The download speed of 'recorded footage' from the 'CCTV system' to the 'portable PC' via a 'service port' shall be at least 80 Mbits/second.	TR_162
Visual indication shall be provided to indicate when a connection has been made between a 'service port' and a 'portable PC'. Examples include: an LED indicator light, text indication on a display screen on the 'recorder box'.	TR_163
The physical connection provided by a 'service port' shall be provided by a ruggedised COTS Ethernet connector.	TR_164

10.9 Network

Requirement	*Req. ID*
IP networks and devices shall be compatible with IPv6.	TR_165
Risk of unauthorised network access shall be minimised by turning off script execution, unused system functions and protocols by default.	TR_166
Any unused physical or logical ports shall be disabled. Any switches or routers shall be configured to restrict usable MAC and IP addresses.	TR_167
The 'supplier' shall appoint an independent party with the agreement of the 'purchaser' to undertake 'penetration testing' of the 'CCTV system' network as part of routine production testing (DD_051).	TR_168
The 'CCTV system' video transmission shall be designed to minimise signal degradation between source and destination devices.	TR_169
The 'CCTV system' video transmission shall comply with BS EN 62676-1-2.	TR_170
Real-time or Time-lapse views shall be encoded via the ITU-T H.264 compression.	TR_171
The 'CCTV system' shall use H.264 compressed video for streaming of live or recorded views.	TR_172

IEEE 802.3 Ethernet switches used in the 'CCTV system' shall support auto-negotiation / auto-crossover and autopolarity correction	TR_173
Ethernet switches and routers used for the 'CCTV system' video transmission shall be 'non-blocking'.	TR_174
Video bandwidth requirements including latency, Jitter and Packet loss shall conform to section 4 (performance) of BS EN 62676-1-2.	TR_175
Network bandwidth calculations shall allow for 25% traffic overhead i.e. only 75% of the link bandwidth shall be used for video traffic (Section 5.3.2.2 BS EN 62676-1-2).	TR_176
‘CCTV system’ data cabling shall be Ethernet compatible complying as a minimum with IEEE 802.3 group standards and 100 BASE-TX shielded (Category 5e/6) or better connectivity.	TR_177
Connections between the ‘CCTV cameras’ and ‘VRS’ shall be realised using an IEEE 802.3af or IEEE 802.3at Power over Ethernet (PoE) connection. **Note 1:** This is to reduce the wiring requirements of the installation. **Note 2:** Cabling used to realise any IEEE 802.3af or IEEE 802.3at connection is to be classified as a mixed signal and power connection, as such, the outer sheath is to be coloured black. **Note 3:** This does not preclude connection via the car-level ECN.	TR_178

10.10 RAMS

10.10.1 Reliability

Requirement	*Req. ID*
The ‘supplier shall determine Minimum Acceptable Condition Standards (MACS) for the ‘CCTV system’ as detailed in S1180 Cl. 3.3.8 in conjunction with the ‘purchaser’.	TR_179
The ‘CCTV system’ shall achieve a ‘fleet mean distance between service affecting failure’ (FMDBSAF) of at least 1,750,000 km.	TR_180
The ‘supplier’ shall agree with the ‘purchaser’ the failures that would cause a delay to the service of two minutes or more (SAF), e.g. 'CCTV system' equipment hanging loose in the saloon and at risk of injuring 'passengers'. **Note:** This could form part of Hazard Identification as per TR_219	TR_181

The ‘CCTV system’ shall achieve a ‘fleet mean distance between technical failure’ (FMDBTF) of at least 700,000 km.	TR_182
The ‘VRS storage medium' shall function to this TRS for at least 5 years based on being written to 24 hours per day, 365 days per year. **Note:** This should be considered as per TR_200 and TR_201.	TR_183
The 'supplier' shall provide information regarding the operable lifespan of any ‘CCTV system’ ‘storage media’ utilised as per the requirements in this TRS. **Note:** This should be considered as per TR_200 and TR_201.	TR_184
Failures of the ‘CCTV system’ shall not immobilise the train.	TR_185
Where possible, the ‘CCTV system’ shall self-recover from fault conditions.	TR_186
The reliability prediction methods used for electronics shall be agreed with the ‘purchaser’.	TR_187
Compliance with reliability targets shall be demonstrated by reliability analysis, reliability growth plans and failure reporting systems.	TR_188
The ‘supplier’ shall use extended life techniques and lifetime calculations during design.	TR_189
Reliability data shall be given as distance-based failure rates. To permit this form of presentation, assumptions as to frequency of demand type events shall be agreed with the ‘purchaser’. **Note:** for tender returns, assume operation of 22 hours a day, an annual fleet distance travelled of 13,000,000km and 85 trains in the fleet.	TR_190
Where calculations are derived from time-based source data, e.g. MTBF (mean time between failures), the combination of these into service distance-based failure rates shall be performed consistently, regardless of equipment source of supply, using an apportionment method. Where calculations are based on frequency-related data, the ‘supplier’ shall use a consistent and documented method, agreed with the ‘purchaser’, to relate such data to the duty cycle and service-distance-based failure rates. Presentation as event probabilities is not acceptable.	TR_191
The design of the ‘CCTV system’ shall be reviewed to determine any areas that require life cycle testing to limit the reliability risks with new or unproven designs or to demonstrate the suitability of the design in its intended application.	TR_192

10.10.2 Availability

Requirement	*Req. ID*
Measures such as redundancy shall be incorporated into the ‘CCTV system’ to support availability.	TR_193

10.10.3 Maintainability

Requirement	*Req. ID*
All hardware at LRU level supplied as part of the ‘CCTV system’ shall have serial numbers.	TR_194
The LRU serial numbers shall be marked either on the case or on a plate permanently attached to the case of the LRU, positioned so as to be easily read by ‘maintenance staff' once installed.	TR_195
All LRUs shall have unique asset numbers in a format suitable for loading into the ‘purchaser’s' maintenance management system for fault history monitoring.	TR_196
‘CCTV system’ installation and maintenance shall not require the use of ‘special tools’. **Note:** this is with the exception of software tools.	TR_197
Access to terminals, components and equipment shall not be hindered by the installation of the ‘CCTV system’. **Note:** this shall be achieved in collaboration with the Saloon Design ‘designer’.	TR_198
No part of the ‘CCTV system’ shall require any form of testing, with the exception of the ‘CCTV system test’ facility.	TR_199
The 'supplier' shall identify any ‘CCTV system’ components that will require replacement or overhaul over the ‘design life’ of the ‘CCTV system’. **Note 1:** This should be included as part of Maintenance Documentation as per Section 15.35 and Obsolescence Management Plan as per Section 15.7.	TR_200
The 'supplier' shall identify the frequency of ‘CCTV system’ component replacement or overhaul, as per TR_200, over the ‘design life’ of the ‘CCTV system’. **Note:** This should be included as part of Maintenance Documentation as per Section 15.35 and	TR_201

Obsolescence Management Plan as per Section 15.7.	
Replacement or overhaul activities identified as per requirements TR_200 and TR_201 shall align with routine maintenance activities and shall not require an additional maintenance activity beyond what currently takes place on the Central Line fleet.	TR_571
The durations for the following maintenance shall not be extended following the implementation of the 'CCTV system': Level 01 – Inspection Level 02 – Examination Level 03 – Annual Modular Maintenance Level 04 – Programme Lift	TR_202
The ‘supplier’ shall specify what unplanned maintenance procedures, if any, are prohibited to be performed on the ‘CCTV system’.	TR_203
Diagnosis and repair of the ‘CCTV system’ shall be able to be conducted without damage or undue disturbance to any components or wiring.	TR_204
It shall be possible for a member of 'maintenance staff’ to replace any individual piece of ‘CCTV system’ hardware and demonstrate it is operational within 30 minutes.	TR_205
It shall be possible for a member of 'maintenance staff’ to upload software and firmware, including ‘configurable data’ to the ’CCTV system’ on a train within 15 minutes. This value includes time to access a 'service port’.	TR_206
‘Service ports’ shall be concealed from passengers and accessible only to ‘maintenance staff’. **Note:** this shall be achieved by collaboration with the Saloon Design 'designer'.	TR_207
Wherever possible, ‘CCTV system’ equipment shall be selected so that on-site local adjustments and configuration changes are minimised. Where needed, adjustments /changes shall be nonintrusive and simple to perform via the ‘service port’ using ‘CCTV download software’. **Note:** This could include equipment location data as per TR_046 and TR_153	TR_208
The ‘CCTV system’ shall automatically detect when a piece of hardware is installed and fully automate device configuration and initialisation.	TR_209
The ‘CCTV system’ hardware shall be ‘plug and play’ so far as is reasonably practicable.	TR_210

‘Updates’ to the ‘CCTV system’ shall be limited to when the train is in a non-operational state or in ‘maintenance mode’.	TR_211
The ‘supplier’ shall provide details of all components, including serialised spares, delivered as part of the ‘CCTV system' in a format suitable for loading into the ‘purchaser’ maintenance management system.	TR_212
The 'supplier' shall provide maintenance documentation in accordance with the requirements in Section 15.35.	TR_213
Full wiring diagrams associated with the ‘CCTV system’ shall be provided.	TR_214

10.10.4 Safety

Requirement	*Req. ID*
The safety risk due to the 'CCTV system' shall be as low as reasonably practicable. At least the following shall be considered: a) All operating conditions, including when ‘powered down’ b) All credible fault conditions c) All maintenance and cleaning conditions d) Interfaces with other railway systems e) Neighbours, including adjacent railways f) Passenger detrainment g) During and after all credible accident conditions, including: i. Arcing ii. Collision between trains iii. Collisions other than between trains iv. Derailment v. Explosion vi. Passenger train interface (PTI) vii. Power failure viii. Train fire ix. Insufficient ventilation h) Vandalism by passengers or trespassers	TR_215
A safety assessment shall be conducted to identify, quantify and reduce safety risks to ALARP. **Note:** ALARP is as defined in S1521	TR_216

The safety assessment shall cover the entire scope of work, including any elements provided by sub-manufacturers (to the 'supplier'), and the health and safety risks and environmental impacts of all changes, activities or projects at the design, implementation, operational and decommissioning stages shall be assessed.	TR_217
The 'supplier' shall ensure that unsafe conditions and failure modes are identified and, as far as practicable, are designed out of the 'CCTV system'. Any remaining unsafe conditions or failure modes identified by the analyses shall be assessed for the risks associated with them; these risks shall be reduced and/or mitigated by one of the following (in descending order of preference) to the satisfaction of the 'purchaser': • Improved design to eliminate the failure mode • Increased reliability of the modified equipment • Enhanced documented maintenance regimes • Documented regular testing regimes	TR_218
The safety reviews shall include the following studies, as a minimum: a) Hazard Identification b) Hazard Analysis c) Risk Assessments and Risk Reduction Assessments d) Failures Modes and Effects Criticality Analysis (FMECA) and Fault Tree Analysis (FTA) to enable the updating of the 'purchaser's' Quantitative Risk Assessment (QRA) e) Secondary impact assessment in accordance with section 6.1.6 of GM/RT2100, Issue five	TR_219
The impact of the 'CCTV system' on all aspects of the rolling stock shall be assessed. The following risks are amongst those that shall be considered: • movement • access • containment • operating in degraded mode including in-service failure • structural failure of rolling stock or components • interfaces • precursors to specific potential risks • precursors to LU Top Event Risks (see TR_248)	TR_220
The hazards associated with the following Top Event Risks shall be explicitly addressed: • arcing • collision between trains • collisions, other than between trains • derailment • explosion • passenger train interface • power failure • train fire • ventilation	TR_221

Minimum life requirements for all components of the ‘CCTV system' that affect safety shall: a) be documented b) be justified c) take into account: i) the criticality of the component ii) the associated maintenance regime	TR_222
Where applicable, controls shall be applied to mitigate the following specific risk events: • passenger door incident • passenger accident • structural failure of rolling stock component or of car structural member • stalled train • loss of emergency lighting/ventilation, external lights or train whistle • communications failure • brake failure	TR_223
Where applicable, the following systems and components shall also be considered: • those involved in mitigating the risk of platform train interface incidents • those involved in mitigating the risk of derailment • those involved in mitigating the risk of collision • those involved in mitigating the risk of fire • those involved in mitigating the risk of arcing • those involved in mitigating the risk of ventilation failure • software in safety systems • communication systems • auxiliary systems • lighting systems • relays • any potential disabling failure • any other relevant system or component, identified as traceable, and treated accordingly in the maintenance regime	TR_224
The risks associated with the use and misuse of safety isolation, bypass or over-ride features shall be identified, with the participation of the 'purchaser', and action taken to ensure they are ALARP.	TR_225
Safety risks related to maintenance activities shall be identified and managed to be ALARP, including but not limited to, risk of burns from equipment with a surface temperature greater than 50 degrees Celsius	TR_226
The proceedings, conclusions and proposals arising from safety reviews shall be formally documented including a statement on the assumptions made and the source.	TR_227

The ‘supplier’ shall identify items of equipment which may present hazards, to identify those hazards and to fit warning signs in accordance with this TRS.	TR_228
Equipment supplied as part of or for use with the 'CCTV system' shall be designed and constructed in full accordance with current UK Safety legislation.	TR_229
Safety related functions for the 'CCTV system' and their specific safety integrity requirements shall be defined in accordance with BS EN 50126-1 (sub clauses 4.3, 4.6 and 4.7).	TR_230
The components of the ‘CCTV system' shall be categorised into three groups of safety criticality using an agreed method of analysis such as Failures Modes and Effects Criticality Analysis (FMECA) conducted by a competent person: • Low risk – where failure of the component to perform as designed has no effect on safety; • Medium risk – where the consequences of failure are moderate – i.e. where the likelihood of failure is low and impact on the railway of failure is not significant; • Critical risk – where failure would or could have a significant impact on the railway	TR_231

10.11 Diagnostics

Requirement	*Req. ID*
The ‘CCTV system’ shall have a fault monitoring system that actively and continuously logs faults within the ‘CCTV system’, whilst the train is ‘powered up’.	TR_232
It shall be possible to conduct fault diagnostics, reconfiguration and software ‘updates’ on the 'CCTV system' via a ‘service port’.	TR_233
The 'CCTV system' shall self-monitor and provide indication of system faults via a health signal to the 'replacement DTS' and via localised visual indication accessible to 'maintenance staff'.	TR_234
All alarm events detected by the 'CCTV system' shall be time-stamped and logged into non-volatile memory.	TR_235

The ‘CCTV system’ shall maintain a 'data log' which shall record: • ‘CCTV system’ ‘self-test’ and ‘CCTV system test’ events • ‘CCTV system’ ‘self-test’ and ‘CCTV system test’ results (pass/fail) • Fault data (including those identified on test and by the fault monitoring system) • ‘Updates’ • Data downloads	TR_236
All ‘data log' events, results and fault data shall be recorded with the time at which it occurred. **Note:** Time shall be as per TR_048.	TR_237
The ‘data log’ shall store at least 15 full days of data.	TR_238
Fault data shall identify the applicable ‘CCTV system’ equipment and the nature of the fault.	TR_239
The ‘CCTV system’ ‘data log’ shall be stored within the car to which the equipment belongs.	TR_240
It shall be possible to retrieve ‘CCTV system’ ‘data logs’ for all ‘CCTV system’ equipment on a car from a 'service port' on that car.	TR_241
It shall be possible to save and export the ‘CCTV system’ ‘data logs’ as a comma delimited format file.	TR_242
The use of extra components for built-in diagnostics shall not considerably influence the reliability of the ‘CCTV system’, and shall be taken into account in reliability calculations.	TR_243

10.12 System test facilities

Requirement	*Req. ID*
The 'CCTV system' shall conduct a 'self-test' upon the train state entering 'powered up'.	TR_244
The 'CCTV system' shall become operable after it has conducted a 'self-test' upon the train state entering 'powered up'.	TR_245

The ‘self-test’ shall take no longer than two minutes to complete.	TR_246
The ‘self-test’ shall provide clear indication in the active cab (when a cab has become active) of the operational status of the ‘CCTV system’ via the ‘replacement DTS’ interface. The nature of the alert shall be agreed with the ‘purchaser’. **Note:** This shall be achieved by collaboration with the 'replacement DTS' supplier.	TR_247
‘Maintenance staff' shall be able to initiate a ‘CCTV system test' from the cab such that it provides a clear indication, in the active cab (when a cab has become active), of the operational status of the ‘CCTV system’ via the ‘replacement DTS’ interface. The nature of the alert shall be agreed with the ‘purchaser’. **Note 1:** This shall be achieved by collaboration with the 'replacement DTS' supplier. **Note 2:** Frequent use of the ‘CCTV system test’ cannot be assumed and cannot be used as part of RAM calculations.	TR_248
The ‘CCTV system test’ shall be triggered by the ‘replacement DTS’ when ‘maintenance staff’ initiate a ‘system test’ (a ‘replacement DTS’ function). **Note:** interface requirements with the ‘replacement DTS’ are contained within Section 9.3.	TR_249
Once started, the 'CCTV system test’ shall run until completion unless it is manually cancelled by a member of 'maintenance staff' via the operating position controls or via any of the 'service ports’ on the train.	TR_250
Inadvertent triggering of a ‘self-test’ or ‘CCTV system test’ shall not be possible by the ‘train operator’.	TR_251

10.13 CCTV system modes

Requirement	*Req. ID*
The 'CCTV system' shall be capable of shutting down without damage or negative effect to 'recorded footage' when power is unexpectedly lost.	TR_252

10.14 Installation

Requirement	*Req. ID*

The 'CCTV system' equipment, including cameras, shall incorporate a means of ensuring correct alignment at installation, without the use of any external calibration devices, an alignment jig or gauge. If a gauge is required, it shall be of a go/no-go type.	TR_253

11 TESTING & PROTOTYPING REQUIREMENTS

11.1 Type testing

Requirement	*Req. ID*
The 'CCTV system' (including lens) resolution shall be measured end-to end using BS EN 50132-7 / IEC 62676-4 test methodology to the conspicuity requirements 'observe', 'recognise', 'identify' in areas as defined in this TRS.	TR_254
Image conspicuity shall be measured as a percentage ratio of a standard test target relative to pixel sizes in BS EN 50132-7/IEC 62676-4 Cl. 6.7.	TR_255
Performance of dewarped images shall be tested in accordance with IEC 62676-1-1 section 6.5 using the ISO 12233 resolution chart.	TR_256
The ‘supplier’ shall type test the equipment modules, sub-systems and interfaces to demonstrate the design’s compliance with this TRS. **Note:** Declarations of conformity, for components or equipment that have already completed type testing, may be accepted by agreement with the ‘purchaser’.	TR_257

Type tests shall include:

a) Visual Inspection in accordance with BS EN 50155
b) Performance Test in accordance with BS EN 50155
c) Cooling Test in accordance with BS EN 50155
d) Supply overvoltage in accordance with BS EN 50155
e) Dry Heat Test in accordance with BS EN 50155
f) EMC test in accordance with EN 50121-3-2
g) Surge and transient tests in accordance with RIA 12 and EN 50121-3-2
h) Insulation test following the test procedure defined in BS EN 50155
i) Vibration test shall be in accordance with the requirements in Section 12.20
j) Any testing as required for design and use assurance purposes, for example Ingress Protection (IP) testing where an IP rating has been declared in the design TR_258
k) Damp heat test, cyclic in accordance with BS EN 50155
l) Equipment stress screening in accordance with BS EN 50155
m) Earth continuity test in accordance with RIA 13
n) Magnetic field test. Only if the equipment contains any magnetic field sensitive components
o) Systems integration testing on bench
p) Systems integration testing on train
q) Fire Tests

Compliance with surge waveform "A" as detailed in RIA 12 is not required.

In addition to the EMC test in accordance with BS EN 50121-3-2 (TR_258), the 'CCTV system' shall be capable of withstanding (as a minimum) the electrostatic discharge in accordance with BS EN 61000-4-2 requirements (6 kV contact, 8 kV air discharge), including equipment that is not accessible to passengers or 'maintenance staff'. TR_259

A magnetic field test shall be carried out if the equipment contains any magnetic field sensitive components. All testing shall be carried out with the equipment under test conditions arranged in a form as close to the installed conditions as possible including any associated wiring. The equipment shall be in its housing with all covers and access panels in place. The equipment shall be tested in a Helmholtz coil set to the following field strengths: TR_260

1) Continuous - 1 x 10-4 T (Tesla)
2) AC 50Hz to 1kHz - 10A/metre
3) AC 1kHz to 50kHz - 10A/metre at 1kHz decreasing to 30mA/metre at 50kHz (Cat 2)
   Tolerance ±2dB for all levels (Cat 2)

The operation of electronic equipment shall not be affected by these magnetic fields.

The measured insulation value under insulation tests shall not be less than 20MOhms. Insulation tests shall be carried out using a sinusoidal RMS signal of 1KVrms. TR_261

Note: this is for insulation tests in type testing and routine production testing

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If the ‘CCTV system’ is susceptible to other forms of interference not defined in BS EN 50121-3-2, RIA 12 and BS EN 50155, a type test specification for the measurement and limitation of effects from such interference shall be produced.	TR_262
Type testing shall be conducted in a certified test facility and all documentation provided to the ‘purchaser’ before the ‘CCTV system’ can be fitted to a prototype train for testing.	TR_263

11.2 System testing

Requirement	*Req. ID*
System level tests, on a test bench, shall be conducted with the overall aim of demonstrating compliance with this TRS, before fitment of the ‘CCTV system’ onto the prototype train.	TR_264
The system level test bench shall be capable of simulating the relevant functionality and interface of the ‘replacement DTS’ and ‘replacement PIS’ in order to demonstrate the ‘CCTV system’.	TR_265

11.3 Prototype testing

Requirement	*Req. ID*
Prototype testing shall demonstrate the ‘CCTV system’ design is compliant with the TRS and can operate in passenger service.	TR_266
Prototyping installation and testing shall be conducted in conjunction with the Saloon Design ‘designer’.	TR_267
Prototyping shall consist of the following stages: • 8-car train, with ‘replacement PIS’, saloon LED lighting, Saloon Design and ‘replacement DTS’, but without ‘AC traction system’ • 8-car train, with ‘replacement PIS’, saloon LED lighting, Saloon Design, ‘replacement DTS’ and ‘AC traction system’, totalling up to two trains worth of ‘CCTV system’ equipment at an LU facility. **Note:** See Figure 2 – Envisaged prototype flow chart for 92TS prototyping	TR_268
Prototype testing shall include static testing and track testing.	TR_269

It shall be possible to adjust 'configurable data' during prototyping.	TR_270

11.4 Routine production testing

Requirement	*Req. ID*
The ‘supplier’ shall define and conduct the production tests required to demonstrate that each ‘CCTV system’, as supplied, meets the requirements in this TRS. Routine tests shall include: • Visual Inspection in accordance with BS EN 50155 • Performance Test in accordance with BS EN 50155 • Supply overvoltage in accordance with BS EN 50155 • Insulation test following the test procedure defined in BS EN 50155 using a sinusoidal RMS value of the test Voltage of 1KVrms and the measured insulation value shall not be less than 20MOhms. • Equipment stress screening in accordance with BS EN 50155 • Earth continuity test in accordance with RIA 13	TR_271

11.5 Installation testing

Requirement	*Req. ID*
The ‘supplier’ shall define the pre-installation tests required to demonstrate the ‘CCTV system’ is fit for installation and will meet the requirements of this TRS once installed.	TR_272
The ‘supplier’ shall define the post-installation tests required to demonstrate the ‘CCTV system’, as installed by the ‘purchaser’, meets the requirements in this TRS and is acceptable for service.	TR_273

12 DESIGN PRINCIPLES REQUIREMENTS

Note: the following requirements relate to design principles. Compliance with these requirements is required where applicable to the ‘CCTV system’ and the modifications required to implement the system.

