

- (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.

30.4 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 30 may be addressed. The Supplier will if required by the Company warrant that any information provided under Clause 30 is accurate, complete and not misleading, including any information supplied in relation to its subcontractors.

30.5 The Supplier will not and will procure that its subcontractors will not in the six (6) months prior to the expiry of the Term or termination of the Agreement (or, where notice of termination is given of less than six (6) months, during any such period of notice) without the Company's 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 relates to the expected expiry of the Term or termination of the Agreement, 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 (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 relates to the expiry of the Term or termination of the Agreement.

- 30.6 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.
- 30.7 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.
 - (c) In this Clause 30.7 "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 or the Replacement Employer 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 under this paragraph.
- 30.8 The provisions of this Clause 30 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 30 shall be in addition to and not in substitution for any remedies available to the Company under any provision of the Transfer Regulations.

Key Personnel

- 30.9 The Supplier shall ensure that each of the Key Personnel devotes substantially their whole time and effort to the provision of the Goods and Services. The Supplier shall take all reasonable steps to ensure it retains the services of the Key Personnel and shall not without the Company's prior written consent terminate their employment, remove or change Key Personnel or do any such thing which would cause any of the Key Personnel to resign.
- 30.10 The Supplier agrees to inform the Company of any changes to the Key Personnel where any relevant member of Key Personnel dies, suffers long term sickness or disability, is incapacitated by reason of ill health or accident from performing his or her duties for a period of or periods aggregating thirty (30) days in the preceding three (3) months, is guilty of gross or serious misconduct, goes on any period of statutory leave (other than holiday) or leaves the Supplier's employment.
- 30.11 The Supplier shall be responsible for the costs of replacing any member of Key Personnel with an appropriately qualified and competent replacement (including but not limited to, the cost of training any replacement to ensure that they can take over the vacated position efficiently and without disrupting the provision of the Goods and Services). The Supplier shall use all reasonable endeavours to ensure that any replacement for any member of Key Personnel is engaged and available to perform his or her role as soon as reasonably practicable and at least within seven (7) days of the expiry of the notice period of the relevant member of Key Personnel. Where termination of the relevant member of Key Personnel is due to gross or serious misconduct, a replacement shall be engaged and available to perform his/her role as soon as reasonably practicable and in any event within twenty-eight (28) days. Further, save where the relevant member of Key Personnel being replaced has vacated the position immediately due to death, illness, gross misconduct or some other similar reason, the Supplier shall, at its own cost, ensure that the member of Key Personnel being replaced works in parallel with his or her replacement to hand over to them for a period of seven (7) days or any shorter period agreed between the parties.
- 30.12 A reasonable period before an offer of engagement is made to a replacement member of Key Personnel, the Supplier shall provide such information about and access to the relevant individual as the Company may reasonably require. The Company shall notify the Supplier if it objects to the appointment of an individual as a member of Key Personnel, together with its reasons for such objection. The Supplier shall comply with any request by the Company that a particular person should not become a member of Key Personnel.
- 30.13 The Company may change the list of Key Personnel on reasonable notice and subject to the consent of the Supplier, such consent not to be unreasonably withheld or delayed.
- 30.14 Not Used

31 Confidentiality

- 31.1 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 his obligations under each Contract.
- 31.2 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.
- 31.3 The Supplier shall ensure that all his subcontractors, suppliers, employees and agents perform his obligations in Clauses 31.1 and 31.2 as if they were the Supplier, and the Supplier shall be responsible to the Company for any act or omission by his subcontractors, suppliers, employees and agents in breach of such obligations.
- 31.4 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.
- 31.5 The Supplier shall not, either alone or jointly with others, publish any material relating to the Company, the Company's Representative, any Contract or the Goods and Services without the prior written consent of the Company.
- 31.6 The Supplier shall not, either alone or jointly with others, make any press, television, radio or other media announcement in connection with any Contract or the Goods and Services, or any Dispute arising under or in connection with any Contract.
- 31.7 The provisions of Clauses 31.1 to 31.6 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

- (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.

31.8 The Supplier acknowledges that damages would not be an adequate remedy for any breach of this Clause 31 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 31.

32 London Living Wage

32.1 The Supplier shall, to the extent each Contract is for the provision of Goods and Services to be undertaken within Greater London or on the Underground Network:

- (a) ensure that none of its employees engaged in the provision of Goods and Services under the relevant Contract is paid an hourly wage (or equivalent of an hourly wage) less than the London Living Wage;
- (b) provide to the Company such information concerning the application of the London Living Wage as the Company or its nominees may reasonably require;
- (c) disseminate on behalf of the Company to its employees who are paid no more than the London Living Wage such perception questionnaires in relation to the London Living Wage as the Company or its nominees may reasonably require and promptly collate and return to the Company responses to such questionnaires;
- (d) co-operate and provide all reasonable assistance to the Company and its nominees in monitoring the effect of the London Living Wage; and
- (e) procure that any subcontractor (of any tier) is required to comply with the provisions of this Clause 32 and the provisions of this Clause 32 are included in any subcontract (of any tier).

32.2 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 32.

33 Responsible Procurement

33.1 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.

- 33.2 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.
- 33.3 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.
- 33.4 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).
- 33.5 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).
- 33.6 The Supplier shall procure that any subcontractor (of any tier) is required to comply with the provisions of this Clause 33 and the provisions of this Clause 33 are included in any subcontract (of any tier).
- 33.7 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 33.

34 Assignment and Subcontracting

- 34.1 The Supplier shall not assign, novate or subcontract any of its rights or obligations under the Agreement or any Contract or any part thereof without the prior written consent of the Company.
- 34.2 The subcontracting of all or any part of the 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. The Supplier shall be responsible for the acts and omissions of its subcontractors.

34.3 The Company may novate, assign, transfer or subcontract the Agreement and/or any 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.

34.4 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 is being novated.

35 Company's and Supplier's Representative

Each party shall in respect of each Contract appoint one or more representatives to act on its behalf under the relevant Contract. Each party shall advise the other party, in writing, of the names and contact details of its representatives and these shall be recorded in the Order. The Supplier shall not appoint such a representative without the prior written consent of the Company (which consent shall not be unreasonably withheld). Any party may, on giving reasonable notice to the other party, appoint an additional representative or replace an existing representative but the Supplier may only do so with the prior written consent of the Company. 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.

36 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.

37 Severance

If a provision of the Agreement or any 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, provided that the operation of this Clause 37 would not negate the commercial interest and purpose of the parties under the Agreement or any Contract.

38 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 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.

39 Corrupt Gifts and Payments of Commission

- 39.1 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.
- 39.2 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.
- 39.3 The Company shall have the right to audit any and all records necessary to confirm compliance with this Clause 39 at any time during performance of the Agreement and each Contract and during the twelve (12) year period following completion of performance.

40 No Waiver

- 40.1 No failure or delay on the part of either party to exercise any right or remedy under the Agreement or any 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. The rights and remedies provided in the Agreement or any Contract are cumulative and are not exclusive of any rights or remedies provided by law.
- 40.2 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 or otherwise.

41 Entire Contract

The 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. 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.

42 Notices and Service of Process

Any notice or other document given under, or in connection with, the Agreement or any Contract must be in English and in writing and sent by letter or fax or delivered by hand to the other party's representatives in each case to the address below. 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;
- (b) if the notice or other document is sent by fax, it will be effective when it has been transmitted and the transmission report from the fax machine states that the entire fax has been sent successfully; 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.

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 may be served in accordance with this Clause 42.

