 2011. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030177794>.

135. —. BS EN IEC 60893-3-6:2004+A2:2018, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Specifications for individual materials. Requirements for rigid laminated sheets based on silicone resins. *BSOL*. [Online] August 2018. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030338612>.

136. —. BS EN 60893-3-7:2004+A1:2009, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Specifications for individual materials. Requirements for rigid laminated sheets based on polyimide resins. *BSOL*. [Online] March 2011. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030177803>.

137. —. PD IEC/TR 60893-4:2014+A1:2017, Insulating materials. Industrial rigid laminated sheets based on thermosetting resins for electrical purposes. Typical values. *BSOL*. [Online] March 2018. [Cited: 24 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030330280>.
138. **BSI committee ISE/111**. BS EN 1559-1:2011, Founding. Technical conditions of delivery. General. *BSOL*. [Online] BSI, 30 April 2011. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030200835>.
139. —. BS EN 1559-2:2014, Founding. Technical conditions of delivery. Additional requirements for steel castings. *BSOL*. [Online] BSI, 31 October 2014. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030266616>.
140. —. BS EN 1559-3:2011, Founding. Technical conditions of delivery. Additional requirements for iron castings. *BSOL*. [Online] BSI, 31 October 2011. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030214935>.
141. —. BS EN 1559-4:2015, Founding. Technical conditions of delivery. Additional requirements for aluminium alloy castings. *BSOL*. [Online] 25 February 2015. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030286637>.
142. —. BS EN 1559-5:2017, Founding. Technical conditions of delivery. Additional requirements for magnesium alloy castings. *BSOL*. [Online] BSI, 31 March 2017. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030327655>.
143. **BSI committee NFE/8**. BS EN 1559-6:1999, Founding. Technical conditions of delivery. Additional requirements for zinc alloy castings. *BSOL*. [Online] BSI, 15 May 1999. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001547331>.
144. **BSI committee ISE/111**. BS EN 10293:2015, Steel castings. Steel castings for general engineering uses. *BSOL*. [Online] 31 January 2015. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030255756>.
145. **BSI committee NFE/34**. BS EN 1982:2017, Copper and copper alloys. Ingots and castings. *BSOL*. [Online] BSI, 10 October 2017. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030330718>.
146. **BSI committee CB/203**. BS EN 1090-2:2018, Execution of steel structures and aluminium structures. Technical requirements for steel structures. *BSOL*. [Online] BSI, 20 June 2018. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030320417>.
147. **BSI committee B/525/9**. BS EN 1090-3:2019, Execution of steel structures and aluminium structures. Technical requirements for aluminium structures. *BSOL*. [Online] BSI, 15 April 2019. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030348950>.
148. **BSI committee PVE/10**. BS EN 13480-1:2017+A1:2019, Metallic industrial piping. General. *BSOL*. [Online] BSI, 21 September 2017. [Cited: 20 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030365593>.

149. —. BS EN 13480-4:2017, Metallic industrial piping. Fabrication and installation. *BSOL*. [Online] BSI, 22 September 2017. [Cited: 20 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030360954>.
150. —. BS EN 13480-3:2017+A1:2021, Metallic industrial piping. Design and calculation. *BSOL*. [Online] 31 March 2021. [Cited: 20 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030382415>.
151. —. BS 1306:1975, Specification for copper and copper alloy pressure piping systems. *BSOL*. [Online] 30 September 1975. [Cited: 20 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000030672>.
152. **BSI committee ISE/111**. BS EN 10250-1:1999, Open steel die forgings for general engineering purposes. General requirements. *BSOL*. [Online] 15 December 1999. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030002346>.
153. —. BS EN 10250-2:2000, Open steel die forgings for general engineering purposes. Non-alloy quality and special steels. *BSOL*. [Online] 15 February 2000. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030029503>.
154. —. BS EN 10250-3:2000, Open steel die forgings for general engineering purposes. Alloy special steels. *BSOL*. [Online] 15 February 2000. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030010711>.
155. —. BS EN 10250-4:2000, Open steel die forgings for general engineering purposes. Stainless steels. *BSOL*. [Online] 15 February 2000. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030010701>.
156. —. BS EN 10254:1999, Steel closed die forgings. General technical delivery conditions. *BSOL*. [Online] 15 December 1999. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030006748>.
157. **BSI committee NFE/35**. BS EN 586-1:1998, Aluminium and aluminium alloys. Forgings. Technical conditions for inspection and delivery. *BSOL*. [Online] BSI, 15 February 1998. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001237753>.
158. —. BS EN 586-2:1994, Aluminium and aluminium alloys. Forgings. Mechanical properties and additional property requirements. *BSOL*. [Online] 15 October 1995. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000344924>.
159. —. BS EN 586-3:2001, Aluminium and aluminium alloys. Forgings. Tolerances on dimensions and form. *BSOL*. [Online] 11 April 2002. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030050636>.
160. **BSI committee NFE/34**. BS EN 12420:2014, Copper and copper alloys. Forgings. *BSOL*. [Online] BSI, 30 June 2014. [Cited: 21 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030261890>.
161. **BSI committee TPR/1/9**. BS 2634-1:2010, Roughness comparison specimens. Specification for turned, ground, bored, milled, shaped and planed specimens. *BSOL*. [Online] BSI, 30 September 2010. [Cited: 22 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030213637>.

162. **BSI committee MTE/18.** BS 5078:1974, Specification for jig and fixture components. *BSOL*. [Online] BSI, 28 June 1974. [Cited: 22 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000127477>.
163. —. BS 1098-1:1967, Specification for jig bushes. Inch units. *BSOL*. [Online] BSI, 24 November 1967. [Cited: 22 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000063724>.
164. —. BS 1098-2:1977, Specification for jig bushes. Metric units. *BSOL*. [Online] BSI, 31 December 1976. [Cited: 22 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000063748>.
165. **ISO Central Secretariat.** International Classification for Standards - Seventh edition. *ISO*. [Online] 13 November 2015. [Cited: 8 April 2021.] <https://www.iso.org/publication/PUB100033.html>. ISBN 978-92-67-10652-6.
166. **BSI committee PRI/66.** PD ISO/TR 17784:2003, Rubber and plastic hoses and hose assemblies. Guide for use by purchasers, assemblers, installers and operating personnel. *BSOL*. [Online] 5 December 2003. [Cited: 13 November 2020.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030099715>.
167. **BSI committee GSE/42.** BS 6501-1:2004, Metal hose assemblies. Guidance on the construction and use of corrugated hose assemblies. *BSOL*. [Online] 19 February 2004. [Cited: 8 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030081653>.
168. **BSI committee PSE/18/1.** BS 6683:1985, Guide to installation and use of valves. *BSOL*. [Online] 31 October 1985. [Cited: 8 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000145091>.
169. **BSI committee MCE/18/-/4.** PD ISO/TS 17165-2:2018, Hydraulic fluid power. Hose assemblies. Practices for hydraulic hose assemblies. *BSOL*. [Online] 10 April 2018. [Cited: 8 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030364899>.
170. **BSI committee GEL/9/2.** BS EN 50343:2014+A1:2017, Railway applications. Rolling stock. Rules for installation of cabling. *BSOL*. [Online] 30 June 2014. [Cited: 8 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030329559>.
171. **BSI committee WEE/37.** BS 7608:2014+A1:2015, Guide to fatigue design and assessment of steel products. *BSOL*. [Online] BSI, 31 March 2014. [Cited: 26 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030329662>.
172. **BSI committee B/525/9.** BS 8118-1:1991, Structural use of aluminium. Code of practice for design. *BSOL*. [Online] 31 March 1992. [Cited: 25 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000019996040>.
173. —. PD 6705-3:2009, Structural use of steel and aluminium. Recommendations for the execution of aluminium structures to BS EN 1090-3. *BSOL*. [Online] BSI, 31 December 2009. [Cited: 25 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030192204>.
174. **BSI committee B/525.** PD 6702-1:2009+A1:2019, Structural use of aluminium. Recommendations for the design of aluminium structures to BS EN 1999. *BSOL*. [Online]

May 2019. [Cited: 25 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030382955>.

175. **BSI committee WEE/1.** BS EN ISO 4063:2010, Welding and allied processes. Nomenclature of processes and reference numbers. *BSOL*. [Online] BSI, 31 December 2010. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030218561>.

176. **BSI committee RAE/3/-/11.** BS EN 15085-2:2020, Railway applications. Welding of railway vehicles and components. Requirements for welding manufacturer. *BSOL*. [Online] BSI, 13 October 2020. [Cited: 8 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030304308>.

177. **BSI committee WEE/36.** PD CEN ISO/TR 15608:2017, Welding — Guidelines for a metallic materials grouping system. *BSOL*. [Online] 28 February 2017. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030333240>.

178. —. BS EN ISO 3834-1:2005, Quality requirements for fusion welding of metallic materials. Criteria for the selection of the appropriate level of quality requirements. *BSOL*. [Online] BSI, 19 January 2006. [Cited: 8 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030094302>.

179. **BSI committee WEE/-/1.** BS EN ISO 3834-5:2015, Quality requirements for fusion welding of metallic materials. Documents with which it is necessary to conform to claim conformity to the quality requirements of ISO 3834-2, ISO 3834-3 or ISO 3834-4. *BSOL*. [Online] 30 June 2015. [Cited: 8 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030292704>.

180. —. PD CEN ISO/TR 3834-6:2007, Quality requirements for fusion welding of metallic materials. Guidelines on implementing ISO 3834. *BSOL*. [Online] 31 May 2007. [Cited: 8 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030136337>.

181. **BSI committee WEE/36.** BS EN ISO 15614-1:2017+A1:2019, Specification and qualification of welding procedures for metallic materials. Welding procedure test. Arc and gas welding of steels and arc welding of nickel and nickel alloys. *BSOL*. [Online] BSI, 7 July 2017. [Cited: 9 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030374664>.

182. **BSI committee WEE/17.** BS EN 1011-1:2009, Welding. Recommendations for welding of metallic materials. General guidance for arc welding. *BSOL*. [Online] 31 March 2009. [Cited: 9 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030158904>.

183. —. BS EN 1011-2:2001, Welding. Recommendations for welding of metallic materials. Arc welding of ferritic steels. *BSOL*. [Online] BSI, 15 March 2001. [Cited: 9 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030109226>.

184. **BSI committee WEE/36.** BS EN 1011-3:2018, Welding. Recommendations for welding of metallic materials. Arc welding of stainless steels. *BSOL*. [Online] 5 December 2018. [Cited: 9 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030357024>.

185. **BSI committee WEE/28.** BS EN 1011-4:2000, Welding. Recommendations for welding of metallic materials. Arc welding of aluminium and aluminium alloys. *BSOL*. [Online] 15 November 2000. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030107664>.
186. **BSI committee WEE/17.** BS EN 1011-5:2003, Welding. Recommendations for welding of metallic materials. Welding of clad steel. *BSOL*. [Online] 2 May 2003. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030022744>.
187. **BSI committee WEE/36.** BS EN 1011-6:2018, Welding. Recommendation for welding of metallic materials. Laser beam welding. *BSOL*. [Online] 12 December 2018. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030358925>.
188. —. BS EN 1011-7:2004, Welding. Recommendations for welding of metallic materials. Electron beam welding. *BSOL*. [Online] 4 August 2004. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030022743>.
189. —. BS EN 1011-8:2018, Welding. Recommendations for welding of metallic materials. Welding of cast irons. *BSOL*. [Online] 15 May 2018. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030336474>.
190. **BSI committee WEE/19.** BS EN 14324:2004, Brazing. Guidance on the application of brazed joints. *BSOL*. [Online] 27 September 2004. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030016749>.
191. **BSI committee RAE/1.** BS EN 15085-3:2007, Railway applications. Welding of railway vehicles and components. Design requirements. *BSOL*. [Online] 30 November 2007. [Cited: 20 June 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030214775>.
192. **BSI committee ISE/103.** BS EN 10163-1:2004, Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections. General requirements. *BSOL*. [Online] BSI, 16 December 2004. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030155654>.
193. —. BS EN 10163-2:2004, Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections. Plate and wide flats. *BSOL*. [Online] 16 December 2004. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030082481>.
194. —. BS EN 10163-3:2004, Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections. Sections. *BSOL*. [Online] 16 December 2004. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030082487>.
195. **BSI committee WEE/18.** BS EN ISO 9013:2017, Thermal cutting. Classification of thermal cuts. Geometrical product specification and quality tolerances. *BSOL*. [Online] BSI, 28 February 2017. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030261579>.
196. **BSI committee RAE/1.** BS EN 15085-4:2007, Railway applications. Welding of railway vehicles and components. Production requirements. *BSOL*. [Online] 30 November 2007. [Cited: 18 June 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030125243>.



197. **BSI committee MTE/15.** BS EN ISO 6789-1:2017, Assembly tools for screws and nuts. Hand torque tools. Requirements and methods for design conformance testing and quality conformance testing: minimum requirements for declaration of conformance. *BSOL*. [Online] BSI, 31 March 2017. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030293073>.
198. —. BS EN ISO 6789-2:2017, Assembly tools for screws and nuts. Hand torque tools. Requirements for calibration and determination of measurement uncertainty. *BSOL*. [Online] BSI, 31 March 2017. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030293076>.
199. **BSI committee FME/9.** BS EN ISO 16426:2002, Fasteners. Quality assurance system. *BSOL*. [Online] BSI, 10 December 2002. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030090665>.
200. —. BS EN ISO 16228:2018, Fasteners. Types of inspection documents. *BSOL*. [Online] BSI, 21 February 2018. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030280563>.
201. —. BS EN ISO 3269:2019, Fasteners. Acceptance inspection. *BSOL*. [Online] BSI, 15 October 2019. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030359789>.
202. **Commercial Support, LU Rolling Stock Engineering.** LU-RSE-CS-0032-00-MEC, Acceptance inspection of fasteners for LU rolling stock. *LU-RSE-CS site*. [Online] 23 December 2020. [Cited: 24 March 2021.] <https://transportforlondon.sharepoint.com/:w:/r/sites/lu-rse-cs/c/LU-RSE-CS-0032-00-MEC--Acceptance-inspection-of-fasteners.docx?d=w3f99bc1c90564353bcbca73fcbfee5c0&csf=1&web=1&e=bUKRe4>.
203. **BSI committee FME/9.** BS 8498:2008, British Standards for screw threads and screw gauges. Introduction and guidance. *BSOL*. [Online] 30 November 2008. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030165215>.
204. —. BS ISO 8992:2005, Fasteners. General requirements for bolts, screws, studs and nuts. *BSOL*. [Online] BSI, 27 April 2005. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030105020>.
205. —. BS 3692:2014, ISO metric precision hexagon bolts, screws and nuts. Specification. *BSOL*. [Online] 31 October 2014. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030283397>.
206. —. BS EN ISO 898-1:2013, Mechanical properties of fasteners made of carbon steel and alloy steel. Bolts, screws and studs with specified property classes. Coarse thread and fine pitch thread. *BSOL*. [Online] BSI, 31 January 2013. [Cited: 26 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030254314>.
207. —. BS EN ISO 898-2:2012, Mechanical properties of fasteners made of carbon steel and alloy steel. Nuts with specified property classes. Coarse thread and fine pitch thread. *BSOL*. [Online] BSI, 30 April 2012. [Cited: 26 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030186733>.
208. —. BS EN ISO 898-3:2018, Mechanical properties of fasteners made of carbon steel and alloy steel. Flat washers with specified property classes. *BSOL*. [Online] BSI, 5 July

2018. [Cited: 26 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030335250>.

209. —. BS EN ISO 2320:2015, Fasteners. Prevailing torque steel nuts. Functional properties. *BSOL*. [Online] BSI, 31 January 2016. [Cited: 26 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030298881>.

210. —. BS EN ISO 4042:2018, Fasteners. Electroplated coating systems. *BSOL*. [Online] BSI, 27 September 2018. [Cited: 26 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030391314>.

211. —. BS EN ISO 10683:2018, Fasteners. Non-electrolytically applied zinc flake coating systems. *BSOL*. [Online] BSI, 27 September 2018. [Cited: 26 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030340614>.

212. —. BS 7371-3:2009, Coatings on metal fasteners. Specifications for electroplated zinc coatings. *BSOL*. [Online] BSI, 31 August 2009. [Cited: 26 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030133821>.

213. —. BS 7371-4:1994, Coatings on metal fasteners. Specification for electroplated nickel, nickel/chromium and copper/nickel/chromium coatings. *BSOL*. [Online] 15 June 1994. [Cited: 6 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/00000000000334213>.

214. —. BS 7371-12:2008, Coatings on metal fasteners. Requirements for imperial fasteners. *BSOL*. [Online] BSI, 31 July 2008. [Cited: 26 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030173611>.

215. —. BS 7371-1:2009, Coatings on metal fasteners. Specification for general requirements and selection guidelines. *BSOL*. [Online] 31 August 2009. [Cited: 6 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030133814>.

216. **BSI committee FME/9/-/1**. BS 7371-6:1998+A1:2011, Coatings on metal fasteners. Specification for hot dipped galvanized coatings. *BSOL*. [Online] 15 January 1998. [Cited: 6 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030218893>.

217. **BSI committee FME/9**. BS 7371-7:2010, Coatings on metal fasteners. Specification for mechanically applied zinc and zinc based coatings. *BSOL*. [Online] 30 April 2010. [Cited: 6 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030191322>.

218. —. BS 7371-8:2011, Coatings on metal fasteners. Specification for sherardized coatings. *BSOL*. [Online] 31 March 2011. [Cited: 6 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030228092>.

219. —. BS 7371-9:1996, Coatings on metal fasteners. Specification for phosphate or phosphate and oil coatings. *BSOL*. [Online] 15 October 1996. [Cited: 6 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/00000000000835626>.