12.1 Electrical equipment

Requirement	*Req. ID*
‘CCTV system’ equipment shall comply with BS EN 50153.	TR_274
All equipment and wiring shall be out of sight of passengers when installed, with the exception of equipment specifically intended to be seen. **Note:** this shall be achieved by collaboration with the Saloon Design 'designer'.	TR_275
Protection against reverse polarity connection shall be incorporated in all equipment where incorrect connection to that equipment or the ‘train wiring’ or to test equipment is possible.	TR_276
The ‘CCTV system’ shall not be adversely affected by voltage excursions outside of the 'control voltage range', or shall shut down in a safe manner and restart when the voltage returns within the 'control voltage range'.	TR_277
The ‘CCTV system’ shall operate correctly over the ‘control voltage range’ of the ‘control supply’ with no degradation to performance.	TR_278
All electrical and electronic components shall be in established ranges and in series production.	TR_279
All control electrical and electronic equipment shall be capable of withstanding the ripple, surges, transients and fluctuations associated with the ‘control supply’.	TR_280
Electrical installations shall comply with BS EN 50343.	TR_281
Electrical connections to equipment shall be designed to minimise the risk of damage during installation, operation and maintenance.	TR_282
Batteries are undesirable and may be used only with agreement with the ‘LU Engineer’.	TR_283

Where batteries are used internal to the ‘CCTV system’ equipment, the front panel of the module in which they are placed shall be marked to indicate their presence and to show the recommended date of replacement; this indication shall be readily visible and it shall be possible to update the recommended date of replacement.	TR_284

12.2 Electronic equipment

Requirement	*Req. ID*
Clearance and creepage distances for all electrical and electronic equipment shall comply with the requirements defined in BS EN 50124-1. • The working voltage on all interfaces between the 'CCTV system' and the train shall be 1kVrms • The working voltage on all other sections shall be agreed between the 'supplier' and 'purchaser' • The 'supplier' shall identify the pollution degree for each electronic equipment and shall be agreed with the ‘purchaser’ • The ‘supplier’ shall nominate a material group as defined in EN 50124-1 to be agreed with the ‘purchaser’	TR_285
The electronic equipment shall operate correctly over the variations and interruptions (Class S2) of voltage supply defined in BS EN 50155.	TR_286
The electronic equipment design and the design development process of a programmable component shall be conducted according to a tailored life cycle model (refer to ISO/IEC/IEEE 15288), which shall be detailed in the quality plan.	TR_287
Where electromechanical relays with potential free contacts are provided, short-circuit protection should be used.	TR_288
Where protective devices of the tripping type are incorporated in the output circuits of electronic equipment, the available current under short-circuit/overload conditions shall be sufficient to operate them.	TR_289
Where the 'supplier' proposes the use of fuses, they shall request acceptance from the 'LU Engineer'.	TR_290
As far as possible, all circuits shall minimise, in the event of a component fault, consequential damage to components on its own printed board or other associated circuits.	TR_291
Power supply units for electronic equipment shall incorporate current limiting to	TR_292

minimise the need for fusing the output circuits. Outgoing cables shall be rated to at least the current limit value.	
Output signals from electronic equipment shall be protected against short circuit conditions.	TR_293
Any protection devices shall be so arranged that the risk of fire within the equipment is minimised.	TR_294
The use of Y-capacitors should be avoided at digital I/O ports. If they cannot be avoided, they shall be designed according to BS EN 60384-14 (recommended class Y1 or Y2) and their capacitance value shall not exceed 4,7 nF.	TR_295
All electronic components used shall be manufactured in accordance with a quality system compliant with the requirements of BS EN ISO 9001 or an equivalent quality system.	TR_296
Where programmable components are used, a minimum percentage of logic gates shall be available for any future use. The minimum percent shall be agreed with the 'purchaser'.	TR_297
Racks, sub-racks, and plug-in units should comply with the dimensional requirements of BS EN 60297-3-100. **Note:** board sizes of 3U or 6U, and 160 mm or 220 mm length are preferred.	TR_298
Integrated circuit sockets and/or edge connectors shall not be used.	TR_299
A warning label shall be affixed to any assembly containing static sensitive devices.	TR_300
Printed board assemblies and wiring shall be arranged to ensure maximum isolation between sensitive signals and other wiring.	TR_301
All individual printed board assemblies in the 'CCTV system' shall be functionally complete and fully interchangeable with any other unit of the same functional type.	TR_302
All individual printed board assembles in the 'CCTV system' shall not require any recalibration of the hardware after the board has been inserted in the system and shall be capable of being tested in isolation.	TR_303

PCB acceptability shall comply with IPC-A-600 class 3 standards. Where acceptability class 2 are suggested, this shall be agreed with the 'purchaser' and the 'supplier' shall provide evidence to the 'purchaser' that this will provide an acceptable level of quality in this application for review and approval.	TR_304
Board layout shall be carried out according to BS EN 62326-1 or the IPC-2220 series (IPC-2221, IPC-2222 or IPC-2223), as appropriate, with due regard to the service conditions of this TRS.	TR_305
PCB base material shall be an epoxy woven glass fabric laminated sheet of defined flammability for rigid printed boards and for use in the fabrication of multilayer printed boards, according to BS EN 61249-2-7, BS EN 61249-2-10, BS EN 62326 or IPC 4101, as appropriate.	TR_306
All printed board assemblies shall be protected on both sides with a protective transparent fluorescent pigment coating. Coating types and thickness shall be according IPC-A-610.	TR_307
Reworking, modification and repair of electronic assemblies are allowed and shall be executed according to IPC-A-610 and IPC-7711/7721. A record of the repaired board shall be provided to the supplier as requested.	TR_308
Test points shall be easily accessible and shall be grouped in a logical manner.	TR_309
The safety requirements for rolling stock equipment applied in design, manufacturing and installation are as follows: a) personnel safety against electric shock shall be in accordance with BS EN 50153, b) insulation coordination shall be in accordance with BS EN 50124-1, c) personnel safety against effects of excessive temperature shall be in accordance with BS EN ISO 13732-1, d) the specific safety integrity requirements shall be defined in accordance with BS EN 50126-1.	TR_310

12.3 Safety circuits

Note: Safety circuits are designated with an indent beginning with "S", e.g. S14A.

Requirement	*Req. ID*
Cables used in designated 'safety circuits' shall have yellow sheath throughout.	TR_311
Yellow sheathed cable shall not be used for wiring circuits other than those classified	TR_312

as a ‘safety circuit’.

12.4 Switches and pushbuttons

Requirement	*Req. ID*
Switches shall comply with BS EN 60947-1 and BS EN 60947-5-1.	TR_313
Where switches are variants of a standard type (different contact arrangements) then each variant must be easily identifiable and distinguishable.	TR_314
Electrical connections to switches shall be either by ring or locking spade crimps.	TR_315
Switch fixings shall either be tamper proof or be designed so that they are not accessible from the front panel to passengers or unauthorised staff.	TR_316
Where a circular mounting hole is used, a means shall be provided to ensure that the switch locates and remains in its required location and is unable to rotate.	TR_317
The contact rating for each application shall be determined to ensure that: a) the switch life will exceed 20 years for the anticipated number of load switching operations, b) they are adequate for the system voltage including any transient effects, c) they are compatible with the power factor or time constant of the load, d) they are adequate for the current including any transient surges, e) they are adequate for low current switching where applicable.	TR_318
Switches shall provide the operator with positive and unambiguous indication of switch operation.	TR_319
Where change over contacts are used these shall be configured as Form Z contacts elements as defined in BS EN 60947-5-1.	TR_320
A push-button pressel shall be flush to the surrounding bezel or the panel to which it is fitted.	TR_321
The minimum pressel surface area of push button switches shall be determined as part of the associated human factors study.	TR_322
Where push buttons are identified by colour, these shall be in accordance with BS EN 60073, unless convention on the train is otherwise, to be confirmed with the ‘LU engineer’.	TR_323

Where illuminated push buttons have been specified, the colour shall be in accordance with BS EN 60073, unless convention on the train is otherwise, to be confirmed with the ‘LU engineer’.	TR_324
The operating force of the push button switches shall be in the range 2N to 6N and it shall be possible to operate the switch contact by applying pressure to any single point on the pressel.	TR_325
It shall not be possible for rotary switch actuators to rest in an intermediate position. The actuator shall be of the "Definite Position" type as defined in BS EN 60947-5-1.	TR_326
Switches used shall be push button or rotary, to be approved by the ‘LU engineer’.	TR_327

12.5 Relays and contactors

Requirement	*Req. ID*
Relays and contactors shall comply with BS EN 60947-1 and BS EN 60947-5- 1.	TR_328
Operating coils shall be continuously rated over the full ‘control supply range’.	TR_329
An economy resistor arrangement shall not be used in the supply to relay and contactor coils.	TR_330

12.6 Electrical and electronic protection

Requirement	*Req. ID*
Where a testing interface is provided, the equipment shall be protected against test equipment malfunction.	TR_331
Protection devices internal to equipment supplied as part of the ‘CCTV system’ shall not require manual intervention to be reset.	TR_332

12.7 Cables and wiring

Requirement	*Req. ID*

All cabling supplied for mixed signal and power shall have a sheath coloured black.	TR_333
All cabling for the supply of power at the potential of the Control Supply (-52V) shall have a sheath coloured violet, excluding cabling for safety circuits to be sheathed yellow as per Section 12.3.	TR_334
All conductors in cable assemblies shall comply with BS EN 60228 Class 5.	TR_335
All conductors in cable assemblies shall be tinned copper.	TR_336

Each type of cable shall undergo the testing requirements in the table below plus an agreed flexural test. TR_337

Cable Category (BS EN)	Additional Type Test Requirements
BS EN 50264-1 BS EN 50264-3-1 BS EN 50264-3-2	BS EN 50305 Clause 7.3 (ageing tests) BS EN 50305 Clause 7.6 (shrinkage tests)
BS EN 50306-1 BS EN 50306-2 BS EN 50306-3 BS EN 50306-4	BS EN 50305 Clause 7.6 (shrinkage tests)
BS EN 50306-4	BS EN 50305 Clause 7.6 (stress cracking)

Cables shall have a cross sectional area appropriate to the environment in which they are to be installed and in-line with the characteristics of the up-stream protection device from which they are supplied. **Note:** guidance can be sought from BS EN 50343.	TR_338
Cable installation shall comply with BS EN 50343.	TR_339
Cables shall be secured in such a manner as to avoid damage being sustained to the cables, e.g. over tightened cable ties.	TR_340
Cable ties shall not be used to secure underframe cables.	TR_341
Wiring which could be subjected to flexing shall be provided with suitable cleats, conduit clamps, sheaths or supports adjacent to the terminations and at suitable locations along its route.	TR_342

Control voltage wiring shall use standard wall cables. **Note:** reduced wall control voltage wiring may be permitted where the use of standard wall insulation is not practicable, upon approval by the 'LU engineer'.	TR_343
Wiring in under seat locations shall be protected by flexible conduit, rigid conduit or solid ducts to prevent damage to cables when equipment is being removed or refitted or from staff standing on cables when seats are removed.	TR_344
Underframe cables shall be protected within existing ducts or new conduits, if installed.	TR_345
Each batch of cable manufactured shall be spark tested in accordance with BS EN 62230.	TR_347
Conductor resistance test shall be undertaken as a sample test in accordance with: • The relevant part of the BS EN 50264 suite of standards • The relevant part of the BS EN 50306 suite of standards • BS EN 50305. Sample testing shall be undertaken on each batch of cable manufactured.	TR_348
Cables shall be dressed neatly on to terminals, such that two further re-terminations may be made on each cable without distorting the cable form.	TR_349
Cable looms or harnesses shall not be self-supporting.	TR_350
Cables shall not rely on their termination for mechanical support.	TR_351
Cables installed in the vehicle interior, other than those running within conduits, shall be secured by means of non-metallic cable ties or suitable cable clips at intervals of no greater than 250mm, or 100mm for routing of cable at terminal rail positions where individual cables are spurred of connections to terminal posts.	TR_352
Cable bundles within ducts shall be secured with approved non-metallic ties at intervals not exceeding 300mm.	TR_353
Self-adhesive cable supports shall not be used.	TR_354
Any spare or redundant cables shall be individually insulated and securely restrained so that they cannot move or come into contact with any terminal or structure.	TR_355

Underframe conduit shall be supported at intervals of no more than 500mm using conduit clamps recommended by the conduit manufacturer as suitable for the operating environment.	TR_357
Where lubrication is required to be used to install cables into ducts or conduits, only lubrication specifically for that purpose shall be specified.	TR_358
Where lubrication is required to be used to install cables into ducts or conduits, the lubricant shall neither contaminate any termination or equipment, nor have any long term detrimental effect on the cable or conduit.	TR_359
Cabling used in the realisation of the connection for TR_178 shall be of a shielded type, either; Type S/UTP – Braided screen over twisted pairs, no screening between pairs, or; Type S/STP – Braided screen over twisted pairs, screening between pairs, electrically connected throughout to the outer braided screen.	TR_360

12.8 Cable markings

Requirement	*Req. ID*
All cables shall be distinctly and permanently identified at each end by means of a single marked sleeve clearly displaying the complete ‘cable ident’ in accordance with the circuit diagrams.	TR_361
The use of individual character sleeves making up the complete ‘cable ident’ is not permissible.	TR_362
All ‘cable idents’ shall read starting at the termination.	TR_363
Both ends of each physical wire shall display the same ‘cable ident’.	TR_364
The ‘supplier’ shall add the suffix BN (for brown) and B (for blue) as appropriate to ‘cable idents’ when twisted and screened cable is used; the ident SCN shall be used for the screen.	TR_365
The ident of all ‘safety circuit’ wires shall include the prefix ‘S’.	TR_366
The ‘cable ident’ sleeves shall be coloured yellow with black characters.	TR_367

The ‘cable ident’ sleeves shall be a tight fit on the cable so that they shall not slip back along cables in the vertical plane, nor turn inside when cleaned with a wiping action.	TR_368
Where heat-shrink ‘cable ident’ sleeves are used, the ‘supplier’ shall ensure that no damage occurs to any part of the installation through the heat shrink process.	TR_369
‘Cable ident’ lettering shall be permanent, not prone to smudging or removal by rubbing and unaffected by cleaning fluids.	TR_370
The cable identification system used shall distinguish between train, unit and car wiring.	TR_371
Colour coding shall not form part of the cable identification system, unless as prescribed in this TRS.	TR_372
All cables shall be marked, on their outer surface, as required by the relevant BS EN standards to which that cable complies. It shall be possible to identify an individual core of a multicore/multipair cable throughout its length. The means of identification may either be a colour or a printed number which contrasts with the core colour. The means of identification shall comply with BS EN 50306-2 and BS EN 50264-3-2.	TR_373

12.9 Cable terminations

Requirement	*Req. ID*
All cable terminations shall be made using crimp terminals.	TR_374
Intermediate connections shall be made using moulded base terminals. These shall be stud type or push-on types where appropriate.	TR_375
Moulded base push-on type terminals may be used in areas where disconnection is not expected or required. They shall be of an approved type and shall not be used on ‘safety circuits’.	TR_376
Cage clamp type terminals shall not be used.	TR_377
Screens shall be terminated to minimise the effects of EMI using best industry practice.	TR_378

Crimped terminations used in the manufacture of rolling stock shall comply with the requirements of the following standards as a minimum; a) BS EN 61238-1 b) BS EN 60228 c) BS EN 60352-2 d) BS 7727 e) BS 5057 f) BS 5G 178-1	TR_379
Crimped terminations for use on cables having an operating temperature up to 85 degrees Celsius shall meet the requirements of BS EN 61238-1 or BS EN 60352-2 as appropriate.	TR_380
Crimped terminations for use on cables which may exceed 85 degrees Celsius shall meet the requirements of BS 5G 178-1.	TR_381
Butt crimp splices shall not be used.	TR_382
Flat, quick-connect crimped terminations shall comply with BS 5057.	TR_383
The construction of all cables shall be such that compatibility with the crimped terminations to be used is ensured and that required "pull off" tests results are achieved.	TR_384
Piggy back type push-on connectors shall not be used.	TR_385
Push-on terminations shall not be used in 'safety circuits', or any cables larger than 2.5mm cross-sectional area.	TR_386

12.10 Connectors

Requirement	*Req. ID*
Multipole connectors shall be used to minimise the time required to replace components. This shall include connectors used to provide the electrical interfaces to all LRUs which are powered from the train's 'control supply' system.	TR_387
Multipole connectors shall include a rear assembly to support the weight of the attached cable harness and retain the cables within.	TR_388

It shall be possible for ‘maintenance staff’ to mate and unmate the connector using only one hand, including sufficient spacing for a 95th percentile hand, without the use of strap wrenches or similar tooling.	TR_389
Connectors shall lock in position when fully mated. It shall be evident to the person making the connection that the lock has been achieved and that the connector is fully mated.	TR_390
Where practical, the connector design shall provide mechanical advantage to reduce the insertion force required.	TR_391
The use of connectors with rotary engagement and locking mechanisms, particularly on control wiring plug and sockets, is the preferred arrangement.	TR_392
The current rating of each pin or socket within a connector, at 55 degrees Celsius shall not be less than the current rating of the cable attached.	TR_393
The free half of a connector pair shall be capable of supporting the weight of the attached cable, when mated.	TR_394
The free half of a connector pair shall be adequately robust to resist damage where there is a possibility of dropping the installed connector, with cable attached, onto a hard surface.	TR_395
The fixed end of any connector, which is normally unconnected (e.g. a test point), shall be provided with a dust cap secured by a flexible link.	TR_396
Where connectors of the same type and form are in close proximity, a robust means of preventing wrong connection shall be employed.	TR_397
The correct orientation of connectors shall be immediately obvious during the connection process.	TR_398
A full complement of pins or sockets shall be fitted whether or not they are used with appropriate accessory (such as a grommet filler plug) to maintain the connector IP rating.	TR_399
All wiring connections into a pin and socket contact shall be made by a mechanical crimping process using the appropriate calibrated crimping tool.	TR_400

All pins and sockets used to pass signal and low voltage control circuits shall be gold plated.	TR_401
When mated, internally located (within carbody and equipment cases) connectors shall seal the pin and socket contacts from ambient, to at least IP65.	TR_402
When mated, externally (external to the car body) mounted connectors shall seal the contacts and attached cable cores, to at least IP66.	TR_403
The disconnection of a plug and socket shall not allow accidental contact with live conductors.	TR_404

12.11 Earth bonds

Requirement	*Req. ID*
All metal parts not intended as circuit conductors shall be bonded to the vehicle body to prevent them developing a potential difference relative to the vehicle structure. This requirement does not apply to metal parts which are protected by an approved system of secondary insulation.	TR_405
The installation of the 'CCTV system' shall avoid the creation of earth loops.	TR_406
Each item of equipment shall be provided with an earth termination of a size suitable for the earth bond.	TR_407
In the event of a fault developing, the bond associated with the faulty equipment shall be capable of carrying the prospective fault current without suffering damage and shall not be smaller than the largest circuit conductor associated with the equipment.	TR_408
The length of bonds shall be kept as short as possible.	TR_409
Bonds shall not be looped between equipment; each item of equipment shall be bonded separately to earth.	TR_410
Earth terminations shall have a clean raised surface and a stud for the equipotential bond termination.	TR_411

Earth terminations shall have high conductivity and shall not be prone to corrosion or oxidisation that could impair the connection to earth.	TR_412
The maximum resistance between an exposed conductive part and the main car earth point shall not be greater than 0.01 Ohms.	TR_413
The ‘CCTV system’ shall be earthed to existing earth locations on the vehicle structure.	TR_414
A single reference point of equi-potential (i.e. earth bonds) shall be agreed with the ‘purchaser’.	TR_415

12.12 Warning labels and safety signs

Requirement	*Req. ID*
All warning labels and safety signs shall conform to BS EN ISO 7010 and be made of non-conducting material.	TR_416
Electrical equipment shall carry warning labels with the symbol designated for CAUTION, RISK OF ELECTRIC SHOCK. The voltage and whether it is AC or DC shall also be indicated.	TR_417
Labels and safety signs shall not be visible to passengers. **Note:** this shall be achieved by collaboration with the Saloon Design ‘designer’	TR_418
If the removal of a cover affords access to live equipment then the cover shall carry the warning ISOLATE SUPPLY BEFORE REMOVING THIS COVER.	TR_419
If removal of a cover affords access to live equipment that is fed from more than one source i.e. DC supplies and AC supplies then the cover shall carry a warning CAUTION MULTIFED CIRCUITS ISOLATE ALL SUPPLIES BEFORE REMOVING COVER.	TR_420
Stored energy devices and all associated equipment fed from or connected to them e.g. terminal boxes, relays, electronic equipment etc. shall be labelled STORED ENERGY CIRCUITS and the safe minimum discharge time in minutes shall also be indicated.	TR_421

Warning labels shall be located in prominent, easily visible locations such that they would be visible to staff before they contacted any potentially live equipment. **Note:** this shall be achieved by collaboration with the Saloon Design ‘designer’	TR_422
A warning label shall be affixed to any assembly containing static sensitive devices.	TR_423
Safety signs shall be securely fixed.	TR_424
Safety signs shall be capable of being readily and safely cleaned to ensure continued legibility.	TR_425
Safety signs mounted on the exterior of the train shall not suffer degradation as a result of regular exposure to train washing plant or the environment.	TR_426
Safety signs shall not be prone to fade.	TR_427
Safety signs shall have a minimum life of 30 years.	TR_428
Safety signs shall be capable of being readily and quickly replaced.	TR_429
Safety signs shall be clearly legible to persons with normal or corrected eyesight at distances in the range 0.4 metres to 1 metre from the sign at viewing angles of up to 60 degrees from a normal to the sign, and in all directions.	TR_430
Safety signs for use on outside sealed equipment cases shall employ recessed lettering to ensure legibility.	TR_431