43 Dispute Resolution

- 43.1 Any question, dispute, difference or claim (a "**Dispute**") shall be resolved in accordance with this Clause 43.
- 43.2 The parties shall use their reasonable endeavours to resolve any Dispute by a meeting between the Company's Representative and a suitably qualified and duly authorised representative of the Supplier (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.
- 43.3 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 43.2 (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 Contracts Manager 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.
- 43.4 If the Dispute has not been resolved within twenty-one (21) days of it being referred to *the* Company's Contracts and Manager and the Supplier's Managing Director or their deputies in accordance with Clause 43.3 either party may refer the matter for resolution in accordance with the provisions of Clause 44.
- 43.5 Clauses 43.1 to 43.4 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 43.5, "**Adjudication Rules**" means the most recent edition of the Company's adjudication rules on the date of the notice referring adjudication.

44 Counterparts

Agreement 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.

45 Partnerships and Joint Ventures

- 45.1 If the Supplier is a partnership, the rights, obligations and liabilities of the partners in the partnership under the Agreement are joint and several. The Agreement and the liabilities of the partners under 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 the Agreement.
- 45.2 If the Supplier comprises two (2) or more parties in joint venture, the rights, obligations and liabilities of each such party under the Agreement are joint and several.
- 45.3 Nothing in the Agreement shall constitute, or shall be deemed to constitute, a partnership between the parties. Except as expressly provided in the Agreement, neither party is deemed to be the agent of the other and neither party holds itself out as the agent of the other.

46 Governing Law and Jurisdiction

- 46.1 This Agreement and each 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.
- 46.2 The Company and the Supplier submit, subject to the provisions of this Agreement and any 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.

47 Contracts (Rights of Third Parties) Act 1999

- 47.1 Subject to the Replacement Employer's rights in accordance with Clause 30, no person except any member of the TfL Group may enforce the Agreement and any 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.

47.2 Notwithstanding those rights referred to in Clause 47.1, the Company and the Supplier may agree to vary or rescind the Agreement or any Contract without the consent of any third party.

48 Bonds, Warranties and Guarantees

48.1 Where stated in Schedule 1, the Supplier shall at its own expense provide within seven (7) days of the Company's request the following:

- (a) an executed bond issued by a financial institution whose long term debt obligations are rated not less than A- by Standard & Poor's and/or A3 by Moody's in the form set out in Schedule 8 in favour of the Company;
- (b) an executed parent company guarantee from the ultimate holding company or other parent company of the Supplier (provided that such company's long-term debt obligations are rated not less than A- by Standard & Poor's and/or A3 by Moody's) in the form set out in Schedule 8 in favour of the Company.

48.2 The Supplier shall ensure that any bond required under Clause 48.1:

- (a) provides, in aggregate, credit protection for the Company in an amount of not less than the amount specified in Schedule 1; and
- (b) is renewed every twelve (12) months until the earlier of (i) expiry of the Warranty Period applicable to the final Delivery Date or (ii) twelve (12) months after termination.

48.3 If at any time the existing bond and/or parent company guarantee cease(s) to meet the requirements of Clauses 48.1 and 48.2 then the Supplier shall replace such bond and/or parent company guarantee with a bond and/or parent company guarantee (as the case may be) that meets the requirements within seven (7) days.

48.4 If requested by the Company, the Supplier shall provide an accompanying legal opinion to the bond and/or parent company guarantee supplied under Clause 48.1 completed and signed by a qualified lawyer from the country in which the guarantor and/or parent company is resident in the form specified by the Company.

48.5 If any performance bond and/or parent company guarantee required by any Contract is not procured by the Supplier and delivered to the Company in accordance with Clause 48.1, one quarter of the aggregate of the Order Price for the relevant Contract shall be retained in assessments of the amount due and shall not be payable to the Supplier until such documents have been delivered.

48.6 If required by the Company, the Supplier shall procure that the terms of any subcontract require the subcontractor, within seven (7) days of a written request by the Company to the subcontractor, to enter into:

- (a) 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 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; and
- (b) a parent company guarantee in the form provided by the Company from the ultimate holding company of the subcontractor in respect of any of the subcontractor's obligations under any collateral warranty required under this Clause 48.6.

48.7 If any warranty (including any accompanying parent company guarantee) required under Clause 48.6 is not delivered to the Company in accordance with Clause 48.6 one quarter of the aggregate of the Order Price relative to the Goods provided by the relevant subcontractor shall be retained in assessments of the amount due and is not payable until such warranty has been delivered.

49 Change of Control

The Supplier shall not without the prior written consent of the Company implement any change of ownership of the Supplier where such change relates to fifty per cent (50%) or more of the issued share capital of the Supplier.

50 Interest

50.1 If either party fails to pay to the other any amount payable in connection with the Agreement or any 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 50.1 shall be immediately payable by the paying party on demand.

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

51 Freedom of Information

51.1 For the purposes of this Clause 51:

"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.

- 51.2 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.
- 51.3 Without prejudice to the generality of Clause 51.2 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, 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.
- 51.4 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.

52 Data Transparency

- 52.1 The Supplier acknowledges that the Company is subject to the Transparency Commitment. Accordingly, notwithstanding Clause 31 and Clause 51, the Supplier hereby gives its consent for the Company to publish the Contract Information to the general public.
- 52.2 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 52.1. The Company shall make the final decision regarding publication and/or redaction of the Contract Information.

53 Survival

- 53.1 The provisions of Clauses 5 (Records and Audit), 9.13 (Set-Off), 19 (Warranty), 20 (Intellectual Property Rights), 21 (Termination), 23 (Indemnity and Insurance), 24 (Environmental Claims) 30 (Supplier Personnel), 31 (Confidentiality), 33 (Responsible Procurement), 37 (Severance), 38 (Publicity), 39 (Corrupt Gifts and Payments of Commission, 40 (No Waiver), 41 (Entire Contract), 42 (Notices and Service of Process), 43 (Dispute Resolution), 46 (Governing Law and Jurisdiction), 47 (Contracts (Rights of Third Parties) Act 1999), 51 (Freedom of Information), 52 (Data Transparency), 53 (Survival), 54.1 and 54.5 (Transport for London Group) will survive the termination or expiry of this Agreement and any Contract and continue in full force and effect, along with any other Clauses or Schedules of this Agreement and any Contract necessary to give effect to them. In addition, any other provision of this Agreement and any 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.

54 Transport for London Group

54.1 Declaration of Ineffectiveness

- (a) Without prejudice to the Company's right to terminate the Agreement and any Contract under Clause 21.1, Clause 21.2(a) or at common law, the Company may terminate the Agreement and any Contract at any time following a Declaration of Ineffectiveness in accordance with the provisions of this Clause 54.1.
- (b) In the event that any court makes a Declaration of Ineffectiveness, the Company shall notify the Supplier. The parties agree that the provisions of this Clause 54.1 shall apply as from the date of receipt by the Supplier of the notification of a Declaration of Ineffectiveness. Where there is any conflict or discrepancy between the provisions of

Clause 21.1 and this Clause 54.1 or the Cessation Plan, the provisions of this Clause 54.1 and the Cessation Plan prevail.

- (c) The Declaration of Ineffectiveness 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.
- (d) As from the date of receipt by the Supplier of the notification of the Declaration of Ineffectiveness, 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 54.1 and to give effect to the terms of the Declaration of Ineffectiveness.
- (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 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 in accordance with this Clause 54.1.

54.2 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, 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.

54.3 The Company's business

The Supplier acknowledges that it:

- (a) has sufficient information about the Company and the supply of Goods and Services;
- (b) is aware of the Company's processes and business;
- (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;
- (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 due to any misinterpretation or misunderstanding by it of any fact relating to the supply of Goods and Services.

54.4 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 in order for the Company to achieve best value.