220. —. BS 7371-10:1994, Coatings on metal fasteners. Specification for organic coatings. *BSOL*. [Online] 15 March 1994. [Cited: 6 April 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/00000000000326085>.

221. —. BS 7751-1:1994, Prevailing torque type wire thread inserts. Specification for ISO metric coarse pitch threads. *BSOL*. [Online] 15 September 1994. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030157872>.
222. —. BS 7751-2:1994, Prevailing torque type wire thread inserts. Specification for ISO metric fine pitch threads. *BSOL*. [Online] 15 September 1994. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030157857>.
223. —. BS 7752-1:1994+A1:2008, Free running type wire thread inserts. Specification for ISO metric coarse pitch threads. *BSOL*. [Online] September 2008. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030167908>.
224. —. BS 7752-2:1994, Free running type wire thread inserts. Specification for ISO metric fine pitch threads. *BSOL*. [Online] 15 October 1994. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000341187>.
225. —. BS 4377:1991, Specification for tapping of holes to receive wire thread inserts (ISO metric threads). *BSOL*. [Online] 31 May 1991. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000240411>.
226. —. BS 3409-1:1961, Specification for the tapping of holes to receive wire thread inserts (UNC and UNF threads). Diameters ¼ in and over. *BSOL*. [Online] 16 August 1961. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000067070>.
227. —. BS 3409-2:1966, Specification for the tapping of holes to receive wire thread inserts (UNC and UNF threads). Diameters below ¼ in. *BSOL*. [Online] 31 January 1966. [Cited: 9 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000067110>.
228. **BSI committee ACE/12**. BS EN 2943:2019, Aerospace series. Inserts, MJ and M screw threads, helical coil. Technical specification. *BSOL*. [Online] 25 November 2019. [Cited: 7 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030411813>.
229. —. BS EN 2944:2018, Aerospace series. Inserts, screw thread, helical coil, self-locking, in corrosion resisting steel FE-PA3004. *BSOL*. [Online] 24 April 2018. [Cited: 11 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030381563>.
230. —. BS EN 2945:1998, Inserts, screw thread, helical coil, self-locking. Assembly procedure. *BSOL*. [Online] 15 August 1998. [Cited: 11 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001445505>.
231. —. BS EN 3044:1998, Installation holes for inserts, screw thread, helical coil, self-locking. Design standard. *BSOL*. [Online] 15 August 1998. [Cited: 11 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001445556>.
232. **BSI committee FME/9**. PD ISO/TR 16224:2012, Technical aspects of nut design. *BSOL*. [Online] 31 July 2012. [Cited: 11 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030256726>.
233. —. BS 3580:1964, Guide to design considerations on the strength of screw threads. *BSOL*. [Online] 28 February 1964. [Cited: 11 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000065474>.

234. **VDI committee for bolted joints (schraubenverbindungen).** VDI 2230-1:2015-11, Systematic calculation of highly stressed bolted joints - Joints with one cylindrical bolt. *Beuth*. [Online] VDI, November 2015. [Cited: 11 April 2021.] <https://www.beuth.de/en/technical-rule/vdi-2230-blatt-1/242566299>.
235. —. VDI 2230-2:2014-12, Systematic calculation of highly stressed bolted joints - Multi bolted joints. *Beuth*. [Online] December 2014. [Cited: 11 April 2021.] <https://www.beuth.de/en/technical-rule/vdi-2230-blatt-2/210006634>.
236. **BSI committee ACE/12.** BS ISO 16130:2015, Aerospace series. Dynamic testing of the locking behaviour of bolted connections under transverse loading conditions (vibration test). *BSOL*. [Online] BSI, 31 August 2015. [Cited: 11 April 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030213840>.
237. **DIN committee NA 087-00-12 AA.** DIN 6701-2:2015-12, Adhesive bonding of railway vehicles and parts - Part 2: Qualification of manufacturer of adhesive bonded materials. *Beuth*. [Online] December 2015. [Cited: 24 March 2021.] <https://www.beuth.de/en/standard/din-6701-2/240693500>.
238. —. DIN 6701-3:2015-12, Adhesive bonding of railway vehicles and parts - Part 3: Guideline for construction design and verification of bonds on railway vehicles. *Beuth*. [Online] December 2015. [Cited: 24 March 2021.] <https://www.beuth.de/en/standard/din-6701-3/240749621>.
239. —. DIN 6701-4:2015-12, Adhesive bonding of railway vehicles and parts - Part 4: Manufacturing controls and quality assurance. *Beuth*. [Online] December 2015. [Cited: 24 March 2021.] <https://www.beuth.de/en/standard/din-6701-4/240693745>.
240. **BSI committee TPR/1/9.** BS 2634-2:2010, Roughness comparison specimens. Specification for spark-eroded, shot-blasted, grit-blasted and polished specimens. *BSOL*. [Online] BSI, 30 September 2010. [Cited: 22 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030213639>.
241. **BSI committee STI/33.** BS ISO 12686:1999, Metallic and other inorganic coatings. Automated controlled shot-peening of metallic articles prior to nickel, autocatalytic nickel or chromium plating, or as a final finish. *BSOL*. [Online] BSI, 15 February 2000. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030015031>.
242. —. BS EN ISO 15730:2016, Metallic and other inorganic coatings. Electropolishing as a means of smoothing and passivating stainless steel. *BSOL*. [Online] BSI, 31 May 2016. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030325204>.
243. —. BS ISO 27831-1:2008, Metallic and other inorganic coatings. Cleaning and preparation of metal surfaces. Ferrous metals and alloys. *BSOL*. [Online] BSI, 28 February 2009. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030252580>.
244. —. BS ISO 27831-2:2008, Metallic and other inorganic coatings. Cleaning and preparation of metal surfaces. Non-ferrous metals and alloys. *BSOL*. [Online] 28 February 2009. [Cited: 23 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030252581>.
245. **BSI committee STI/34.** BS EN ISO 1461:2009, Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods. *BSOL*. [Online] BSI, 31

July 2009. [Cited: 23 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030174186>.

246. —. BS EN ISO 14713-1:2017, Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures. General principles of design and corrosion resistance. *BSOL*. [Online] BSI, 06 July 2017. [Cited: 23 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030341068>.

247. —. BS EN ISO 14713-2:2020, Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures. Hot dip galvanizing. *BSOL*. [Online] 23 January 2020. [Cited: 23 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030414454>.

248. **BSI committee ISE/110**. BS EN 10240:1998, Internal and/or external protective coatings for steel tubes. Specification for hot dip galvanized coatings applied in automatic plants. *BSOL*. [Online] BSI, 15 April 1998. [Cited: 23 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000001348983>.

249. **BSI committee STI/34**. BS EN ISO 17668:2016, Zinc diffusion coatings on ferrous products. Sherardizing. Specification. *BSOL*. [Online] BSI, 31 March 2016. [Cited: 23 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030256685>.

250. —. BS EN ISO 14713-3:2017, Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures. Sherardizing. *BSOL*. [Online] 8 June 2017. [Cited: 23 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030341071>.

251. **BSI committee STI/40**. BS EN ISO 12679:2015, Thermal spraying. Recommendations for thermal spraying. *BSOL*. [Online] BSI, 31 October 2015. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030384734>.

252. **BSI committee STI/33**. BS EN ISO 12683:2004, Mechanically deposited coatings of zinc. Specification and test methods. *BSOL*. [Online] BSI, 25 November 2004. [Cited: 23 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030103878>.

253. —. BS EN ISO 2081:2018, Metallic and other inorganic coatings. Electroplated coatings of zinc with supplementary treatments on iron or steel. *BSOL*. [Online] BSI, 28 March 2018. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030329240>.

254. —. BS EN ISO 7599:2018, Anodizing of aluminium and its alloys. Method for specifying decorative and protective anodic oxidation coatings on aluminium. *BSOL*. [Online] BSI, 23 February 2018. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030333722>.

255. —. BS ISO 10074:2017, Anodizing of aluminium and its alloys. Specification for hard anodic oxidation coatings on aluminium and its alloys. *BSOSL*. [Online] BSI, 24 November 2017. [Cited: 24 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030333710>.

256. **Head of Engineering Information**. S1011 issue A2, Product acceptance and registration. *TfL management system*. [Online] TfL, September 2013. [Cited: 22 March 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1011.pdf>.

257. **BSI committee STI/21.** BS EN ISO 12944-8:2017, Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Development of specifications for new work and maintenance. *BSOL*. [Online] BSI, 12 January 2018. [Cited: 22 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030337300>.

258. —. BS EN ISO 12944-1:2017, Paints and varnishes. Corrosion protection of steel structures by protective paint systems. General introduction. *BSOL*. [Online] 12 January 2018. [Cited: 23 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030327435>.

259. —. BS EN ISO 12944-2:2017, Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Classification of environments. *BSOL*. [Online] 12 January 2018. [Cited: 23 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030327438>.

260. —. BS EN ISO 12944-3:2017, Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Design considerations. *BSOL*. [Online] 12 January 2018. [Cited: 23 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030327441>.

261. —. BS EN ISO 12944-5:2019, Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Protective paint systems. *BSOL*. [Online] 8 November 2019. [Cited: 23 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030390878>.

262. —. BS EN ISO 12944-6:2018, Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Laboratory performance test methods. *BSOL*. [Online] 9 March 2018. [Cited: 23 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030337282>.

263. —. BS EN ISO 12944-7:2017, Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Execution and supervision of paint work. *BSOL*. [Online] BSI, 24 January 2018. [Cited: 23 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030327444>.

264. —. BS EN 12206-1:2004, Paints and varnishes. Coating of aluminium and aluminium alloys for architectural purposes. Coatings prepared from coating powder. *BSOL*. [Online] BSI, 16 July 2004. [Cited: 23 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030355381>.

265. **BSI committee AMT/8.** BS EN ISO 17296-2:2016, Additive manufacturing. General principles. Overview of process categories and feedstock. *BSOL*. [Online] 28 February 2015. [Cited: 24 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030339008>.

266. —. BS EN ISO/ASTM 52901:2018, Additive manufacturing. General principles. Requirements for purchased AM parts. *BSOL*. [Online] BSI, 16 October 2017. [Cited: 22 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030373867>.

267. —. BS EN ISO/ASTM 52950:2021, Additive manufacturing. General principles. Overview of data processing. *BSOL*. [Online] 17 February 2021. [Cited: 24 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030402904>.
268. **Head of Profession for Road and Rail Traffic Control Systems**. S1202 issue A3, Signal Equipment Overhaul. *TfL Management System*. [Online] October 2019. [Cited: 25 April 2021.] <https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1202.pdf>.
269. **BSI committee TPR/1**. BS ISO 11005:2010, Technical product documentation. Use of main documents. *BSOL*. [Online] BSI, 31 October 2010. [Cited: 10 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030195879>.
270. **BSI committee GEL/3**. BS EN 62023:2012, Structuring of technical information and documentation. *BSOL*. [Online] BSI, 31 May 2012. [Cited: 10 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030178175>.
271. **BSI committee TPR/1**. BS ISO 29845:2011, Technical product documentation. Document types. *BSOL*. [Online] BSI, 30 September 2011. [Cited: 10 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030195882>.
272. **BSI committee GEL/3**. BS EN 82045-1:2001, IEC 82045-1:2001, Document management. Principles and methods. *BSOL*. [Online] BSI, 20 December 2001. [Cited: 10 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030059089>.
273. **BSI committee RAE/1**. BS EN 15016-4:2006, Technical drawings. Railway applications. Data exchange. *BSOL*. [Online] BSI, 31 July 2009. [Cited: 10 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030203731>.
274. **BSI committee GEL/3**. BS EN 61355-1:2008, Classification and designation of documents for plants, systems and equipment. Rules and classification tables. *BSOL*. [Online] BSI, 29 August 2008. [Cited: 10 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030130641>.
275. **BSI committee TPR/1**. PD ISO/TS 81346-3:2012, Industrial systems, installations and equipment and industrial products. Structuring principles and reference designations. Application rules for a reference designation system. *BSOL*. [Online] BSI, 31 July 2012. [Cited: 10 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030251278>.
276. **Head of Profession for Vehicles**. S1187 issue A4, Index of zone and component codes for rolling stock. *TfL management system*. [Online] TfL, October 2017. [Cited: 16 May 2021.] <https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1187.pdf>.
277. **BSI committee RAE/1**. BS EN 15380-1:2006, Railway applications. Designation system for railway vehicles. General principles. *BSOL*. [Online] BSI, 31 August 2006. [Cited: 26 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030141893>.
278. —. BS EN 15380-2:2006, Railway applications. Designation system for railway vehicles. Product groups. *BSOL*. [Online] 31 July 2006. [Cited: 26 May 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030141895>.

279. —. BS EN 15380-3:2006, Railway applications. Designation system for railway vehicles. Designation of installation sites and locations. *BSOL*. [Online] 31 July 2006. [Cited: 26 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030141897>.
280. —. BS EN 15380-4:2013, Railway applications. Classification system for railway vehicles. Function groups. *BSOL*. [Online] 31 January 2013. [Cited: 26 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030202542>.
281. —. BS EN 15380-5:2014, Railway applications. Classification system for railway vehicles. System Breakdown Structure (SBS). *BSOL*. [Online] 30 September 2014. [Cited: 26 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030250932>.
282. **BSI committee TPR/1**. BS ISO 14617-1:2002, Graphical symbols for diagrams. General information and indexes. *BSOL*. [Online] 31 August 2004. [Cited: 26 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030118720>.
283. **BSI committee WEE/1**. BS EN ISO 2553:2019, Welding and allied processes. Symbolic representation on drawings. Welded joints. *BSOL*. [Online] BSI, 17 April 2019. [Cited: 23 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030353045>.
284. **BSI committee GEL/3**. BS EN 61082-1:2015, Preparation of documents used in electrotechnology. Rules. *BSOL*. [Online] BSI, 31 January 2015. [Cited: 26 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030257496>.
285. **BSI committee TPR/1**. BS ISO 7573:2008, Technical product documentation. Parts lists. *BSOL*. [Online] BSI, 30 November 2008. [Cited: 26 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030168959>.
286. **BSI committee GEL/3**. BS EN 62027:2012, Preparation of object lists, including parts lists. *BSOL*. [Online] BSI, 29 February 2012. [Cited: 26 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030178179>.
287. **BSI committee RAE/1**. BS EN 15016-2:2004, Technical drawings. Railway applications. Parts lists. *BSOL*. [Online] BSI, 31 July 2009. [Cited: 10 May 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030115076>.
288. **Messler, R.** Reverse Engineering: Mechanisms, Structures, Systems and Materials. *Access Engineering*. [Online] 2014. [Cited: 25 April 2021.]  
<https://www.accessengineeringlibrary.com/content/book/9780071825160>. ISBN 9780071825160.
289. **Raja, V. and Fernandes, K.** Reverse Engineering: An Industrial Perspective. *Springer*. [Online] 2008. [Cited: 25 April 2021.]  
<https://www.springer.com/gp/book/9781846288555>. ISBN 9781846288562.
290. **BSI committee TPR/1**. DD CEN ISO/TS 14253-4:2010, Geometrical product specifications (GPS). Inspection by measurement of workpieces and measuring equipment. Background on functional limits and specification limits in decision rules. *BSOL*. [Online] BSI, 30 June 2010. [Cited: 25 April 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030199267>.
291. **BSI committee DS/1/2**. PD 6614:2002, Obsolescence management. Guide to the substitution of components in electronic equipment. *BSOL*. [Online] 14 June 2002. [Cited:



6 May 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030062904>.

**292. Head of Profession for Vehicles.** S1180 issue A10, Standard for rolling stock. *TfL Management System*. [Online] January 2020. [Cited: 16 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1180.pdf>.

**293. Head of Profession for Permanent Way.** S1157 issue A7, Track – Performance, Design and Configuration. *TfL management system*. [Online] TfL, January 2016. [Cited: 16 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/S1157.pdf>.

**294. Head of Safety, Health and Environment.** London Underground Safety Certificate and Safety Authorisation. *TfL public website*. [Online] April 2021. [Cited: 21 May 2021.]

<https://tfl.gov.uk/corporate/publications-and-reports/underground-safety-certificate>.

**295. Head of Profession for Vehicles.** G1100 issue A4, Guidance - Change to rolling stock (CRS). *TfL management system*. [Online] July 2020. [Cited: 21 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/G1100.pdf>.

**296. Head of Profession for Road and Rail Traffic Control Systems.** PR0635 issue A3, Signalling product approval. *TfL management system*. [Online] TfL, July 2017. [Cited: 16 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/PR0635.pdf>.

**297. —.** G0635 issue A3, Guidance - Signalling product approval. *TfL management system*. [Online] July 2017. [Cited: 21 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/G0635.pdf>.

**298. LU Signalling Equipment Engineering Manager.** PR0190 issue A1, Signals Equipment Design Custodian and Change Control. *TfL management system*. [Online] June 2020. [Cited: 16 June 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/PR0190.pdf>.

**299. Head of Profession for Permanent Way.** PR0124 issue A1, Managing permanent way items in the Approved Products Register. *TfL management system*. [Online] TfL, August 2019. [Cited: 16 May 2021.]

<https://transportforlondon.sharepoint.com/sites/TMSManagementSystem/Management%20System/PR0124.pdf>.

**300. BSI committee SVS/1/6.** BS EN 16311:2013, Engineering services — Terminology to describe engineering services for industrial products. *BSOL*. [Online] 28 February 2013. [Cited: 16 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030247592>.