12.13 EMC Design

Requirement	*Req. ID*
Cables shall be routed in a manner to minimise the effects of EMI using best industry practice. **Note:** this shall be achieved by collaboration with the Saloon Design 'designer'.	TR_432
All equipment shall comply with S1222 and S1193.	TR_433

The installation of the electronic equipment of the ‘CCTV system’ shall be arranged so as to reduce, as far as possible, the effects of external electrical disturbances. **Note:** this shall be achieved by collaboration with the Saloon Design 'designer'.	TR_434
The design and layout of input circuits shall be such as to minimise the effects of radiated energy from interference suppression components, upon the low level signals of the system.	TR_435
All supplied electrical and electronic equipment shall comply with the EMC Directive 2014/30/EU.	TR_436
The ‘CCTV system’ shall operate correctly, without degradation of performance or function in its intended electromagnetic environment, under normal operating and failure conditions. **Note:** the intended electromagnetic environment will include trains with the existing traction system and trains with the ‘AC traction system’	TR_437
The ‘CCTV system’ shall not cause electromagnetic interference under normal operating and failure conditions.	TR_438
The ‘CCTV system’ shall be constructed in such a way that it has an adequate level of immunity in its intended electromagnetic environment.	TR_439
The ‘CCTV system’ shall be CE marked for the environment in which it is intended to operate.	TR_440
Any radio transmitter systems used as part of the ‘CCTV system’ shall comply with the EMF Directive 2013/35/EU.	TR_441
Appropriate segregation distances of any radio antenna shall ensure other equipment is not exposed to more than 3V/m.	TR_442
Intermodulation effects with existing radio systems shall be considered.	TR_443
Cable routes for the ‘CCTV system’ shall be designed to avoid routes containing cables or equipment with high emissions (e.g. traction cables). **Note 1:** existing cable runs may have high levels of EMI already present. **Note 2:** this shall be achieved by collaboration with the Saloon Design 'designer'.	TR_444

The ‘CCTV system’ shall be designed to withstand any EMI level present in the train. The ‘supplier’ shall be responsible for any test to guarantee the performance of the ‘CCTV system’.	TR_445
The 'supplier' shall ensure that the EMC assessment includes any credible detrimental equipment performance effects that could be caused by manufacturing tolerances, ageing, usage and corrosion.	TR_446
The 'supplier' shall identify those components that will require replacement or overhaul over the ‘design life’ of the ‘CCTV system’ to maintain EMC. **Note:** This should be included as part of Maintenance Documentation as per Section 15.35.	TR_447
The 'supplier' shall demonstrate that fitment of the ‘CCTV system’ does not generate magnetic fields, RFI or conducted interference at a level that could affect the correct operation of (as a minimum): • Train systems and equipment • Existing and modified trains and other units within the same train, existing and modified • The ‘train radio’ system • Wayside signalling equipment	TR_448
The 'supplier' shall ensure that all EMC aspects are considered as part of the overall risk assessment.	TR_449
The 'supplier' shall comply with standard BS EN 50121-1.	TR_450
The 'supplier' shall comply with standard BS EN 50121-3-2.	TR_451
The 'supplier' shall comply with EMF Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields).	TR_452
The 'supplier' shall conduct an EMC Hazard Identification in conjunction with ‘purchaser’ experts from all relevant disciplines.	TR_453

12.14 Enclosures & LRUs

Requirement	*Req. ID*

Equipment supplied as part of the ‘CCTV system’ shall provide at least IP65 protection (IP code according to BS EN 60529).	TR_454
Where seals are used to achieve an IP rating, they shall maintain their performance when subjected to opening and closing.	TR_455
The items to be considered as LRUs shall be agreed with the ‘purchaser’.	TR_456
Provision shall be made in the ‘CCTV system’ to permit damaged items of equipment (e.g. due to stripped or worn screw threads) to be reclaimed.	TR_457
LRUs shall utilise standard engineering fixings, seals and connections for their removal and fitment.	TR_458
PCB assemblies, not forming part of a plug-in unit, shall be mounted on a rigid mechanical framework.	TR_459
Where a printed board assembly forms part of a plug-in unit (e.g. rack system), it shall be directly mounted on card guides without the use of an additional mechanical framework.	TR_460
LRUs shall be installed such that the removal of one LRU shall not require other LRUs or any other components (except the immediately local fixings) to be disturbed.	TR_461
Electrical connections to LRUs shall be via multi-pole connectors.	TR_462
Connections and ports provided on LRUs for diagnostics or overhaul which are not usually connected in service shall be protected by a cover to prevent misuse or accidental damage.	TR_463
LRUs shall be arranged so that they can be easily manoeuvred in and out of position.	TR_464
LRUs shall be provided with a legible, permanent label indicating key parameters (e.g. description, type, where used, setting, version, modification status).	TR_465
Printed boards used on a rack shall accommodate connectors with dimensional standards to BS EN 60603-2.	TR_466

Unless otherwise agreed by the ’purchaser’, rack system rear wiring shall be protected by a removable metal cover.	TR_467
If keypads are provided as part of the ‘CCTV system’, they shall be rated to IP66.	TR_468
If keypads are provided as part of the ‘CCTV system’, they shall have indelible legends.	TR_469
If keypads are provided as part of the ‘CCTV system’, they shall be operable with a gloved hand.	TR_470
Items of equipment which are visually similar but which have different internal components affecting the system response (e.g. delay in timer relay) shall be designed to avoid fitment in an incorrect location	TR_471

12.15 Mechanical/Structural

Requirement	*Req. ID*
The mass of the ‘CCTV system’ shall be minimised as far as is reasonably practicable and shall be agreed with the 'LU Engineer'.	TR_472
The structural integrity of equipment and enclosures of the ‘CCTV system’ shall be demonstrated by Finite Element Analysis and/or other suitable calculation method.	TR_473

12.16 Materials

Requirement	*Req. ID*
Materials used in the 'CCTV system' shall be fit for purpose and suitable for the environment in which they shall be used.	TR_474
Materials used in the 'CCTV system' shall be resistant to damage that can be caused by: a) cleaning products and processes, b) graffiti and gum removal products and processes, c) maintenance products and processes, d) other substances that may be found on the LU railway.	TR_475

Materials used in the ‘CCTV system' shall maintain safety and health risks to be ALARP.	TR_476
The use of every hazardous material in the 'CCTV system' shall be justified to and agreed with the 'LU Engineer'.	TR_477
Glass used in the ‘CCTV system' shall: a) withstand passengers leaning against it (if applicable) b) have exposed edges adequately protected or treated.	TR_478
Glass shall not be used to prevent unintended operation of mechanisms, controls or equipment.	TR_479
Exposed glass used in the 'CCTV system' shall be laminated if used above the tops of the car windows, e.g. for camera enclosures/protection.	TR_480

12.17 Fire safety performance

Requirement	*Req. ID*
Materials used as part of the 'CCTV system' shall achieve the performance specified in Table 11 of S1180 when tested in accordance with the prescribed test method(s) listed in the table. For each Parameter, the appropriate Profile shall be selected. A material shall be considered to be compliant if it can pass all of the tests in at least one of the three columns “BS EN 45545-2 HL3”, “BS6853:1999 Category 1a” and “Other Applicable Tests and Notes”.	TR_481
Flat surfaces requiring fire testing shall be subject to toxic fume test B2 in Annex B of BS 6853, having a mass of combustible material (as opposed to inert substrate) of not less than 5g, or (if this mass is impractical) scaled by mass from a B1 test, the latter including sampling of the toxicity of the gases liberated.	TR_482
Technical liquids', including electrical components, used in the 'CCTV system' shall be subject to a fire risk assessment, carried out in accordance with G085.	TR_483
The 'CCTV system' shall not contain flammable gas installations, either pressurised or unpressurised.	TR_484
Batteries used in the 'CCTV system' shall be subject to a separate fire risk assessment for every application, carried out in accordance with G085.	TR_485
Where the use of non-compliant materials in the 'CCTV system' is unavoidable, the fuel load density shall be restricted by limiting use to the minimum required.	TR_486
Individual items of equipment shall be subjected to fire tests unless: a) there is an existing, valid entry in LU's 'approved products register' which is applicable for the specific item and its proposed application (to be confirmed with the LU Engineer), or b) the items are contained within a container with an adequate degree of fire resistance as defined by TR_481.	TR_487
Fire testing on coated and composite materials used in the 'CCTV system' shall be undertaken on the complete assembly.	TR_488
Where a degree of fire resistance is claimed for a container, it shall be subjected to fire testing sufficient to validate the fire resistance.	TR_489

12.18 Environmental resistance

Requirement	*Req. ID*
Surfaces that are exposed to passengers, or that may be exposed to passengers through wear, shall be proven to be graffiti resistant in accordance with type test LU-RSE-T001.	TR_490
Surfaces that are exposed to passengers, or that may be exposed to passengers through wear, shall be proven to be liquid resistant in accordance with type test LU-RSE-T002.	TR_491

12.19 Environment

Requirement	*Req. ID*
Maintenance and cleaning materials shall not damage the 'CCTV system'.	TR_492
The 'CCTV system' shall function in accordance with this TRS throughout the range of ambient environmental conditions defined in the Environmental Context Document.	TR_493
The 'CCTV system' shall not be damaged by a change in ambient temperature of 3 degrees Celsius per second sustained for 13 and a 1/3 seconds, over any range within the ambient temperatures defined in the Environmental Context Document.	TR_494
For equipment in locations where the ambient temperature range is exceeded (e.g. due to solar irradiance as defined in the Environmental Context Document), the actual temperatures occurring at the location of the equipment concerned shall be used in the design.	TR_495
Following 60 hours 'powered down' at -15 degrees Celsius, the 'CCTV system' shall function to this TRS.	TR_496
The 'CCTV system' shall function to this TRS following a period installed on the vehicle but 'powered down' for up to 60 weeks.	TR_497
The 'CCTV system' shall be designed for a humidity stress over the ambient temperature range according to a yearly average of no less than 75% relative humidity.	TR_498

The 'CCTV system' shall be designed for a humidity stress over the ambient temperature range according to 30 consecutive days having 95% within the year.	TR_499
Any moisture condensation within the 'CCTV system' shall not lead to any malfunction or failure.	TR_500
For equipment in locations where the specified humidity stress is exceeded the actual humidity occurring at the location of the equipment concerned shall be used in the design.	TR_501
For equipment in locations where additional environmental factors are present, the design and manufacture of these components shall take the environmental conditions in BS EN 50125-1 and the Environmental Context Document into account.	TR_502
For equipment within equipment cases and enclosures, the design and manufacture of these components and enclosures shall take the temperature rises as defined in BS EN 50155 into account.	TR_503
The 'CCTV system' shall be protected against the ingress of foreign material and items described in the Environmental Context Document.	TR_504
The 'CCTV system' shall not cause vibration in excess of 1m/s^2 over the frequency range 10 to 1000Hz on the car floor, side walls, ceiling panels, stanchions, hand holds or seat frames. **Note:** this shall be achieved by collaboration with the Saloon Design 'designer'.	TR_505
Outside of the limits defined in the Environmental Context Document, a reduction in performance of the 'CCTV system' shall be allowable but it shall continue to operate within limits that do not result in damage to any equipment.	TR_506
The 'CCTV system' shall be suited for the specific environment it is to be employed in with respect to ingress of solids (dust) and liquids (generally water).	TR_507
The means of protection of the 'CCTV system' against ingress of solids and liquids shall last for the ‘design life’ without harmful degradation in function.	TR_508
The means of protection of the 'CCTV system' against ingress of solids and liquids shall be repairable on a casualty basis, requiring replacement of only those components that directly form the protection system (i.e. seals shall be replaced independently of case covers).	TR_509

The IP rating of each item supplied as part of the 'CCTV system' shall be declared by the 'supplier' in accordance with BS EN 60529.	TR_510
Each item supplied with a declared IP rating greater than IP00 as part of the 'CCTV system' shall be type tested or a certificate of conformance provided (the method of demonstration commensurate to the design risk) to prove compliance with BS EN 60529.	TR_511

12.20 Noise, shock & vibration

Requirement	*Req. ID*
The 'CCTV system' shall be adequately supported such that it shall not resonate, vibrate or emit any noticeable sound in normal service conditions. **Note:** this shall be achieved by collaboration with the Saloon Design 'designer'.	TR_512
The 'CCTV system' shall be no louder than any other saloon based system.	TR_513
The 'CCTV system' shall be able to withstand, without deterioration or malfunction, vibrations and shocks that occur in service on the routes the modified trains are required to operate, according to the vibration levels given in the Environmental Context Document. **Note:** this shall be achieved by collaboration with the Saloon Design 'designer'.	TR_514
Each separately mounted piece of 'CCTV system' equipment, together with its auxiliaries and mountings, shall be subjected to: a) a functional random vibration test in all three axes, b) a simulated long-life test, c) shock testing, in accordance with BS EN 61373.	TR_515
The test severity, frequency range, pulse shape and directions employed for shock and vibration testing of each separately mounted piece of the 'CCTV system' shall be those given in the Environmental Context Document, or calculated from the same, or those given in BS EN 61373 for the equipment mounting locations, whichever is the most onerous.	TR_516
The fundamental modes of vibration of each separately mounted piece of 'CCTV system' equipment, on their mountings and in all operation conditions, shall be separated from the modes of vibration of the car body structure and suspension, or otherwise decoupled.	TR_517

Note: this shall be achieved by collaboration with the Saloon Design 'designer'.

12.21 Human factors

Requirement	*Req. ID*
The 'CCTV system' shall be suitable for use by and interaction with passengers and 'maintenance staff' within the 'reference population'.	TR_518
The 'CCTV system' shall be suitable for use by and interaction with passengers and ‘maintenance staff’ outside of the 'reference population', so far as is reasonably practicable.	TR_519
The ‘CCTV system' shall not include or create holes or gaps between fixed or movable parts that could cause injury by trapping body parts, including finger traps, as defined in section 4.2.7 of BS EN 1176-1.	TR_520
All interactions between the following user groups and the 'CCTV system' shall be identified and subjected to Human Factors analysis and design activities as part of the design development process, in accordance with S1217: a) Passengers, including those with impairments and disabilities, b) Train operators, c) Shunters, d) Train maintainers and engineers, e) Station staff, f) LU Emergency Response Unit, g) Emergency services.	TR_521
The design of the 'CCTV system' shall take into account the clothing typically worn by the user groups.	TR_522
Human factors analyses shall consider at least the following conditions: a) Normal operation of the railway, b) Degraded operation of the railway, c) All times of the day and night, d) All climatic conditions, e) Emergencies, including: i. Detrainment, ii. Coupling.	TR_523

Human factors analyses shall consider the variation in at least the following aspects of staff performance: a) Competence, b) Experience, c) Reliability, d) Ease of access to required information.	TR_524
The 'CCTV system' shall be safe and shall maximise staff performance during, but not limited to, the following tasks: a) Recovery from a 'CCTV system' failure during service, b) Routine (planned) maintenance tasks, c) Fault finding, including the connection and use of diagnostic equipment, d) Repair (unplanned) maintenance tasks.	TR_525
The parts of the ‘CCTV system’ that interact with passengers, ‘train operators’ or ‘maintenance staff’ by means of dialogues, including notifications, shall comply with S1218.	TR_526
The likelihood that staff or passenger interaction with the 'CCTV system' will result in a delay to the train service shall be minimised.	TR_527
System elements involving HMI or HCI interfaces shall comply with LU Standard S1217 and S1218.	TR_528

12.22 Labelling

Requirement	*Req. ID*
All surveillance and security system assets shall be permanently labelled / numbered. Numbering shall be agreed with the 'purchaser'.	TR_529
Labels shall be resistant to the adverse effects of the LU environment (see Environmental Context Document) such that text /numeric identification information shall remain legible for the life of the asset.	TR_530

12.23 Network

Requirement	*Req. ID*
The network design shall be a closed network with defined end-points as far as reasonably practicable, in line with guidance set out in BS EN 50159. This excludes	TR_531

any connection to the ‘replacement PIS’, ‘replacement DTS’ or other train-borne management network, for the acquisition of 'metadata' and reporting of health monitoring only.	
The ‘CCTV system’ shall be designed in accordance with LU policy EASF-POL-0004, where applicable.	TR_532
The ‘CCTV system’ shall be designed in accordance with LU standard S1744.	TR_572
The 'supplier' shall produce a cyber threat risk assessment that determines the cyber-attack threat to the 'CCTV system'.	TR_533
A cyber risk assessment shall be undertaken in compliance with the LU ESAC process. **Note:** This shall be performed in collaboration with the ‘purchaser’.	TR_534

12.24 Software

Requirement	*Req. ID*
Software or firmware ‘updates’ to ‘CCTV system’ hardware should be able to be carried out without the uninstallation of the previous version.	TR_535
If the uninstallation of CCTV system firmware or software is unavoidable for upgrading, it shall be possible to revert back to the previous version.	TR_536
Software in the 'CCTV system' with SIL 0 or higher integrity shall be compatible with BS EN 50128.	TR_537
Regression testing shall be carried out following all software changes to reveal any adverse effects on the system.	TR_538
Software changes that could impact system security shall be followed by a vulnerability assessment and if necessary full penetration tests shall be conducted to confirm that the integrity of the security system has not been reduced.	TR_539
All software changes / ‘updates’ and testing shall be via formal planning / approvals and conducted by competent and authorised personnel.	TR_540
The design, development and quality management of software used in the operation of surveillance and security systems will be compatible with BS ISO/IEC 90003 and the guidance on software dependability stated in BS EN 62628.	TR_541
‘CCTV system' software testing shall be compatible with BS ISO/IEC 29119.	TR_542
‘CCTV system' software tests shall not compromise the security of the system.	TR_543
To aid understanding of system operation and for fault diagnostics and testing, the 'supplier' shall produce a sufficiently detailed system architecture model that shows the interactions / coupling between the individual software modules.	TR_544
Accounts shall be assigned the minimum privileges necessary to complete given tasks. Password information and entry process shall be secured by default. For example by using salted hashes and character masking respectively. **Note:** Access levels shall be configurable by the 'purchaser'.	TR_545

Comments and annotations provided in the source code of the ‘CCTV system’ shall be in UK English.	TR_546
‘CCTV system’ software shall be structured in such a manner as to segregate the 'configurable data' from the non-configurable aspects.	TR_547
Updating and uploading ‘configurable data’ shall not cause the ‘CCTV system’ software version to be incremented.	TR_548
All ‘CCTV system’ ‘configurable data’ shall be configurable within safe working limits.	TR_549
Changing the 'configurable data' on the 'CCTV system' shall not require removal of equipment from the train.	TR_550
All software related to the ‘CCTV system’ shall comply with the requirements of S1210.	TR_551
A proven translator shall be used to avoid any difficulties due to translator failures which can arise during development, verification and maintenance of a software package. **Note:** explanations of this design measure can be found in BS EN 50128.	TR_552
Software design shall proceed according to the tailored life cycle model in BS ISO/IEC 12207.	TR_553
The application of BS EN ISO 9001 to the software shall be according to BS ISO/IEC 90003.	TR_554
'Debouncing software techniques' shall be used to guarantee the input signals are read correctly.	TR_555
All software shall have an appropriate Safety Integrity Level (SIL) assigned and justified.	TR_556
Safety Integrity Levels shall be determined with reference to BS EN 50126-1 and BS EN 50129 with appropriate guidance from the principles of the safe management of engineering change.	TR_557

Software shall be designed and supplied in accordance with the relevant requirements for the determined SIL rating as defined in BS EN 50128.	TR_558
Software documentation shall comply with the requirements of BS EN 50155 and BS EN 50128.	TR_559
Software documentation shall be updated throughout the vehicle life cycle if changes in design are made.	TR_560

13 DOCUMENTATION REQUIREMENTS

Requirement	*Req. ID*
The design review and acceptance process as outlined in Section 14 shall be followed.	TR_561
All design review documentation as outlined in Section 15 shall be provided by the ‘supplier’ to the ‘purchaser’ as per the design acceptance process (TR_561).	TR_562
In addition to the design review documentation called up in TR_562, the ‘supplier’ shall provide the ‘purchaser’ with the specifications outlined in TR_564 and TR_565 at Production Readiness Review.	TR_563
The 'supplier' shall provide a minimum specification for a PC that is compatible with 'CCTV download software' and that can interface easily with a 'VRS storage medium' caddy, without the need to remove the 'VRS storage medium' from its caddy. **Note:** This is so the 'purchaser' can procure appropriate hardware for 'security viewing suites' and any standalone depot computers as required.	TR_564
The 'supplier' shall provide a specification for a test rig / test equipment that can be used to prove functionality of all aspects of the 'CCTV system', including systems testing of interfaces with the 'replacement DTS' and 'replacement PIS', prior to installation on a train.	TR_565
All asset documentation shall be released to the 'purchaser' by the 'supplier' in electronic format under version control. Hard copies shall be provided for approved (signed & dated) versions except where specified otherwise.	TR_566
Information and documentation integrity and retrieval shall be compatible with BS 10008.	TR_567
Asset records shall conform to LU engineering asset information standard S1041.	TR_568
Drawings (formats/ conventions/ notations) shall comply with R0585.	TR_569
CCTV system' software test documentation shall be compatible with BS ISO/IEC/IEEE 29119-3.	TR_570

14 DESIGN ACCEPTANCE

14.1 Overview

14.1.1 The design acceptance process is the methodology by which the design is progressed through the scope of work. The 'supplier' shall facilitate the acceptance process by holding design reviews at key stages of the design process. Figure 3 shows the design stages and reviews required.