54.5 **Data Protection**

- (a) The Supplier shall comply with all of its obligations under the Data Protection Act 1998 and if processing personal data (as such terms are defined in section 1(1) of that Act) on behalf of the Company ("**Company Personal Data**"), the Supplier shall only carry out such processing in order to carry out the supply of Goods and Services and at all times in accordance with any instructions from the Company.
- (b) When the Supplier receives a written request from the Company for information about, or a copy of, Company Personal Data, the Supplier shall supply such information or data to the Company within such time and in such a form as is specified in the request (such time to be reasonable) or if no period of time is specified in the request, then the Company shall supply the information or data within fourteen (14) days from the date of the request.
- (c) The Company shall remain solely responsible for determining the purposes and manner in which Company Personal Data is to be processed. The Supplier shall not share any Company Personal Data with any subcontractor or third party unless there is a written agreement in place which requires the subcontractor or third party to:
 - (i) only process Company Personal Data in accordance with the Company's instructions to the Supplier; and
 - (ii) comply with the same data protection requirements that the Supplier is required to comply with under the Agreement and any Contract.

54.6 **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, 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 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 or with any member of the TfL Group 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.

54.7 **Equality and Diversity**

54.7.1 Without limiting the generality of any other provision of the Agreement and any Contract, the Supplier:

- (a) shall not unlawfully discriminate;
- (b) shall procure that its employees and agents do not unlawfully discriminate; and
- (c) shall use reasonable endeavours to procure that its subcontractors do not unlawfully discriminate when providing the Supply,

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.

54.7.2 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:

- (a) 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;
- (b) advance equality of opportunity between persons who share a Protected Characteristic and persons who do not share it; and
- (c) foster good relations between persons who share a Protected Characteristic and persons who do not.

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

54.7.3 The Supplier shall ensure that its staff, and those of its subcontractors who are engaged in the performance of the Agreement and each 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.

54.7.4 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.

54.8 **Work Related Road Risk**

54.8.1 For the purposes of Clauses 54.8.2 to 54.8.9 (inclusive) of this Agreement, the following expressions shall have the following meanings:

“Bronze Accreditation” the minimum level of accreditation within the FORS Standard, the requirements of which are more particularly described at:

www.fors-online.org.uk

“Car-derived Vans” 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;

“Collision Report” a report detailing all collisions during the previous 12 months involving injuries to persons or fatalities;

“Delivery and Servicing Vehicle” a Lorry, a Van or a Car-derived Van;

“Driver” any employee of the Supplier (including an agency driver), who operates Delivery and Servicing Vehicles on behalf of the Supplier while delivering the Goods and Services;

“DVLA” Driver and Vehicle Licensing Agency;

“FORS” the Fleet Operator Recognition Scheme, which is an accreditation scheme for businesses operating van and lorry fleets. It offers impartial, independent advice and guidance to motivate companies to improve their compliance with relevant laws and their environmental, social and economic performance;

“FORS Standard” the standard setting out the accreditation requirements for the Fleet Operator Recognition Scheme, a copy of which can be found at:

www.fors-online.org.uk

“Gold Accreditation” the highest level of accreditation within the FORS Standard, the requirements of which are more particularly described at:

www.fors-online.org.uk

“Lorry”	a vehicle with an MAM exceeding 3,500 kilograms;
“MAM”	the maximum authorised mass of a vehicle or trailer including the maximum load that can be carried safely while used on the road;
“Side Guards”	guards that are fitted between the front and rear axles of a Lorry and that comply with EC Directive 89/297/EEC and the Road Vehicles (Construction and Use) Regulations 1986;
“Silver Accreditation”	the intermediate level of accreditation within the FORS Standard, the requirements of which are more particularly described at: www.fors-online.org.uk
“Van”	a vehicle with a MAM not exceeding 3,500 kilograms.

Fleet Operator Recognition Scheme Accreditation

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

- (a) (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
- (b) (unless already accredited) have attained the standard of Bronze Accreditation (or higher) or the equivalent within the Alternative Scheme and shall maintain the standard of Bronze Accreditation (or equivalent standard within the Alternative Scheme) by way of an annual independent assessment 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 Silver or Gold Accreditation, the maintenance requirements shall be undertaken in accordance with the periods set out in the FORS Standard.

Safety Equipment on Vehicles

54.8.3 The Supplier shall ensure that every Lorry, which it uses to provide the Goods and Services, shall:

- (a) have Side Guards, unless the Supplier can demonstrate to the reasonable satisfaction of the Company that the Lorry will not perform the function for which it was built if Side Guards are fitted;
- (b) have front, side and rear blind spots completely eliminated or minimised as far as practical and possible, through the use of fully operational direct and indirect vision aids and driver audible alerts;
- (c) have equipment fitted with an audible means of warning other road users of the Lorry's left manoeuvre; and
- (d) have prominent signage on the Lorry to warn cyclists and other road users of the dangers of passing the Lorry on the inside and of getting too close to the Lorry.

Driver Licence Checks

54.8.4 Where the Supplier operates Delivery and Servicing Vehicles to provide the Goods and Services the Supplier shall ensure that:

- (a) it has a system in place to ensure all its Drivers hold a valid driving licence for the category of vehicle that they are tasked to drive, along with recording any endorsements, or restrictions on the Drivers licence; and
- (b) each of its Drivers engaged in the provision of the Goods and Services has a driving licence check with the DVLA or such equivalent before that Driver commences delivery of the Goods and Services and that the driving licence check with the DVLA or equivalent authority is repeated in accordance with either the following risk scale (in the case of the DVLA issued licences only), or the Supplier's risk scale, provided that the Supplier's risk scale has been Approved in writing by the Company within the last 12 months:
 - (i) 0 – 3 points on the driving licence – annual checks;
 - (ii) 4 – 8 points on the driving licence – six monthly checks;
 - (iii) 9 – 11 points on the driving licence – quarterly checks; or
 - (iv) 12 or more points on the driving licence – monthly checks.

Driver Training

54.8.5 Where the Supplier operates Delivery and Servicing Vehicles to provide the Goods and Services the Supplier shall ensure that each of its Drivers undergo approved progressive training (to include a mix of theoretical, e-learning, practical and on the job training) and continued professional development to include training covering the safety of vulnerable road users and on-cycle hazard awareness, throughout the term of the Agreement and each Contract.

Collision Reporting

54.8.6 Where the Supplier operates Delivery and Servicing Vehicles to provide the Goods and Services, the Supplier shall:

- (a) ensure that it has a system in place to capture, investigate and analyse road traffic collisions that results in fatalities, injury or damage to vehicles, persons or property and for generating Collision Reports; and
- (b) 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.

Self Certification of Compliance

54.8.7 Where the Supplier operates Delivery and Servicing Vehicles to provide the Goods and Services, within 90 days of the Commencement Date, the Supplier shall make a written report to the Company detailing its compliance with Clauses 54.8.3, 54.8.4 and 54.8.5 of this Agreement (the "WRRR Self-certification Report"). The Supplier shall provide updates of the WRRR Self-certification Report to the Company on each three month anniversary of its submission of the initial WRRR Self-certification Report.

Obligations of the Supplier Regarding Subcontractors

54.8.8 The Supplier shall ensure that those of its subcontractors who operate Delivery and Servicing Vehicles to provide the Goods and Services shall:

- (a) comply with Clause 54.8.2; and
- (b) where its subcontractors operates the following vehicles to provide the Goods and Services shall comply with the corresponding provisions of this Agreement:
 - (i) For Lorries – Clauses 54.8.3, 54.8.4, 54.8.5 and 54.8.6; and
 - (ii) For Vans – Clauses 54.8.4, 54.8.5, and 54.8.6,

as if those subcontractors were a party to this Agreement.