**301. Commercial Support, LU Rolling Stock Engineering.** LU-RSE-CS-0025-00-BEC, Interface management. *LU-RSE-CS site*. [Online] 28 June 2020. [Cited: 5 February 2021.] <https://transportforlondon.sharepoint.com/:w:/r/sites/lu-rse-cs/c/LU-RSE-CS-0025-00-BEC-Interface->

management.docx?d=w31897c17db794637a410b015ad42eacc&csf=1&web=1&e=tvG8xs

302. **BSI committee SS/5.** BS 6001-1:1999+A1:2011, ISO 2859-1:1999, Sampling procedures for inspection by attributes. Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection. *BSOL*. [Online] 15 December 1999. [Cited: 8 June 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030219543>.
303. **ISO committee ISO/TC 69.** ISO 2859-1:1999, Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection. *ISO online browsing platform*. [Online] November 1999. [Cited: 8 June 2021.] <https://www.iso.org/obp/ui/#iso:std:iso:2859:-1:ed-2:v1:en>.
304. **TfL management system team.** TfL glossary. *TfL management system*. [Online] TfL, 2021. [Cited: 5 February 2021.]  
<https://transportforlondon.sharepoint.com/sites/tflchangerequests/Pages/Jargonbuster.aspx>.
305. **BSI committee RAE/1.** BS EN 17343:2020, Railway applications. General terms and definitions. *BSOL*. [Online] 23 December 2020. [Cited: 16 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030359158>.
306. **BSI committee CB/101/-/2.** BS 6100-4:2008, Building and civil engineering. Vocabulary. Transport. *BSOL*. [Online] 31 July 2008. [Cited: 16 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030087599>.
307. **BSI committee HS/1.** BS ISO 45001:2018, Occupational health and safety management systems. Requirements with guidance for use. *BSOL*. [Online] 31 March 2018. [Cited: 15 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030299985>.
308. **BSI committee SES/1/1.** BS EN ISO 14001:2015, Environmental management systems. Requirements with guidance for use. *BSOL*. [Online] 30 September 2015. [Cited: 15 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030281203>.
309. **BSI committee QS/1.** BS EN ISO 9000:2015, Quality management systems. Fundamentals and vocabulary. *BSOL*. [Online] 30 September 2015. [Cited: 30 June 2020.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030262729>.
310. **BSI committee ISE/100.** BS EN 10020:2000, Definition and classification of grades of steel. *BSOL*. [Online] 15 July 2000. [Cited: 15 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030015678>.
311. **BSI committee NFE/35.** BS EN 12258-1:2012, Aluminium and aluminium alloys — Terms and definitions — General terms. *BSOL*. [Online] 30 June 2012. [Cited: 16 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030268928>.
312. **BSI committee MCE/7.** BS ISO 5593:2019, Rolling bearings — Vocabulary. *BSOL*. [Online] 2 May 2019. [Cited: 16 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030285981>.

313. —. BS ISO 24393:2008, Rolling bearings — Linear motion rolling bearings — Vocabulary. *BSOL*. [Online] 28 February 2009. [Cited: 16 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030139651>.
314. —. BS ISO 1132-1:2000, Rolling bearings — Tolerances — Terms and definitions. *BSOL*. [Online] 15 December 2000. [Cited: 16 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030013161>.
315. **BSI committee MCE/12**. BS ISO 4378-1:2017, Plain bearings — Terms, definitions, classification and symbols — Part 1: Design, bearing materials and their properties. *BSOL*. [Online] 2 August 2017. [Cited: 16 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030335624>.
316. —. BS ISO 4378-2:2017, Plain bearings — Terms, definitions, classification and symbols — Part 2: Friction and wear. *BSOL*. [Online] 26 July 2017. [Cited: 16 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030335621>.
317. —. BS ISO 4378-3:2017, Plain bearings — Terms, definitions, classification and symbols — Part 3: Lubrication. *BSOL*. [Online] 18 August 2017. [Cited: 16 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030335618>.
318. **BSI committee MCE/7**. BS ISO 6811:1998, Spherical plain bearings — Vocabulary. *BSOL*. [Online] 15 December 1998. [Cited: 16 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030018828>.
319. —. BS ISO 15243:2017, Rolling bearings — Damage and failures — Terms, characteristics and causes. *BSOL*. [Online] 11 May 2017. [Cited: 16 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030285990>.
320. **BSI committee MCE/3/10**. BS ISO 23472-1:2020, Foundry machinery. Vocabulary. General. *BSOL*. [Online] 21 July 2020. [Cited: 9 June 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030381653>.
321. —. BS ISO 23472-2:2020, Foundry machinery. Vocabulary. Molding and coremaking machines and other equipment related to non-permanent mold casting process. *BSOL*. [Online] 13 November 2020. [Cited: 9 June 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030397429>.
322. **BSI committee MTE/12**. BS ISO 21223:2019, Tools for pressing — Vocabulary. *BSOL*. [Online] 16 December 2019. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030367097>.
323. —. BS ISO 8695:2010, Tools for pressing — Punches — Nomenclature and terminology. *BSOL*. [Online] 31 August 2010. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030192871>.
324. **BSI committee MTE/1**. BS 4184:1994 (ISO 8540:1993), Glossary for power presses, open front mechanical type. *BSOL*. [Online] 15 May 1994. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000332202>.
325. **BSI committee MTE/15**. BS 6416:1983 (ISO 1703:1983), Nomenclature for assembly tools for screws and nuts. *BSOL*. [Online] 30 November 1983. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000072894>.

326. **BSI committee WEE/1.** PD ISO/TR 25901-1:2016, Welding and allied processes — Vocabulary — Part 1: General terms. *BSOL*. [Online] 31 March 2016. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030280561>.
327. —. PD ISO/TR 25901-3:2016, Welding and allied processes — Vocabulary — Part 3: Welding processes. *BSOL*. [Online] 31 March 2016. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030300269>.
328. —. PD ISO/TR 25901-4:2016, Welding and allied processes — Vocabulary — Part 4: Arc welding. *BSOL*. [Online] 31 March 2016. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030280594>.
329. —. BS EN ISO 6947:2019, Welding and allied processes — Welding positions. *BSOL*. [Online] 13 November 2019. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030366136>.
330. —. BS EN 14610:2004, Welding and allied processes — Definitions of metal welding processes. *BSOL*. [Online] 25 November 2004. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030050634>.
331. —. BS EN 1792:2003, Welding — Multilingual list of terms for welding and related processes. *BSOL*. [Online] 13 March 2003. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030050558>.
332. —. PD CEN/TR 14599:2005, Terms and definitions for welding purposes in relation with EN 1792. *BSOL*. [Online] 7 December 2005. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030118793>.
333. —. BS EN ISO 17659:2004, Welding — Multilingual terms for welded joints with illustrations. *BSOL*. [Online] 1 July 2004. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030103053>.
334. **BSI committee WEE/18.** BS EN ISO 15296:2018, Gas welding equipment — Vocabulary. *BSOL*. [Online] 29 January 2018. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030333740>.
335. **BSI committee WEE/1.** BS 499-1:2009, Welding terms and symbols — Part 1: Glossary for welding, brazing and thermal cutting. *BSOL*. [Online] 31 December 2008. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030162762>.
336. —. BS 499-1:Supplement:1992, Welding terms and symbols — Part 1: Glossary for welding, brazing and thermal cutting — Supplement: Definitions for electric welding equipment. *BSOL*. [Online] 15 December 1992. [Cited: 18 March 2018.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000287374>.
337. **BSI committee WEE/36.** PD CEN ISO/TR 20172:2009, Welding — Grouping systems for materials — European materials. *BSOL*. [Online] 31 July 2009. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030166728>.
338. —. PD CEN ISO/TR 20173:2018, Welding — Grouping systems for materials — American materials. *BSOL*. [Online] 31 August 2018. [Cited: 18 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030361602>.

339. —. PD CEN ISO/TR 20174:2020, Welding — Grouping systems for materials — Japanese materials. *BSOL*. [Online] 14 July 2020. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030398301>.
340. **BSI committee WEE/19**. BS EN 14324:2004, Brazing — Guidance on the application of brazed joints. *BSOL*. [Online] BSI, 27 September 2004. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030016749>.
341. **BSI committee WEE/1**. BS ISO 857-2:2005, Welding and allied processes — Vocabulary — Part 2: Soldering and brazing processes. *BSOL*. [Online] 12 January 2006. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030088103>.
342. **BSI committee WEE/19**. BS EN ISO 3677:2016, Filler metal for soldering and brazing — Designation. *BSOL*. [Online] 31 October 2016. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030298293>.
343. **BSI committee WEE/29**. BS EN ISO 17677-1:2021, Resistance welding — Vocabulary — Part 1: Spot, projection and seam welding. *BSOL*. [Online] 17 March 2021. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030424267>.
344. **BSI committee FME/9**. BS ISO 1891:2009, Fasteners — Terminology. *BSOL*. [Online] 31 March 2009. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030178221>.
345. **BSI committee FME/9/-/2**. BS EN ISO 1891-2:2014, Fasteners — Terminology — Part 2: Vocabulary and definitions for coatings. *BSOL*. [Online] 30 November 2014. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030259650>.
346. **BSI committee FME/9**. BS EN ISO 1891-4:2018, Fasteners — Vocabulary — Part 4: Control, inspection, delivery, acceptance and quality. *BSOL*. [Online] 29 June 2018. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030280510>.
347. —. BS EN ISO 14588:2001, Blind rivets — Terminology and definitions. *BSOL*. [Online] 15 March 2001. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030125810>.
348. —. BS 7776:1995, Glossary of torque terminology for threaded fasteners. *BSOL*. [Online] 15 February 1995. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000000416335>.
349. —. BS ISO 5408:2009, Screw threads - Vocabulary. *BSOL*. [Online] 31 July 2009. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030180236>.
350. **BSI committee PRI/52**. BS EN 923:2015, Adhesives — Terms and definitions. *BSOL*. [Online] 31 January 2016. [Cited: 18 March 2021.] <https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030343463>.
351. **BSI committee STI/33**. BS EN ISO 2080:2009, Metallic and other inorganic coatings — Surface treatment, metallic and other inorganic coatings — Vocabulary. *BSOL*. [Online]

29 August 2009. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030193414>.

352. —. BS ISO 7583:2013, Anodizing of aluminium and its alloys — Terms and definitions. *BSOL*. [Online] 31 August 2013. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030257617>.

353. —. BS EN ISO 16348:2003, Metallic and other inorganic coatings — Definitions and conventions concerning appearance. *BSOL*. [Online] 27 May 2003. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030087639>.

354. —. BS EN ISO 2064:2000, Metallic and other inorganic coatings — Definitions and conventions concerning the measurement of thickness. *BSOL*. [Online] 15 July 2000. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000019981976>.

355. **BSI committee STI/40**. BS EN ISO 14917:2017, Thermal spraying — Terminology, classification. *BSOL*. [Online] 31 March 2017. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030285036>.

356. **BSI committee STI/36**. BS EN ISO 19496-1:2017, Vitreous and porcelain enamels — Terminology — Terms and definitions. *BSOL*. [Online] 30 April 2017. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030328594>.

357. —. BS EN ISO 19496-2:2017, Vitreous and porcelain enamels. Terminology. Visual representations and descriptions. *BSOL*. [Online] 30 April 2017. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030303567>.

358. **BSI committee STI/10**. BS EN ISO 4618:2014, Paints and varnishes — Terms and definitions. *BSOL*. [Online] 30 November 2014. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030236315>.

359. —. BS ISO 22553-1:2020, Paints and varnishes — Electro-deposition coatings — Part 1: Vocabulary. *BSOL*. [Online] 25 October 2019. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030421139>.

360. —. BS EN ISO 8130-14:2019, Coating powders —Part 14: Vocabulary. *BSOL*. [Online] 20 May 2019. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030369391>.

361. **BSI committee AMT/8**. BS EN ISO/ASTM 52900:2017, Additive manufacturing — General principles — Terminology. *BSOL*. [Online] 31 January 2016. [Cited: 18 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030343265>.

362. **BSI committee DS/1**. BS EN 13306:2017, Maintenance. Maintenance terminology. *BSOL*. [Online] 21 December 2017. [Cited: 16 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030324472>.

363. **BSI committee RAE/1/-/16**. BS EN 17018:2019, Railway applications. Rolling stock maintenance. Terms and definitions. *BSOL*. [Online] 6 March 2019. [Cited: 16 March 2021.]

<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030326143>.

364. **BSI committee DS/1.** BS EN 60300-3-14:2004, Dependability management. Application guide. Maintenance and maintenance support. *BSOL*. [Online] 10 June 2004. [Cited: 25 April 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030101018>.

365. **BSI committee TPR/1.** BS 8888:2020, Technical product documentation and specification. *BSOL*. [Online] 17 December 2019. [Cited: 16 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030384746>.

366. —. BS EN ISO 10209:2012, Technical product documentation. Vocabulary. Terms relating to technical drawings, product definition and related documentation. *BSOL*. [Online] BSI, 31 July 2012. [Cited: 16 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030197396>.

367. —. BS EN ISO 14660-1:2000, Geometrical Product Specifications (GPS) — Geometrical features — Part 1: General terms and definitions. *BSOL*. [Online] 15 July 2000. [Cited: 16 March 2021.]  
<https://bsol.bsigroup.com/Bibliographic/BibliographicInfoData/000000000030009173>.

## **Schedule 4**

### **Mini Competition and Call-Off Documents**

Part A – Template Request Form including Supplier's Form of Proposal

- i) Section 1 – Requirements
  - (a) Attachment 1 – [technical drawings/not used]
  - (b) Attachment 2 - [Contract Specification, Standards and other technical information]
- ii) Section 2 – Supplier's Form of Proposal (including proposed Contract Quality Plan)
- iii) Section 3 – Contract Award Criteria
- iv) Appendices
  - (a) Appendix 1 –Template Contract Material Data Sheet
  - (b) Appendix 1A - Template Item Price Breakdown
  - (c) Appendix 2 –Template Services Price Breakdown

Part B – Template Contract

Part C –Template Form of Order (delivery request) (for Call-Off Contracts)



## **Part A – Template Request Form including Supplier's Form of Proposal**

Template Request Form (including Supplier's Form of Proposal)

Request Form (including Supplier's Form of Proposal)

**Framework: Supply of bespoke components – manufacture, overhaul and repair and other services**

**Framework Agreement Reference Number: TfL00716**

**Request Form Number:**

**To:**

**Address:**

**From: [London Underground Limited]**

**Date:**

This is a Request Form for a proposal ("Proposal") for the provision of Goods and/or Services under a Contract in accordance with the framework agreement referenced above (the "**Agreement**"). Words and expressions defined in the Agreement shall have the same meaning in this Request Form unless otherwise provided.

This is an enquiry document only, constituting an invitation to treat and it does not constitute an offer capable of acceptance. Your Proposal must be submitted as an offer capable of acceptance by the Company; however such acceptance will not occur unless and until the Company posts notice of acceptance to you. Your Proposal must remain valid for *[at least six (6) months] [specific longer period]* from submission.

Section 1 (Requirements) of this Request Form sets out the Goods and/or Services required by the Company. In your Proposal you must respond by completing Section 2 (Supplier's Form of Proposal) and provide any information requested.

Your Proposal will be assessed in accordance with the Contract Award Criteria set out in Section 3 (Contract Award Criteria) against proposals submitted by other Framework Suppliers as part of a Mini-Competition, using Option *[to refer to A or B as applicable]*. The Company will award the relevant Contract to the Framework Supplier who has submitted a proposal that is the most advantageous to the Company with reference to the Contract Award Criteria. The Company is under no obligation to award any Contract as a result of this Request Form.

In the event that a conflict, ambiguity or inconsistency exists between the provisions of the Agreement and this Request Form and/or any Proposal, the provisions of the Agreement shall prevail.

You must complete and return your Proposal by **[INSERT TIME AND DATE]** *[no later than 10 Working Days after the [date above]]*. If you do not intend to submit a Proposal you shall notify the Company accordingly in writing (**No Entry Confirmation**) no later than 5 Working Days [after the date above] in accordance with Clause 4.3(a) and provide details of the reason(s) why a Proposal will not be submitted.

Your Proposal or No Entry Confirmation and any queries in relation to this Request Form should be submitted to the Company's Representative via the Company's electronic contract management system.