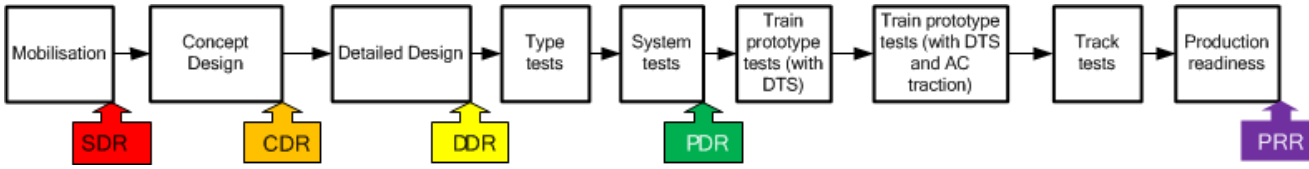


Figure 3 – Design stages and reviews

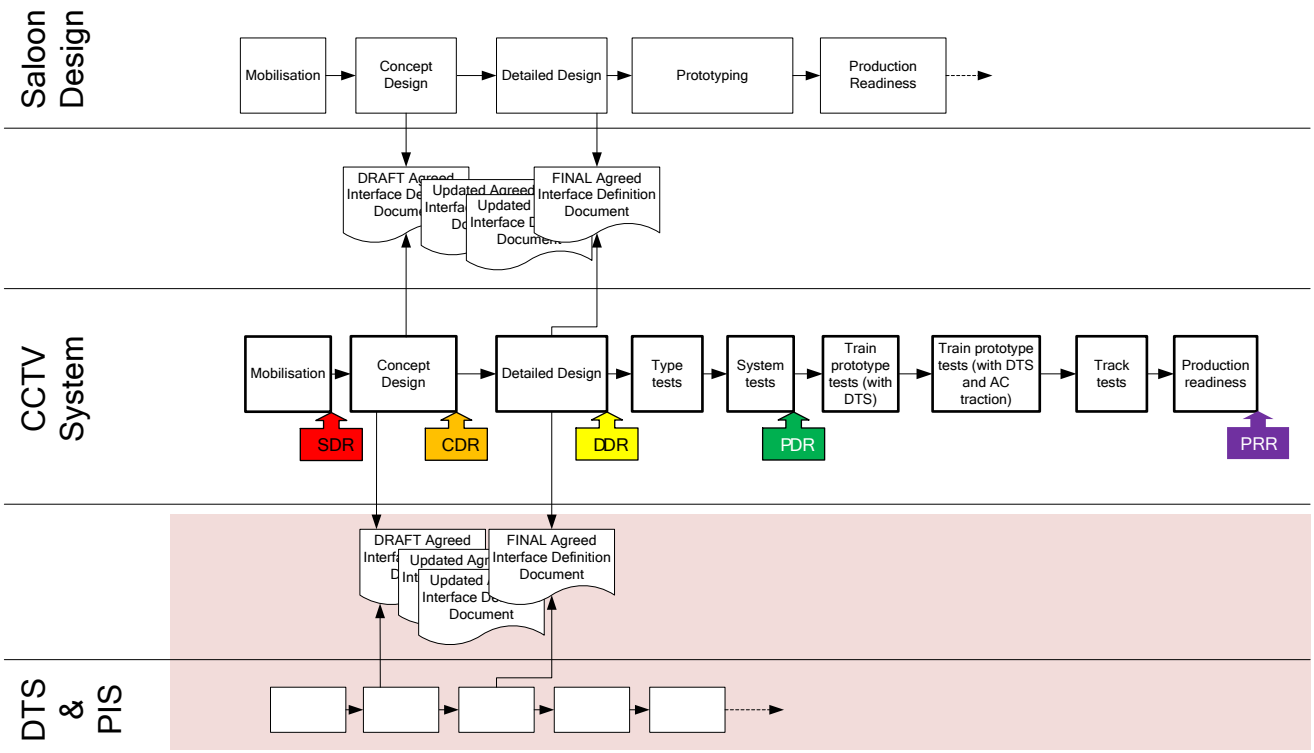


Figure 4 – Interface management architecture

14.2 Design review process

14.2.1 The design process shall be split into four stages, with five design reviews as shown in Table 1.

Table 1 – Required design reviews

Stage	Review	Initialism

Concept	1	Specification Design Review	SDR
	2	Concept Design Review	CDR
Detailed	3	Detailed Design Review	DDR
Prototyping	4	Prototype Design Review	PDR
Production Readiness	5	Production Readiness Review	PRR

14.2.2 Design Reviews shall facilitate the raising, discussion and agreed action of issues that have arisen during the submission review period.

14.2.3 The 'supplier' shall hold each Design Review and invite the 'purchaser'. All reviews shall be single gateway reviews. Each review may be held over a number of consecutive days.

14.2.4 The 'supplier' shall provide documentary evidence prior to each Design Review, as detailed in the section relating to that Design Review, to demonstrate that the design will meet requirements and facilitate acceptance. These documents form the Design Review Submission.

14.2.5 The 'supplier' shall provide meeting schedules and agendas to the 'purchaser' at least five working days before each Design Review.

14.2.6 The Design Review Submission shall be submitted to the 'purchaser' at least 20 working days prior to the respective review date. Each submission shall include a clear explanation of the scope of the submission for that stage.

14.2.7 Each Design Review shall be minuted by the 'purchaser' such that the minutes, once agreed and issued to all parties, and all actions closed to the satisfaction of the 'purchaser', will form the agreed platform for project progression to the subsequent stage.

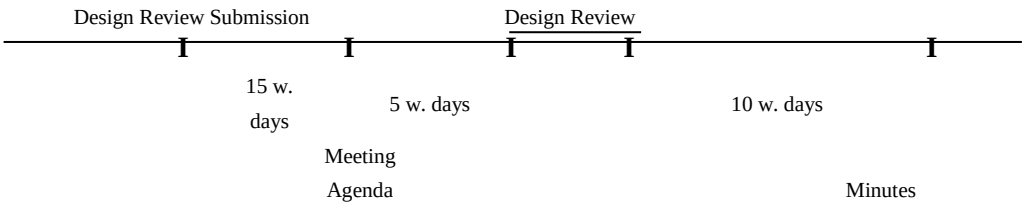


Figure 5 – Timescales for each Design Review

14.2.8 Other review meetings shall occur as and when necessary. These shall be minuted by the 'purchaser'.

14.2.9 At each Design Review an Open Issues Log (OIL) will be compiled by the 'purchaser' with agreed action plans for all issues.

14.3 Design Review Documentation

14.3.1 At each stage in the design review process, the 'supplier' shall be responsible for submitting a number of products for review in order to proceed to the next design stage.

14.3.2 Some products shall be created at one design stage and updated or finalised at subsequent stages.

14.3.3 Table 2 provides the abbreviations used to describe submission status and Table 3 shows the expected status of each product at each design stage.

14.3.4 Section 14.4 to Section 14.8 describe what documents are required at each Design Review.

Table 2 – Design review product stage abbreviation

	Status
Create/Draft product	C
Update product from previous review	U
Complete final product	F

Table 3 - Design review product status at each Design Stage

ID	Product	SDR	CDR	DDR	PDR	PRR
DD_001	Engineering Plan	C	U	U	F	
DD_002	Requirements Management Plan	C F				
DD_003	Risk Register	C	U	U	U	F
DD_004	Engineering Safety Management Plan	C F				
DD_005	Quality Plan	C	U	U	U	F
DD_006	Manufacturability plan	C	U	U	U	F
DD_007	Obsolescence management plan	C	U	U	U	F
DD_008	Product Specification (PS)	C	U	U	U	F
DD_009	Software design development document	C	U	U	U	F
DD_010	HMI concepts	C	U	U	F	
DD_011	Interface Control Plan	C	F			
DD_012	Interface Definition Document	C	U	U	U	F
DD_013	Design Management and Assurance Plan	C F				
DD_014	Weight management plan	C F				
DD_015	Weight declaration	C	U	U	U	F
DD_016	Configuration Management Plan	C	U	F		
DD_017	RAM Strategy Plan	C F				
DD_018	EMC Strategy & Control Plan	C	F			
DD_019	Software management plan	C	F			
DD_020	HF Integration Plan	C	F			
DD_021	Test Plan	C	U	F		
DD_022	Engineering safety management report	-	C	U	U	F
DD_023	Design calculations	-	C	U	U	F
DD_024	Declaration of design performance	-	C	U	U	F
DD_025	Register of non-metallic components	-	C	U	U	F

DD_026	RAM report	-	C	U	U	F
DD_027	Installation requirements and constraints	-	C	U	U	F
DD_028	Reliability Management Plan	-	C F			
DD_029	Human factors report	-	C	U	U	F
DD_030	Type Test Specifications	-	C	F		
DD_031	System Test Specifications	-	C	F		
DD_032	Maintenance documentation	-	C	U	U	F
DD_033	Physical and functional configuration specifications	-	-	C F		
DD_034	EMC Test Specification	-	-	C F		
DD_035	Train prototype test specifications	-	-	C	U F	
DD_036	Prototype Production Plan	-	-	C	U F	
DD_037	Training Matrix	-	-	C F		
DD_038	Maintainability Demonstration Plan	-	-	C F		
DD_039	Physical & functional configuration audit reports	-	-	-	C	F
DD_040	EMC Technical file	-	-	-	C	F
DD_041	EMC compliance / safety case documentation	-	-	-	C	F
DD_042	Type Test Reports/Certificates	-	-	-	C F	
DD_043	System Test Reports/Certificates	-	-	-	C F	
DD_044	Training Materials	-	-	-	C	F
DD_045	Prototype CRS (relevant sections of)	-	-	-	C F	
DD_046	Prototype CTC (relevant sections of)	-	-	-	C F	
DD_047	Maintainability Demonstration Report	-	-	-	C	F
DD_048	Software change log	-	C	U	U	F
DD_049	Train prototype test specifications (AC Traction train)	-	-	-	-	C F
DD_050	Train prototype test reports/certificates	-	-	-	-	C F
DD_051	Routine Production Test Specification	-	-	-	-	C F
DD_052	Pre-installation test specifications	-	-	-	-	C F
DD_053	Pre-installation test equipment product specification	-	-	-	-	C F
DD_054	Post-installation (commissioning) test specifications	-	-	-	-	C F
DD_055	Production Plan	-	-	-	-	C F
DD_056	Physical and Functional Configuration Specifications and Audits	-	-	-	-	C F
DD_057	Fleet fit CRS	-	-	-	-	C F
DD_058	Fleet fit CTC	-	-	-	-	C F
DD_059	Test Rig Specification	-	-	-	-	C F
DD_060	PC Specification	-	-	-	-	C F

14.4 Specification Design Review (SDR)

14.4.1 The SDR shall be conducted to confirm to the 'purchaser's' satisfaction the adequacy of the 'supplier's' translation of the TRS into the required suite of design products. The SDR will evaluate the initial design concepts developed to meet the requirements of the TRS, together with the engineering processes and analysis which underpin them. There shall also be detailed discussion on the interfaces and interface management.

14.4.2 The SDR Design Review Submission shall include the following products.

ID	Product	Defined in paragraph
DD_001	Engineering Plan	15.1
DD_002	Requirements Management Plan	15.2
DD_003	Risk Register	15.3
DD_004	Engineering Safety Management Plan	15.4
DD_005	Quality Plan	15.5
DD_006	Manufacturability plan	15.6
DD_007	Obsolescence management plan	15.7
DD_008	Product Specification (PS)	15.8
DD_009	Software design development document	15.12
DD_010	HMI concepts (including maintainer interface, alarm strategy)	15.14
DD_011	Interface Control Plan	15.15
DD_012	Interface Definition Document (including space envelopes, fixings points, and installation constraints)	15.16
DD_013	Design Management and Assurance Plan	15.18
DD_014	Weight management plan	15.19
DD_015	Weight declaration	15.19
DD_016	Configuration Management Plan	15.20
DD_017	RAM Strategy Plan	15.22
DD_018	EMC Strategy & Control Plan	15.36

DD_019	Software management plan	15.24
DD_020	HF Integration Plan	15.25
DD_021	Test Plan	15.34

14.5 Concept Design Review (CDR)

14.5.1 The entry criteria for the CDR review is a completed SDR for which all actions have been closed to the satisfaction of the 'purchaser' and completion of the CDR Design Review Submission.

14.5.2 The CDR shall be conducted to evaluate the design concepts developed to meet the requirements of the TRS. The 'supplier's' submissions shall provide sufficient information to demonstrate how the proposed concepts are likely to meet the requirements of the TRS, and that they will be fit for purpose.

14.5.3 The CDR Design Review Submission shall include the following products.

ID	Submission	Defined in paragraph
DD_001	Engineering Plan	15.1
DD_003	Risk Register	15.3
DD_022	Engineering safety management report	15.4
DD_005	Quality Plan	15.5
DD_006	Manufacturability plan	15.6
DD_007	Obsolescence management plan	15.7
DD_008	Product Specification	15.8
DD_023	Design calculations	15.9
DD_024	Declaration of design performance	15.10
DD_025	Register of non-metallic components	15.11
DD_009	Software design development document	15.12
DD_010	HMI concepts (including maintainer interface, alarm strategy)	15.14
DD_011	Interface Control Plan	15.15
DD_012	Interface Definition Document (including space envelopes, fixings points, and installation	15.16

	constraints)	
DD_027	Installation requirements and constraints	15.17
DD_015	Weight declaration	15.19
DD_016	Configuration Management Plan	15.20
DD_026	RAM report	15.22
DD_028	Reliability Management Plan	15.23
DD_018	EMC Strategy & Control Plan	15.36
DD_019	Software management plan	15.24
DD_020	HF Integration Plan	15.25
DD_029	Human factors report	15.26
DD_021	Test Plan	15.34
DD_030	Type Test Specifications	15.34
DD_031	System Test Specifications	15.34
DD_032	Maintenance documentation	15.35
DD_048	Software change log	15.13

14.6 Detailed Design Review (DDR)

14.6.1 The entry criteria for the DDR review is a completed CDR for which all actions have been closed to the satisfaction of the 'purchaser' and completion of the DDR Design Review Submission.

14.6.2 The DDR shall be conducted to evaluate the detailed design developed to meet the requirements of the TRS. The 'supplier's' submissions shall provide sufficient information to demonstrate that the 'CCTV system' design is complete, will meet the requirements of the TRS, and that it will be fit for purpose.

14.6.3 The DDR Design Review Submission shall include the following products.

ID	Submission	Defined in paragraph
DD_001	Engineering plan	15.1
DD_003	Risk Register	15.3
DD_022	Engineering safety management report	15.4

DD_005	Quality Plan	15.5
DD_006	Manufacturability plan	15.6
DD_007	Obsolescence management plan	15.7
DD_008	Product Specification	15.8
DD_023	Design calculations	15.9
DD_024	Declaration of design performance	15.10
DD_025	Register of non-metallic components	15.11
DD_009	Software design development document	15.12
DD_010	HMI concepts (including maintainer interface, alarm strategy)	15.14
DD_012	Interface Definition Document	15.16
DD_027	Installation requirements and constraints	15.17
DD_015	Weight declaration	15.19
DD_016	Configuration management plan	15.20
DD_033	Physical and functional configuration specifications	15.21
DD_026	RAM report	15.22
DD_034	EMC Test Specification	15.36
DD_029	Human factors report	15.26
DD_021	Test Plan	15.34
DD_030	Type test specifications	15.34
DD_031	System test specifications	15.34
DD_035	Train prototype test specifications	15.34
DD_036	Prototype Production Plan	15.31
DD_037	Training Matrix	15.27
DD_032	Maintenance documentation	15.35
DD_038	Maintainability Demonstration Plan	15.30

DD_048	Software change log	15.13

14.7 Prototype Design Review (PDR)

14.7.1 The entry criteria for the PDR review is a completed DDR for which all actions have been closed to the satisfaction of the 'purchaser' and completion of the PDR Design Review Submission.

14.7.2 A PDR review shall be conducted to evaluate the readiness of the designs for prototype installation and testing. The 'supplier's' submission shall provide sufficient information to demonstrate that the prototype and testing plans are fit for purpose. Once all actions are completed to the 'purchaser's' satisfaction, prototype manufacture and testing can commence.

14.7.3 The PDR Design Review Submission shall include the following products.

ID	Submission	Defined in paragraph
DD_001	Engineering Plan	15.1
DD_003	Risk Register	15.3
DD_022	Engineering safety management report	15.4
DD_005	Quality Plan	15.5
DD_006	Manufacturability plan	15.6
DD_007	Obsolescence management plan	15.7
DD_008	Product Specification (prototype)	15.8
DD_023	Design calculations	15.9
DD_024	Declaration of design performance	15.10
DD_025	Register of non-metallic components	15.11
DD_009	Software design development document (prototype)	15.12
DD_010	HMI concepts (including maintainer interface, alarm strategy)	15.14
DD_012	Interface Definition Document	15.16
DD_027	Installation requirements and constraints	15.17
DD_015	Weight declaration	15.19

DD_039	Physical & functional configuration audit reports	15.21
DD_026	RAM report	15.22
DD_040	EMC Technical file	15.36
DD_041	EMC compliance / safety case documentation	15.36
DD_029	Human factors report	15.26
DD_042	Type Test Reports/Certificates	15.34
DD_043	System Test Reports/Certificates	15.34
DD_035	Train prototype test specifications	15.34
DD_036	Prototype production plan	15.31
DD_044	Training Materials	15.27
DD_045	Prototype CRS (relevant sections of)	15.28
DD_046	Prototype CTC (relevant sections of)	15.29
DD_032	Maintenance documentation	15.35
DD_047	Maintainability Demonstration Report	15.30
DD_048	Software change log	15.13

14.8 Production Readiness Review (PRR)

14.8.1 The entry criteria for the PRR review is a completed PDR for which all actions have been closed to the satisfaction of the 'purchaser', completion of prototype testing, completion of track testing preparation and completion of the PPR Design Review Submission.

14.8.2 The PRR shall be conducted to evaluate the results of prototype testing and complete remaining design documentation. Close out of all agreed actions of the PRR shall provide the platform for project progression to the production stage.

14.8.3 The combined PRR Design Review Submission shall include the following products.

ID	Submission	Defined in paragraph
DD_003	Risk Register	15.3
DD_022	Engineering safety management report	15.4

DD_005	Quality Plan	15.5
DD_006	Manufacturability plan	15.6
DD_007	Obsolescence management plan	15.7
DD_008	Product Specification (As-Built)	15.8
DD_023	Design calculations	15.9
DD_015	Weight declaration	15.19
DD_024	Declaration of design performance	15.10
DD_025	Register of non-metallic components	15.11
DD_009	Software design development document	15.12
DD_048	Software change log	15.13
DD_012	Interface Definition Document	15.16
DD_027	Installation requirements and constraints	15.17
DD_039	Physical & functional configuration audit reports	15.21
DD_026	RAM report	15.22
DD_040	EMC Technical file	15.36
DD_041	EMC compliance / safety case documentation	15.36
DD_029	Human factors report	15.26
DD_049	Train prototype test specifications (AC Traction train)	15.34
DD_050	Train prototype test reports/certificates	15.34
DD_051	Routine Production Test Specification	15.34
DD_052	Pre-installation test specifications	15.34
DD_053	Pre-installation test equipment product specification	15.33
DD_054	Post-installation (commissioning) test specifications	15.34
DD_055	Production Plan	15.32

DD_032	Maintenance documentation	15.35
DD_047	Maintainability Demonstration Report	15.30
DD_044	Training Materials	15.27
DD_057	Fleet fit CRS	15.28
DD_058	Fleet fit CTC	15.29
DD_059	Test Rig Specification	TR_564 15.34
DD_060	PC Specification	TR_565

15 DOCUMENTATION

15.1 Engineering Plan

The engineering plan shall include a work breakdown structure, incorporating all the engineering activities required to deliver the scope of work. It shall include;

Specifications	A list of the product specifications to be produced.
Plans	A list of plans to be prepared
Design Schedule	A list of the design products to be produced and their date of production
Software Schedule	A list of software to be produced and their date of production
Design Reviews	A list of the internal and 'purchaser'-focused design reviews to be carried out.
Test Schedule	A list of the bench and on-train testing to be carried out, to be developed into the test plan.
Submittals	A list of all the information required to be prepared and submitted to the 'purchaser' shall be made
Calculations	A list of calculations to be carried out to be developed into concept and detailed design submissions.
Configuration Control	A list of equipment which is traceable at all stages of manufacture and for which its modification status shall be maintained to be developed into the configuration management plan.

15.2 Requirements Management Plan

The requirements management plan shall state how the 'supplier' intends to manage the requirements in this TRS. It shall include but not be limited to the following:

- Description of how the 'supplier' intends to manage the technical requirements, including identification and recording
- The list of technical requirements
- The 'supplier's' method for correlating work activities and requirements
- The 'supplier's' method for identifying requirements not met by any work activity

The requirements management plan may form part of the Engineering Plan.

15.3 Risk Register

The risk register shall list all project risks, complete with analysis of its probability, impact and how the risk will be mitigated. It shall be kept up to date throughout the project.

15.4 Engineering Safety Management Plan & Reports

The engineering safety management plan shall list the assessments and reports that will be produced in order to meet the safety requirements in this TRS. This shall also include a fire safety management plan. The Engineering Safety Management Plan may form a part of the Engineering Plan.

The engineering safety management reports shall summarise the emerging safety detail to reflect the progress of the developing design and include the outcome from all safety studies. This shall include all assessments identified in the Engineering Safety Management Plan and include those related to fire safety:

- Fire safety performance reports, including evidence for each material's compliance to fire safety requirements and a register of non-metallic components
- Hazardous materials register

15.5 Quality Plan

The quality plan shall demonstrate the recognition of quality requirements of the project, with a structured management system and methods for satisfying these requirements. It shall contain as a minimum:

- The names of the key personnel assigned to the project with details of authority levels and responsibilities
- An organisation chart showing the relationship between the various functions of the 'supplier's' employees on the project
- A method statement providing a breakdown of the scope of work into each and every activity and details of the quality control procedures, criteria and certification to be undertaken for each activity
- Details of the records of quality achievement which are to be retained and forwarded to the 'purchaser' during the agreement
- For electronic equipment in particular, a tailored life cycle model (refer to ISO/IEC/IEEE 15288), as required by TR_287.
- Details of all facilities used for design and production
- Details of specific design, production and quality controls

15.6 Manufacturability plan

The manufacturability plan shall demonstrate how manufacturability has been considered in the design, including evidence that the proposed designs are suitable for large scale production.

It may form a part of the Engineering Plan.

15.7 Obsolescence management plan

The obsolescence management plan shall demonstrate how obsolescence will be managed for each item and sub-system (refer to TR_200). The obsolescence plan

shall consider maintenance tools, hardware and software to maintain the ‘CCTV system’.

It may form a part of the Engineering Plan.

15.8 Product Specification

The Product Specification, or PS, shall detail the complete design definition and specification of the ‘CCTV system’ for manufacturing and verification purposes. It shall conform to BS 8888, LU RSE-S001 and S1180.

This shall also include a system-interfacing diagram, compliant to BS EN 50155, including the particular areas where isolation is required. It shall include the reference power supplies and the means of connections.

15.9 Design Calculations

Design calculations that support the production specification shall be provided, showing the working and result clearly.

Design calculations may form part of the PS.

15.10 Declaration of design performance

The declaration of design performance shall include sufficient explanation (and references to supporting documents where applicable) to indicate how the requirements of this TRS will be met, including a verification matrix with individual reference to each of the applicable requirements.

The document shall include a clear statement that compliance with the TRS will be achieved and a clear statement that the proposed design will be fit for purpose. It shall also clearly indicate any items that will not be compliant with the TRS, and an explanation of the basis for any concession requests. The ‘supplier’s’ concession requests shall include sufficient evidence to demonstrate that the non-compliance is appropriate and the risk mitigations that are in place.

15.11 Register of non-metallic components

A register of all components within the ‘CCTV system’ that contains non-metallic materials, along with material specification, and fire performance status.