Failure to Comply with Work Related Road Risk Obligations

54.8.9 Without limiting the effect of any other clause of this Agreement or any Contract relating to termination, if the Supplier fails to comply with any of Clauses 54.8.2, 54.8.3, 54.8.4, 54.8.5, 54.8.6, 54.8.7 and/or 54.8.8:

- (a) the Supplier has committed a material breach of this Agreement and any Contract; and
- (b) 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).

55 CompeteFor

55.1 Without prejudice to Clause 34 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, to supply goods, works and services to the Supplier.

55.2 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, to supply goods, works and services to the Supplier's Sub-contractors.

55.3 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, made available to other suppliers via CompeteFor, whether by the Supplier or the Supplier's Sub-contractors, as required by this Clause 55, and will report this information on a quarterly basis by way of email to the Company Representative.

56 Criminal Record Declarations

56.1 For the purposes of this Clause 56:

"**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 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.

- 56.2 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.
- 56.3 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.
- 56.4 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 56 at any time during performance of this Agreement and each Contract.
- 56.5 If the Supplier fails to comply with the requirements under Clauses 56.2 and/or 56.3 the Company may, without prejudice to its rights under Clause 21.1, 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/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 56.2) 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 56.2.
- 56.6 A persistent breach of Clause 56.2 and/or Clause 56.3 by the Supplier shall entitle the Company to terminate the Agreement and each Contract in whole or in part with immediate effect in accordance with Clause 21.1(a).
- 56.7 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/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.
- 56.8 Nothing in this Clause 56 shall in any way waive, limit or amend any obligation of the Supplier to the Company arising under the Agreement and each 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 56.

Schedule 1
Detailed Terms

Commencement Date	01/07/2016
Term	Four Years with an option to extend for an additional two years
Warranty Period	
Initial Period	01/07/2016 (Commencement date), 30/06/2020 (End of initial period)
Volume Discount Percentage	See Schedule 2
Framework Specification	See Schedule 3
<i>[Additional standards pursuant to Clause 3.3(d) and 3.5(d):</i>	<i>Please insert this where applicable.]</i>
The Liquidated Damages for delay for the purpose of Clause 10.3 payable for such Goods are: The period of delay over which the Liquidated Damages shall be calculated for the purpose of Clause 10.3 is every:	[] [week/day]
<i>[The maximum amount of Liquidated Damages payable under Clause 10.3 expressed as a percentage of the price payable for such Goods is:</i>	<i>]</i>
<i>[The Liquidated Damages for delay for the purpose of Clause Error! Reference source not found. payable for such Services are:</i> <i>The period of delay over which the Liquidated Damages shall be calculated for the purpose of Clause Error! Reference source not found. is every:]</i> <i>[The maximum amount of Liquidated Damages payable under Clause Error! Reference source not found. expressed as a percentage of the price payable for such Services is:]</i>	

Security required pursuant to Clause 48.1:	
Bond	<i>[yes] [no]</i> <i>[if "Yes", include the following statement, otherwise delete such statement.]</i> <i>The credit protection level to be provided by way of a bond for the purposes of Clause 48.2 is [] % of the aggregate of the Order Price of each Contract at all times until the final Order Completion Date and/or final Order Delivery Date.</i>
Parent Company Guarantee	<i>[yes] [no]</i>
<i>[Application for payment dates]</i>	<i>[Please see Schedule 2]</i>
<i>[Interest Rate pursuant to Clause 50.1]</i>	<i>[Insert if applicable.]</i>
<i>[The Suppliers total liability for the purpose of Clause 23.9 is</i>	<i>[insert amount in words (£ insert agreed amount in numbers)]</i>
<i>[The following Supplier Personnel are Key Personnel</i>	<i>[]</i>

Schedule 2

Prices

All PRICES IN THIS SCHEDULE 2 ARE FIXED FOR THE 1st YEAR OF THIS FRAMEWORK AGREEMENT (UNTIL 30/06/2017)

Prices for years 2-4 (initial period) and years 5-6 (in the event of a contract extension) will be determined through the following mechanism: Annual RPI rate in the United Kingdom applicable for that particular year.

DISCOUNTS & VOLUME BASE REBATES – Prices will be based on estimated forecast volumes. If the Company should exceed it's forecast, the Supplier will give the Company a value based rebate of the amount detailed in Table 2.1 below. This value is calculated annually in accordance with Clause 9 of the Conditions of Contract on each anniversary of the Start Date.

Table 2.1

Aggregated Annual Spend	Volume Discount Percentage (% Rebate on Additional Spend)
£500,000 to £999,999	1.0%
Over £1m	1.5%

Schedule 3
Framework Specification

Technical Specification

T0417 **Second-stage concrete for tube track**

Issue: A2

Issue date: February 2015

Review date: February 2018

MAYOR OF LONDON



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1 Purpose

The purpose of this specification is to set out the concrete performance to be achieved (materials and processes) for tube track including the requirements for the manufacture, supply and installation of pre-bagged dry-mix and ready mix concretes.

2 Scope

The specification sets out the overall performance requirements of the concrete for refurbishment of tube track; and the specific requirements for:

- Constituent materials,
- Concrete mix design,
- Batching and mixing of the concrete,
- Fresh concrete properties,
- Placing and finishing of the concrete,
- Post placing and treatment of the concrete,
- Limitations on cracking,
- Testing of proposed material and mix design to justify general conformance with the requirements,
- Quality control testing to demonstrate the concrete supplied meets the specified requirements.

3 Requirements

3.1 General

- 3.1.1 All materials used and concrete produced shall be in accordance with appropriate British, European or International Standards.
- 3.1.2 A number of concrete grades are identified, including one with very high early strength. The contractor and/or materials supplier may propose different technical solutions or options to meet various project requirements. The materials for consideration may include concretes designed with Portland and/or non-Portland cements, or using proprietary pre-formulated mixes. Concrete supply can be by mix-on-site prebatched/prebagged mortars or by remote location ready-mix concretes as determined by project requirements.
- 3.1.3 The key properties and performance for each concrete mix are shown in Attachment 1. The concrete mixes shall be capable of being produced and placed in the spacial and environmental conditions of the work space. The contractor shall design the concrete mixes to meet the specified concrete requirements. Mixing, placing and confidence in the achievement of strength and other physical properties shall be demonstrated to the satisfaction of the LU Track Engineering Manager before use in the works.
- 3.1.4 Concrete produced for the second stage works shall be produced subject to a quality assurance, quality control regime so as to assure conformance with the specified requirements. The quality control regime shall be in accordance with the principles and processes within EN ISO 9001. Materials manufacturing and production shall be in accordance with ISO 14001 and Occupational Health and Safety with OHSAS 18001.

3.2 Mix grades

3.2.1 High early strength concrete (HES)

3.2.1.1 The high early strength concrete is required to be placeable in the deep tube tunnel environment, to provide a structural support to track formation. The concrete is required to be delivered in accurately batched, dry sealed bags or containers, then mixed with the required water, placed by flow, assisted by light vibration if deemed necessary and to develop sufficient early compressive strength – 15N/mm^2 at one hour - and long-term compressive strength (after 28 days) of not less than 30N/mm^2 . All strengths must be achieved within space constraints of deep tube tunnel and ambient tunnel temperature range of between 5°C and 35°C .

3.2.2 Normal strength concrete (NS)

3.2.2.1 The concrete is required to be delivered in accurately batched, dry sealed bags, then mixed with required water, placed by flow assisted by light vibration if deemed necessary and to develop strength equivalent to Grade C30 in standard compressive strength cube tests at 20°C in water.

3.2.2.2 Concrete shall have proven compressive strength of not less than 15N/mm^2 before site or trafficable structure is handed back "fit-for-traffic".