<b>Framework Agreement Reference Number:</b> <b>TfL00716</b> <b>[Supplier details]</b>	<b>Request Form Number: [INSERT ]</b>	
<b>SECTION 1 - REQUIREMENTS</b>		
1.1	Brief description of proposed Goods and/or Services	<i>[Company to insert brief description of the proposed Goods and/or Services] as more particularly described in 1.2. to 1.11 of this Section 1]</i>
1.2	Contract Specification	<i>i) [Company to insert the reference of the technical drawing(s) and provide as attachment(s) to this Request Form at attachment 1]</i>  <i>and/or</i>  <i>ii) [Company to insert reference to any specific Contract Specification, Standards and other technical information as additional information to or in lieu of i). and provide as attachment(s) to this Request Form at attachment 2]</i>  <i>and</i>  <i>iii) [Company to confirm if any Free Issue Materials and Equipment are to be provided and on what terms, e.g. obligation to use, impact on price]</i>
1.3	The Commencement Date of the Contract is:	<i>[Company to insert]</i>
1.4	The Expiry Date of the Contract is:	<i>[Company to insert any specific date, or link to term of the Framework Agreement or a statement that all future supply of the particular Goods and/or Services will be provided by the particular Supplier.]]</i>
1.5	Option(s) to extend the Contract	<i>[Company to insert period, if any.]] or [Not used]</i>
1.6	Specific programme requirements	<i>[Company to provide any specific programme of delivery if certain quantities and/or services are required on certain dates] or [Not Used]</i>
1.7	Unit of Measure (Goods only)	<i>[For Goods only, as defined in the Contract Material</i>

		<i>Data (CMDR.) Sheet provided as Appendix 1]</i>
1.8	Indicative (only) quantities for the term of the Contract (excluding any extensions)	<i>[For Goods only, as defined in the CMD Sheet provided as Appendix 1]</i>
1.9	Stock Holding	<i>[For Goods only and as required, as defined in the CMD Sheet provided as Appendix 1 which will be the minimum quantities to held at all times as stock by the Supplier available for call off by the Company and TfL Group]</i>
1.10	Price Breaks	<i>[For Goods only, as defined in the CMD sheet provided as Appendix 1]</i>
1.11	Optional Terms Requirements	<p><i>i) [Company to confirm if Clause 50.8(e), Direct Vision Standard (DVS) applies]</i></p> <p><i>ii) [Company to confirm if Clause 44, Collateral Warranties applies, and the timing of any requirement if identified at Request Form stage]</i></p> <p><i>iii) [Company to detail any particular Contractual Documentation and information that is to be delivered by the Supplier, in addition to any required elsewhere under the terms of the Agreement. This may include records, reports, documents, papers, unpatented designs, drawings, data specifications, manufacturing or work processes, testing procedures, relevant computer data and all other technical business and similar information originated by or on behalf of the Supplier]</i></p>

<b>Framework Agreement Reference Number:</b> <b>TfL00716</b> <b>[Supplier details]</b>	<b>Request Form Number: [INSERT ]</b>
<b>SECTION 1 - REQUIREMENTS - ATTACHMENTS</b>	

***Attachment 1 – technical drawings***

*[technical drawing(s) referred to in 1.2, (i)Contract Specification to be provided as attachment(s)]*

***Attachment 2 – specific Contract Specification, Standards and other technical information***

*[specific Contract Specification, Standards and other technical information provided referred to in 1.2*

*(ii) Contract Specification to be provided as attachment(s)]*

<b>Framework Agreement Reference Number:</b> <b>TfL00716</b>	<b>Request Form Number: [INSERT ]</b>	
<b>SECTION 2 – SUPPLIER’S FORM OF PROPOSAL</b>		
2.1	<i>We confirm that we can provide the [relevant Goods and/or Services] on the terms of the Agreement and [include/attach] evidence of our compliance with the requirements] detailed in Section 1 – Requirements</i>	<i>[Supplier to provide evidence of compliance / confirm Yes]]</i>
2.2	<i>For Goods, we confirm we have populated the CMD Sheet and the item price breakdown (where provided as part of Section 1 – Requirements) with the following information:</i>  <i>i) Economic batch quantity (the optimum batch quantity the Supplier is able to manufacture and supply at the lowest cost) – to be provided for information only</i>  <i>ii) Delivery lead time</i>  <i>iii) Prices which take into account any Free Issue Materials and Equipment to be provided by the Company (as set out in Section 1 Requirements)</i>  <i>or</i>  <i>Not Used</i>	<i>[Supplier to provide completed CMD Sheet as Appendix 1 and the item price breakdown as Appendix 1A ]</i>
2.3	<i>We confirm a completed Contract Quality Plan is provided with this Form of Proposal setting out the methodology of providing the [Goods and/or Services]. We also confirm that the Contract Quality Plan provided reflects the Quality Plan [so far as relevant] [and that any non-conformances identified in the inspection and audit carried out under Clause 5.7 of the Agreement have been, and continue to be, addressed as notified to and agreed by the Company].</i>	<i>[Supplier to provide Contract Quality Plan]</i>
2.4	<i>For Services, we confirm a total fixed price for the provision of the Services broken down into the following cost</i>	<i>[Supplier to provide price breakdown as Appendix 2]</i>

	<p><i>elements is provided</i></p> <ul style="list-style-type: none"> <li>- <i>Labour (operatives)</i></li> <li>- <i>Management and Supervision</i></li> <li>- <i>Materials, Plant and Equipment</i></li> <li>- <i>Sub-Contractors</i></li> <li>- <i>Other Costs (please specify)</i></li> <li>- <i>Overheads and Profit</i></li> </ul> <p>or</p> <p>Not used</p>	
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## SECTION 3 – CONTRACT AWARD CRITERIA

3.1 The Proposal will be evaluated in two categories:

(1) Technical, (2) Pricing

with reference to the information provided as part of the Supplier's Form of Proposal.

3.2 The Company will evaluate the Proposal using the following evaluation process *[Company to select Option A or Option B for particular Mini-Competition]*

### 3.3 Option A – Standard Evaluation

3.3.1 The Proposal will be evaluated, with any Contract awarded to the Framework Supplier who submits the most economically advantageous proposal as determined by the Company against the Contract Award Criteria stated below.

3.3.2 General guidance relating to the aspects of the evaluation and how these relate to the evaluation categories are provided in Table 1 below. *[Company to tailor for each Request depending on the nature of the supply and the specific requirements].*

Table 1

Evaluation Category	Scoring methodology	Weighting range for scored questions	Information provided by Supplier which will be evaluated
(1) Technical	[-Scored and weighted and/or -Scored with minimum to pass and/or -Discretionary Pass/Fail]	[Insert within band of 10% - 90%]  N/A	For example (to reflect the specific Requirements in the relevant Request Form): 2.1 – [Evidence/confirmation of Compliance]
			2.2 – [CMD Sheet - (ii) Delivery Lead Time]
			2.3 – [Contract Quality Plan]
(2) Pricing	[Scored and weighted]	[Insert within band of 10% - 90%]	For example: 2.2 – [CMD Sheet – (iii) Prices] and/or 2.4 – [Price Breakdown]



### 3.4 Option B – Evaluation with Reverse Auction

3.4.1 The Proposal will be evaluated in 2 stages, with any Contract awarded to the Framework Supplier who submits the most economically advantageous proposal as determined by the Company against the Contract Award Criteria stated below .

#### **Stage 1 – Initial Evaluation**

3.4.2 The Supplier's technical submission provided as part of their Proposal will be evaluated at Stage 1 on a 'Discretionary Pass/Fail' basis. General guidance relating to this technical evaluation at Stage 1 and how this relates to the evaluation categories are provided in Table 2 below. *[Company to tailor for each Request depending on the nature of the supply and the specific requirements].*

Table 2

<b>Evaluation Category</b>	<b>Scoring methodology</b>	<b>Information provided by Supplier which will be evaluated</b>
(1) Technical	<i>-Discretionary Pass/Fail]</i>	<i>For example (to reflect the specific Requirements in the relevant Request Form):</i>
		2.1 – <i>[Evidence/Confirmation of Compliance ]</i>
		2.2 – <i>[CMD Sheet - (ii) Delivery Lead Time]</i>
		2.3 – <i>[Contract Quality Plan]</i>
(2) Pricing	<i>-Compliant/ Non-compliant</i>	Pricing submission compliant with the relevant requirements

3.4.3 Non-compliant proposals, failure to meet any threshold and any Fail will exclude a Framework Supplier from participation in Stage 2 Reverse Auction.

## **Stage 2 – Reverse Auction**

- 3.4.4 If the Supplier's Proposal has satisfied the initial evaluation at Stage 1 and is admissible in accordance with the Utilities Contracts Regulations 2016 the Supplier will be invited to participate in a Reverse Auction.
- 3.4.5 The Reverse Auction will be used to evaluate pricing only and is intended to allow each Framework Supplier the opportunity to reduce their Stage 1 pricing offer through to the point where none wishes to offer a lower price for the requirement.
- 3.4.6 The Reverse Auction process will be conducted using the electronic contract management system via which Framework Suppliers who have submitted a compliant Stage 1 response will be invited in electronic competition to offer one or more price(s) (each an "Offer Price") lower than the starting price(s) posted by the Company (each a "Comparator Price").

### Process

- 3.4.7 The Company shall simultaneously notify the date and scheduled start and finish times of the Reverse Auction to Framework Suppliers no later than 2 clear Working Days before the start of the Reverse Auction.
- 3.4.8 To participate in the Reverse Auction, the Supplier must have registered on the Company's then current electronic contract management system and have access to one of the applicable browsers notified by the Company from time to time, including (at the Commencement Date)

- Microsoft Internet Edge/Explorer

- Mozilla Firefox

- Google Chrome

Training to enable Framework Suppliers to log on to the electronic contract management system and to participate in the Reverse Auction process shall be provided by the Company prior to the commencement of the first relevant Mini-Competition.

- 3.4.9 The Company shall state one or more Comparator Price(s) with reference to one or more of the following:

- lowest price(s) submitted at Stage 1;
- the Company's budget as internally determined and documented prior to the commencement of the applicable Mini-Competition;
- the last price(s) paid for the Goods, or goods similar to the Goods, by the Company;
- the average of lowest price(s) submitted at Stage 1;
- any other price benchmark as determined by the Company.

The Company is not obliged to share the source or rationale for any Comparator Price(s) used but may do so at its discretion with the identity of any Framework Supplier whose pricing information or submission is used in forming the Comparator Price(s) kept confidential.

3.4.10 General guidance relating to the aspects of the pricing evaluation and scoring methodology which will be used to rank Framework Suppliers during any Reverse Auction is provided in Table 3 below with any Contract which the Company wishes (but is not obliged) to award being awarded to the Framework Supplier who is ranked the highest with reference to the stated evaluation and methodology for the Mini-Competition *[Company to tailor for each Mini-Competition depending on the nature of the supply and the specific requirements]*

Table 3

Evaluation Category	Scoring methodology and associated calculation to determine rankings	Pricing elements scored during Reverse Auction
Pricing	<p>Offer Price(s) submitted as part of the Reverse Auction will be scored using the following method with reference to the Comparator Price(s) which will be determined for each pricing element and for each requirement):</p> <p>Inverse proportion of Comparator Price</p> $\text{Weighted Score} = \left( \frac{\text{Comparator Price}}{\text{Offer Price}} \right)$ <p style="text-align: center;">* Price Weighting</p> <p>Pricing is weighted at 100% total with sub-</p>	<p><i>[Line item price]</i> and/or <i>[Total of line item prices for the overall requirement]</i> and/or <i>[Sub bundle of line item prices within the requirement]</i></p>

	<p>weightings applied as determined by the Company for each pricing element.</p> <p>The cumulative score after weighting will then be scored with the highest scoring Framework Supplier ranked 1 with all other Framework Suppliers ranked comparatively e.g. second highest scoring Framework Supplier ranked 2, third highest scoring Framework Supplier ranked 3 etc.</p>	
--	---	--

3.4.11 Framework Suppliers shall have the opportunity to view the starting Comparator Price(s) on the electronic contract management system one Working Day (from 10:00 hours onwards) prior to the date on which the Reverse Auction is scheduled to take place, but shall not be able to make any revised pricing submission until the start of the Reverse Auction. Each Framework Supplier shall also be able to see its own starting price(s) as included in its pricing submission, and, in comparison to the other Framework Supplier(s), its individual ranking. Framework Suppliers are strongly encouraged to review their own starting price(s) shown on the electronic contract management system, in order to confirm to their satisfaction that these details accurately reflect the price(s) submitted as part of their proposal and evaluated at Stage 1. The Supplier shall immediately report any inaccuracy to the Company.

3.4.12 During the Reverse Auction process, Framework Suppliers may bid a lower Offer Price electronically in competition with other Framework Suppliers in “real time”. Each Framework Supplier shall be able to see its individual ranking, in comparison to the other Framework Supplier(s), throughout the Reverse Auction, however the identity of the other Framework Suppliers will remain anonymous. No minimum or maximum reduction in the Offer Price for any Goods will be applied in the Reverse Auction.

3.4.13 In addition to each Framework Supplier’s own Offer Price(s) and individual ranking, the electronic contract management system shall display the lowest Offer Price offered (by an individual Framework Supplier) for the total sum of all line item prices, and also the lowest Offer Price bid for each of those line items.

3.4.14 The electronic contract management system shall also indicate the time remaining to the end of the Reverse Auction, after which no more bids may be placed.

3.4.15 In case of difficulty or technical breakdown during the Reverse Auction, the Supplier shall advise the Company immediately by telephone. Following notification from a Framework

Supplier of difficulty or technical breakdown encountered during the Reverse Auction, the Company may, in its sole discretion, extend the duration of the Reverse Auction, or suspend and not re-open the Reverse Auction, until the difficulty or technical breakdown has been satisfactorily resolved. In the event that the Company has to either manually extend or suspend the Reverse Auction, a notice shall be posted on the auction page of the electronic contract management system to advise Framework Suppliers accordingly and the Company shall inform Framework Suppliers once the difficulty or technical breakdown has been satisfactorily resolved.

- 3.4.16 Framework Suppliers are under no obligation to participate in the Reverse Auction or to reduce the price offered in their pricing submission evaluated at Stage 1.
- 3.4.17 Any new Offer Price submitted by a Framework Supplier shall automatically be ranked in the Reverse Auction. A new Offer Price shall only receive a ranking higher than that of an existing Offer Price submitted by a Framework Supplier if it is lower than that existing bid. A new valid Offer Price submitted by a Framework Supplier that equals an existing Offer Price will be ranked behind that existing bid.
- 3.4.18 The Company reserves the right to amend or alter the Reverse Auction process for any particular Mini-Competition at any time up to and including the commencement of the Reverse Auction itself. If any amendment or alteration to the process is made, then the Company will notify Suppliers accordingly.

APPENDIX 1 – TEMPLATE CONTRACT MATERIAL DATA SHEET [Company to insert relevant information for each Mini-Competition – Supplier to review in conjunction with the requirements detailed in the Request Form]

Description of Part (s) which comprise the Goods requirement	PART IDENTIFIER			TECHNICAL INFORMATION			ORDER & DELIVERY				Indicative quantities for term of Contract	STOCK HOLDING REQUIREMENTS	Price Break x 1 unit :		Price Break A:		Price Break B:		Price Break C:	
	Short Description of part from TfL SAP Purchasing system	Product Number		Specification Number	Relevant Standards	Unit Of Measure	Economic Batch Quantity (provided for informati on only)	Delivery Lead Time	Delivery Method	Total Quantity	Quantities	Qty	Price per unit	Qty	Price per unit	Qty	Price per unit	Qty	Price per unit	
TfL		Supplier	Drawing Number								Issue									Minimum

	To be completed by the Company
	To be completed by the Supplier

# APPENDIX 1A – TEMPLATE ITEM PRICE BREAKDOWN

CMD Sheet Item Reference	Price Break (Identify as appropriate from CMD Sheet)				
	1 unit	A	B	C	
1.2.3	✓				
<b>1. MATERIAL COSTS</b>	<b>Cost (£)</b>				
Aluminum					
Steel					
Silver					
Magnets					
Epoxy					
Ferrites					
Other - please specify					
<b>TOTAL MATERIAL COST</b>	<b>0.00</b>				
<b>2. LABOUR COSTS - PROCESSING ACTIVITY</b>	<b>Set Up</b>		<b>Run</b>		<b>Total (£)</b>
	<b>Time (# of Minutes)</b>	<b>Cost (£) / Hour</b>	<b>Time (# of Minutes)</b>	<b>Cost (£) / Hour</b>	
Cutting					
Machining					
CNC					
Welding					
Labeling					
Other - Please specify					
<b>TOTAL LABOUR COST</b>					<b>0.00</b>
<b>3. OVERHEAD AND PROFIT</b>	<b>Cost (£)</b>				<b>% mark up (on Materials and Labour Costs)</b>
Tooling					
Packaging					
Carriage					
Other - Please specify					
Other - Please specify					
Other - Please specify					
Other - Please specify					
Profit					
<b>TOTAL OVERHEAD AND PROFIT COST</b>	<b>0.00</b>				<b>0%</b>

<b>4. TOTAL ITEM PRICE SUMMARY</b>	<b>Cost (£)</b>
MATERIAL COSTS	0.00
LABOUR COSTS - PROCESSING ACTIVITY	0.00
OVERHEAD AND PROFIT	0.00
<b>ITEM PRICE</b>	<b>0.00</b>



## APPENDIX 2 – TEMPLATE SERVICES PRICE BREAKDOWN

Pricing Element	Price £
Labour (operatives)	
Management and supervision	
Materials, plant and equipment	
Sub-contractors	
Other costs (please specify)	
Overheads	
Profit	
<b>Total</b>	

## Part B – Template Contract

Contract Reference Number: \_\_\_\_\_

This Contract, dated and entered into as of this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, [(the “Effective Date”)] is made by and between:

- (1) **[London Underground Limited]** (the “Company” which expression shall include its successors, transferees and assignees), a company registered in England and Wales under number 01900907 and having its registered office at 5 Endeavour Square, London E20 1JN;
- (2) **[SUPPLIER DETAILS TO BE INSERTED]** (the “Supplier”), a company registered in England and Wales under number [●] and having its registered office at [●],

pursuant to, and subject to, the terms and conditions of the Framework Agreement for the manufacture, overhaul and repair of bespoke components dated \_\_\_\_\_ (the “**Agreement**”) between London Underground and **[Supplier]** Limited.

**THE PARTIES AGREE** as follows:

- (A) The Company appoints the Supplier on a non-exclusive basis during the [Contract Term] starting on the Contract Commencement Date to provide, and the Supplier agrees to provide, the Goods and/or Services to the Company in accordance with this Contract and Call-Off Contracts entered into under it.
- (B) This Contract incorporates the terms and conditions set out in the Agreement, other than as expressly stated otherwise in the Agreement or as set out in this Contract. The terms “Contract Commencement Date”, “Contract Expiry Date” and “Contract Term” shall have the meanings set out in Schedule 1 to this Contract.
- (C) *[The Company may extend the [Contract Term] beyond the [Contract Expiry Date] in line with any extension to the Term of the Agreement, or by a maximum aggregate period of [two (2) years] from and including the Contract Commencement Date (in one or more extension periods of [six (6)] months] unless the Agreement has terminated or notice to terminate has been served by the Company (and on any such extension, the Contract Expiry Date shall be extended by the applicable period)].*

### 1 **[Goods and/or Services] and Contract Specification**

The Supplier is appointed to supply the following [Goods and/or Services] under this Contract as the Company may require under a Call-Off Contract:

- *[insert full description of the Goods and/or Services to be supplied by the Supplier. Confirm also if the Direct Vision Standard schedule applies]*

as further described in the Contract Specification attached at Schedule 2 to this Contract [and Contract Material Data Sheet at Appendix 1 to Schedule 2].