15.12 Software design development document

The software design development document shall:

- Describe all software design development activities undertaken
- Follow the development process as detailed in BS EN 50128 and BS ISO/IEC 90003.
- Contain all documentation as detailed in BS EN 50128 and BS ISO/IEC 90003
- Be appropriate to the maturity of the software design at each design review stage.

Include a system architecture model demonstrating the functionality/interactions between each 'CCTV system' software module.

15.13 Software change log

The software change log shall log all the software changes made throughout prototyping.

This can form part of the software design development document.

15.14 Human Machine Interface (HMI) concepts

This shall document all human-machine interface concepts. This shall include:

- The ‘train maintainer’ facing menu screens
- The ‘train operator’ alarm strategy, i.e. health signal sent via ‘replacement DTS’

15.15 Interface Control Plan

The Interface Control Plan shall describe the strategy for managing the interfaces within the project and external to the project. The Interface Control Plan may form a part of the Engineering Plan. It shall:

- List the physical and functional interfaces between the modifications and other train systems, items of equipment, facilities and personnel, including those with the ‘supplied equipment, and internal LU projects. It shall include all physical interfaces, all electrical interfaces and all direct system interfaces.
- Describe how the interfaces identified will be managed and controlled
- Define how interface requirements will be identified
- Define how interface risks will be resolved, controlled or mitigated

15.16 Interface Definition Document (IDD)

An Interface Definition Document (IDD) will be produced by the ‘supplier’ to define and describe all interfaces with other systems or parties identified in the Interface Control Plan.

Where the interface is with another supplier, the ‘purchaser’ shall produce an Agreed Interface Definition Document (AIDD) generated from the relevant content of both suppliers’ IDDs. This shall be reviewed, agreed and signed by both suppliers and the ‘purchaser’. Changes shall then only be made by mutual agreement of all owners.

Note: these will be key in the management of the interface between the ‘CCTV system’, the Saloon Design ‘designer’, ‘replacement DTS’ supplier, and the ‘replacement PIS’ supplier (including space envelopes, fixing points, mass, EMC requirements etc.).

15.17 Installation requirements and constraints

The ‘supplier’ shall provide installation information to the ‘purchaser’ to allow the Saloon Design ‘designer’ to generate installation work instructions. This may include requirements or constraints on:

- Location
- Orientation
- EMC
- Fixings and fastenings
- Tooling
- Environmental resistance
- PPE requirements
- Safety considerations
- Installer competency requirement
- Materials
- Preparation tasks
- Installation tasks

- Recording arrangements

These requirements may be taken out of this TRS or generated by the ‘supplier’.

15.18 Design Management and Assurance Plan

The design management and assurance plan shall detail how the design will be managed, including the required design activities, work breakdown structure, resources allocated to each activity, plans for design reviews and assurance, technical risk and design interfaces and order of design delivery.

The Design Management and Assurance Plan may form a part of the Engineering Plan.

15.19 Weight Management Plan & Declaration

The weight management plan shall detail the processes that will be used to monitor, control and reduce, where possible, the weight of the ‘CCTV system’.

The weight declaration shall be derived from the PS of the relevant design review. It shall include new components, modified components and removed components and thus produce a total change in vehicle, unit and car weight.

15.20 Configuration Management Plan

The configuration management plan shall describe the resource, processes, procedures and disciplines which are to be applied to ensure the full traceability and delineation of all new or modified components supplied by the ‘supplier’.

The configuration management plan may form part of the engineering plan.

15.21 Physical and Functional Configuration Specifications and Audits

An audit of the physical and functional configuration of ‘CCTV system’ components shall be specified and conducted to demonstrate the component is consistent with the design.

The audit report shall record the results of the audit confirming that the product to be tested is consistent with the design.

15.22 RAM Strategy Plan and Report

The ‘supplier’ shall adopt a systems approach to reliability, availability, maintainability and safety (RAMS) as described in BS EN 50126-1. Preliminary plans shall show how the ‘supplier’s’ RAM management processes will integrate to deliver safety within the scope of work. Specific requirements relating to safety, reliability and maintenance are contained in this TRS.

The following specific RAM assurance deliverables are detailed in BS EN 50126-1 and shall be provided to the 'purchaser' as part of the RAM strategy and RAM report delivered as part of the design acceptance process:

- Reliability Management Plan
- Reliability apportionment – for each major subsystem of the ‘CCTV system’
- FMECAs - of the ‘CCTV system’ and its subsystems down to component level
- Fault Tree Analysis
- Reliability block diagrams – for all key components and subsystems

The RAM plan may form part of the engineering plan.

15.23 Reliability Management Plan

The reliability management plan shall identify all activities to ensure all reliability targets shall be met.

As a minimum, the Reliability Management Plan shall specify the following:

i. the reference mission profile
ii. the target reliability and availability
iii. monitoring and recording criteria
iv. acceptance-rejection criteria
v. the maximum duration time
vi. the cumulative test duration
vii. numerosity of the specimen
viii. specimen insertion/cancellation criteria
ix. failure analysis criteria

This can form part of the RAM strategy plan.

15.24 Software management plan

This shall define the software management activities required and how those activities shall be managed throughout the project lifecycle to ensure that the project is capable of meeting the software requirements of the TRS, specifically as required by BS EN 50128 and BS ISO/IEC 90003.

15.25 Human Factors Integration Plan

The Human Factors Integration Plan is defined in S1217 “Integration of Human Factors into System Development”.

The human factors integration plan may form part of the engineering plan.

15.26 Human factors report

The human factors report shall summarise the human factors detail of the developing design, as required by the Human Factors Integration Plan. This shall include the human factors task analysis.

15.27 Training matrix & materials

The training matrix shall identify the required training materials required to support the operation and maintenance of the ‘CCTV system’. It shall identify where there are skills, knowledge and attribute differences between new roles and existing roles as a result of the project to list the training needs.

The training material shall include train-the-trainer associated materials to support on-train and off-train maintenance, operation, testing, and commissioning of the ‘CCTV system’.

15.28 Change to Rolling Stock (CRS) (Prototype and Production)

The CRSs are LU internal submissions which will be produced by the ‘purchaser’. The ‘supplier’ shall submit such supporting evidence as requested by the ‘purchaser’ to ensure that the CRSs will be completed before installation commences.

15.29 Certification of Technical Conformance (CTC) (Prototype and Production)

The CTCs are LU internal submissions which will be produced by the 'purchaser'. The 'supplier' shall submit such supporting evidence as requested by the 'purchaser' to ensure that the CTCs will be completed before installation commences.

15.30 Maintainability Demonstration Plan and Report

The maintainability demonstration plan shall detail how maintainability shall be demonstrated i.e. physical demonstration of all maintenance activities.

The maintainability demonstration plan may form part of the engineering plan.

The maintainability demonstration report shall detail the results of the maintainability review, highlighting any issues with the proposed maintenance process, the steps taken to identify the causes, and mitigate or rectify the same, such that the relevant causes of the TRS are complied with.

15.31 Prototype Production Plan

The prototype production plan shall detail the plans for the manufacture, delivery, installation and testing of the prototype 'CCTV system'.

The prototype production plan may form part of the engineering plan.

15.32 Production Plan

The Production Plan shall detail the plans for the manufacture, testing and delivery of the 'CCTV system' production systems, and shall provide evidence that the items listed have been considered;

- Production planning
- Facilities allocation
- Incorporation of production engineering changes
- Identification and fabrication of tools/equipment
- Procurement of long lead items
- Routine testing

15.33 Pre-installation test equipment product specification

This product specification shall detail the complete design definition and specification of the pre-installation test equipment. It shall conform to BS 8888, LU RSE-S001 and S1180.

Test Rig Specification (DD_59) can form part of, or if appropriate can be, this specification.

15.34 Testing documentation

Testing documentation should support the testing the 'supplier' shall carry out as per Section 11.

15.34.1 Test Plan

The test plan shall describe all required tests to prove the 'CCTV system', including those during design, prototyping and production. These shall include those required as part of, as a minimum:

- Type tests

- Prototype tests
- Routine production tests
- Pre-installation tests
- Post-installation tests

For each test, the following shall be detailed:

- the equipment(s)/system(s)/car(s) to be tested
- when the test specification(s) will be produced and submitted for 'purchaser' acceptance
- when the test(s) will take place
- where the test(s) will take place
- when the test report(s) will be submitted for acceptance

15.34.2 **Test Report**

The 'supplier' shall produce a test report for each test, after the completion of each test. It shall detail the nature of the tests, the pass/fail criteria, the result of the test and whether the test was passed.

The test reports shall include the following:

a) Unique report reference number, issue number and report title, the issue and status of the test plan that applies to the test.

b) Location and date of test,

c) Name(s) of tester(s),

d) The serial numbers and modification state/version (hardware and software) of the equipment or car being tested,

e) Car number of the car undergoing test,

f) List of test equipment and instrumentation used including serial numbers and copies/details of calibration certificates,

g) Ambient conditions – for tests undertaken in the open,

h) Relevant test site characteristics,

i) Reference number of test specification,

j) Description of test undertaken,

k) Test results,

l) Analysis including Pass/Fail criteria,

m) Clear statement on whether test was passed or failed and why,

n) A clear description of any test failures;

   i. the equipment concerned and affected
   ii. the failure mode
   iii. the effect
   iv. corrective actions arising
   v. outcome of re-test.

15.35 Maintenance Documentation

15.35.1 The ‘supplier’ shall provide detail to facilitate updating of the illustrated parts list for 92TS in accordance with LU-RSE-S001 to reflect the 'CCTV system'.

15.35.2 The 'supplier' shall provide work instructions that comply with LU-RSE-S001 for all routine cleaning, maintenance, testing and inspection tasks, and periodic replacements (as per TR_200 and TR_201) required to maintain the serviceable condition and safe operation of the ‘CCTV system’ throughout the ‘design life’.

15.35.3 The 'supplier' shall provide work instructions that comply with LU-RSE-S001 for all expected casualty maintenance and inspection tasks anticipated within the ‘design life’ of the 'CCTV system’.

15.35.4 The 'supplier' shall provide raw data and images to allow the 'purchaser' to:

a) issue 'train operator' guidance information relating to the 'CCTV system'
b) update existing Defect Guides for the rolling stock type.

15.35.5 The ‘supplier’ shall give maintenance demonstrations for the purpose of LU health and safety risk assessment and human factors analyses.

15.35.6 The 'supplier' shall provide a storage schedule that complies with LU-RSE-S001 to the ‘purchaser’ which shall include, at least, the following:

a) General storage condition requirements
b) General storage instructions
c) On an individual item basis:
    i. Reference number – LU part number
    ii. Description of item
    iii. ‘manufacturer’ part number
    iv. Weight of item
    v. Dimension of packed item (if packed, may include multiple items in pack)
    vi. Dimension of part
    vii. Special handling conditions
    viii. Special storage instructions
    ix. Stackability – number that can be stacked
    x. Shelf life
    xi. Hazard details
    xii. Disposal requirements
    xiii. Whether the item is repairable or consumable
    xiv. Serialised spare
    xv. In-storage maintenance requirements

15.36 EMC documentation

15.36.1 EMC documentation shall comply with S1222, S1193 and G222.

15.36.2 Documented evidence (such as Declarations of Conformity DoCs) shall be required to demonstrate compliance of the 'CCTV system' with relevant EMC standards.

15.36.3 **EMC Strategy & Control Plan**

The EMC strategy plan shall describe the management of EMC requirements in this TRS, with reference to the following interfaces:

- Compatibility within the train between the new equipment and the existing train systems and equipment
- 'Train radio'
- Lineside signalling equipment;
- Neighbouring railways, including other London Underground lines
- Neighbours other than railways

The EMC strategy plan shall present a breakdown of activities to be undertaken in order to achieve EMC, and detail how the outputs of these activities will be compiled within the final EMC Technical Documentation.

The EMC control plan identifies the actions necessary to implement the EMC Strategy, including test specifications, FTA, FMECA, signalling compatibility documents, HAZOP and HAZIDs relating to EMC, including when they are planned to be produced.

The EMC control plan shall incorporate an assessment of the EM environment of the intended operating route.

15.36.4 EMC Test Specification

The EMC test specification shall define the EMC measurements of the prototype train necessary to demonstrate compliance with the EMC requirements.

15.36.5 EMC Technical File

The EMC Technical file shall collate all documentation that demonstrates compliance with the EMC requirements, including the outputs of the EMC Hazard Identification, in an EMC Hazard Log.

15.36.6 EMC compliance/safety case documentation

This document shall include sufficient evidence such that it can be demonstrated that the proposed 'CCTV system' complies fully with the EMC-related clauses of the TRS.

The 'supplier' shall demonstrate that all the EMC aspects have been considered and the 'CCTV system' will not increase the existing EMC risk to the railway.

The 'supplier' shall also demonstrate that the equipment does not generate magnetic fields, radiated electromagnetic fields and conducted interference that could affect the correct operation of other equipment or be injurious to persons.

All coupling mechanisms shall be considered e.g. inductive, capacitive, radiated and conducted. The following interfaces shall be considered:

- Signalling equipment on route
- Neighbouring railways, including other London Underground lines
- Neighbours other than railways
- Compatibility within the train between the new equipment and the existing Train systems and equipment
- 'Train radio'
- Consideration shall be given to failures that normally occur on the infrastructure and which could increase susceptibility

15.37 Safety documentation

15.37.1 Safety documentation shall be provided by the ‘supplier’ to the ‘purchaser’ with reference to the requirements in Section 10.10.

15.37.2 A safety assessment shall be conducted utilising a structured systems approach to assess all areas of the design and maintenance of the 'CCTV system' to identify, quantify and reduce the risks to be ALARP as per Section 10.10.4.

15.37.3 The safety assessment shall cover the entire scope of work, including any elements provided by sub-'suppliers' (to the ‘supplier’), and the health and safety risks and environmental impacts of all changes, activities or projects at the design, implementation, operational and decommissioning stages shall be assessed.

15.37.4 The ‘supplier’ shall produce a Safety Management Plan that outlines how the ‘supplier’ with approach and management safety in the design of the ‘CCTV system’ as dictated in Section 10.10.4.

16 REFERENCED DOCUMENTS

16.1.1 The following documents are referenced in this specification.

Reference	Issuer	Title/Description	Version
ROGS	ORR	Railways and Other Guided Transport Systems (Safety) Regulations	2006
BS EN 50153	BSI	Railway applications. Rolling stock. Protective provisions relating to electrical hazard	2014
BS EN 50343	BSI	Railway applications. Rolling stock. Rules for installation of cabling	2014
BS EN 50124 -1	BSI	Railway applications. Insulation coordination. Basic requirements. Clearances and creepage distances for all electrical and electronic equipment	2001
BS EN 50155	BSI	Railway applications. Electronic equipment used on rolling stock	2007
BS EN 1176-1	BSI	Playground equipment and surfacing. General safety requirements and test methods	2008
BS EN 62676-1-2	BSI	Video surveillance systems for use in security applications (Part 1-2: System requirements – Performance requirements for video transmission)	2014
BS EN 50132-5-1	BSI	Alarm systems - CCTV surveillance systems for use in security applications (Part 5-1: Video transmission – General video transmission performance requirements	2011
BS EN 50125-1	BSI	Railway applications — Environmental conditions for equipment	2014
BS 6853	BSI	Code of practice for fire precautions in the design and construction of passenger carrying trains	1999
BS EN 12663-1	BSI	Railway applications. Structural requirements of railway vehicle bodies. Locomotives and passenger rolling stock	2010
BS 7608	BSI	Guide to fatigue design and assessment of steel products	2014
BS 8118	BSI	Structural use of aluminium	1991

BS EN 60529	BSI	Degrees of protection provided by enclosures (IP code)	2013
BS EN 62262	BSI	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)	2002
BS ISO 3864-1	ISO	Graphical symbols. Safety colours and safety signs. Design principles for safety signs and safety markings	2011
BS 8888	BSI	Technical product documentation and specification	2013
BS EN 50128	BSI	Railway applications. Communication, signalling and processing systems. Software for railway control and protection systems	2011
BS EN 50126-1	BSI	Railway applications — The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) Part 1: Basic requirements and generic process	1999
BS ISO/IEC 90003	ISO	Software engineering. Guidelines for the application of ISO 9001:2008 to computer software	2014
BS EN ISO 22311	BSI	Societal security — Video - surveillance — Export interoperability (ISO 22311:2012)	2014
S1147	LU Standard	Surveillance & Security Systems	A1
S1180	LU Standard	Standard for Rolling Stock	A8
S2180	LU Standard	Passenger Rolling Stock	A3
S1538	LU Standard	Assurance	A11
S1222	LU Standard	Electromagnetic compatibility	A3
S1193	LU Standard	Electromagnetic Compatibility (EMC) With LU Signalling System Assets	A3
S1521	LU Standard	Safety and Decision Making	A6
S1217	LU Standard	Integration of Human Factors into Systems Development	A2

S1744	LU Standard	Operational Technology Cyber Security	A1
G222	LU guidance document	Guidance on electromagnetic compatibility	A3
G085	LU guidance document	Code of practice – Fire Safety of Materials and Fire Safety of Specific Items and Materials Used in the Underground	A5
LU-RSE-S001	LU project	Rolling Stock Engineering Product Specification requirements	0.01
LU-RSE-T001	LU project	Graffiti resistance type test	0.4
LU-RSE-T002	LU project	Liquid resistance type test	0.3
PVEC3149-LU-RSK-CCT-RP-0013-00	LU Project	Saloon CCTV 360^{o} Camera Trial	
PVEC3149-LU-RSK-CLI-RP-0020	LU Project	92TS Electrical Assessment of Control Supply	
PVEC3127-TR-002	LU Project	Environmental Context Document (Central Line)	A4
EASF-POL-0001	LU Policy	Security Policy: Cyber Security Procurement Language for Computer Based Engineering Assets	V1.31
EASF-POL-0004	LU Policy	Security Policy: Secure Network Engineering for Computer Based Engineering Assets	v1.0

17 APPENDICES

17.1 Appendix A - Envisaged CCTV system architecture

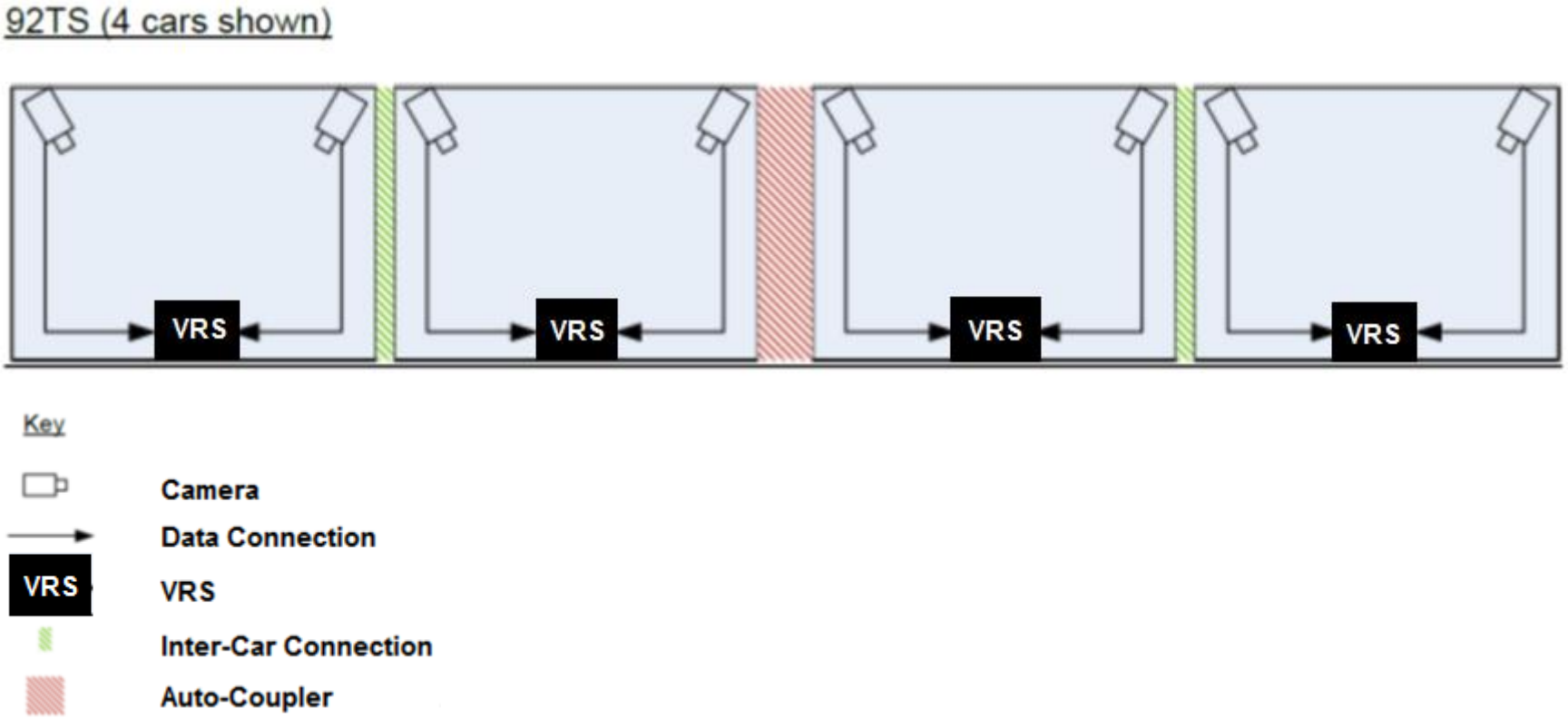


Figure 6 – 'CCTV system' per car system architecture

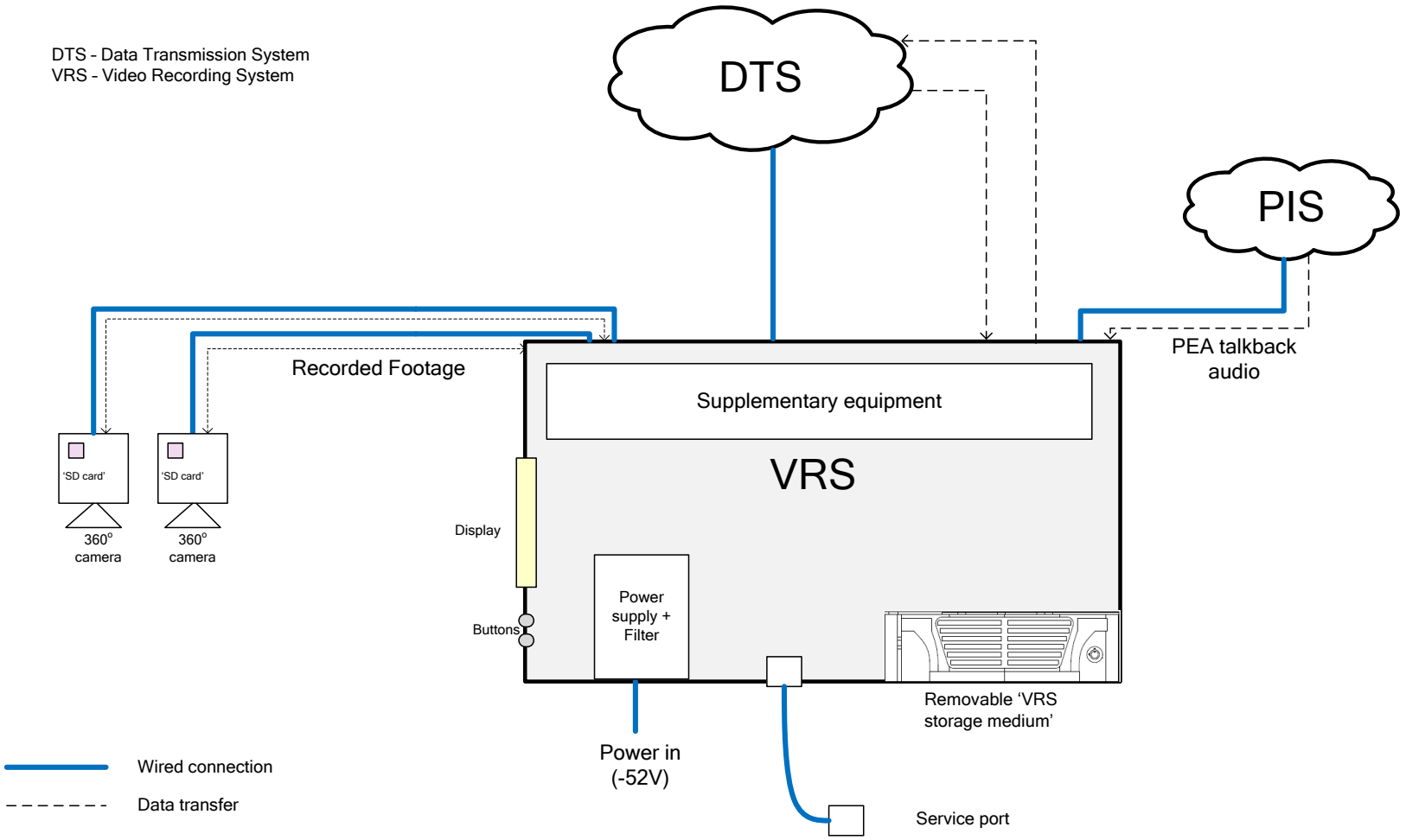


Figure 7 – Envisaged future 'CCTV system' per car

17.2 Appendix B − 92TS Central Line Fact Sheet

Please note, the information in this fact sheet is for the existing Central Line fleet, please see Section 6 for a description of the proposed changes to the Central Line fleet under CLIP.