3.2.3 Normal strength ready mix concrete (NSRM)

3.2.3.1 The concrete is to be produced and controlled at a production facility operated under a 3rd party quality assurance scheme as set out in EN 206 and BS 8500 current edition at the time of production. Concrete shall develop strength equivalent to Grade C30 in standard compressive strength cube tests at 20°C .

3.2.3.2 Concrete shall have proven compressive strength of not less than 15N/mm^2 before site or trafficable structure is handed back "fit-for-traffic".

3.3 Service Life and durability

3.3.1 The materials for second stage concrete shall be fit for purpose and shall conform to the general performance criteria of this specification, as defined in S1157 and a minimum concrete durability design life of 50 years.

3.3.2 The tunnel environment is deemed to be generally dry and warm and the BS 8500 durability exposure class shall be XC1. For any local areas of sustained wetness or persistent higher humidity the class may be designated XC3. The 'Durability Exposure' for each concrete and location in the works shall be agreed with the LU Track Engineering Manager before ordering or placing of the particular concrete.

3.4 Cement

3.4.1 Portland cement used for concrete mixes described in this specification shall comply with EN 197-1. For HES concrete requirements, the cementing component (including admixtures) shall comply with relevant British or European standard or have a current European Technical Approval certification.

3.4.2 The cementing material proposed by the contractor shall be suitable to meet the durability requirements set out in EN 206, BS 8500 or other relevant standard or European Technical Approval.

3.4.3 Where the concrete contains Portland cement, test certificates shall be submitted to the LU Track Engineering Manager to confirming that the total equivalent sodium oxide soluble alkali content of the concrete, from all constituents, are in accordance with EN 206 and BS 8500.

- 3.4.4 For non-Portland cement-based concrete mixes, or proprietary products, evidence shall be provided that, in the expected operating environment, no deleterious or damaging internal expansion, increased porosity or unacceptable loss of properties will occur during the required service life.

3.5 Aggregate

- 3.5.1 Aggregates shall consist of natural rocks or gravel and shall comply with EN 12620:2002+A1:2008 and PD 6682-1:2009+A1:2013 unless otherwise agreed with LU.
- 3.5.2 The following aggregates shall not be used unless otherwise agreed with LU:
- a) Aggregates that would produce concrete with an excessively high drying shrinkage after placing and curing. 'Excessively high' will be taken to mean drying shrinkage that causes or could cause unacceptable cracking in the future;
 - b) Aggregate materials that could result in surface staining, degradation or unsoundness of the concrete;
 - c) Aggregates containing any material that could retard the setting or rate of gain of strength or reduce the ultimate strength achieved;
 - d) Aggregates that contain that contain leachable compounds, potentially harmful to the strength and durability of the concrete.

3.6 Water

- 3.6.1 Water for mixing shall be free from all deleterious matter likely to affect the curing time, strength, durability or finished appearance of the concrete. Tests on mix water shall conform to the requirements and recommendations of EN 1008.
- 3.6.2 Testing of water supply for conformance shall be carried out at an agreed independent laboratory before start of works at a particular work place and at subsequent intervals required by the LU Track Engineering Manager.
- 3.6.3 No addition of ice for cooling, or heating of water shall be used or allowed for concrete mixes unless agreed with the LU Track Engineering Manager.
- 3.6.4 The water content of the concrete shall be strictly controlled, allowing for the moisture content of the aggregates and admixtures, to give a consistent free water-cement ratio and maintain the quality and workability of the mix. The water addition for any concrete mix option shall be as directed by the supplier and as confirmed by LU supervised trials.

3.7 Admixtures

- 3.7.1 Any admixtures used in the concrete for modification of workability or strength development shall be demonstrated as suitable for the cement type adopted and shall;
- a) comply with the relevant standards; and
 - b) be clearly declared, including their proportion by mass, on the product data sheet.

3.8 Reinforcing

- 3.8.1 Any proposed inclusion of reinforcing within the track formation shall be agreed with the LU Track Engineering Manager and signed off by a competent Civil Engineer.
- 3.8.2 Any such reinforcing shall be ungalvanised to avoid possible reaction with chemical contents of concrete mix.
- 3.8.3 Proposals for the incorporation of synthetic polymeric fibres in the mix may be made if it can be shown that the incorporation of such fibres gives clear benefit to the strength and/or rheological behaviour of the fresh concrete with regard to its flow and compaction into the space being concreted.
- 3.8.4 Any proposed fibres shall be of a type with established performance in concretes.
- 3.8.5 The use of steel fibre will not be considered in deep tube track works due to risks associated with possible signalling faults (either within the concrete or the potential to be left loose on track).

3.9 Concrete mixes

- 3.9.1 The concrete mix for conventional concrete (e.g. NS or NSRM) shall comply with the general principles of EN 206-1 and BS 8500.
- 3.9.2 The concrete mixes proposed for the non-Portland cement or proprietary product route shall be as determined and supplied by the manufacturer and confirmed by certified independent testing. The mix design and materials used shall be declared to the LU Track Engineering Manager as part of the submission by the contractor on suitability for purpose.
- 3.9.3 The minimum cement content for the conventional concrete solutions shall be 300 kg/m³ but the actual cement content of the concrete requirement will be that which results in a cohesive and workable concrete.
- 3.9.4 The maximum allowed cement content shall be determined by considerations of the effect on peak in-situ temperatures during the cement hydration after placing and the effect of in-situ temperature on early age strength development and thermal restraint cracking. Except where specifically agreed otherwise with LU Track Engineering Manager, the maximum cement content shall be as per concrete mix schedule table in Attachment 1.
- 3.9.5 The free water-cement ratio shall always be the lowest value compatible with:
 - a) producing fully compacted concrete without segregation or bleeding;
 - b) achieving workability but minimising cracking from autogenous or long-term drying shrinkage.
- 3.9.6 The total chloride content of the concrete mix arising from all sources shall not exceed 0.4% of chloride ion by mass of cement.
- 3.9.7 The sulphur trioxide content shall not exceed 4% by mass of the cement in the mix.

3.10 Concrete mixing

3.10.1 Ready-mix concrete

- 3.10.1.1 Ready-mix concrete (NSRM) shall be batched and mixed by a Quality Scheme for Ready Mix Concrete (QSRMC) or other 3rd party accredited depot with quality control procedures that meet all the requirements of this specification and EN 206-1.

3.10.2 Bagged dry-batched concrete

- 3.10.2.1 Such concrete, either of Normal Strength (NS) or High Early Strength (HES) shall be batched, weighed and sealed in bags or containers at an off-site plant dedicated to factory-produced concrete mixes and shall be subject to a quality management system approval by a UKAS materials certification body and shall be subject to LU quality management system review.
- 3.10.2.2 Bagged concrete mixes shall be supplied in robust containers capable of dry-sealing the materials and protecting against damage by typical site practice. The maximum weight of individual containers shall be agreed with the contractor so as to create safe handling practice and the use of 'whole-bag' mixing regimes, in the particular conditions of the tunnel work space.
- 3.10.2.3 The respirable crystalline silica content of any pre-bagged concrete shall be as low as reasonably practical to allow the product to meet conformance with EH40/2005 HSE - Workplace Exposure Limits. LU will undertake independent testing to determine content and product preference based on this data and a worksite environment risk assessment.
- 3.10.2.4 Pre-bagged concrete mixes shall be handled and stored in such ways as minimise the creation of airborne dust and the settlement of dust on surfaces.
- 3.10.2.5 Water addition at the mixer for HES and NS concretes shall be measured by calibrated scales or by 'fail-safe' calibrated water jug. Any concrete found to contain higher water content may not be accepted in the works.
- 3.10.2.6 Mixing of the dry-bagged concrete shall be by the use dedicated forced action proprietary concrete mixer. Where a purpose designed hand held paddle mixer is proposed by the contractor, this may be accepted provided the equipment and method of materials addition and mixing cycle is shown by trials to be capable of producing fresh and hardened concrete properties comparable to those assumed in the design.