## 2 **Contractual Documentation**

The Supplier shall deliver the following Contractual Documentation to the Company:

*[Insert the documentation and information agreed shall be delivered by the Supplier. That may include records, reports, documents, papers, unpatented designs, drawings, data specifications, manufacturing or work processes, testing procedures, relevant computer data and all other technical business and similar information originated by or on behalf of the Supplier in accordance with this Contract and/or any Call-Off Contract. Distinguish between the requirements for this Contract and some/all of the Call-Off Contracts placed under it.]*

## 3 **[Specific programme requirements]**

*[insert any specific programme of delivery, e.g. if certain quantities of Goods and/or particular Services are required on certain dates]*

## 4 **[Collateral Warranty]**

*[Insert Contract-specific requirements for collateral warranties, in addition and without prejudice to those in Clause 44 of the Agreement.]*

*[For example:*

*The Supplier shall procure the agreement of [any subcontractor/named subcontractor/specific category of subcontractor] to provide a collateral warranty in favour of the Company (and/or relevant other member of the TfL Group) in the form set out in Schedule 9 to the Agreement as a term of the relevant subcontract and a condition precedent to it coming into effect[, together with a legal opinion completed and signed by a qualified lawyer from the country in which the subcontractor is resident in the form specified by the Company].*

## 5 **Equipment and Free Issue Materials**

*The Company shall supply the following Equipment to the Supplier for use in the supply of the [Goods and/or Services]:*

- *[insert description] / [None]*

*The Company shall supply the following Free Issue Materials to the Supplier for use in the supply of the [Goods and/or Services]:*

- *[insert description] / [None] / [as specified in an individual Call-Off Contract]*

## 6 **Contract Pricing and Invoicing**

6.1 The Contract Pricing for this Contract shall be as set out in Schedule 4 to this Contract.

6.2 The provisions of Clauses 9 (Price and Payment) and 46 (Interest) of the Agreement apply to this Contract and any Call-Off Contract entered into under it.

7 **Termination**

7.1 This Contract and/or any Call-Off Contract entered into under it may be terminated or suspended in accordance with the provisions of the Agreement.

**IN WITNESS OF THE ABOVE** the parties have signed this Contract on the date written at the head of this Contract.

<b>SIGNED by</b>	)	
<b><i>[insert name of signatory]</i></b>	)	.....
on behalf of	)	Authorised Signatory
<b>[LONDON UNDERGROUND]</b>	)	

<b>[SIGNED by</b>	)	
<b><i>[insert name of signatory]</i></b>	)	.....
on behalf of	)	Authorised Signatory
<b>[SUPPLIER] LIMITED</b>	)]	

## **SCHEDULE 1 TO THE CONTRACT**

**Company Representative:** [name] [contact details]

**Contract Commencement Date:** [   ]

**Contract Expiry Date:** [   ]

**Contract Term:** [   ]

**Supplier Representative:** [name] [contact details]

## SCHEDULE 2 TO CONTRACT

### CONTRACT SPECIFICATION

*[Note: Specification for the Goods and/or Services to be provided under this Contract to be inserted – including any purpose(s). As well as the specification for the Goods and/or Services, this document should cover requirements specific to this Contract and potential Call-Offs under it e.g.: (a) application of, or concessions from, Standards, including specific revisions, (b) any additional standards (which are not LU Standards) with which the Supplier must comply, (c) any interface management requirements, (d) any output acceptance processes, (e) any specific licences required for the Goods/Services, (f) any design elements which are relevant to the Goods/Services, (g) any specific rules and regulations which must be observed by the Supplier in the supply, including DVS, and (h) any reporting or meeting requirements.]*

**APPENDIX 1 TO SCHEDULE 2**  
**CONTRACT MATERIAL DATA SHEET**

**SCHEDULE 3 TO CONTRACT**  
**[CONTRACT QUALITY PLAN]**



**SCHEDULE 4 TO CONTRACT**  
**CONTRACT PRICING**

## Part C – Template Form of Order/Delivery request

*[Template form of Order/Delivery request at Appendix 1 to be completed for each Call-off Contract and to include the following details:*

- *Description of Goods/and or Services*
- *The Expected Date(s)*
- *The Order Price (Total Cost)*
- *Any relevant Standards and other technical information. This should also set out the purpose(s) for which the Goods and/or Serviced Goods are to be used, to the extent this is different from the relevant Contract.*
- *The Company Representative and the Supplier Representative's names and contact details (if different to the Contract)*
- *Any additional comments or special instructions]*

In this form of Order/delivery request the following definitions shall have the following meanings:

**Contract Number** means the Contract Reference Number;

**Proposal reference** means the Request Form Number as set out in the Request Form;

**Total Price** is the Order Price as defined in the Agreement; and

**Vendor** is the Supplier, party to the Agreement.



## Delivery request

Page 1 of 2

### Vendor address

#### Invoice to

London Underground Ltd  
Accounts Payable  
1st Floor  
PO Box 45276, 14 Pier Walk  
London SE10 1AJ  
Telephone: 0343 222 5100  
Fax: 020 3054 5331  
Email: [invoices@tfl.gov.uk](mailto:invoices@tfl.gov.uk)

#### Delivery address

#### Contact

Requested by :  
Telephone :  
Email :

#### Information

Delivery request no. :  
Creation date :  
Vendor no. :  
Currency : GBP  
Payment terms :  
  
Proposal ref no. :  
Contract number :

### Instructions to vendor

The supply of goods/services under this delivery request is subject to the terms and conditions of the contract number referenced above.

Expected Date:

Specific Specification, Standards and other technical information applicable to this Call-Off Contract:

[marked as N/A or detailed as applicable for each Call-Off Contract]

Order Programme:

[marked as N/A or detailed as applicable for each Call-Off Contract]

Additional comments or special instructions:

[marked as N/A or detailed as applicable for each Call-Off Contract]

**Procurement Department:**

**Date:**

London Underground Limited.

Registered Office: 5 Endeavour Square, Stratford, London, E20 1JN. Registered in England and Wales no. D1900907.

VAT number: 756 2770 08. London Underground Limited is a company controlled by a local authority within the meaning of Part V of the Local Government and Housing Act 1989. The controlling Authority is Transport for London.

**MAYOR OF LONDON**

### Appendix 1 Form of Order/delivery request

Information	
Delivery request no.	:
Creation date	:
Vendor no.	:
Currency	: GBP
Payment terms	:
Proposal ref no.	:
Contract number	:

Item	Description	Quantity	UM	Net price	Total price
0010					
	Sub Totals				
	Total Cost (excl. VAT)				

Procurement Department:

Date:

## Schedule 5

### Contract Variation Procedure

- 1 The cost of any Variation Order shall be agreed between the parties taking account of the reasons why the Variation Order was required.
- 2 The Company may propose a variation by completing Part A of the Variation Proposal and supplying three (3) copies of it to the Supplier. Within five (5) Working Days of receipt, or such other time as may be agreed by the Company, the Supplier shall complete Part B of the Variation Proposal and shall supply two (2) copies of the Variation Proposal to the Company. The Company shall be entitled, at any time within thirty (30) days of receipt, to instruct and authorise the Supplier to proceed with the variation on the terms so set out by each party by completing and signing Part C of one copy of the Variation Proposal (which, following such signature, will be referred to as a “**Variation Order**”) and supplying such Variation Order to the Supplier. The relevant part(s) of the Agreement or relevant Contract or Call-Off Contract shall thereupon be varied accordingly.
- 3 The Supplier may propose a variation, after requesting the issue by the Company of a Variation Proposal variation number, by completing Parts A and B of a Variation Proposal and supplying two (2) copies of it to the Company. The Company shall be entitled, at any time within thirty (30) days of receipt, to instruct the Supplier to proceed with the variation on the terms so set out by the Supplier by completing and signing Part C of one copy of the Variation Proposal (which, following such signature, will be referred to as a “**Variation Order**”) and supplying such Variation Order to the Supplier. The relevant part(s) of the Agreement or relevant Contract or Call-Off Contract shall thereupon be varied accordingly.
- 4 The Supplier may indicate in a Variation Proposal that the price is an estimated price but, if it does so, it shall supply a firm price to the Company in writing at least seven (7) days before the expiry of the time within which the Company is entitled to instruct the Supplier to proceed with the variation.
- 5 The price indicated by the Supplier must be the full price and shall cover all costs associated with the variation. If appropriate a range of prices may be shown corresponding to the quantity of Goods to be supplied and extent of the Services to be carried out.
- 6 In an emergency, both parties shall use their reasonable endeavours to expedite the actions permitted or required under the Contract Variation Procedure.

- 7 The Company will not accept any retrospective claims for additional work caused by a variation which has not been approved by the Company in accordance with the Contract Variation Procedure before the commencement of such additional work.
- 8 All authorised additional work resulting from any Variation Proposal shall be priced in accordance with any rates previously submitted by the Supplier (if available) in relation to any Proposal where the Goods and Services are the same, or similar in nature, to the additional work.
- 9 The Supplier shall at all times act reasonably and shall price each Variation Proposal at the least possible additional cost to the Company that it is reasonably and economically practicable for the Supplier to offer and which has the least possible impact on the terms of the Agreement and the relevant Contract or Call-Off Contract, including, but not limited to the Specification or Contract Specification and the Order Programme.
- 10 Strict adherence to the procedure described in this Schedule 5 shall be a condition precedent to any addition to the price for the Goods and Services. If the Supplier does not adhere to each paragraph in this Schedule 5 then the Supplier shall not be entitled to any addition to the price notwithstanding that the Supplier may have supplied additional or varied Goods and/or Services.

# **Appendix 1** **Form of Variation Proposal/Variation Order**

<b>To:</b>	<b>From:</b>
------------	--------------

**Framework Contract Reference Number:**  
**Contract [Reference Number/Title]**  
**Order/Call-Off Contract Number:**  
**Variation Number:**  
**Variation Title:**

<b>PART A (TO BE COMPLETED BY THE ORIGINATOR OF THE VARIATION ORDER)</b>	
Description of change:	
Reason for changes and impact (if any) on Agreement, Contract, Call-Off Contract:	
Variation Proposal Authorised by:	Proposal Date:
<b>PART B (TO BE COMPLETED BY THE SUPPLIER)</b>	
<b>Price Breakdown</b>  Note: If a further breakdown is needed please append details as a separate sheet.	
Expected Order Delivery Date and/or Expected Order Completion Date:	
Supplier's Representative:	
Print Name: .....	Signature: ..... Date: .....
Completed document to be returned to the Company's Representative .....	

**PART C (TO BE COMPLETED BY THE COMPANY'S REPRESENTATIVE)**

**Comment on Parts A and B:**

Variation Authorisation

**Company's Representative:**

**Print Name:** .....

**Signature:** .....

**Date:** .....



**Schedule 6**  
**Quality Plan**































## Schedule 7

## Deed of Novation

**THIS DEED** is made

day of

202[ 1

**BETWEEN:**

**[LONDON UNDERGROUND LIMITED** a company registered in England and Wales under number 01900907] and having its registered office at 5 Endeavour Square, London E20 1JN (the “**Company**”); and

[ ] a company registered in [England and Wales] under number [ ] and having its registered office at [ ] (the “**Supplier**”); and

[ ] a company registered in [England and Wales] under number [ ] and having its registered office at [ ] (the “**New Company**”).

**WHEREAS:**

- (A) The Company has a framework agreement dated [ ] and referenced [insert contract number] with the Supplier pursuant to which contracts (and below those call-off contracts) may be entered into for the provision of [describe in brief the scope of supply] (together the “**Contract**”).
- (B) The Company wishes to transfer [part of] its benefit and burden under the Contract to the New Company.
- (C) The Supplier and the New Company have agreed to such transfer upon the terms and conditions of this Deed.

**IT IS AGREED AS FOLLOWS:**

1. In this Deed:
  - 1.1 “**Transfer Date**” means [ ].
2. With effect from the Transfer Date:
  - 2.1 the New Company undertakes to perform the obligations of the Company under the Contract and be bound by its terms in every way as if the New Company is and had been named at all times as a party to the Contract in lieu of the Company;



- 2.2 the Supplier releases and discharges the Company from all demands and claims whatsoever in respect of the Contract and accepts the liability of the New Company in relation to the Contract in lieu of the liability of the Company and agrees to be bound by the terms of the Contract in every way as if the New Company were and had been a party to the Contract at all times in lieu of the Company;
- 2.3 for the avoidance of doubt, it is hereby expressly agreed that:
- 2.3.1 any and all rights, claims, counter-claims, demands and other remedies of the Supplier against the Company accrued under or in connection with the Contract prior to the date hereof shall be exercisable and enforceable by the Supplier against the New Company; and
- 2.3.2 any and all rights, claims, counter-claims, demands and other remedies of the Company against the Supplier accrued under or in connection with the Contract prior to the date hereof shall be exercisable by the New Company against the Supplier.
- 2.4 the Company transfers its rights and obligations under the Contract to the New Company.
3. A person who is not a party to this Deed may not enforce any of its terms by virtue of the Contracts (Rights of Third Parties) Act 1999.

Executed as a deed by the parties and delivered on the date of this Deed

Executed as a deed by affixing the Common Seal of )

[London Underground Limited] )

in the presence of:- )

.....

*[Authorised Signatory]*

Executed as a Deed by [SUPPLIER] )

acting by ) .....

) Authorised Signatory

and ) .....

) Authorised Signatory

Executed as a Deed by [NEW COMPANY] )

acting by ) .....

) Authorised Signatory

and ) .....

) Authorised Signatory

## **Schedule 8**

### **Equality, Diversity and Inclusion**

#### **PART A**

##### **EDI Audit**

- 1 Without prejudice to its rights under Clause 5 of the Agreement, the Company may from time to time undertake any audit or check of any and all information regarding the Supplier's compliance with clauses 50.7(e) - 50.7(g), and this Schedule 8. The Company's rights pursuant to this paragraph shall include audit of any and all documents and records of the Supplier and its subcontractors and, where applicable, subject to the provisions of paragraph 1 of this Schedule 8 Part B, subcontractors of any tier, and shall include the Minimum Records.
- 2 The Supplier shall maintain and retain the Minimum Records for a minimum of 6 years from the termination or expiry of the Agreement (unless any Contract or Call-Off Contract terminates or expires after the Agreement, in which case the latest termination or expiry date shall apply). The Supplier shall procure that each of its subcontractors and, where applicable, subject to the provisions of paragraph 1 of this Schedule 8 Part B, subcontractors of any tier, maintain and retain records equivalent to the Supplier's Minimum Records for a minimum of 6 years from the termination or expiry of the Agreement (unless any relevant Contract or Call-Off Contract terminates or expires after the Agreement, in which case the latest termination or expiry date shall apply). The Supplier shall procure that each subcontract between it and its subcontractors and, where applicable, subject to the provisions of paragraph 1 of this Schedule 8 Part B, each subcontract between its subcontractors and subcontractors of any tier, contains rights of audit in favour of and enforceable by the Company substantially equivalent to those granted by the Supplier pursuant to this Schedule 8.
- 3 The Company shall use reasonable endeavours to co-ordinate its audits and to manage the number, scope, timing and method of undertaking audits so as to ensure that the Supplier and each subcontractor is not, without due cause, disrupted or delayed in the performance of its obligations under the Agreement, Contracts or Call-Off Contracts and each relevant subcontract.
- 4 The Supplier shall promptly provide, and procure that its subcontractors and, where applicable, subject to the provisions of paragraph 1 of this Schedule 8 Part B, subcontractors of any tier, promptly provide, all reasonable co-operation in relation to any audit or check including, to the extent reasonably possible in each particular circumstance:
  - (a) granting or procuring the grant of access to any premises used in the Supplier's performance of the Agreement, and any Contract or Call-Off Contract, or in the

performance by its relevant subcontractor or subcontractors of any tier, whether the Supplier's own premises or otherwise;

- (b) granting or procuring the grant of access to any equipment (including all computer hardware and software and databases) used (whether exclusively or non-exclusively) in the performance of the obligations specified in paragraph 1 of this Schedule 8 Part B by the Supplier or the relevant subcontractor or any subcontractor of any tier, wherever situated and whether the Supplier's own equipment or otherwise; and
- (c) complying with the Company's reasonable requests for access to senior personnel engaged in the Supplier's performance of the Agreement, Contracts or Call-Off Contracts, or in the performance of its subcontract by the relevant subcontractor or subcontractor of any tier.

## **5 Gender Neutral Language**

For the duration of the Term, the Supplier shall endeavour to employ gender-neutral language in all communications relating to the Agreement, Contracts and Call-Off Contracts, including but not limited to communications with job applicants, employees, apprentices, contractors, customers and members of the public. Gender-neutral language includes avoidance of male or female pronouns and male or female forms of job titles where unnecessary.

## **6 Equality, Diversity and Inclusion Definitions**

When completing its EDI Policy and/or EDI Statement and/or EDI Action Plan, the Supplier shall use the definitions and terminology as set out in Appendix 1 of this Schedule 8 or as notified to the Supplier by the Company from time to time.

# **PART B**

## **1 EDI Action Plan**

The Supplier shall comply with the EDI Action Plan and shall procure that each of its subcontractors:

- (a) adopts and implements; and
- (b) in respect of subcontractors of any tier, uses reasonable endeavours to procure that those subcontractors of any tier adopt and implement,

a strategic equality and diversity plan in respect of their respective employees engaged in the performance of their Agreement, Contracts and Call-Off Contracts which is at least as extensive in scope as that agreed with the Company and set out in the EDI Action Plan.