Equipment details

Bodies:	Constructed by using welded aluminium extrusions. Pneumatically-operated sliding doors, externally hung. Exterior painted in London Underground corporate red, white and blue livery.
Bogies:	H-frame type bogies without headstocks, for welded steel-box section, built by Siemens Rail Solutions. Wheel diameter 700mm.
Couplers:	London Underground Automatic Wedgelock between units, semi-permanent bar between cars within a unit.
Traction system:	Brush Traction/ABB G.T.O. thyristor, dc chopper control with all axles motor by Brush Electrical Machines type LT130, frame-mounted traction motors with 21/136 gearbox ratio.
Compressors:	Westinghouse Type V.R.S.20 (reciprocating).
Brakes:	Fully blended dynamic regenerative rheostatic and E.P. brake with slip/slide protection. Automatic controlled spring applied, air-released parking brakes.
Auxiliary power supplies:	A.B.B./Brush Electrical Machines static converter, one per 2-car unit.
Main lighting:	Fluorescent tubes fed by inverters from 50V dc – 26 per car
Emergency lighting:	As main lighting, but remains lit when line supply fails. 4 fluorescent tubes per DM, 6 per NDM (additional to main lighting).

1992 Tube Stocks

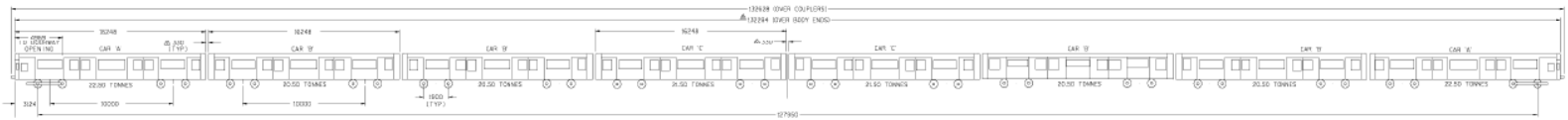
Central line

Built by ABB Transportation, Derby 1991-1994
Entered service Central line 1993-1995
Maintained by: LUL Nominee Company BCV

Principal characteristics

Track gauge:	4ft 8½ ins/1435mm
Current system:	630V dc 3rd and 4th rail, floating earth
Types of vehicle:	Driving Motor (DM) – car type 'A'
	Non-Driving Motor (NDM) – car types 'B' or 'C'
	De-icing Non-Driving Motor (NDM) – car type 'D'
Formation per unit:	Two cars, formed A-B, B-C or B-D
Formation per train:	Eight cars, in any one of 36 combinations of A-B, B-C and B-D two car units, with 'A' type car always at outer ends.
Number of train:	85 eight-car trains.
Operation:	Fully Automatic (A.T.O.).
	Non-automatic driving (coded manual (A.T.P.)).
	Emergency driving (slow manual)
	Doors operated by the train operator in leading cab.
	One person operated.

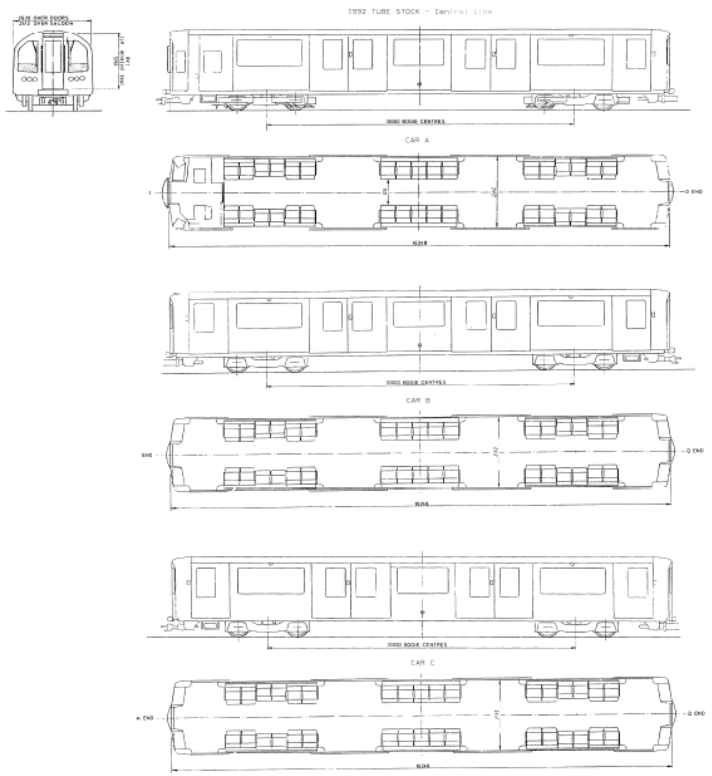
Information sheet : 4th Edition



1992 TUBE STOCK (TARE WEIGHT - 170.00 TONNES - 8 CAR TRAIN)

Vehicle details and statistics

		DM Car 'A'	NDM 'B'	NDM 'C'/'D'
Length over body ends:		16248mm	16248mm	16248mm
Width of body:		2620mm	2620mm	2620mm
Car height:		2869mm	2869mm	2869mm
Tare weight		22.5 tonnes	20.5 tonnes	21.5 tonnes
Tare weight of 8-car train:			170.0 tonnes	
Passenger door open width	(double) :	1664mm	1664mm	1664mm
Passenger door open width	(single) :	832mm	832mm	832mm
Car number series:	AB Units	A: 91001-91349 (odd numbers)	B: 920001-92349 (odd numbers)	-
	BC Units	-	B: 920002 – 92266 (even numbers)	C: 93002-93266 (even numbers)
	BD Units		B: 92402-92464 (even numbers)	D: 93402-93464 (even numbers)
Vehicles in stock:		175	340	165
Grand total in stock			680	



Passenger accommodation:

Please note that standing capacity figures exclude seating capacity

Seating capacity: (Number of seats per train)	272
Standing capacities: Floor area available for standing passengers (m^2)[a]	155.02
Maximum observed standing capacity (5 customers per m^2)	775
Maximum full load standing capacity (6 customers per m^2)[b]	930
Theoretical crush standing capacity (7 customers per m^2)[c]	1085

NOTES:

a) Capacities here are figures calculated from floor area for design purposes

b) For propulsion performance rating

c) For structural and braking capacity

SCHEDULE 1B: CONTRACT MANAGEMENT

PART A: PROJECT EXECUTION PLAN

1 INTRODUCTION

1.1 The Project Execution Plan ("**PEP**") sets out how the Supplier must manage the design, manufacture and supply of all items of Goods and the Services in accordance with this Agreement. The PEP will set out the management structure that will be responsible and accountable for all items of Goods and the Services.

1.2 The PEP is comprised of the plans, information and obligations set out in paragraphs 2 to 11 of this Schedule 1B Part A. The Supplier shall ensure that all plans contained within the PEP remain in place for the duration of this Agreement and shall perform its obligations under this Agreement in accordance with the PEP.

1.3 The PEP will be a working document for the duration of the Agreement. The Supplier may submit additional information to be included in the PEP to the Purchaser from time to time for the Purchaser's approval (such approval not to be unreasonably withheld or delayed). Following approval by the Purchaser, such additional information shall form part of the PEP.

1.4 For the purposes of this Schedule 1B Part A, the procurement of the Goods and the Services shall be referred to as the "**Project**".

2 DESIGN AND MANUFACTURING MANAGEMENT PLAN

2.1 The document titled "DS-01: Design and Manufacturing Management Plan" (set out in Appendix 1 of Schedule 1B Part A) shall form part of the PEP and provide details of the following:

2.1.1 the activities that demonstrate how the Supplier will mobilise and organise sufficient, appropriately qualified and experienced staff;

2.1.2 any suitable facilities required for the Design, development, manufacturing and Testing of the goods;

2.1.3 the principal locations where the design, development, manufacturing, assembly and Routine Production Testing of the Goods will take place; and

2.1.4 in accordance with paragraph 1.3 above, the locations where any other tests relating to the Goods take place other than the Routine Production Tests, upon such tests being identified by the Supplier and/or agreed between the parties (as applicable).

3 PRINCIPAL LOCATIONS

3.1 The Supplier will use the Supplier's Works detailed below as the principal location for the Design, development, manufacturing, assembly, Testing and Storage of the goods. Third party type testing will take place at certified test houses for EMC, shock, IP and flammability testing, the location of which will be provided and agreed with the Purchaser in accordance with Clause 10.1.

3.2 **Specifications of the Supplier's Works**:

Suppliers Works	Employees	Size of site	Layout of Facility
The unit is located in Woolwich, South East London and local rail links to central London serviced via DLR, Network Rail and soon to be Crossrail. The location has good road links to the City via the A205 and A2 where the Jubilee Line can also be accessed at North Greenwich. It is estimated that during the day we are approximately 1 hours away to deliver goods from our Premises to the LU works in Acton. The design and production team are both located within the building. • The design would be undertaken by our qualified inhouse experienced engineering team located within the premises who individually all have over 15 years design experience in the transportation industry. • The work shop facility has access to a number of qualified site engineers who are called upon based on the project and skill sets required to implement the works. The Workshop facility can accommodate up to 5 engineers to work on system builds ranging from FAT rigs through to system build and test. •	*The unit currently accommodates 19 Employees comprising:* • *6 Design* • *6 Project Management* • *1 Planning* • *3 Business Development* • *2 Project Engineers* • *1 Stores Logistics*	*Site comprises of 2 floors with welfare amenities and meeting rooms comprising:* *1st Floor Offices* *160SqM* *Stores and Workshop* *250m³*	[redacted] [redacted]

4 LONG LEAD TIME ITEMS

4.1 The table below sets out details of any long lead items, being any Parts or Spares which will take longer than three (3) months to procure. The Supplier shall ensure that any long lead items are ordered promptly on becoming aware that they will be required.

Item	Component	Lead Time
NVR	MDR 6 - DVR	16 Weeks
360 Camera	[redacted]	8 Weeks
LU Rolling Stock Approved Data Cables	Cables and Connectors	12 Weeks

4.2 Paragraph 4.3 provides details of the principal Subcontractors that the Supplier will use to perform its obligations under this Agreement and the Design and Manufacturing Management Plan (as defined in paragraph 3 above) shall set out how assurance will be obtained from those Subcontractors. The determination of which Subcontractors are "principal Subcontractors" for the purpose of this paragraph shall be at the sole discretion of the Purchaser.

4.3 The Subcontractors listed below have been provisionally identified and form part of the Supplier's approved Subcontractor list. The Supplier shall update the below list following key Subcontractor selection and order placement and in any event within four (4) weeks of the Commencement Date.

Service	Subcontractor	Location
Procurement of all products from an existing supplier of surveillance hardware and software	DTI Australia	DTI Group Ltd 31 Affleck Rd Perth Airport WA 6105 Western Australia

5 TRAINING STRATEGY

5.1 The document titled "DS-02: Training Strategy" (set out in Appendix 2 of this Schedule 1B Part A) outlines how the Supplier will deliver Training Services in line with this Agreement and Schedule 3ASchedule 3Part BSchedule 3A (Continuing Support) and shall form part of the PEP.

6 PROJECT QUALITY PLAN

6.1 The document titled "DS-03: Project Quality Plan" (set out in Appendix 3 of this Schedule 1B Part A) (the "**Project Quality Plan**") shall form part of the PEP, it sets out the Supplier's approach to delivering the quality aspect referred to in Schedule 1A (*Specification*), Schedule 3A (Continuing Support) and Schedule 14 (*QUENSH*).

6.2 The Project Quality Plan details how the Supplier ensures:

6.2.1 the quality requirements are delivered in their sourcing of Parts and Subcontractors; and

6.2.2 the effective knowledge transfer in relation to the quality requirements to the Purchaser's staff for the installation and maintenance of all items of the Goods.

6.3 The Supplier will perform its obligations under the Agreement in accordance with the Project Quality Plan.

7 HEALTH, SAFETY AND ENVIRONMENT PLAN

7.1 The document titled "DS-04: Project Health, Safety and Environmental Plan" ("**HSEP**") (set out in Appendix 4 of this Schedule 1B Part A) shall form part of the PEP.

7.2 The Supplier confirms that the documents set out in Paragraph 7.1 above are consistent with the following guidelines and policies below.

Compliance Statement	Statement of compliance
All relevant EU/UK health, safety and environmental guidelines	Fully Compliant
The Supplier's own health, safety and environment management systems	Fully Compliant
The Rail and Underground Health, Safety and Environment Strategy 2014 – 2017	Fully Compliant
The Rail and Underground Health, Safety and Environment Policy (February 2014)	Fully Compliant
The Purchaser's corporate environment framework and all necessary elements of the QUENSH in Schedule 14	Fully Compliant
The Purchaser's accident and incident reporting procedure	Fully Compliant
TfL Work Related Road Risk (WRRR), required to transport the Goods.	Fully Compliant

7.3 The HSEP includes the following:

7.3.1 information on the Supplier's health, safety and environmental incident reporting procedures and how any such incidents will be reported to the Purchaser;

7.3.2 details of the Supplier's health and safety management system;

7.3.3 method statements and risk assessments (to be provided by the Supplier during the period from the delivery of the first goods until the handover of all goods to the Installer) that demonstrate a safe system of work in the delivery of the goods and handover to the Installer, including any special provisions associated with the size or weight of the goods and Spares;

7.3.4 a schedule of activities required to meet the delivery of the HSEP.

7.3.5 a completed QUENSH 'Supplier Menu' in accordance with Schedule 14;

7.3.6 a signed Health and Safety Executive ("**HSE**") policy statement; and

7.3.7 a copy of the Supplier Supplier's valid ISO 14001 certification (or equivalent) accredited by an appropriate body.

8 PROJECT GOVERNANCE PLAN

8.1 The document titled "DS-05: Project Governance Plan and Organisation" (Set out in Appendix 5 of this Schedule 1B Part A) shall form part of the PEP.

8.2 The Project Governance Plan ("PGP") details the Supplier's agreed internal governance process for the design, manufacture, assembly and testing of the Goods and provision of the Services.The Supplier's agreed internal project governance and controls include but are not limited to the following:

(A) the process for the Design, manufacture and acceptance of all items of Goods and the Services;

(B) organisation (responsibilities for project controls);

(C) scope management (including requirements management, and configuration management).

(D) change control (including design change control);

(E) estimation of any Variations; and

(F) the delivery of section 14 of the Specification in accordance with Schedule 1A of this Agreement;

8.3 The PGP includes details of the Supplier's project boards, or equivalent, that may affect the delivery of the Goods and the Services, including any terms of reference;

8.4 The PGP includes details of resources, processes, and procedures that will:

8.4.1 ensure that project progress is reviewed, assessed and reported on; and

8.4.2 demonstrate how all aspects of the development of the Goods and Services, requirements compliance and project risk are communicated to and agreed with the Purchaser.

9 PROJECT ORGANISATION:

9.1 The document titled "DS-05: Project Governance Plan and Organisation (Set out in Appendix 5 of this Schedule 1B Part A) (the "**Project Organisation Plan**") shall form part of the PEP.

9.2 The Supplier's Project Organisation Plan, includes, but is not limited to, the following:

9.2.1 an organisational chart showing a hierarchical management chart;

9.2.2 key interfaces (including the Purchaser, regulatory and approving bodies, sub-suppliers and other stakeholders);

9.2.3 a RACI (Responsible, Accountable, Consulted and Informed) Matrix for the Project Organisation.

9.3 The Project Organisation Plan details how the Supplier will organise the Project and sets out the Key Personnel. The table below sets out the details of the Key Personnel that the Supplier intends to use to perform its obligations under this Agreement. This table indicates whether such personnel are "Key Personnel" for the purpose of this Agreement.

Role	Person	Directorate / Organisation	Commitment (hrs/wk)	Key Personnel (Y/N)
Operations Manager (Project)	[redacted]	Delatim	16	Y
Commercial/Contractual Management	[redacted]	Delatim	5	Y
Design Manager	[redacted]	Delatim	8	Y
Assistant Project Manager	[redacted]	Delatim	28	Y
Project Engineer	[redacted]	Delatim	24	Y
CAD Designer	[redacted]	Delatim	40	Y
Document Controller	[redacted]	Delatim	5	Y
Quality/RISQS	[redacted]	Delatim	1	N
Technical Director	[redacted]	Delatim	3	N
Quantity Surveyor	[redacted]	Delatim	4	N
Health & Safety Officer	[redacted]	Delatim	4	N

10 DATA MANAGEMENT & COMMUNICATION PLAN

10.1 The document titled "DS-06: Data and Communications Plan (set out in Appendix 6 of this Schedule 1B Part A) shall form part of the PEP.

10.2 The method of data sharing and communication between the Supplier and Purchaser during this Agreement shall be the online contract management tool 'ASITE'. The Purchaser will provide the licences for 'ASITE' to the Supplier's Key Personnel at no charge.

10.3 The Data and Communications Plan ("DCP") sets out details of how the Supplier will share data and communicate with the Purchaser and the structure of the review meetings that are required;

10.3.1 document control;

10.3.2 methods of communication;

10.3.3 use of interface notices in accordance with Schedule 3A of this Agreement; and

10.3.4 periodicity of meetings with the Purchaser, which shall be in accordance with paragraphs 10.3 and 10.4 of this Schedule 1B Part A.

10.4 A project review meeting shall be held every two (2) weeks from the Commencement Date, in a manner, method and location which is agreed by both Parties (the "**Project Progress Meetings**"). Project Progress Meetings will include, but not be limited to:

10.4.1 a presentation from the Supplier on the current project status;

10.4.2 a health, safety and environmental review;

10.4.3 a review of the Contract Programme;

10.4.4 a review of any outstanding project communications;

10.4.5 a review of the Supplier Risk Register;

10.4.6 a review of key performance indicators;

10.4.7 a review of outstanding issues list; and

10.4.8 a review of the change control log;

10.5 Three (3) days in advance of the Project Progress Meetings, the Supplier shall provide the Purchaser with a current progress report containing details of the design, manufacture, supply, testing, development and implementation of all items of Goods and the Services including but not limited to the following:

10.5.1 a report recording performance against specific key performance indicators, as agreed with the Purchaser;

10.5.2 an updated Contract Programme with a specific report including but not limited to:

(A) all changes to critical path from previous update;

(B) changes in activity float; and

(C) Milestone report;

10.5.3 a brief narrative describing progress since the previous report including photos and videos if required; and

10.5.4 progressed details and update on all items and infrastructure required to deliver the Goods and the Services (such as all spares, and long lead items).

10.6 Where required the Supplier may be requested to take part in a further meetings with the Purchaser during term of this Agreement, at the Purchaser's discretion. The topics of such meetings will include but are not limited to:

10.6.1 reactions to commercial meetings via the ASITE process:

10.6.2 arising issues;

10.6.3 risk reduction reviews; and

10.6.4 Outstanding Issues List (OIL).

10.7 If a Party submits an early warning notice to notify the other Party of a particular risk or issue in advance, then the Parties shall convene a risk reduction meeting within three (3) to five (5) Working Days to formally address and resolve the issue.

11 RISK

The Supplier shall produce a risk management plan as further detailed in Schedule 1B (*Contract Management*) Part B (*Risk Management*).

Appendix 1: DS-01: Design & Manufacturing Management Plan

Transport for London
Saloon CCTV System for Central Line 92 TS

Title:

Design & Manufacturing Plan

Document No & Revision:

DEL-ITT-PLN-5741 R2

Date:
11-10-2017

		Signature	Date
Prepared by:	[redacted]		11-10-2017
Checked by:	[redacted]		11-10-2017
Approved by:	[redacted]		11-10-2017

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1. DOCUMENT SCOPE

This plan seeks to outline the manor of which the project will be mobilised and managed through the Design and Manufacturing phase of the works. Delatim as an organisation are experienced in large integrated role out projects for and on behalf of TfL which in particular involves the design, testing, storage and delivery of integrated systems across the multiple sites that make up the London Underground network. To undertake these sorts of projects we have both the experience and facilities to design complex solutions and undertake off site testing and manufacturing close to the heart of the network. Although this project does not reflect multiple sites it adopts all the same principles in ensuring the smooth implementation of the works.