3.10.3 Workability and concrete placing

- 3.10.3.1 All the concretes governed by this specification shall be batched and mixed so as to achieve fluidity such that the spaces or voids to be filled can be compacted and finished to line and level. The detail of the mix workability will be influenced by the nature and quantities of the particulate constituents, the efficiency of the mixer used, the water addition, any fluidity-modifying admixtures; coupled with any mechanical vibration to be adopted. Wherever possible, mechanical vibration of the concrete to aid compaction shall be minimised so as to avoid mechanical damage in adjacent concrete pours.
- 3.10.3.2 The required concrete fluidity shall be retained for the time period required to complete the placing and compaction. The required fluidity shall be retained when the mix temperature and ambient working environment is between 5⁰C and 35⁰C.
- 3.10.3.3 The concrete supplier in collaboration with the contractor shall, by laboratory and site trials, establish a mix with suitable fluidity and in addition prove a suitable fluidity measuring method of test. Unless otherwise agreed, the workability for mixes shall be determined by a flow-trough or flow-table proven by trials to be suitable for the specific concrete.
- 3.10.3.4 Determination of workability shall be incorporated into the site construction QA/QC procedures as a means of confirming batch acceptability before placing in the works. The specific sampling and testing programme shall be developed and agreed between the LU Track Engineering Manager and the contractor.

3.10.4 Bleed water

- 3.10.4.1 The mix designed and produced for the second stage tube works shall create no discernible bleed water after placing. No water shall be allowed to collect on top of the concrete and below the track supports.

3.10.5 Concrete finishing and protection

- 3.10.5.1 Any concrete not protected or shielded after placing and compaction shall be finished by wood float or steel trowel unless specifically required otherwise by the LU Track Engineering Manager. Following surface finishing the placed concrete shall be protected from mechanical damage or rapid water loss by evaporation. Concrete surface protection methodology shall be agreed, with the LU Track Engineering Manager, suitable for the works (e.g. use of approved curing agents, etc.).

3.10.6 Concrete cracks

- 3.10.6.1 The concrete designed and produced to provide the performance required for all the scheduled concretes shall be formulated and placed such as to minimise the risk of cracking from restrained drying shrinkage, autogenous shrinkage and thermal contraction, within the concrete during curing.
- 3.10.6.2 Any visible surface crack within concrete shall have a maximum nominal width of 0.3mm. Larger cracks shall be repaired by full-depth resin grouting or other LU Track Engineering Manager-approved method, such that the integrity of the concrete track bed is restored.

3.10.7 Construction Quality Control Testing and Records

- 3.10.7.1 Pre-bagged concrete brought to site for incorporation into the works shall be contained within robust packaging, clearly marked with the supplier's name, product or grade, date of manufacture or use-by-date, batch number, weight of contents and any other information critical to the use of the concrete.
- 3.10.7.2 For each shift/possession where concrete is being placed, regular records shall be made of ambient air, water and cement temperature. Regular measurement of the temperature of mixed concrete at the mixing station and in-situ should also to be recorded.
- 3.10.7.3 Accurate records shall be kept of the dates, times and boundaries between loads/pours including marks on site so that each batched load may be identified at a later stage where in the event of non-complying test results or poor performance, such records accurately define the limits of any remedial action required.
- 3.10.7.4 The records above are to be made for high early strength concrete (HES) and pre-bagged normal strength concrete (NS).
- 3.10.7.5 For ready-mixed normal strength concrete (NSRM) the above records are to be made plus the load-specific data from the delivery ticket shall be recorded.

3.11 Acceptance testing

- 3.11.1 A testing regime shall be devised to demonstrate that compressive strength and other stated performance requirements have been met. The contractor shall propose to the LU Track Engineering Manager a sampling and testing regime suitable for the rate of construction and the rates of material use. The sampling and testing regime shall be based on sampling of freshly-mixed concrete at the point of mixing. The testing regime shall comprise the minimum as defined below for mix types.
- 3.11.2 **For concrete mix types HES and HS;** A sample shall be taken for each batch of manufacturer product used within each concrete "pour". A sample shall comprise two 100mm cubes tested for compressive strength at 7 days at 20°C in accordance with

EN12390. The test results for the two cubes shall be averaged and the average strength taken as the result for the sample. (e.g. if within a single 'pour', 3 manufacturer batches are used on site, 6 cubes to be taken or if a second pour is undertaken during shift a second "set" of cubes depending on number of batches used will also be taken). See definitions of 'batch' and 'pour' below.

A "**pour**" is defined as a concrete volume greater than 0.50m^3 within a single location or multiple locations within a 100m length of track where total dry product used is less than 0.50m^3 , for example;

- Pouring concrete for "1in4 sleeper ends" over 45m track length would be defined as single pour, BUT
- Pouring concrete for installing 6 sleepers at 1.0m centre plus 1in4 sleepers 150m further down the track would be 2 pours AND separate cubes would be required for each activity.
- 2 No pours within 100m of each other, within station grounds, both pouring 0.8m^3 (approx. $3.0\text{m} \times 0.6\text{m} \times 0.4\text{m}$ deep) would require separate cube samples as defined by this specification.

A "**batch**" is defined as bagged concrete mix that comes from the same manufacturer production batch and hence, has the same production date and batch reference number marked on each bag.

- 3.11.3 **For concrete mix type NSRM;** A sample shall be from every 7m^3 of ready mix concrete poured in situ or from each mixed batch (where batched on site in continuous process) whichever generates a greater number of samples. A sample shall comprise two 100mm cubes tested for compressive strength at 7 days at 20°C in accordance with EN 12390. The test results for the two cubes shall be averaged and the average strength taken as the result for the sample.
- 3.11.4 Accurate records of all test data shall be kept linking product, batch, manufacture date, location and date of the concrete pour. In the event of non-conforming test results this data will be used to define the limits of remedial action.
- 3.11.5 If requested by the LU Track Engineering Manager, extra test cubes shall be taken as defined above and shall be tested at any requested curing period to give an indication of in-situ or supplied concrete meeting the requirements of this specification.
- 3.11.6 If both cube tests are non-conforming an in-situ concrete core shall be taken at the pour location and tested in accordance with the requirements of EN 12504 for minimum $30\text{N}/\text{mm}^2$ compressive 28 day strength.
- 3.11.7 Test cubes and cores found to be non-compliant shall be held until all relevant investigations have been completed and all issues related to the failure resolved.

3.12 Test Plan and Acceptance Data

- 3.12.1 The manufacturer/supplier shall provide a product test plan for review by the LU Track Engineering Manager, demonstrating methodology and data to support product compliance to this specification and fitness for use. Any such plan shall include guidance for storage, transportation, site/in-situ mixing methodology and quality control.
- 3.12.2 For acceptance data requirements refer to Attachments 1 to 4.
- 3.12.3 All documentation required by this specification, including but not limited to Acceptance Data and Site Trial reports, shall be submitted to the LU Track Engineering Manager for review highlighting any limitations or specific conditions relating to the products' use.

4 Competence

Any person assigned a responsibility related to this specification shall be qualified and certificated to undertake that responsibility. In particular they shall be fully conversant with the requirements of this specification.

5 Supporting information

5.1 Safety considerations

Inadequate or incorrect mix of materials used in the manufacture of second-stage concrete may result in insufficient support to the track causing rough riding of the trains and in the extreme case, derailment or collision with structures.