## **2 Monitoring and Reporting**

The Supplier shall use reasonable endeavours to provide to the Company within 30 days of the aggregate value of the price of Call-Off Contracts entered into exceeding £5m and on each 12 month anniversary of that date, or such other frequency as the Company may reasonably request, an annual report on performance and compliance with paragraph 1 of this Schedule 8 Part B with the following information:

- (a) other than for the first report, the performance of the Supplier over the past 12 months in relation to the EDI Action Plan;
- (b) employee breakdown: the proportion of its employees engaged in the performance of the Agreement, Contracts and Call-Off Contracts to the extent reasonably possible, the employees of its subcontractors of any tier engaged pursuant to the terms of the relevant subcontracts who are:
  - (i) of non-white British origin or who classify themselves as being non-white British;
  - (ii) female;
  - (iii) from the local community;
  - (iv) disabled.
- (c) expenditure breakdown: a statement broken down by activity and material type of how they have used and how much has been spent with:
  - (i) SMEs;
  - (ii) BAME businesses;
  - (iii) suppliers from other under-represented or protected groups;
  - (iv) suppliers demonstrating a diverse workforce composition.

- 3 Progress and approval (where due) of actions will be monitored via 4 (four) weekly (or as otherwise agreed) progress meetings with the Company. The Supplier shall provide a written

update prior to the progress meetings and should request additional meetings (if necessary) with the Company to discuss progress or seek sign-off for complete actions.

- 4 The Supplier shall ensure at all times that it complies with the requirements of the Data Protection Act 2018 in the collection and reporting of the information to the Company pursuant to paragraph 2 of this Schedule 8 Part B.

**APPENDIX 1**  
**Equality, Diversity and Inclusion Definitions and Terminology**

<b>Definitions and terminology</b>	<b>Meaning</b>
Accessibility	This term refers to the design of products, devices, services, or environments that is inclusive of disabled people.
Black Asian and Minority Ethnic (BAME) Groups	Ethnic groups who have a common experience of discrimination based on their skin colour or ethnic origin. Individuals may self-identify in different ways but BAME is the collective term used by TfL to describe people who may have this range of experiences.
Disability	Physical or mental impairment that has a 'substantial' and 'long-term' negative effect on a person's ability to do normal daily activities.
Diversity	Recognising, respecting and valuing a wide set of differences and understanding that an individual's opportunities are impacted by characteristics beyond those protected by legislation, e.g. class, family background, political views, union membership etc.
Equality	<p>Recognising and respecting differences, including different needs, to ensure that everyone:</p> <ul style="list-style-type: none"> <li>• can live their lives free from discrimination;</li> <li>• knows their rights will be protected; and</li> <li>• has what they need to succeed in life.</li> </ul> <p>Equality is about ensuring equality of opportunity by tackling the barriers that some groups face and making London fairer by narrowing the social and economic divides that separate people. The characteristics protected by equality legislation are age, disability, gender, gender reassignment, ethnicity, pregnancy and maternity, religion and/or belief and sexual orientation.</p>
Equality Impact Assessments (EqIA)	As a public body, TfL is bound by the Public Sector Equality Duty (PSED) under the Equality Act 2010. An EqIA is a tool used to demonstrate that TfL has met its PSED duties. Like a risk assessment process, an EqIA is a process that helps TfL to make more inclusive decisions and to make sure that TfL's programmes, policies, projects and the way TfL designs, builds and operates services works well for TfL staff and customers.
Ethnicity	An individual's identification with a group sharing any or all of the following: country of origin, cultural origins or practice, language, nationality religion, skin colour.

Gender	The social differences between women and men that have been learned are changeable over time and have wide variations both within and between cultures. The term is often used to differentiate from 'sex', a term referring to biological differences. It is important to note that some people consider themselves to be 'gender fluid' (someone whose sense of their gender may vary) or 'gender non-binary' (someone who does not wish to be defined as male or female).
Gay	Refers to a man who has a romantic and/or sexual orientation towards men. Also a generic term for lesbian and gay sexuality - some women define themselves as gay rather than lesbian.
Inclusion	Removing barriers and taking steps to create equality, harness diversity and produce safe, welcoming communities and cultures that encourage innovative and fresh ways of thinking and allow people to speak up, especially to suggest where things could be done better.
Inclusive Design	Creating environments which everyone can use to access and benefit from the full range of opportunities available, confidently, independently, with choice and dignity, which avoids separation or segregation and is made up of places and spaces that acknowledge diversity and difference, meeting the needs of everyone in society.
Lesbian	Refers to a woman who has a romantic and/or sexual orientation towards women.
Neurodiverse	A concept where neurological differences are recognised and respected in the same way as any other human difference.
Non-Binary	An umbrella term for people whose gender identity is not comfortably expressed by 'man' or 'woman'. Non-binary identities are varied and can include people who identify with some aspects of binary identities, while others reject them entirely.
Pay gap	Difference between the average pay of two different groups of people, for example men and women, or groups from different ethnic backgrounds.
Sexual Orientation	A person's emotional, physical and/or sexual attraction, and the expression of that attraction.
Supplier Diversity	<p>Diverse suppliers are from one of the following five categories:</p> <p>1. Small and Medium Enterprises (SMEs).</p> <p>A small enterprise is a business which has both 0-49 full-time equivalent employees and either:</p> <ul style="list-style-type: none"> <li>• turnover per annum of no more than £5.6 million net (or £6.72 million gross) in the last financial year; or</li> <li>• balance sheet total of no more than £2.8 million net (£3.36 million</li> </ul>



gross).

A medium enterprise is a business which has both 50-249 full-time equivalent employees and either;

- turnover per annum of no more than £22.8 million net (or £27.36 million gross) in the last financial year; or
- balance sheet total of no more than £11.4 million net (or £13.68 million gross).

2. A minority-led business is a business which is 51% or more owned by members of one or more BAME groups. Minority ethnic groups are all people including those who have classified themselves as members of ethnic groups other than 'white British'. The minority ethnic classification groups used by TfL for monitoring purposes are those taken from the census:

<b>Ethnic group</b>	<b>Racial Origin</b>
White British	Irish Any other White background
Mixed	White & Black Caribbean White & Black African White & Asian Any other Mixed background
Asian or Asian British	Indian Pakistani Bangladeshi Any other Asian background
Black or Black British	Caribbean African Any other Black background
Chinese or other Ethnic Group	Chinese Any other ethnic group

3. A supplier from an under-represented group which is 51% or more owned by members of one or more of the following groups (where not covered by previous definitions):

- women;
- disabled people;
- lesbians, gay men, bisexual people;

	<ul style="list-style-type: none"> <li>• trans people;</li> <li>• older people (aged 60 or over); and</li> <li>• younger people (aged 24 or under).</li> </ul> <p>4. A supplier from a protected group is one which is 51% or more owned by members of a group for which protection is provided by anti-discriminatory legislation and which is not already covered by the above (such as religious, faith or belief groups or alternatively, ownership by a social enterprise or a voluntary/community organisation).</p> <p>5. Suppliers demonstrating a diverse workforce composition are those with full time equivalent employees in the supplier's workforce who may be from one or more minority ethnic groups, and/or under-represented groups and/or protected groups as listed above.</p>
Trans or transgender	Current terminology for people who do not want to live as the sex they were assigned at birth.
Young adults, children and young people	<p>Young adults are people aged 16 to 24, whether in education or employment.</p> <p>Children and young people can be further subdivided into:</p> <p>i) Young children – those that use the transport network escorted by parents or carers.</p> <p>ii) School children – those, usually aged between 11-16 at secondary school, that use the transport network independently or with members of their peer group.</p>

**APPENDIX 2**  
**[Insert agreed EDI Action Plan]**

The specific example below is purely for illustrative purposes.

<b>EDI Objective</b>	<b>Current position/ baseline</b>	<b>Action</b>	<b>Timing</b>	<b>Person responsible</b>	<b>Resources</b>	<b>KPIs</b>
Recruit and retain a workforce reflective of the local area	From workforce diversity statistics					
Move all staff onto London Living Wage						
Collect and analyses diversity data						
Reduce gender pay gap						
Inclusive recruitment training for hiring managers						
Managing diversity for all line managers/ supervisors						
Inclusive customer service for all public facing staff						

## Schedule 9

## Form of Collateral Warranty

**THIS AGREEMENT is made the**

day of 20[ ]

**BETWEEN : -**

- (1) [London Underground Limited registered in England and Wales under number: 01900907] and having its registered office at 5 Endeavour Square, London E20 1JN (the “**Company**”);
- (2) [ ] a company registered in England and Wales under number: [.....]and having its registered office at [.....] (the “**Sub-Contractor**”); and
- (3) [ ] a company registered in England and Wales under number: [.....]and having its registered office at [.....] (the “**Supplier**”).

**WHEREAS :-**

- (A) [The Company/London Underground Limited] has entered into a framework agreement, pursuant to which contracts (and below them further call-off contracts) may be made, with the Supplier (together the “**Main Contract**”) pursuant to which the Supplier is to undertake and complete the following supply: [.....] (the “**Supply**”).
- (B) The Sub-Contractor has submitted a tender to the Supplier for the carrying out and completion of certain parts (the “**Sub-Contract Supply**”) of the Supply referred to above as more particularly described in the tender.

NOW IN CONSIDERATION of the payment of £1 (one pound) by the Company to the Sub-Contractor (receipt of which the Sub-Contractor hereby acknowledges) IT IS HEREBY AGREED as follows:

1. The Sub-Contractor warrants to the Company that:
  - (a) the Sub-Contract Supply have been and will be carried out with the skill and care to be expected of appropriately qualified and experienced professional contractors with experience in carrying out works or services of a similar type, nature and complexity to the Sub-Contract Supply;
  - (b) reasonable skill and care has been and will continue to be exercised in connection with:

- (i) the design of any goods, works or services to the extent that the Sub-Contractor has or will be responsible for such design;
  - (ii) the selection of all goods and materials comprised in the Sub-Contract Supply (in so far as such goods and materials have been or will be selected by the Sub-Contractor);
  - (iii) the satisfaction of any performance specification or requirement in so far as the same are included or referred to in the contract between the Supplier and the Sub-Contractor in relation to the Sub-Contract Supply (the “**Sub-Contract**”);
  - (iv) the execution and completion of the Sub-Contract Supply;
  - (v) the Sub-Contract Supply will, on completion of the Main Contract, comply with all Applicable Laws and Standards (as such capitalised terms are defined in the Main Contract);
- (c) the Sub-Contract Supply will be reasonably fit for the purposes for which they are intended (awareness of which purposes the Sub-Contractor hereby acknowledges) and in particular but without limitation will be so fit for the period and with a rate of deterioration reasonably to be expected of high quality, reliable, well designed and engineered goods, materials and construction; and
- (d) it has the right to grant to the Company all licences (including without limitation all rights to sub-license) of all intellectual property rights as contemplated in this Agreement.

For the purposes of construing the warranties in this Clause 1, references to the Sub-Contract Supply shall include any part of the Sub-Contract Supply. Each warranty shall be construed as a separate warranty and shall not be limited by reference to, or reference from, the terms of any other warranty or any other term of the Sub-Contract.

2. The Sub-Contractor shall, save in so far as it is delayed by any event in respect of which the Supplier is granted an extension of time under the Main Contract for completion of the Supply:
- (a) execute and complete the Sub-Contract Supply in accordance with the provisions of the Sub-Contract; and

- (b) ensure that the Supplier shall not become entitled to any extension of time for completion of the Supply or to claim any additional payment under the Main Contract due to any failure or delay by the Sub-Contractor.
3. The Sub-Contractor shall from time to time supply the Company and the Supplier with such information as either may reasonably require.
4. To the extent that the intellectual property rights in any and all Documents have not already vested in the Company or the Supplier, the Sub-Contractor hereby grants to the Company an irrevocable, non-exclusive, non-terminable, royalty-free licence to copy and make full use of any and all Documents and all amendments and additions to them and any works, designs or inventions of the Sub-Contractor incorporated or referred to in them for the following purposes:
- (a) understanding the Supply;
  - (b) operating, maintaining, repairing, modifying, altering, enhancing, re-figuring, correcting, replacing, re-procuring and re-tendering the Supply;
  - (c) extending, interfacing with, integrating with, connecting into and adjusting the Supply;
  - (d) enabling the Company to carry out the operation, maintenance repair, renewal and enhancement of the Underground Network or TfL Network (as such capitalised terms are defined in the Main Contract);
  - (e) executing and completing the Supply; and
  - (f) enabling the Company to perform its functions and duties as Infrastructure Manager and Operator of the Underground Network or TfL Network (as such capitalised terms are defined in the Main Contract)

provided always that the Supplier shall not be liable for the consequences of any use of the Documents as aforesaid for any other purpose. Such licence shall carry the right to grant sub-licences and shall be transferable to third parties without the prior consent of the Sub-Contractor.

For the purposes of this Clause, the term “**Documents**” shall mean documents, items of information, data, reports, drawings, specifications, plans, software, designs, inventions and any other materials provided by or on behalf of the Sub-Contractor in connection with the Sub-Contract (whether in existence or to be made).

5. The Sub-Contractor agrees:
- (a) on request at any time to give the Company or any persons authorised by the Company access to the material referred to in Clause 4 and at the Company's expense to provide copies of any such material; and
  - (b) at the Sub-Contractor's expense to provide the Company with a set of all such material on completion of the Sub-Contract Supply.
6. The parties hereby agree that:
- (a) this Agreement shall be personal to the Sub-Contractor;
  - (b) the Company may assign the benefit of this Agreement to any third party;
  - (c) the rights and remedies contained in this Agreement are cumulative and shall not exclude any other right or remedy available to either party in law or equity.
7. The Sub-Contractor warrants and undertakes to the Company that he has maintained and will continue to maintain all insurances required to be maintained pursuant to the terms of the Sub-Contract and that, insofar as he is responsible for the design of the Sub-Contract Supply, he has professional indemnity insurance with a limit of indemnity of not less than one million pounds (£1,000,000) in respect of each and every claim which may be made against the Sub-Contractor in respect of the Sub-Contract Supply. The Sub-Contractor shall maintain such professional indemnity insurance for a period of twelve (12) years from completion of the Supply provided such insurance remains available at commercially reasonable rates and shall notify the Company forthwith if such insurance ceases to be so available. When deciding whether such insurances are available at commercially reasonable rates, no account shall be taken of any increase in the premium or imposition of terms which arise as a result of the Sub-Contractor's insurance claims record.<sup>1</sup>
8. If any dispute of any kind whatsoever arises between the parties in connection with this Agreement or the Sub-Contract Supply which raises issues which are in opinion of the Company the same as or substantially the same as issues raised in a related dispute (the **"Related Dispute"**) between the Company and the Supplier and such Related Dispute has already been referred to a conciliator or arbitrator appointed under the provisions to that effect

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<sup>1</sup> If the Sub-Contractor is not undertaking any design as part of the Sub-Contract Supply Clause 7 can be stated as "Not Used".

contained in the Main Contract, then the Sub-Contractor hereby agrees that the Company may at its discretion by giving notice in writing to the Sub-Contractor refer the dispute arising out of this Agreement or the Sub-Contract Supply to the adjudicator, conciliator, arbitrator or other party (the “**Appointed Party**”) appointed to determine the Related Dispute. In this event the Appointed Party shall have power to give such directions for the determination of the dispute and the Related Dispute as he may think fit and to make such awards as may be necessary in the same way as if the procedure of the High Court as to joining one or more defendants or joint co-defendants or third parties was available to the parties and to him.

9. (a) Neither the Sub-Contractor nor the Supplier shall exercise or seek to exercise any right which may be or become available to it to terminate or treat as terminated the Sub-Contract or discontinue or suspend the performance of any of its duties or obligations thereunder or treat the Sub-Contract as determined without first giving to the Supplier or the Sub-Contractor (as applicable) not less than 35 days prior written notice of its intention to do so, with a copy to the Company, specifying the Sub-Contractor's or Supplier's grounds for terminating or treating as terminated the Sub-Contract or discontinuing or suspending its performance thereof or treating the Sub-Contract as determined.
- (b) If the Main Contract (or any contract or call-off contract entered into below it) is terminated for any reason, within 35 days of such termination the Company may give written notice to the Sub-Contractor and to the Supplier (a “**Step-in Notice**”) that the Company or its appointee shall henceforth become the Supplier under the Sub-Contract in accordance with the terms of sub-clause (c) below.
- (c) With effect from the date of the service of any Step-in Notice:
  - (i) the Company or its appointee shall be substituted in the Sub-Contract as the Supplier thereunder in place of the Supplier and references in the Sub-Contract to the Supplier shall be construed as references to the Company or its appointee;
  - (ii) the Sub-Contractor shall be bound to continue with the performance of its duties and obligations under the Sub-Contract and any exercise or purported exercise by the Sub-Contractor prior to the date of the Step-in Notice of any right to terminate or treat as terminated the Sub-Contract or to discontinue or suspend the performance of any of its duties or obligations thereunder or to treat the Sub-Contract as automatically determined shall be of no effect;



- (iii) the Company shall become bound by the terms and conditions of the Sub-Contract in respect of all obligations and duties of the Supplier thereunder which fall to be performed after the date of the Step-in Notice and shall promptly thereafter make payment of any amounts properly due to the Sub-Contractor as at the date of the Step-in Notice and still outstanding; and
    - (iv) the Supplier shall be released from further performance of the duties and obligations of the Supplier under the Sub-Contract after the date of the Step-in Notice, but without prejudice to any rights and remedies of:
      - (1) the Sub-Contractor against the Supplier in respect of any matter or thing done or omitted to be done by the Supplier on or before the date of the Step-in Notice; and
      - (2) the Supplier against the Sub-Contractor in respect of any matter or thing done or omitted to be done by the Sub-Contractor on or before the date of the Step-in Notice.
  - (d) Notwithstanding anything contained in this Agreement and notwithstanding any payments which may be made by the Company to the Sub-Contractor, the Company shall not be under any obligation to the Sub-Contractor and the Sub-Contractor shall not be under any obligation to the Company unless the Company shall have served a Step-in Notice pursuant to Clause 9(b) above.
10. The Sub-Contractor's liabilities, duties and obligations hereunder shall be no greater and of no longer duration than the liabilities, duties and obligations which the Sub-Contractor owes to the Supplier under the Sub-Contract.
11. The Sub-Contractor further undertakes to indemnify the Company from and against the consequences of any breach by the Sub-Contractor of any of the warranties, covenants and undertakings contained in this Agreement.
12. The rights and benefits conferred upon the Company by this Agreement are in addition to any other rights and remedies that the Company may have against the Sub-Contractor including, without prejudice to the generality of the foregoing, any remedies in negligence.
13. Nothing contained in this Agreement shall in any way limit the obligations of the Supplier to the Company arising under the Main Contract or otherwise undertaken by the Supplier to the Company in relation to the Sub-Contract Supply.