This plan will reference and should be read in conjunction with other submitted documents that form part of the overall Project Execution Plan such as the Governance Plan, Design Management plan and the Storage Schedule.

2. PROJECT ORGANISATIONAL STRUCTURE

Upon Contract award we will mobilise the project management team that will be dedicated to developing the project team from our own pool of employees to set up the line of communications and architecture of skill sets required to deliver the works from a detailed handover of the project scope from the Delatim Operations Manager. This team will be the overall responsible parties for interfacing with the client's representatives

3. DELIVERY PROCESS

The project will enter a number of phases however the foundation for these will be set out from contract award and mobilisation and the team that will be set up as outlined in section 5 will begin work on ensuring everything is in place from the outset of the works. Please refer to the project programme for full details on the project phases and timescales for each activity.

The Operations Manager will be overall responsible for the delivery in accordance with the program of works and will initially develop and modify the RACI table and communicate the roles and responsibilities to the project team and provide a narrative of the programme to ensure that everyone is conversant with the project milestones that they are wholly responsible for.

The key elements of the delivery are the:

- Contract award
- Concept Design
- Detailed Design, SDR, CDR, DDR, PDR and PRR
- Detailed Design review's SDR, CDR, DDR, PDR and PRR
- Type Testing
- System Testing
- Train Prototype testing – DTS
- Train Prototype testing – DTS + AC Traction
- Track Tests
- Production Readiness
- Fleet Fitment

The design will require a small team to produce documentation and liaise with the client for interfaces to the rolling stock and develop the prototype system. This team will be assigned immediately to start developing the requirements specification, Interface management process and updating the risk register as required.

The Design will be developed in line with the Design Management plan of which the processes and techniques allow for the following:

- **Requirements Management** – ensuring the client's needs are delivered though the design;
- **LUL Design Requirements** – specific requirement relating to the project;
- **Design Philosophy** – the overall approach and aims of the multi-discipline Design Team;
- **Standards** – regulation of the design;
- **Design deliverables** – the design stages and tasks that will be undertaken and associated dependencies and deliverables;
- **Change Control** – managing technical and commercial change during the project;
- **Roles and Responsibilities** – the organisation of the Design Team;
- **Review & Design Checking** – a description of the various activities to be undertaken to ensure designs are robust and accurate.
- **Design Certification** – demonstrating the Assurance behind the design.

Full details of the design process for this project can be found within the Design Management Plan (DEL-ITT-DMP-4054 R1)

The procurement team will require to set in place all logistical process required to purchase and store the equipment in line with the project call off plan dedicating an area large enough in the stores to securely segregate the stock from the other day to day items required for other projects for the duration of the works. The key products such as the DVR and cameras will come from our distributor directly to our London warehouse for storage and the first batch will be prepared for the prototype

testing and installation works. Other sundry items are not considered to be long lead items and will initially be procured on an as required basis until the final component list has been confirmed. The storage requirements will be subject to further review in case certain items also require large scale stock holdings. Long lead items are listed in the table located in Section 9.

Monitoring

It is the responsibility of each Delatim department to apply quality metrics, statistical techniques and where applicable, other suitable means for monitoring processes. The methods used demonstrate the ability of the processes to achieve planned results. Appropriate corrective actions are taken when planned results are not achieved according to specified requirements. Continued suitability and increased effectiveness of processes is sought by developing, documenting and monitoring process measurements at appropriate points.

Corrective Action

The supplier has established and maintains a process of corrective action for non-conformance and preventative action to eliminate potential non-conformances. Customer complaints, product, process, or other types of non-conformance are recorded and tracked. Non-conformances are investigated to determine and eliminate the actual cause. Corrective Action following a non-conformance is determined, implemented, evaluated and incorporated and will be conveyed to the customer as necessary.

Preventive Action pre-empts process failure and is implemented prior to a system irregularity when it is foreseen that this action would improve overall performance. It also is used as a means of improving processes and outcomes.

Supply Chain

The Bidders sub-contract Supplier ensures that purchased products conform to specified requirements. They define supplier selection, evaluation and re-evaluation criteria. Purchased products are procured from approved suppliers and/or subcontractors that are evaluated and selected based on their ability to meet the bidders and its customers requirements.

Sub-contractors shall be required to submit a Project Management Plan and a Quality Assurance Plan to Delatim, as part of their response to the Scope of Work, to demonstrate the means by which the applicable requirements are to be met. These plans shall form the basis for formal assessment of the sub-contractor by Delatim, and shall be made available for review by the Customer on request.

Work will be allocated by means of work packages, which describe a significant portion of the total work to be performed by the sub-contractor. The work package will define tasks, deliverables, due dates, standards and procedures and quality acceptance criteria. These responses shall form the basis for formal assessment of the sub-contractor by Delatim, and shall be made available for review by the Customer on request.

Assessment of potential sub-contractors shall be performed prior to signing of any sub contract to verify qualifications, experience, skills, financial standing, and availability of appropriate resources.

Standard reporting procedures for the sub-contractor will be defined and form part of their terms and conditions. The sub-contractors will be required to conform to the Issue Management and Change Management procedures defined for the Project.

Escalation procedures shall be defined to permit issues to be escalated both within the project (sub-contractor to System Consultants to Delatim to the customer) and within each company's management levels through to executive level. Such escalation procedures will define trigger points for automatic escalation of unresolved issues.

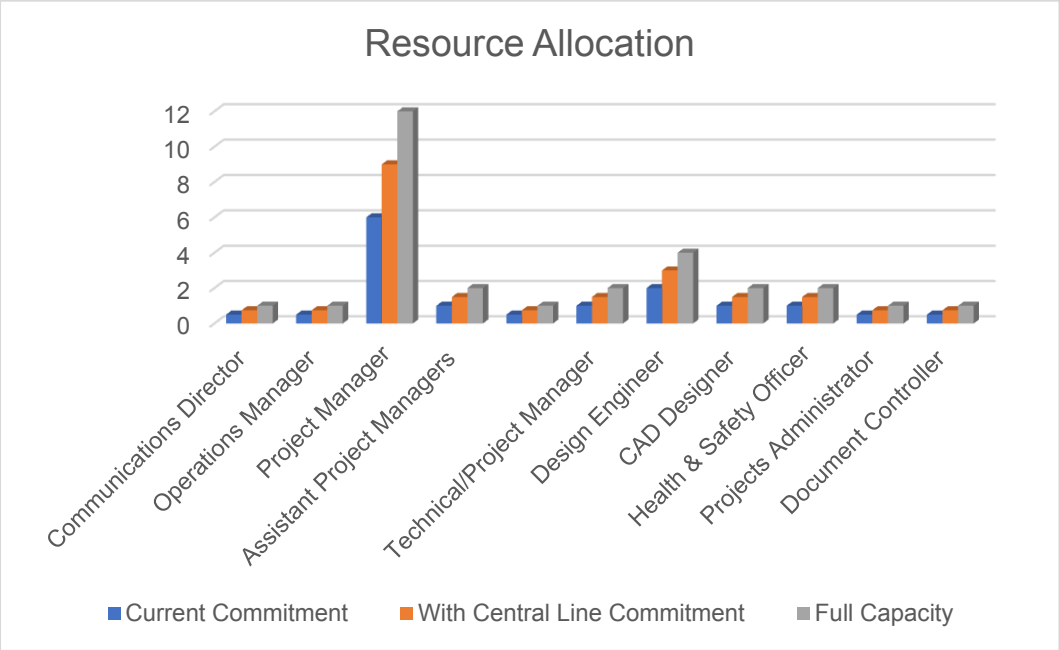
Periodic audits shall be performed to ensure compliance and continued effectiveness of procedures and controls identified in the Project Management Plan and the Quality Assurance Plan. An audit program will be maintained for sub-contractor audit, and made available to the Customer on request for review.

All material for products and contracted (deliverable) supplies, and services, are to be procured on internal orders, purchase orders or sub-contracts. The originator of a purchase order or sub-contract shall clearly describe the goods or services required, in addition to the price and quality inspection, traceability and acceptance requirements. When delivery is required by a particular time or date, it shall be defined on the purchase order or sub-contract.

The description of goods and services shall clearly define the requirement and, where applicable, make adequate reference to drawings, specifications or standards, issue status, or suppliers catalogue part numbers or other identifying features.

Each purchase order and sub-contract shall be raised by authorised staff and reviewed by the Project Manager for deliverable goods and services. The Project Manager and other technical staff, shall ensure that appropriate technical and quality requirements are detailed in the purchase orders and sub-contracts.

Resources Allocation



The chart above shows in blue the project teams current commitment. In orange the project team's commitment with the central line project. In grey the project team at projected full capacity. However it is to be noted that the project is to be active over a number of years and the expected management commitment is likely to full once the design and proto type installations are completed. This underlines the importance of the regular review and subsequent planning of the resources with the committed project time taking precedent in the later part of the project duration. The actual commitment required will be assessed during the regular planned meetings and lessons learnt workshops at the key project milestones.

The output of this may determine that either more or less resources are required from this point through to project completion and this will be communicated via the correct communication protocols as required. The table below outlines the key functions in the initial process of key personnel during the first 12 months of the project.

Resource	Responsible For
Communications Director	Client Kick Off Meeting

	Project Initialisation Resource Allocation Chair of Lessons Learnt Workshops
Operations Manager	Client Kick Off Meeting Project Initialisation Internal Project Kick Meeting Internal Review of Programme Staff Mobilisation Project Meetings Batch Deliveries Training
Project Manger	Client Kick Off Meeting Project Initialisation Project Meetings Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Assistant Project Manager	Project Meetings Status Reports Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Design and Assurance Manager	Review of Project Scope Design Meetings Test Plans Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Technical/Project Manager	Surveys Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Test Rigs/Prototyping Prototype Installation Support Production Readiness Review (PRR) Installation Support Test and Commissioning Training
Design Engineer	Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR) Post Design Deliverables
CAD Designer	Specification Design Review (SDR)

	Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Health & Safety Officer	Internal Risk Review Method Statements/Risk Assessments Risk Meetings
Projects Administrator	Project Documentation Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Document Controller	Project Documentation Documentation (Template Alignment Review)

It can be seen that the project is adequately resourced from the outset and the Governance plan review and escalation process will ensure that the correct resource level is both considered and maintained throughout the project life cycle. This will be ensured by regular assessment and review via Project Meetings, the Tier Management escalation procedure and lessons learnt workshops where all concerned can communicate concerns and identify risks to the resource levels of the project.

4. DESIGN AND WORKSHOP/WAREHOUSE FACILITY

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Recent examples of similar Design and build projects include:

- Virgin Trains East Coast On Board Pantograph CCTV
- Virgin Trains West Coast On Board Pantograph CCTV
- GBRF Pantograph , In-Cab and Side Body CCTV
- Earls Court Station Integrated Communications Systems upgrade).
- CCTV Phase 5 (comprised of 119 stations on LU's CCTV network)

Transportation links to the London Underground offices can be direct link via Network Rail, the DLR and soon to be opened Cross Rail system with the Jubilee line only a short drive away to North Greenwich.

The layout of the premises are incorporated over leaf in the facilities table.

Sub-Contractor(s)

The bidder will procure all products from an existing supplier of surveillance hardware (DTI Australia) and software whom with the exception of the manufacture of the cameras themselves are the designer, Supplier and supporter of all hardware and software for the project. The supplier is ISO-9001 certified and as part of ongoing projects with Rail vehicle OEM's undergoes regular audits of their business systems and supplier assurance programs.

The main suppliers manufacturing plant is based in Perth, Australia and is supported by numerous project and warehouse offices within the UK and wider European community.

The supplier produces the surveillance equipment in manufacturing batches of 200 – 400 systems with lead-times of 12 weeks routinely, therefore since the LRU's offered for this project are already in use on the UK rail network availability and volume of stock will not be an issue.

The supplier will have a locally based project manager to support the bidder on the contract.

Transport for London
Saloon CCTV System for Central Line 92 TS

Title:

Training Strategy

Document No & Revision:

DEL-ITT-DOC-5748 R2

Date:
11-10-2017

		Signature	Date
Prepared by:	[redacted]		11-10-2017
Checked by:	[redacted]		11-10-2017
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1. **ABBREVIATIONS**

CPU	Central Processing Unit.
DVR	Digital Video Recorder.
DVSS	Digital Video Security System.
GPS	Global Positioning System: a navigational system involving satellites and computers that can determine the latitude and longitude of a receiver on Earth by computing the time difference for signals from different satellites to reach the receiver.
SSD	Solid State Disk Drive.
LAN	Local Area Network.
LRU	Line Replacement Unit
MDR	Mobile Data Recorder.
MDR-6	A fixed/mobile security recorder and controller that integrates a video and audio security surveillance system with other location input and output parameters.
NetBIOS	Network Basic Input / Output System: A software interface that provides services to allow applications on separate computers to communicate over a LAN.
OS	Operating System.
PC	For the purpose of this manual, refers to a desktop or laptop computer running a Microsoft Windows XP or Windows 7 operating system and installed with the relevant application(s).
SoW	Scope of Work.
Video Manager	Refers to the Video Manager software incorporating the Video Editing features.

2. **INTRODUCTION**

2..1 Training Objectives

The training will be multi-disciplined based on a ‘train the trainer’ model. Regardless of the function the core objectives are the same that is following completion each candidate will be able to use the system with confidence within their remit. In doing so they will be able to:

- Efficiently use the system to achieve their necessary output;
- Provide instruction to others on the use of the system;
- Identify and report any fault or issue with the hardware or software.
- Measure performance of the system and system output.

2..2 General Training Methodology

DTI Training can be conducted on-vehicle, or classroom-based.
Trainees (participants) are assumed to:

- Have an accepted level of technical skill if they are carrying out installation or maintenance tasks on equipment. This required skill level is to be determined by the customer, and may involve formal qualifications or organisation-based certification;
- Have an accepted level of computer applications and basic network/server competence if they are being trained in the use of back-end applications (e.g. Video Manager);
- Have an accepted level of understanding and commitment to principles of occupational health and safety.

2..3 Training delivery

Training is provided using the following process:

- Welcome and housekeeping (safety, facilities, etc.);
- Introduction of modules – overview Course Objectives and context of training;
- Module delivery (for each module):
    - Description of concept (theory) using slides as required;
    - Demonstration by trainer – for devices at the demonstration bench, and for
    - applications on the trainer's computer projected onto a screen;
    - Hands-on activity and Question/Answer dialog as an ongoing assessment of understanding and skills;
    - Breaks as required;
    - Summary of module and review of module objectives;
    - If required – module assessment of understanding, using a questionnaire format;
- Trainees fill in Course Evaluation forms at the conclusion of all modules.

2..4 Course Summary

In summary, the courses will be structured to provide knowledge transfer to the clients training team, who following successful completion, will be able to construct, organise and provide instruction as part of training courses to those within the client organization who will interface with the proposed system on the following subjects:

- CCTV System Operations and Maintenance: This course is targeted for field technicians to understand and perform maintenance on the Digital Video Recorder (DVR) or cameras, and test operations and recording using Video Manager;
- Video Manager: Course covering all aspects on how to use the system media player to locate footage, save, export, edit, load to media and print.

2..5 Training Methodology

As the courses cover both hardware and software, they will include the following elements:

- Instructor-led training using PowerPoint presentation;
- Practical-based demonstration, using site-mock up training aids and guided discussions;
- Practical Assessment, the trainer uses an observational check-list per trainee and test each trainee one at a time after the demonstration;
- Recap questions to quiz the group;
- Theory assessment, which is closed book at the end of the course – however all answers will be explicitly hinted throughout the course and trainees encouraged to write answers to remember.

2..6 Assessment Methodology

Unless required by a Customer, DTI courses are not designed for officially qualifying participants. DTI is not a Registered Training Organisation (RTO). For this reason – and to ensure successful meeting of the Course Objectives - general assessment of skills and understanding is carried out by the course trainer frequently throughout the course delivery.

The trainer is expected to ensure that participants have a good understanding of key concepts, and can demonstrate key skills on an ongoing basis as the course is delivered.

Where a Customer requires formal assessment for an in-house qualification/certification, DTI can provide assessment (as defined by the course objectives) that determines:

- Understanding of key concepts – an assessment questionnaire completed and marked at the end of the course;

- Demonstration of key skills – assessed by the trainer during the course, as workshops are carried out for key activities. Competence for each participant is entered into a form in the trainer's Assessment Pack, if formal assessment is required.

At the end of the course, trainees are judged as:

- Competent – the trainer is confident the participant has the required knowledge and skills to carry out the tasks outlined in the course objectives. This is judged (by the trainer) on their competence and confidence with hands-on tasks and in showing a high level of understanding through the written assessment. The percentage of correct answers can be set in correlation with the customer – but should not be less than 80% (any safety training inherently requires 100% success of demonstrated understanding);
- Not Yet Competent – at the end of the course, the trainer will identify any trainee that clearly lacks skills and/or understanding to the degree that the trainer is not confident that the participant can independently carry out the required tasks (outlined in the Course Objectives). A remediation plan should be negotiated with the customer to provide additional training or assistance for such participants.

Trainees will be assessed for understanding throughout the course. There are three assessments:

- practical activity;
- problem solving;
- final assessment;
- recap questions.

2..7 Practical Activity

During the course, trainees are provided instruction on system awareness in terms of how the CCTV components interface with each other, why and key commissioning information such as naming system components and establishing that key operational parameters are in order. During this instruction, each candidate will be shown and asked to perform a practical activity and again at the end of each topic, the trainer will perform a practical demonstration using a training aid either by software or hardware, and then ask the trainees to repeat the activity.

2..8 Problem Solving

As part of the learning process once familiarity with the system is established and the Practical element has been completed to the satisfaction of the trainer, the course will be made aware of common faults that typically reveal themselves either through genuine malfunction of the system or via incorrect user operation. As part of each instance the most efficient means of resolving will be discussed and settled upon.

Following this informal instruction and discussion the candidates will leave the course room to allow the system mock-up units to be loaded / programmed with common faults that trainees will then be tasked to evaluate, identify and importantly solve whether this is LRU replacement or remedial works on the LRU in-situ. This valuable practice will also encompass the software suite.

2..9 Final Assessment

At the end of the course, trainees are expected to participate in a final assessment consisting mostly of multiple choice and true or false-based questions. This is a closed book assessment. The exam is twenty questions designed to test the knowledge of the candidate. The grading is as follows:

- High 16/20 or greater;
- Average 10/20 to 15/20;
- Fail 0/20 to 9/20.

2..10 Recap Questions

After each practical assessment is completed recap questions are then asked to quiz the group. This is an informal assessment for the trainer to engage the group as an interactive exercise.

Trainees are encouraged to write the answers in the provided space in their workbook, and then the trainer reveals the answers on the slide, and if necessary discusses the answers.

2..11 Report

The trainer submits a report outlining the following:

- Attendance;
- Learning difficulties and eases from observations;
- Technical issues from training system or facilities;
- Parking Lot questions – unanswerable questions are listed and fed back separately;
- Course Evaluation feedback;
- Exam Results;
- Nominated Champions – recommended trainees to be phone support if other personnel experience on the job difficulties.

2..12 Training Materials

The following manuals and training materials will be provided as part of and following the course enabling the successful candidates to conduct their own training class:

- trainers guide;
- powerpoint;
- student workbooks;
- user manuals;
- final assessments.

It is also anticipated that a number (to be confirmed) of bench systems will be provided ideally located within the training centre(s) to facilitate future courses.

2..13 Video Recording

The training sessions (key stages) are to be recorded on video with audio and at a later date (after all training is completed) edited and submitted and made available to the client training department.

2..14 Required Resources

To deliver the curriculum, the following resources are required:

- Training room;
- The following concept diagram (figure 1) shows the basic elements to be set up for running a training session. The room mimics a simplified system, with examples of devices connected to a backend server. This allows participants to discuss aspects of installation (mounting, cabling, etc.) and carry out device connection activities.

- Data projector
- 1 networked laptop for the trainer
- 1 x whiteboards with suitable pens, eraser etc.
- 8 x networked workstations/laptops
- Access to:
    - Microsoft Office, including Word, PowerPoint, Excel;
    - Adobe Acrobat.
- Training Materials:
    - Trainers Guide;
    - PowerPoint;
    - Student Workbook;
    - User Manuals;
    - Final Assessment.
- Training Aids:
    - Video Manager and archival video;
    - DVR;
    - Security Camera;
    - Video Camera and tripod;
    - Audio recording;
    - Ample media to record sessions.

2..15 Instructor's Laptop System Requirements

Hardware Requirements

When connecting the Video System components to a laptop or desktop computer system, the minimum requirements of this computer system are:

- Computer operating system and support software:
    - Windows 7 Professional 64-bit;
- Computer hardware:
    - Intel CPU, Core i5-4570 (Quad Core, 3.2 GHz) or better;
    - Intel 945 graphics GPU or better;
    - 4 GBytes RAM minimum;
    - 20 GByte hard disk space (60 GByte recommended);
    - DVD+/-RW drive.
- SVGA monitor: minimum 1024 x 768 pixel resolution;

- Data Projector: supports VGA and HDMI ports.

Installed Software

The instructor's laptop is to have the following software programs and applications installed:

- Microsoft Windows 7 Professional 64-bit;
- Video Manager application, including applicable map files;
- Log Viewer application (loaded with Video Manager).

2..16 Trainee's Laptop System Requirements

Hardware Requirements

When connecting the Video System components to a laptop or desktop computer system, the minimum requirements of this computer system are:

- Computer operating system and support software:
  - Windows 7 Professional 64-bit.
- Computer hardware:
  - Intel CPU, Core i5-4570 (Quad Core, 3.2 GHz) or better;
  - Intel 945 graphics GPU or better;
  - 4 GBytes RAM minimum;
  - 20 GByte hard disk space (60 GByte recommended);
  - DVD+/-RW drive;
  - SVGA monitor: minimum 1024 x 768 pixel resolution.

Installed Software

The trainee's laptop is to have the following software programs and applications installed:

- Microsoft Windows 7 Professional 64-bit;
- Video Manager application, including applicable map files;
- Fleet Manager application, including applicable map files;
- Log Viewer application (loaded with Video Manager.)

NOTE: This is not mandatory and is an option only but one we recommend.

2..17 Training Aids

- Saloon CCTV mock-up (Training System) including:
  - DVR;
  - Site camera assembly and SD card;
  - Other components that connect to the DVR;
  - Network connection;
  - All interconnecting cable assemblies;
  - Power Supply 240 VAC to 24 VDC @ 2 Amps, connector suitable for MDR-5L/MDR-5, part No. 1JT1008;
  - Spare Solid State Disk Drive (SSD) Caddy with HDD installed and formatted.