6 References

6.1 References

6.1.1 British Standards

Reference is to the current edition unless a specific edition is cited.

Document no.	Title
EN 197-1:2011	Cement Composition, specifications and conformity criteria for common cements
EN 206-1:2013	Concrete. Specification, performance, production and conformity
BS 8500	Concrete. Complementary British Standard to EN 206-1
EN 933	Tests for geometrical properties of aggregates
EN 1008: 2002	Mixing water for concrete
EN 1097	Tests for mechanical and physical properties of aggregates
PD 6682-1 (2009 +A1:2013)	Aggregates: Aggregates for concrete: Guidance on the use of EN 12620
EN 12390	Testing hardened concrete
EN 12504	Testing concrete in structures
EN 12620 (2002 +A1:2008)	Aggregates for concrete.
EN ISO 9001	Quality management systems – Requirements
ISO 14001	Environmental management systems -Requirements with guidance for use
OHSAS 18001	Occupational health and safety management systems – Requirements
EH40	Workplace Exposure Limits - HSE

Note: Euronorms (EN) are prefixed “BS” when used in the UK.

6.1.2 LU company documents

Document no.	Title
S1157	Track – Performance, design and configuration
S1622	Glossary of terms

6.2 Abbreviations

The following abbreviations are created:

- a) within London Underground's Glossary of Terms (S1622) (a Category 1 Standard);
- b) from published sources that are clearly identified.

Abbreviation	Definition	Source
BS	British Standard	a
EN	Euronorm	a
LU	London Underground	a
QSRMC	Quality scheme for ready mixed concrete	b (Construction Products Certification)
HES	High Early Strength Concrete	b (T0417)
NS	Normal Strength Bagged Concrete	b (T0417)
NSRM	Normal Strength Ready Mix Concrete	b (T0417)

6.3 Definitions

A comprehensive list of track definitions is given in LU standard S1622.

6.4 Person accountable for the document

Person accountable for the document
Stephen Barber, Head of Track Engineering, LU

6.5 Document history

Issue no	Date	Changes	Author
A1	Feb 2012	Reclassify cat 2 standard TE- DS-0332 to technical specification T0417 per DRACCT No. 1023	Quentin Phillips
A2	Feb 2015	Update standard references and general review of criteria and acceptance requirements per DRACCT No. 02626	Shawn Doring and Quentin Phillips

7 Attachments

7.1 Attachment 1 – Concrete Mix Schedule

Designation	HES	NS	NSRM
Strength grade	*	C30**	C30***
Durability designation	XC1	XC1	XC1
Cement type	EN 197 or other to BS EN approval or ETA	EN197	EN197
Aggregate	EN 12620 & PD 6682-1	EN 12620 & PD 6682-1	EN 12620 & PD 6682-1
Minimum cement content	300kg/m ^{3##}	300kg/m ³	300kg/m ³
Maximum cement content	400kg/m ^{3##}	450kg/m ³	450kg/m ³
Fluidity/workability	To calibrated flow trough or table #	To calibrated flow trough or table#	To calibrated flow trough or table#
Saturated density	Minimum 2250kg/m ³ at 24 hours	Minimum 2250 kg/m ³ at 28 days	Minimum 2250 kg/m ³ at 28 days
Setting time	EN 196-3. Required to set in line with the needs to achieve High Early Strength but also retain sufficient fluidity in the workplace to permit proper placing.	Setting time required to retain sufficient fluidity to permit proper placing under environmental temperature and humidity conditions at work place.	Setting time required to retain sufficient fluidity to permit proper placing under environmental temperature and humidity conditions at work place. Design setting time to make allowance for losses in transport from ready-mix plant and point of placing.

* The test regime for initial proof of conformance with specified requirements and production control during construction is set out in Attachment 2 to this specification.

** The test regime for initial proof of conformance with specified requirements and production control during construction is set out in Attachment 3 to this specification.

*** The design and production of this concrete grade shall be in line with the principles within EN 206, BS8500 and Attachment 4.

Detail of method and acceptance limits to be agreed between contractor and LU Track Engineering Manager.

Unless alternative values or contents can be demonstrated as acceptable.

7.2 Attachment 2 – Evidence for High Early Strength Concrete Grade (HES)

The following details the evidence to demonstrate that the proposed concrete mix will meet the requirements for specified strength and other properties for High Early Strength Concrete Grade (HES).

Laboratory tests

The contractor and/or materials supplier shall undertake and present to LU, a report on the results of a test programme designed to demonstrate that the proposed concrete mix and construction method is capable of meeting the specific project requirement. The test programme shall demonstrate that the concrete mix can achieve minimum compressive cube strength of 15N/mm² within 1 hour of casting and 30N/mm² by 7 days, which is then sustained for the duration of the service life.

The proposed concrete mix shall also achieve and retain sufficient workability or fluidity when mixed, at test temperatures, to allow placing of the concrete without layering between successive pours using manufacturers mixing methodology and have the ability to achieve a smooth surface finish.

The testing requirements and acceptance of the proposed technical solution to this specification shall be based upon laboratory testing and full-scale trials. To demonstrate that specified 15N/mm² minimum cube strength has been achieved, the 100mm cube compressive strength shall be no less than 18N/mm².

All testing shall be carried out by a UK laboratory 3rd party certified for such work.

The testing scope shall include, as a minimum:

- Tests at 5°C increments of ambient temperature of stored and mixed concrete in the range of 5°C to 35°C.
- Tests records of compressive strength of 100mm concrete cubes at age 1hr, 2hrs, 4hrs, 12hrs, 24hrs, 7 days and 28 days for each of the temperatures above. Sets of two cubes for each condition are to be tested and the two results 'averaged' to give the strength in the condition.
- For sample sets of 5°C, 20°C and 35°C a further set of specimens shall be tested where the concrete mix is batched at water cement ratio 5%, 10%, 15% and 20% higher than the optimum proposed free water cement ratio.
- The testing at different temperatures shall simulate the conditions during curing, such as heat build-up, with a typical pour size of 750mm x 600mm x 3000mm.
- Tests on the retention of workability under various temperature conditions. The test method to be one using the flow trough or flow table equipment proposed and agreed in Attachment 1 with flow tested at mix and ambient temperatures over the range 5°C to 35°C. The testing is intended to demonstrate that the proposed concrete has sufficient retained workability in all the site conditions anticipated.
- A method to be agreed with the LU Track Engineering Manager for a non-destructive in-situ test procedure that can provide early age confirmation that the minimum in-situ strength of the concrete meets the requirements of this specification to put the track in service. A Schmidt Hammer rebound may be appropriate, using local groups of five impacts within a 100mm x 50mm test area. The indicative concrete strength to be determined by cross-testing of standard cubes cured under various conditions, as above.