14. No amendment to this Agreement shall be valid unless it is in writing and signed by all parties.
15. Other than any member of the TfL Group, any person who is not a party to this Agreement may not enforce any of its terms under the Contracts (Rights of Third Parties) Act 1999.
16. This Agreement shall be governed by and construed in accordance with English law and shall be subject to the exclusive jurisdiction of the Courts of England and Wales.

Executed as deed by the parties and delivered on the date of this Agreement.

Executed as a deed by affixing the Common Seal of )  
[London Underground Limited] )  
in the presence of:- )

.....  
*[Authorised Signatory]*

Executed as a Deed by [SUB-CONTRACTOR] )  
acting by ) .....  
 ) Authorised Signatory  
and ) .....  
 ) Authorised Signatory

Executed as a Deed by [SUPPLIER] )  
acting by ) .....  
 ) Authorised Signatory  
and ) .....  
 ) Authorised Signatory

## Schedule 10

### Supplier Performance Measurement and Contract Management and Reporting

#### Schedule 10(a) (Performance Measurement Mechanism)

1. Overview
  - 1.1 This Schedule 10(a) (Performance Measurement Mechanism) comprises a performance measurement mechanism ("**PMM**") applicable to the Agreement, all Contracts and Call-Off Contracts, in order to incentivise the Supplier to perform the Agreement, Contracts and Call-Off Contracts in accordance with the applicable terms and to deliver the Goods and perform the Services (including in relation to Serviced Goods) in accordance with the requirements of all such Contracts and/or Call-Off Contracts and to provide the Company with a remedy where the Supplier fails to do so. Any rights and remedies, obligations and procedures under this Schedule 10(a) (Performance Measurement Mechanism) are in addition to and without prejudice to the Company's other rights and remedies under or in connection with the Agreement, each Contract and Call-Off Contract.
  - 1.2 The PMM set out in this Schedule 10(a) (Performance Measurement Mechanism) shall come into effect on the date that the Company issues its first Request Form under the Agreement.
  - 1.3 The PMM comprises and incorporates:
    - (A) A range of Key Performance Indicators (KPIs);
    - (B) The details as to how the KPIs are to be measured, the frequency and methodology of monitoring performance and the performance level required; and
    - (C) The method of calculation of the Abatement (if any) in respect of the Supplier's failure to perform, and provide the Goods and Services in accordance with, the Agreement, any Contract and/or Call-Off Contract.
  - 1.4 In respect of each KPI, a failure by the Supplier to meet the required level of performance set out in Appendix 1 shall entitle the Company to:
    - (A) enact the Escalation Procedure subject to and in accordance with paragraph 4; and/or
    - (B) if applicable to the relevant KPI and Contract and/or Call-Off Contract as set out in that Contract and/or Call-Off Contract, recover Abatements from the Supplier in the circumstances set out in Appendix 1
  - 1.5 The Company shall also be entitled to suspend participation by the Supplier in any or all future Mini-Competitions subject to and in accordance with paragraph 5.
  - 1.6 At the end of each Accounting Period, the sum of all Abatements due in relation to a Contract and/or Call-Off Contract in respect of such period calculated pursuant to Schedule 10(a) (Performance Measurement Mechanism) and the Contract and/or Call-Off Contract shall at the Company's option:

- (A) be deducted from any payment due to the Supplier whether under the relevant Contract and/or Call-Off Contract, another Contract and/or Call-Off Contract or otherwise; and/or
- (B) be the subject of a demand for payment from the Company, which shall be payable by the Supplier as a debt due within fourteen (14) days,

and at the discretion of the Company (without double recovery) some or all of the Abatements may be cumulated into a single demand for payment for the preceding Financial Year.

## **2. Key Performance Indicators**

- 2.1 The Supplier will report in accordance with Schedule 10(b) (Contract Management and Reporting), performance against the following KPIs and keep a full audit trail of the evidence to support the information and figures reported.

KPI 1 – performance of Call-Off Contracts on time

KPI 2 – compliant quality performance of Call-Off Contracts

KPI 3 – management information reporting

KPI 4 - compliance with stock holding requirements

KPI 5 – timely and compliant submission of Proposals and submission of No Entry Confirmations in response to Mini-Competitions

- 2.2 Details of the KPIs, their application to the supply, their method of measurement and the level of any applicable Abatements are provided in Appendix 1 (Key Performance Indicators).

## **3. Reporting**

- 3.1 The Supplier will provide the reports required pursuant to Schedule 10(b) (Contract Management and Reporting), including measurements against each of the KPIs.
- 3.2 A Performance Scorecard will be produced by the Company in relation to the Agreement and all Contracts and Call-Off Contracts for a rolling year. The Performance Scorecard will be updated by the Company and submitted to the Supplier's Representative each Accounting Period incorporating an analysis of the performance of each of the KPIs for the previous Accounting Period.

## **4. Escalation Procedure**

- 4.1 The purpose of the Escalation Procedure set out in this paragraph 4 is to provide a structured framework within which the parties can resolve failures to meet KPIs. References to the Agreement in this paragraph 4 shall be deemed to include the relevant Contract(s) and Call-Off Contract(s).
- 4.2 The following table summarises the Escalation Procedure. If and to the extent that there is a conflict between the text of Schedule 10(a) (Performance Measurement Mechanism) and Table 1, the text of Schedule 10(a) (Performance Measurement Mechanism) shall prevail. It is possible for a number of Non Conformances to be in process at any one time.

**Table 1 – Summary of Escalation Procedure**

TRIGGER	LEVEL	ACTION	REVIEW BY	RESULT
Level 1 Non Conformance	Level 1	<p>Level 1 Non Conformance Report required specifying Level 1 Required Action and Level 1 Rectification Period.</p> <p>(Financial adjustments may also be made under Appendix 1 if KPIs meet the criteria for this as set out in this Schedule 10(a) (Performance Measurement Mechanism))</p>	Supplier's Representative and Company's Representative	<p>Resolved – Stop</p> <p>Unresolved - Level 2</p>
Level 2 Non Conformance	Level 2	<p>Level 2 Non Conformance Report required specifying Level 2 Required Action and Level 2 Rectification Period.</p> <p>(Financial adjustments may also be made under Appendix 1 if KPIs meet the criteria for this as set out in this Schedule 10(a) (Performance Measurement Mechanism))</p>	Supplier's Representative and Company's Representative	<p>Resolved – Stop</p> <p>Unresolved - Level 3</p>

TRIGGER	LEVEL	ACTION	REVIEW BY	RESULT
Level 3 Non Conformance	Level 3	Level 3 Non Conformance Report required specifying Level 3 Required Action and Level 3 Rectification Period. (Financial adjustments may also be made under Appendix 1 if KPIs meet the criteria for this as set out in this Schedule 10(a) (Performance Measurement Mechanism))	Supplier's Representative and Company's Representative	Resolved – Stop Unresolved - Level 4
Level 4 Non Conformance	Dispute Resolution, suspension or termination  (Financial adjustments may also be made under Appendix 1 if KPIs meet the criteria for this as set out in this Schedule 10(a) (Performance Measurement Mechanism))			

4.3 The parties acknowledge that the Escalation Procedure does not preclude attempts to resolve issues to the mutual satisfaction of the parties and is without prejudice to other rights and obligations under the Agreement and any Contract or Call-Off Contract. Issues should be presented to the Company's Representative and the Supplier's Representative for review and possible resolution.

#### 4.4 **Level 1**

(A) Any Level 1 Non Conformance will be recorded by the Company and it shall submit a notice to the Supplier giving details of the Non Conformance. The Supplier shall in response (such response to be within five (5) Working Days of service of the notice by the Company) prepare and submit to the Company a report regarding the Non Conformance (a "Level 1 Non Conformance Report"). Such report will contain:

- (1) confirmation of the date(s) and details of the Level 1 Non Conformance;

- (2) suggested steps to be taken by the Supplier to ensure that performance will improve to meet the requirements of the Agreement and there is no repetition of such Level 1 Non Conformance, being (following agreement or determination pursuant to paragraph 4.4(B) ) the "Level 1 Required Action"; and
  - (3) the time within which the Supplier suggests that such Level 1 Required Action is to be completed (which shall be a reasonable period being no longer than twenty (20) Working Days unless the Company otherwise agrees in writing), being (following agreement or determination pursuant to paragraph 4.4(B)) the "Level 1 Rectification Period".
- (B) The Supplier's Representative and the Company's Representative will use all reasonable endeavours to agree:
  - (1) as soon as reasonably practicable, following receipt of the Level 1 Non Conformance Report, the Level 1 Rectification Period and the Level 1 Required Action (or, in default of such agreement of either or both matters within such period as the Company reasonably requires, as determined by the Company);
  - (2) within ten (10) Working Days, following the end of the Level 1 Rectification Period, whether the Level 1 Required Action has been completed within the Level 1 Rectification Period,
- (C) If it is agreed pursuant to paragraph 4.4(B)(2) that the Level 1 Required Action has been completed within the Level 1 Rectification Period then the Non Conformance will be recorded as resolved.
- (D) All unresolved Level 1 Non Conformances at the time of the review and any Level 1 Non Conformances resolved during the preceding Accounting Period will be reviewed jointly every Accounting Period by the Company's Representative and the Supplier's Representative with the aim of ensuring that reoccurrence is (where possible) eliminated.

#### 4.5 **Level 2**

- (A) Where a Level 2 Non Conformance occurs, the Company shall submit a notice to the Supplier giving details of the Non Conformance. The Supplier shall in response (such response to be within five (5) Working Days of service of the notice by the Company) prepare and submit to the Company a report regarding the Non Conformance (the "Level 2 Non Conformance Report"). Such report will contain:
  - (1) the date and details of the Level 2 Non Conformance;
  - (2) suggested steps to be taken by the Supplier to ensure that performance will improve to meet the requirements of the Agreement and there is no repetition of such Level 2 Non Conformance, being (following agreement or determination pursuant to paragraph 4.5(B)) the "Level 2 Required Action"; and
  - (3) the time within which such Level 2 Required Action is to be completed (which shall be a reasonable period being no longer than twenty (20) Working Days unless the Company otherwise agrees in writing, being (following agreement or determination pursuant to paragraph 4.5(B)) the "Level 2 Rectification Period".
- (B) The Supplier's Representative and the Company's Representative will use all reasonable endeavours to agree:



- (1) as soon as reasonably practicable following receipt of the Level 2 Non Conformance Report, the Level 2 Rectification Period and the Level 2 Required Action (or, in default of such agreement of either or both matters within such period as the Company reasonably requires, as determined by the Company); and
  - (2) within ten (10) Working Days, following the end of the Level 2 Rectification Period, whether the Level 2 Required Action has been completed within the Level 2 Rectification Period;
- (C) If it is agreed pursuant to paragraph 4.5(B)(2) that the Level 2 Required Action has been completed within the Level 2 Rectification Period then the Non Conformance will be recorded as resolved.
- (D) All unresolved Level 2 Non Conformances and any Level 2 Non Conformances resolved during the preceding Quarter will be reviewed at the Contract Review Meeting as set out in Schedule 10(b) (Contract Management and Reporting) with the aim of ensuring reoccurrence is (where possible) eliminated.

#### 4.6 **Level 3**

- (A) Where a Level 3 Non Conformance occurs the Company shall submit a notice to the Supplier giving details of the Non Conformance.
- (B) The notice referred to in Paragraph 4.6(A) shall set out:
- (1) the deadline by which it requires the Supplier to serve on the Company a report (a "Level 3 Non Conformance Report") setting out the steps which the Supplier has taken, or will take, to ensure that performance will improve to meet the requirements of the Agreement and there is no repetition of such Level 3 Non Conformance (being, following agreement or determination in accordance with paragraph 4.6(C), the "Level 3 Required Action"); and
  - (2) the period (which shall be a reasonable period, being no longer than twenty (20) Working Days from the time of occurrence of the Level 3 Non Conformance unless the Company otherwise agrees in writing) in which the Supplier must complete the Level 3 Required Action (being, following agreement or determination in accordance with paragraph 4.6(C), the "Level 3 Rectification Period").
- (C) The Supplier's Representative and the Company's Representative must agree (or the Company determine):
- (1) as soon as reasonably practicable following receipt of the Level 3 Non Conformance Report, the Level 3 Rectification Period and the Level 3 Required Action (or, in default of such agreement of any of these matters within such period as the Company reasonably requires, as determined by the Company); and
  - (2) within ten (10) Working Days, following the end of the Level 3 Rectification Period, whether the Level 3 Required Action has been completed within the Level 3 Rectification Period;
- (D) If it is agreed in accordance with paragraph 4.6(C) that the Level 3 Required Action has been completed within the Level 3 Rectification Period the Non Conformance will be recorded as resolved.

- (E) All unresolved Level 3 Non Conformances and any Level 3 Non Conformances resolved during the preceding Quarter will be reviewed at the Contract Review Meeting as set out in Schedule 10(b) (Contract Management and Reporting).

#### 4.7 **Level 4**

- (A) When a Level 4 Non Conformance occurs the Company is entitled to:
  - (1) suspend performance of the Agreement, Contracts and/or Call-Off Contracts; and/or
  - (2) terminate the Agreement, Contracts and/or Call-Off Contracts in whole or in part.

### 5. **Suspension from Mini-Competitions**

- 5.1 If the Supplier achieves a score of "Unsatisfactory" in respect of any one or more KPIs on two or more occasions in any twelve (12) month rolling period the Company may by written notice to the Supplier suspend the Supplier's right to participate in any or all Mini-Competitions until:
  - (A) the date up to six (6) months (at Company's discretion) from the date of such notice; or
  - (B) such time as the Supplier has rectified the relevant Non-Conformances (to which the "Unsatisfactory" score relates) during the applicable Level 1, 2 or 3 Rectification Period and in accordance with the applicable Level 1, 2 or 3 Required Actions agreed with (or determined by) the Company in accordance with the Escalation Procedure to the satisfaction of the Company.
- 5.2 The Company's Representative will inform the Supplier in writing when the Supplier may recommence participation in future Mini-Competitions.

**Schedule 10(a) (Performance Measurement Mechanism:  
APPENDIX 1 – KEY PERFORMANCE INDICATORS**

Ref	Title	Measure	Frequency	Performance Criteria		
				Unsatisfactory	Below Requirements	Meets Requirements
KPI 1	Performance of Call-Off Contracts on time	<p><u>Measure</u> The number of Orders where Goods have been delivered and/or Services (including in relation to Serviced Goods) have been completed by the Expected Date</p> <p><u>Measurement Rule</u>  The Company will record the Expected Dates for each Order (where the Expected Date was due within the Accounting Period being measured) (the "Orders Due").</p> <p>The Company will determine the number of Orders where the Actual Dates were on the Expected Dates (the "Delivered and Completed Orders").</p> <p>Percentage success rate = <math>\frac{\text{Delivered and Completed Orders}}{\text{Orders Due}} \times 100</math></p> <p><u>Data Source</u>  The Company's SAP system  :</p>	Each Accounting Period	Less than or equal to 79.99%	Between 80% and 92.99%	Greater than or equal to 93%
		Abatement level		An amount equivalent to 3% of the aggregate Order Price for all Orders Due	An amount equivalent to 1% of the aggregate Order Price for all Orders Due	None

Ref	Title	Measure	Frequency	Performance Criteria		
				Unsatisfactory	Below Requirements	Meets Requirements
KPI 2	Compliant quality performance of Call-Off Contracts	<u>Measure</u> The number of Non Conformance Reports (NCR's) issued during the Accounting Period. For the purposes of this measure, an NCR means a report issued by the Company identifying technical non compliance with the Specification and/or Contract Specification.  <u>Measurement Rule</u>  The Company will record the number of NCR's issued during the Accounting Period in respect of any Goods and/or Services provided .  .  <u>Data Source</u>  The Company's SAP system  :	Each Accounting Period	3 or more NCRs issued	Between 1 and 2 NCRs issued	No NCRs issued
		Abatement level		120% of the value of the aggregate Order Price of the Goods and /or Services to which the NCR(s) relate	110% of the value of the aggregate Order Price of the Goods and/or Services to which the NCR(s) relate to	None

Ref	Title	Measure	Frequency	Performance Criteria
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				Unsatisfactory	Below Requirements	Meets Requirements
KPI 3	Management Information Reporting	<p><u>Measure</u> Submission of reports by the Supplier (on time in full) in accordance with Schedule 10(b) (Contract Management and Reporting).</p> <p><u>Measurement Rule</u></p> <p>The Company will collate the results and will determine the number of reports delivered on or before the report due date which were complete and accurate in all material respects (the "Delivered Reports") and the number of reports which were due within the measured Accounting Period (the "Reports Due").</p> <p>Percentage Success Rate =</p> $\frac{\text{Delivered Reports}}{\text{Reports Due}} \times 100$ <p><u>Data Source</u></p> <p>The Supplier's reports provided and recorded as received by the Company</p> <p>:</p>	Each Accounting Period	Percentage Success Rate is below 80%	Percentage Success Rate is between 80% and 99.99%	Percentage Success Rate is equal to 100%
		Abatement level		None	None	None

Ref	Title	Measure	Frequency	Performance Criteria		
				Unsatisfactory	Below Requirements	Meets Requirements
KPI 4	Compliance with stock holding requirements	<u>Measure</u> Maintaining the quantity of stock for Contracts where a stock holding requirement is specified in the Contract  <u>Measurement Rule</u>  The Supplier will confirm and provide evidence for all Contracts where a current stock holding is specified that the specified stock holding is in place and specifically available for supply under the relevant Contracts.  The Company will determine the number of Contracts where the Supplier has verified (to the Company's satisfaction) that the specified stock holding is in place and specifically available for call off by the Company (the "Stock on Hand") and the number of Contracts where a current stock holding is specified within the measured Accounting Period (the "Specified Stock Holding").  Percentage Success Rate =  $\frac{\text{Stock on Hand}}{\text{Specified Stock Holding}} \times 100$  <u>Data Source</u>  The stock holding report provided by the Supplier each Accounting Period in accordance with the reporting requirements of Schedule 10(b) (Contract Management and Reporting)	Each Accounting Period	Percentage Success Rate is below 80%	Percentage Success Rate is between 80% and 99.99%	Percentage Success Rate is equal to 100%
		Abatement level		None	None	None
Ref	Title	Measure	Frequency	Performance Criteria		

				Unsatisfactory	Below Requirements	Meets Requirements
KPI 5	Timely and compliant submission of Proposals in response to Mini Competitions	<p><u>Measure</u> Number of “nil”, late, incomplete or non-compliant Proposals (including any No Entry Confirmations) provided in response to Request Forms issued as part of the Mini Competition process</p> <p><u>Measurement Rule</u>  The Company will record the dates when Proposals were due and when Proposals [were provided together with the numbers of No Entry Confirmations received in response to Request Forms issued under the Mini Competition process (where a Proposal was due within the Accounting Period being measured).</p> <p>The Company will collate the results and will determine the number of Proposals which were provided and were on time, fully complete and compliant (the “Compliant Proposals”) and the number of Request Forms in respect of which a Proposal was due (the “Proposals Due”).</p> <p>Percentage success rate =</p> $\frac{\text{Compliant Proposals}}{\text{Proposals Due}} \times 100$ <p><u>Data Source</u>  The Company's e-tendering system</p>	Each Accounting Period	Percentage Success Rate is below 80%	Percentage Success Rate is between 80% and 99.99%	Percentage Success Rate is equal to 100%
		Abatement level		None	None	None



## **Schedule 10(b) (Contract Management and Reporting)**

1. Governance/Management Groups and Meetings
  - 1.1 The Supplier shall establish and maintain an account management team suitable for the Goods and Services required, both technically and managerially, to be responsible for matters including but not limited to the following:
    - (A) the satisfactory execution of its obligations and the day to day supply of the Goods and Services on a timely basis, and to the standard required, as described in the Agreement and the Contracts and/or Call-Off Contracts;
    - (B) ensuring proactive and pre-emptive management of all deliveries;
    - (C) providing strategic advice and support in the provision of the Goods and Services;
    - (D) providing a Supplier's Representative to act as the liaison point between the Supplier and the Company; and
    - (E) ensuring that the Goods and Services provided are supplied, and obligations carried out, in accordance with the Framework Agreement, the relevant Contract and Call-Off Contract, and to the satisfaction of the Company's Representative.
  - 1.2 The Supplier shall provide an organisational chart populated with the names of relevant Supplier Personnel within twenty (20) Working Days of the Commencement Date. The Supplier shall update such organisational chart and submit to the Company on each anniversary of the Commencement Date or at the time of any changes to personnel in the organisational chart.
  - 1.3 The Supplier and Company shall ensure that their relevant representatives meet, as a minimum, in accordance with the frequencies set out in Table 1 (Contract Management Meeting Frequencies) of this Schedule 10(b) (Contract Management and Reporting).
  - 1.4 The Supplier shall ensure that all Supplier's Representatives and/or Supplier Personnel attending meetings have the necessary delegated authority to act on behalf of the Supplier.
  - 1.5 The Company shall, prior to each anniversary of the Commencement Date, develop and issue an annual schedule of meetings to monitor and manage the supply of the Goods and Services by the Supplier under, and the performance of, the Agreement, Contracts and Call-Off Contracts.
  - 1.6 The Company shall develop and issue agendas for all meetings no later than two (2) Working Days prior to each meeting and shall take minutes of all meetings. The Meeting Chair (as set out in Tables 2-3 of this Schedule 10(b) (Contract Management and Reporting)) shall be responsible for issuing the minutes of all meetings within five (5) Working Days of each meeting taking place.
  - 1.7 Annual Strategic Review and Contract Review Meetings (as detailed below) shall be held at the Company's premises but the Company reserves the right to hold a minimum of one meeting per year at the Supplier's premises.
  - 1.8 The Supplier shall, in addition to attending all meetings, produce and provide all reports in accordance with and as set out in Table 4 of this Schedule 10(b) (Contract Management and Reporting), together with such other reports as are reasonably requested by the Company from time to time in writing. All information and reports shall be produced and provided in the format reasonably requested by the Company and shall, if required by the Company, be sent

electronically to the Company's electronic storage system or as otherwise specified by the Company.

- 1.9 The Supplier shall attend, with the Company, in each Financial Year the meetings set out in Tables 2-3 of this Schedule 10(b) (Contract Management and Reporting), in the frequencies stated below:

**Table 1- Contract Management Meeting Frequencies**

Annual Strategic Review (may be part of the relevant Contract Review Meeting)	Annually
Contract Review Meeting	Quarterly

**Table 2: Annual Strategic Review**

Strategic - Annual Strategic Review	
<p>Purpose - A strategic assessment of the relationship between the parties, including:</p> <ul style="list-style-type: none"> <li>• Review of up and coming expiring Contracts</li> <li>• Supplier performance with agreement of actions for improvement;</li> <li>• Review of the Supplier's progress in respect of strategy, health, safety and environmental issues and com</li> <li>• Developments within the parties and changes in the applicable market and industry that may affect the A</li> </ul>	
Title:	Annual Strategic Review
Frequency	Annual
Business Level	Pan TfL
Main Agenda Items	<ul style="list-style-type: none"> <li>• Annual performance review</li> <li>• Annual financial review</li> <li>• Business and marketplace developments</li> <li>• Capability Report</li> </ul>
Attendees (Company)	<ul style="list-style-type: none"> <li>• Director or nominated deputy representing the Company</li> <li>• commercial management representative(s) as appropriate</li> <li>• operational and engineering representative(s) as appropriate</li> </ul>
Attendees (Supplier)	<ul style="list-style-type: none"> <li>• Director or nominated deputy representing the Supplier</li> </ul>

Meeting Chair	<ul style="list-style-type: none"> <li>Company's Representative</li> </ul>
Reports Required	<ul style="list-style-type: none"> <li>All Performance Scorecards for that Financial Year in respect of the Supplier's performance in accordance with the Contract</li> <li>Latest versions of reports as required by Schedule 10(b) (Contract Management and Reporting)</li> </ul>
Decisions/ Reports/ Outputs	<ul style="list-style-type: none"> <li>Minutes</li> <li>Actions with responsibility for completion allocated and target dates for completion of such actions</li> </ul>

**Table 3: Periodic Contract Review Meeting**

Tactical – Periodic Contract Review Meeting	
<p>Purpose - A review of the Supplier's performance over the preceding Quarter and for each Accounting Period in the Quarter which will entail:</p> <ul style="list-style-type: none"> <li>• status update of all relevant Call-Off Contracts – planned, in progress and completed</li> <li>• review of performance achieved against the KPI's set out in Schedule 10(a) (Performance Measurement Mechanism)</li> <li>• review of remedial actions undertaken as a result of the escalation process and/or any NCR's issued</li> <li>• review of technical queries</li> <li>• brief update on operational priorities</li> <li>• review of Company's potential new requirements</li> <li>• review of Payment Applications and payment adjustments</li> <li>• review of the Supplier's skills and resourcing requirements</li> <li>• business updates from the Company and the Supplier</li> <li>• significant risks and issues affecting the Supplier's performance</li> <li>• any other issues in relation to the performance of the Framework, Contract(s) and Call-Off Contract(s) as deemed appropriate by the Company Representative</li> </ul>	
Title:	Periodic Contract Review Meeting
Frequency	Quarterly
Business Level	Pan TfL
Main Agenda Items	<ul style="list-style-type: none"> <li>• Performance review</li> <li>• Financial review including abatements if applicable</li> <li>• Business and marketplace developments</li> </ul>
Attendees (Company)	<ul style="list-style-type: none"> <li>• Company Representative</li> <li>• other commercial management representative(s) as appropriate</li> <li>• operational and engineering representative(s) as appropriate</li> </ul>
Attendees (Supplier)	<ul style="list-style-type: none"> <li>• Supplier Representative</li> <li>• commercial management representative(s) as appropriate</li> <li>• operational and engineering representative(s) as appropriate</li> </ul>
Meeting Chair	<ul style="list-style-type: none"> <li>• Company Representative</li> </ul>
Reports required from the Supplier	<ul style="list-style-type: none"> <li>• Performance Scorecard for the Quarter which is subject to review</li> <li>• Latest versions of the reports as set out in Schedule 10(b) (Contract Management and Reporting)</li> </ul>

Decisions/ Reports/ Outputs	<ul style="list-style-type: none"> <li>• Minutes and actions</li> </ul>

## 2. Reports

The Supplier shall produce and provide to the Company the reports set out in the following table (together with such other reports as the Company (acting reasonably) requests from time to time in writing and the reports otherwise required under the Agreement and any Contract):

**Table 4-**

	<b>Report</b>	<b>Content to include, as a minimum:</b>	<b>Frequency</b>
1.	Spend report (cumulative from Commencement Date)	Individual spend for each Call-Off Contract, aggregate spend for each Contract and aggregate Agreement spend with the following details to be provided as appropriate: -name/reference brief description of the Goods and Services provided against the Agreement, the Contracts and associated Call-Off Contracts - Contract numbers -Order Numbers Sites - business unit	Quarterly
2.	Capability Report	Supplier to advise of any proposed changes to the Supplier's manufacturing capability (as described in paragraph 2.5.8 of the Specification) for the Company's consideration. Any reduction in capability is subject to the Company's prior agreement and approval which will not be unreasonably withheld (with regard to the Company's operational requirements in particular) in accordance with Clause 8 of the Agreement (Variation)	Quarterly
3.	On time performance of Call-Off Contracts	Full details of Call-Off Contracts where Goods or Serviced Goods are due to be delivered and/or where Services are due to be completed in the relevant Accounting Period. Call-Off Contract name and reference, Order Number, delivery addresses(es),business unit, Order Price, Order Completion Date/Order Delivery Date (as agreed by the Company in the form of a signed delivery note) including , confirmation as to whether the relevant Expected Date was achieved. All supporting documentation, including Delivery Notes	Each Accounting Period

		and any other relevant correspondence.	
4.	Remedial Actions Report	<p>Update on any remedial actions undertaken by the Supplier as a result of:</p> <ul style="list-style-type: none"> <li>- the Escalation Procedure;</li> <li>- any NCRs issued;</li> <li>- first article inspections undertaken;</li> <li>- concessions to specifications and/or Standards; or</li> <li>- any other technical issues.</li> </ul> <p>Information to include:</p> <ul style="list-style-type: none"> <li>- Call-Off Contract name and reference;</li> <li>- Order Number;</li> <li>- business unit;</li> <li>- level of Escalation Procedure (and status under it) if the issue has been raised under the Escalation Procedure;</li> <li>- any other applicable reference(s) relating to NCRs issued, first article inspections undertaken or any other technical issues;</li> <li>- details of any remedial actions undertaken to resolve any Non Conformance;</li> <li>- details of any remedial actions undertaken to resolve a technical query;</li> <li>- proposed rectification period;</li> <li>- confirmation as to whether any Non Conformance or technical query has been rectified in line with any period set by the Company, evidence of the Company confirming closure of any Non Conformance or technical query.</li> </ul>	Each Accounting Period
5.	Stock Holding Report	<p>Confirmation of stock holding in place and specifically available for call off by the Company (for all Contracts where a current stock holding is specified):</p> <p>Call-Off Contract name and reference, LUL material number, stock holding location, stock holding level, stock holding value, photographic and documentary evidence, confirmation that the specified stock holding is in place and specifically available for call off by the Company and TfL Group.</p>	Each Accounting Period



6.	Supplier Intelligence Report	Supplier to provide an update on their manufacturing capacity and capability (including their supply chain) and any industry or legal or regulatory factors which may impact on the supply of any Goods or Services	Quarterly
7.	Management systems, special processes and insurance	Supplier to provide certificates and documents relating to management systems (e.g. quality, occupational health and safety, environmental), special processes (e.g. EN-15085-2 certification for welding of rail vehicle components) and insurance on an annual basis as proof of compliance.	Annually
8.	London Living Wage	To provide written confirmation that obligations with regard to the London Living Wage has been met by the Supplier and its supply chain.	Annually
9.	WRRR Self-Certification Report	Supplier to provide a WRRR Self-Certification Report every 6 months as proof of compliance in accordance with Clause 50.8(h) of the Agreement.	6 months from 1st issue
10.	WRRR compliance report	To provide a report of any non compliances with the WRRR requirements identified and/or recorded during the period and any actions taken including rectification periods	Each Accounting Period
11.	Equality, Diversity and Inclusion report	Where Clause 50.7(g) of the Agreement applies, the Supplier is to provide a report in accordance with Schedule 8, Part B, paragraphs 2-4 (Monitoring and Reporting).	Every 12 months after 1st issue.

**Schedule 11**  
**Heavy Goods Vehicle Direct Vision Standard**

## 1 Introduction

1. In this Schedule, the following terms shall have the corresponding meanings:

**“Agreed DVS Plan”** means the Initial DVS Plan as updated and approved in accordance with the terms of this Schedule;

**“Business Day”** means any day excluding Saturday, Sundays or public or bank holidays in England;

**“Initial DVS Plan”** means the initial plan set out at Appendix 1 which sets out and proposes how the Supplier shall ensure that:

(a) from and including 26 October 2019, all Category N3 HGVs used in the delivery of the contract achieve a minimum of a one (1) star Direct Vision Standard rating;

(b) from and including 26 October 2023 all Category N3 HGVs used in the provision of the Goods and Services achieve a minimum of three (3) star Direct Vision Standard rating;

## 2 DVS Plan

2.1 The Supplier shall comply with the Initial DVS Plan from the Contract Commencement Date. Within fifteen (15) Business Days of the Contract Commencement Date the Company shall either;

2.1.1 confirm that the Initial DVS Plan is approved, in which case such plan shall become the Agreed DVS Plan; or

- 2.1.2 provide the Supplier with any comments on and/or amendments to the Initial DVS Plan.
  - 2.2 Within thirty (30) Business Days (for the purpose of paragraph 2.1.2) or 15 Business Days (for the purpose of paragraph 2.3.2) of receipt of any comments and/or amendments from the Company in accordance with paragraph 2.1.2 or paragraph 2.3.2 (as applicable), the Supplier shall:
    - 2.2.1 develop the Initial DVS Plan to reflect such comments and/or amendments; and
    - 2.2.2 submit an updated Initial DVS Plan to the Company for approval.
  - 2.3 Within fifteen (15) Business Days of receipt of the updated Initial DVS Plan, the Company shall confirm that either the updated Initial DVS Plan:
    - 2.3.1 is approved, in which case it shall become the Agreed DVS Plan; or
    - 2.3.2 not approved and provide its further comments and/or amendments to the Supplier and the Supplier shall revise and re-submit the updated Initial DVS Plan for approval in accordance with paragraph 2.2.
- The process set out in this paragraph 2.3 shall be repeated until the updated Initial DVS Plan is approved by the Company.
- 2.4 Where the Company, acting reasonably, has not approved the updated Initial DVS Plan, the Supplier may refer that decision to the dispute resolution process set out in the Contract.
  - 2.5 Without limiting any other provision of this Contract, the Supplier shall, at no additional cost to the Company, and as part of the Goods and Services:
    - 2.5.1 implement, observe and comply with the Agreed DVS Plan; and
    - 2.5.2 review and amend the Agreed DVS Plan (as necessary) on each 12 month anniversary of the Contract Commencement Date or earlier if requested by the Company, to reflect:

2.5.2.1 any changes to the nature of the Goods and Services; and

2.5.2.2 any comments and/or amendments made or proposed by the Company.

### **3 DVS Co-ordinator**

3.1 The Supplier shall nominate an employee of the Supplier with the necessary experience, competency and authority to:

3.1.1 be responsible for implementation and compliance with the Agreed DVS Plan; and

3.1.2 act as the Supplier's authorised representative on all matters concerning the Agreed DVS Plan ("**DVS Co-ordinator**").

### **4 Self Certification and Reporting**

On each 12 month anniversary of the Contract Commencement Date, the Supplier shall submit a report to the Company which sets out the Supplier's progress in respect of implementation of the Agreed DVS Plan and confirms (with supporting evidence) that the Supplier has complied with the Agreed DVS Plan.

## **APPENDIX 1 TO SCHEDULE 11**

### **[Note to bidders**

Appendix 1 will be the Initial DVS Plan submitted as part of the tender submission and will be developed to form the Agreed DVS Plan.]

**EXECUTION PAGE:**

Executed as a deed by the parties and delivered on the date of this Agreement

Executed as a deed by affixing the Common Seal of  
**London Underground Limited**  
in the presence of:-

.....  
[Authorised Signatory]

Authorised Signatory

) 7057  
)  
)



Executed as a Deed by **Mantec Engineering Ltd**  
acting by

and