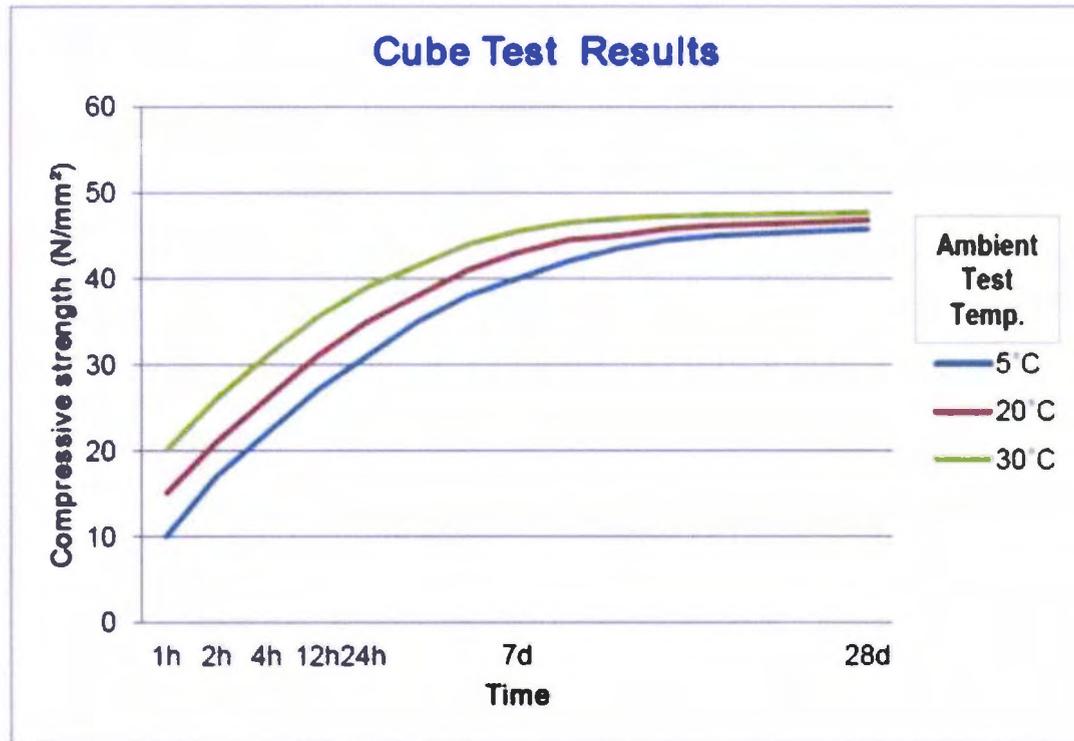
The specific detail of the test programme and the test laboratory to be employed shall be notified and agreed with the LU Track Engineering Manager before commencing the work.

The contractors' technical report of this testing and evaluation of the proposed concrete solution shall include a full list of the essential composition of the dry-bagged concrete including

admixtures, additives etc. The report shall include reference to any national or International standards or technical approvals the concrete has been assessed against. Any non-conformance of the concrete mix or components with EU regulation or advice shall also be reported.

Results

Results shall be tabulated and combined with Independent testing, future quality control tests and further manufacturer testing to allow development of assessment graphs (refer to indicative example shown below) to be produced and maintained for indication of concrete compressive strength gain over 28 days.



Typical Compressive Strength Graph

Site or off-site trials

Before construction of the works can begin the contractor shall, at a place and time agreed with the LU Track Engineering Manager, carry out full scale trial concrete placing. These trials are intended to have various benefits: demonstration of up-scaling of the mixing process within Deep Tube environment, site training for the construction teams and location or specific concreting issues (e.g. complete with canting track, direct fix base-plates, etc) related to proposed use.

Full records of the trials shall be kept including working space conditions, temperatures, batching and mixing records, materials supply records, workability of fresh concrete mix, compressive strength of 100mm cubes (twin-sets) and any other observations. A report covering all aspects of the trials and testing shall be presented to the LU Track Engineering Manager by the contractor.

7.3 Attachment 3 – Evidence for Pre-bagged Concrete Grade (NS)

The following details the evidence to demonstrate that the proposed concrete mix will meet the requirements for specified strength and other properties for Normal Strength Pre-bagged Concrete Grade (NS).

Laboratory tests

The contractor and/or materials supplier shall undertake and present to LU, a report on the results of a test programme designed to demonstrate that the proposed concrete mix and construction method is capable of meeting the specification requirement. The test programme shall provide evidence of the time for the concrete to gain strength and reach its characteristic strength of 30N/mm² within 28 days, and that it shall be sustained for the duration of the service life.

The proposed concrete mix shall also achieve and retain sufficient workability or fluidity when mixed, at test temperatures, to allow placing of the concrete without layering between successive pours using manufacturers mixing methodology and have the ability to achieve a smooth surface finish.

The testing requirements and acceptance of the proposed technical solution to this specification shall be based upon laboratory testing and full-scale trials.

All testing shall be carried out by a UK laboratory 3rd party certified for such work.

The testing scope shall include, as a minimum:

- Tests of compressive strength of 100mm concrete cubes at age 3 days, 7 days and 28 days for each of the temperatures in the range 5oC to 35oC. Sets of two cubes for each condition are to be tested and the results 'averaged' to provide the strength at the condition.
- Tests on the retention of workability under various temperature conditions. The test method to be one using the flow equipment proposed and agreed in Attachment 1 with flow tested at mix and ambient temperatures over the range 5oC to 35oC. The testing is intended to demonstrate that the proposed concrete has sufficient retained workability in all the site conditions anticipated.

Site or off-site trials

Before construction of the works can begin the contractor shall, at a place and time agreed with the LU Track Engineering Manager, carry out full scale trial concrete placing. These trials are intended to have various benefits: demonstration of up-scaling of the mixing process within Deep Tube environment, site training for the construction teams and location or specific concreting issues (e.g. complete with canting track, direct fix base-plates, etc) related to proposed use.

Full records of the trials shall be kept including working space conditions, temperatures, batching and mixing records, materials supply records, workability of fresh concrete mix, compressive strength of 100mm cubes (twin-sets) and any other observations. A report covering all aspects of the trials and testing shall be presented to the LU Track Engineering Manager by the contractor.

7.4 Attachment 4 – Evidence for Normal Strength Ready Mix Concrete (NSRM).

The following details the evidence to demonstrate that the proposed concrete mix will meet the requirements for specified strength and other properties for Normal Strength Ready Mix Concrete Grade C30 to BS8500 (NSRM).

Laboratory tests

The contractor and/or materials supplier shall undertake and present to LU, a report on the results of a test programme designed to demonstrate that the proposed concrete and construction method is capable of meeting the specification requirements. The test programme shall provide evidence of proven predictions of the time for the concrete to gain strength and reach a characteristic strength of 30N/mm^2 within 28 days, and that it shall be sustained for the duration of the service life.

The proposed concrete mix shall also achieve and retain sufficient workability or fluidity when mixed, at test temperatures, to allow placing of the concrete without layering between successive pours using manufacturers mixing methodology and have the ability to achieve a smooth surface finish.

The testing requirements and acceptance of the proposed technical solution to this specification shall be based upon laboratory testing and full-scale trials.

All testing shall be carried out by a UK laboratory 3rd party certified for such work.

The testing scope shall include, as a minimum:

- Tests of compressive strength of 100mm concrete cubes at age 3 days, 7 days and 28 days for each of the temperatures in the range 5°C to 35°C . Sets of two cubes for each condition are to be tested and the results 'averaged' to provide the strength at the condition.
- Tests on the retention of workability under various temperature conditions. The test method to be one using the flow equipment proposed and agreed in Attachment 1 with flow tested at mix and ambient temperatures over the range 5°C to 35°C . The testing is intended to demonstrate that the proposed concrete has sufficient retained workability in all the site conditions anticipated.

Site or off-site trials

Before construction of the works can begin the contractor shall, at a place and time agreed with the LU Track Engineering Manager, carry out full scale trial concrete placing. These trials are intended to have various benefits: demonstration of up-scaling of the mixing process within Deep Tube environment, site training for the construction teams and location or specific concreting issues (e.g. complete with canting track, direct fix base-plates, etc) related to proposed use.

Full records of the trials shall be kept including working space conditions, temperatures, batching and mixing records, materials supply records, workability of fresh concrete mix, compressive strength of 100mm cubes (twin-sets) and any other observations. A report covering all aspects of the trials and testing shall be presented to the LU Track Engineering Manager by the contractor.