2..18 Additional Training Tools and Materials Required

The following tools and materials will be required for the various training operations in this document:

- DVR Caddy key;
- Instructor's laptop computer;
- Cable Ethernet CAT5e, RJ45 male connectors;
- Cable Ethernet CAT5e , RJ45 male to M12 8-way A-coded male connector, 1 Gbit version;
- Cable VGA male to VGA male connectors;
- Hand tools including:
  - M5 Allen key or Screwdriver with M5 Allen key head;
  - Screwdrivers;
  - Pliers, both long nose and bull nose.

3. **COURSE OUTLINES**

This section covers the considerations that have been made in scheduling the courses, and provides a timetable of courses per system.

3..1 Scheduling Considerations

Following is a list of limitations and other logistical considerations that have been taken into account when scheduling the training program:

- The program should commence four weeks prior to the go live date;
- Courses vary in duration;
- Some courses may need to be run more than once to allow personnel to attend;
- There is one trainer delivering all ‘Train the Trainer’ courses;
- There will be one dedicated mock-up training system. The training system will need to be prepared at least three weeks prior to training;
- There is a logical sequence for delivering the courses:
    - CCTV System;
    - Video Manager.

4. COURSE OUTLINES

This section lists each course and provides details such as the covered content, duration and recommended participants. The following courses are listed:

- CCTV Operations and Maintenance;
- Video Manager.

4..1 CCTV System

This section outlines information for the CCTV operations and maintenance course.

Table 4 - CCTV Operations and Maintenance Course

Course Element	Element Description
Course Title	CCTV Operations and Maintenance
Description	[redacted]
Learning Outcomes	[redacted]
Target audience	[redacted]
Prerequisites	[redacted]
Duration	[redacted]
Class size	[redacted]
Delivery method	[redacted]
Venue	[redacted]

Course Element	Element Description
Trainer Materials	• [redacted]
Training Aids	[redacted]
Trainee Material	• [redacted]
Assessment	[redacted]

4..2 Video Manager

This section outlines information for the Video Manager course.

Table 5 - Video Manager Course

Course Element	Element Description
Course Title	[redacted]
Description	[redacted]
Learning Outcomes	[redacted]
Target audience	[redacted]
Prerequisites	[redacted]
Duration	[redacted]
Class size	[redacted]
Delivery method	[redacted]
Venue	[redacted]
Trainer Materials	[redacted]
Training Aids	[redacted]
Trainee Material	[redacted]
Assessment	[redacted]

5. **COURSE LAYOUT AND BREAKDOWN**

This section summarises the course details, delivery and a breakdown of the course with timeframes.

5..1 Course Layout Structure

The course is delivered in the following structure:

- Course Introduction welcomes everyone, and lists the agenda (course topics), followed by the learning outcomes;
- Trainer briefly outlines student work features:

Sections divided into topics, containing;

  - Introduction to the topic;
  - Area to write notes;
  - Activity and relevant references to user or maintenance manuals;
  - Recap questions and spaces to write answers.

- PowerPoint topics contain the following:
- Number of slides which are lectured, notes or instructions are written into the slide notes;
  - Instructions are written in brackets, e.g. (Give trainees two minutes);
  - Instructions may include animations which require a mouse click, indicated by {CLICK};
  - Instructions indicated with {PRACTICAL ASSESSMENT} require the use of the Observational Check List (per trainee) to assess trainee to execute practical activity after the lecture demonstration;
  - There are also lecture notes to read out to the class, indicated in italics, e.g. this is the easiest way to connect locally, which is using a monitor, keyboard and mouse;
  - Throughout the course, lecture notes mention exam questions, this is the closed book assessment at the end, indicated as {EXAM} and key text underlined;
- Demo/Activity Slide, a demonstration of what was lectured is performed, and then trainees are asked to do it as an activity:
  - At this time, the practical activity is observed one at a time;
  - Advise other trainees waiting to read on the topic, reference numbers are available in the student workbook;
  - Three recap questions are then posed as a quiz, offer trainees two minutes to write down answers in the provided space in the work book, then spend a minute on the answers (revealed by clicking on slide).
- At the end after all topics, demonstrations, practical assessments, and quiz questions, hand out final assessment – this is a closed book assessment, no workbook, manuals, or notes are permitted. Duration is 20 minutes;
- Final questions and course evaluation;
- Refer to the breakdown table 5 below.

5..2 Course Breakdown

The following tables outline a breakdown of the courses with time estimates.

5..3 CCTV Operations and Maintenance

Table 6 - CCTV Operations and Maintenance Breakdown

Course Breakdown		
Time	**Activity**	**Training Material**
[redacted]		

Table 7 - Video Manager Breakdown

Course Breakdown		
Time	**Activity**	**Training Material**
[redacted]		

Transport for London
Saloon CCTV System for Central Line 92 TS

Title:

Quality Plan

Document No & Revision:

DEL-ITT-QP-5728 R2

Date:
11-10-2017

		Signature	Date
Prepared by:	[redacted]		11-10-2017
Checked by:	[redacted]		11-10-2017
Approved by:	[redacted]		11-10-2017

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1. **ABBREVIATIONS**

CCTV	CLOSE CURCUIT TELEVISION
COSHH	CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH
CRB	CRIMINAL RECORDS BUREAU
DVR	DIGITAL VIDEO RECORDER
FAT	FACTORY ACCEPTANCE TEST
LUL	LONDON UNDERGROUND LIMITED
ISO	INTERNATIONAL ORGANISATION FOR STANDARDS
PMT	PROJECT METHODOLOGY
PPE	PERSONAL PROTECTIVE EQUIPMENT
RIDDOR	REPORTING OF INJURIES, DISEASES & DANGEROUS OCCURRENCES REGULATIONS
SAT	SITE ACCEPTANCE TEST
SIT	SITE INTEGRATION TEST

2. QUALITY POLICY AND OBJECTIVES

2.1. Quality Policy Statement

It is the policy of the company to maintain a Business Management System designed to meet the requirements of EN ISO 9001:2008 in pursuit of its primary objectives.

The Company's Business Management System defines our quality objectives and key procedures.

Customer Service is an essential part of the quality process and to ensure this is fulfilled, all employees receive training to ensure awareness and understanding of quality and its impact on customer service.

Familiarisation with the contents of the Business Management System is part of the Induction process for new employees of Delatim Limited. It is also distributed to all employees in the event of an update.

To ensure that the Company maintains its awareness for continuous improvement, the Business Management System is regularly reviewed and is subject to annual audit.

The requirements of the Company's Business Management System are mandatory and all company personnel have a responsibility and obligation to it.

2.2. Quality Objectives

Delatim Limited aim to provide a professional and ethical service to clients. In order to demonstrate these, the following Quality Objectives have been identified:

- Customer Satisfaction
- Quality of our Service and Products
- On time Schedules and Budget
- A Complete Safe and Professional Service
- Attention to detail by Trained Personnel
- Technical Support at all times
- Commitment to Customer Service

To meet this commitment, the Organisation will operate under the control of a Quality System laid down in the ISO 9001:2008 series of standards. It is the Company's objective to operate and review this Quality Policy continuously by the Management and to implement and operate fully the ISO 9001:2008 Standard through registration and annual review.

3. PROJECT QUALITY

3.1. Organisation

The Managing Director James Delahunt, has senior management responsibility for ensuring that the Business Management System is implemented and maintained in accordance with the requirements of Delatim Limited EN ISO 9001:2008 accreditation.

The Designated Project manager is responsible for implementing the Business Management System/Procedures throughout this project. The management structure for this project can be referenced in Section 7.

3.2. Periodic Review

This plan has been reviewed in accordance with Delatim Limited Business Management System Section 13 Quality – Part 2 – Process Control.

The listed plans and documentation will be reviewed by the Project Manager when a significant event has occurred (e.g. the issue of variations or changes of scope) or every 6 months whichever is the sooner.

The intention of regular reviews is to ensure that:

- All contract requirements are adequately defined and documented;
- All requirements are agreed before their acceptance;
- Any differences between the contract scope and the tender/quotation are identified and resolved;
- All contract quality requirements are being met;
- Sub-contractors will comply with the contract quality requirements.

Quality will essentially be assured by the review and re-work of deliverables and the accountability being assigned to the appropriate parties involved in the delivery and submission of them. This is outlined in the RACI which is appended to the Governance Plan. Review is not only to be associated with documentation as it will also refer to the review of the physical works which will come under the jurisdiction of the testing and inspection plan and regimes. However, the project will develop a number of plans to ensure the process and appropriate metrics are achieved to ensure that the project end product meets both the commercial and technical requirements in accordance with the appropriate standards, these are identified in the table below. Where necessary documents are to be revised and reissued as required throughout the project lifecycle.

3.3. Table of documents for Quality Assurance

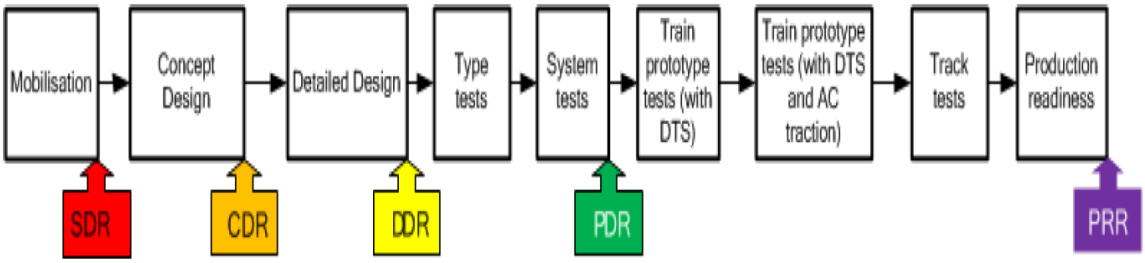
• Engineering Plan	• EMC Technical File
• Requirements Management Plan	• EMC Compliance / Safety Case Documentation
• Risk Register	• Type Test Reports/Certificates
• Engineering Safety Management Plan	• System Test Reports/Certificates
• Quality Plan	• Training Materials
• Manufacturability Plan	• Prototype CRS (relevant sections of)
• Obsolescence Management Plan	• Prototype CTC (relevant sections of)
• Product Specification (PS)	• Maintainability Demonstration Report
• Software Design Development Document	• Software Change Log
• HMI Concepts	• Train Prototype Test Specifications (AC Traction Train)
• Interface Control Plan	• Train Prototype Test Reports/Certificates
• Interface Definition Document	• Routine Production Test Specification
• Design Management and Assurance Plan	• Pre-Installation Test Specifications
• Weight Management Plan	• Pre-Installation Test Equipment Product Specification
• Weight Declaration	• Post-Installation (Commissioning) Test Specifications
• Configuration Management Plan	• Production Plan
• RAM Strategy Plan	• Physical and Functional Configuration Specifications and Audits
• EMC Strategy & Control Plan	• Fleet fit CRS
• Software Management Plan	• Fleet fit CTC
• HF Integration Plan	• Test Rig Specification
• Test Plan	• PC Specification
• Engineering Safety Management Report	
• Design Calculations	
• Declaration of Design Performance	
• Register of Non-Metallic Components	
• RAM Report	
• Installation Requirements and Constraints	
• Reliability Management Plan	
• Human Factors Report	
• Type Test Specifications	
• System Test Specifications	
• Maintenance Documentation	
• Physical and Functional Configuration Specifications	
• EMC Test Specification	
• Train Prototype Test Specifications	
• Prototype Production Plan	
• Training Matrix	
• Maintainability Demonstration Plan	

• Physical & Functional Configuration Audit Reports	

4. DESIGN INFORMATION

The Delatim design requirements and activities are in accordance with the Scope of works and include the following;

- Discharging our obligations as CCTV Designer and adopt full responsibility of the design for the works as described in the technical requirements documentation;
- Complete the required design stages from SDR thought to PRR with LU and other stakeholders.
- Proposing design changes to LUL, to optimise the system whole-life cost or performance;
- Design Compliance and approval will be based on the processes defined in LUL Standards and Technical requirements documentation. Please refer to figure 1 for the project design processes to be employed for this project.
- Interface designs and Management will be conducted throughout the project life cycle up until the production reediness review.
- Attending Technical meetings, if required, to discuss and agree interface and configuration requirements relating to the Saloon and DTS/PIS designs.
- The Anticipated Design Activities (figure 1), provides an overview of the above and all other design activities related to the works;
- Conduct design reviews for the following states of the design.
    1. Specification design review;
    2. Concept Design Review;
    3. Detailed Design Review;
    4. Prototype Design Review;
    5. Production Readiness Review**.**



5. PROJECT PLAN

5.1 Project Plan

A project plan has been generated to take into consideration key activities of known tasks for this project. Our standard 10 phase project programme template has been utilized for this project. Please refer to document DEL-ITT-POG-5701.

5.2 Project Plan – Phases/Activities

Identified programme of works phases are: -

Phase 0a – Project Initialisation
Activities included - Instruction to proceed, mobilisation, projects meeting

Phase 0b – Specification Design Review (SDR)
Activities included – Engineering Plan, Manufacturability Plan, Survey Method Statement/Risk Assessment

Phase 1 – Survey
Activities included – Survey works and survey reports

Phase 2 – Concept Design Review (CDR)
Activities included – Engineering Safety Management Report, Design Calculations, RAM Report

Phase 3a – Detailed Design Review (DDR)
Activities included – Physical and Functional Configuration Specification, Train Prototype Test Specification

Phase 3b – Prototype Design Review (PDR)
Activities included – Physical and Functional Configuration Audit Reports, EMC Technical File, Type Test Reports/Certificates

Phase 3c – Test Rigs/Prototype
Activities included – Test Rig Bill of Materials, Purchase Test Rig Materials, Soak Test

Phase 3d – Prototype Installation Support
Activities included – Train 01 First/Second Fixing

Phase 3e – Test & Commissioning Support
Activities included – SAT Testing

Phase 4a – Production Readiness Review (PRR)
Activities included – Train Prototype Test Specifications (AC Traction Train), Train Prototype Test Reports/Certificates, Pre-Installation Test Specifications

Phase 4b- Pre-Installation Batch Delivery
Activities included – Fleet Rollout Materials

Phase 5 – Installation – Support

Phase 6 – Test Commissioning
Activities included – SAT Testing, Health Status – Tigger Fault

Phase 7 – Training
Activities included – Training Syllabus, Train Trainer Sessions, Training Log

Phase 8 – De-Commissioning (Not Used)
Activities included – Decommissioning of redundant materials

Phase 9 – Post Design Deliverables
Activities included – Project Documentation, O&M Manuals, Test Certification

Phase 10 – Project Completion
Activities included – Project Completion Certificate, Lessons Learnt

5.3 **Project Plan - Resources**

From project conception, a resource schedule is developed along with the programme of works. Initially the resource schedule is generated from our training matrix which will identify key personnel required on the project.

The selection process is based on:-

- Competencies levels
- Availability
- Previous knowledge of system products
- Previously worked with the customer (with good feedback)

Categories of staff roles are:

Staff Member	**Quantity**
Project Team	

• Communications Director	1
• Operations/Project Manager	1
• Design and Assurance Manage	1
• Technical/ Project Engineer	1
• Design Engineer	1
• CAD Designer	1
• Health & Safety Officer	1
• Projects Administrator	1
• Document Controller	1

6. DOCUMENT CONTROL

6.1 Documentation

All documentation of controlled issue status will be controlled in accordance with Delatim Limited Business Management Procedures.

Section 1 – Administration – Part 6– Document Control, Documents shall be marked with a number, issue level, date and approval signature.

6.2 Document Retention

Documents relating to the supply and design shall be handed over to the customers representative at the completion of the project.

Internal records shall be retained in accordance with the contract requirements, or our Business Management system (Section 1 - Project Filing & Records Procedure – Part 8), whichever is the longest retention period.

Records that need to be generated and retained are:

- Design drawings, reports, reviews and calculations
- Test & Inspection records
- Records of calibration (to include details of the equipment used)
- Process and manufacturing details and traceability documents
- Non-conformance records
- Certificates of conformity, calibration and test

7. PROCESS CONTROL

7.1 General

The project shall be conducted in accordance with Delatim Limited Business Management Procedures – Document Control, Planning, Design, Product Realisation, Control of Monitoring and measuring equipment and Purchasing.

7.2 Survey Works

A project programme of Works shall be used to co-ordinate the survey, design and installation activities and can be used to control labour and material resources.

Method Statements and Risk Assessments shall be used to define, assess and control the works and are issued as documents of controlled issue status. Method Statements and Risk Assessments shall be sufficiently detailed to fully define the scope of works and shall be reviewed and approved by the designated employers representative prior to conducting the works.

7.3 Procurement/Handling of Goods/Suppliers

The project programme of works shall be used to identify the critical path, identifying items and suppliers with long-lead times, and to define the timely ordering and delivery of materials.

All supplier's will be on the Delatim Limited approved suppliers list. Delatim approved suppliers list is subject to control through the company BMS under section 1 parts 9 and 10. Whereby new suppliers are required to complete a "suppliers questionnaire" to ensure that they meet the correct criteria and this will be endorsed by further audits as detailed in Part 10 of the company BMS. The supplier will need to satisfy the criteria regarding the quality and compliance of the products and that the components are sourced taking into consideration both the related ethical sourcing and manufacturing of components and the environmental impact of subsequent production techniques and waste biproducts.

The Purchase policy/procedure is outlined within our Business Management System Section 13 – Quality - Part 3 – Purchasing. The correct handling and storage of materials shall ensure that they are maintained in good condition. This shall be in accordance with the suppliers/manufactures recommendations.

Supplier auditing will be a continuous activity through the project lifecycle and will be measured against the delivery of goods with the metrics being measured on:

- Timely delivery
- Quality of delivered goods
- Correctness of test results
- Failure rates of installed products
- Time scales of rectified failures

The key suppliers will be required in accordance with the Governance plan, be expected to be proactive in the "Escalation Process" and will be required to undertake and or participate in review meetings and "Lessons Learned" workshops at our request.

No items of equipment will require stock rotation or maintenance procedures to be conducted during storage.

7.4 **Corrective Actions / Concessions**

Non-conforming products and services will be dealt with in accordance with Delatim Limited Business Management Section 13 – Quality – Part 4 - Control of non-Conformance, Corrective/Preventative Action and Control of Non-Conforming Products.

Where non-conforming goods are to form a part of a permanent installation a concession shall be requested through the designated employers representative using the procedure to be defined by the designated employers representative.

Deficiencies in first in class/prototype/installation work (snagging) shall be recorded in a formalised manner and closure shall be recorded on either the completion sign off sheet, snagging sheet or the Inspection and Test Plan if required.

Corrective actions arising from defective goods or workmanship shall be investigated by the Project Engineer and the appropriate preventative action shall be planned and action taken. Preventative actions may include revisions to method statements/drawings/working practices or specific elements of training.

Preventive actions may introduce inspections of specific work areas to prevent re-occurrence of identified deficiencies.

7.5 Complaint Management

Complaints are dealt with through our Complaints Management process outlined within our Business Management System Section 13 – Quality - Part 6 - Customer Complaints –. Complaint log, Section 1 – Administration – Part 4 - HSQE Review Group is used to log complaints. Complaints are reviewed within projects meetings and the company's quarterly management review meetings.

7.6 Access / Protection Booking Procedures

Access to customer or customers representative property for the purposes of survey Prototype shall be booked in accordance with the individual customer Procedures.

7.7 Recording of Assets

All principal items of equipment shall be serialised and an Asset Register in agreement with the designated employers representative format shall form a part of the as-built packages submitted to the client. Designated employers representative shall provide details of the required format to Delatim Limited. Where this is not available (example of format) Delatim Limited will provide an Asset Register in our standard format.

7.8 Training/Competencies

Delatim Limited staff and subcontractors undertaking project management, design, Prototyping and maintenance activities shall be competent to do so.

The Delatim Limited staff competencies shall be recorded following the Staff Competence process within our Business Management System Section 2 – Training - Procedure for Competence Assessment – Part 3. Training Matrix is available to review these recorded staff competencies on a team or an individual's level of training and re-qualifications as appropriate.

7.9 Staff Performance Monitoring

[redacted]

7.10 Inspection and Test Plan

Inspection and test plans for this project will be developed from our standard template format. Using this methodology will ensure continuity throughout the contract. There are three main inspections and test plans available these being Factory Acceptance Test (FAT), Site Acceptance Test (SAT) and Site integration test (SIT). The use of these tests are explained below.

7.11 Factory Acceptance Test (FAT)

A test is drawn up for an individual product or system at our offices/factory or at the main product suppliers premises. This test is usually provided to the customer ahead of the test for approval. The customer is invited to witness the test and sign off.

7.12 Site Acceptance Test (SAT)

A test is drawn up for an individual product or system test at site. This test is usually provided to the customer ahead of the test for approval. The customer is invited to witness the test and sign off.

7.13 Site Integration Test (SIT)

A test is drawn up for a complete or part of a system on site or at an agreed site/premises. This type of test is usually formed of several systems, possibly alternative suppliers and therefore needs coordination usually through the customer. This test is usually provided to the customer ahead of the test for approval. The customer is invited to witness the test.

Other intermediate test are available which can be tailored to contractual obligations such as individual camera tests. All these tests will form a part of this Quality Plan.

8. INSPECTION, MEASURING AND TEST EQUIPMENT

8.1 Identification of Equipment used to Conduct Tests

Equipment used for inspection, measuring and test, where appropriate, shall be calibrated.
Calibrated equipment shall be marked with a label identifying its unique identity and current calibration status.

The identity of equipment used for a specific test shall be identified on the relevant Inspections and Test Plan (ITP) and/or appropriate test certificate.

8.2 Control of Calibrated Equipment

The Delatim Facilities Manager at Delatim's Offices maintains a register of calibrated equipment.
Competent contractors shall calibrate test equipment and provide and maintain records directly traceable to National Standards. All equipment shall be calibrated in accordance with the Supplier's recommendations, the contract requirements, and as a minimum, on an annual basis.
The Delatim Facilities Manager retains all calibration certificates (as a quality record held at the Delatim offices).

Equipment requiring calibration, or suspected of having been damaged will be recalled by the Delatim Facilities Manager/Quality Manager/ Project Manager/Projects leader, removed from use, labelled "Do Not Use" and physically quarantined until it has been re-calibrated / repaired to the required standard.

Equipment failing calibration will be both repaired and re-calibrated or if un-economical destroyed. The Delatim Facilities Manager/Quality Manager shall investigate the reason for the failure. The Facilities Manager/Quality Manager shall evaluate the potential consequences to the work performed using the failed item and, if required, re-work will be authorised by a Company Director.

The Delatim Facilities Manager in accordance with Delatim Limited Business Management System Section 9 - Provision & Use of Work Equipment – Part 1– Control of Calibrated Equipment, manages the calibration. The procedure incorporates all of the above control measures.

9. CONTRACT SURVEILLANCE AND AUDIT

9.1 Internal Quality System Audits

The Delatim Limited Business management is reviewed periodically and systematically on a regular basis, at least annually, in accordance with Delatim Limited Business Management System Section 1 – Managing the BMS – Part 21 – Management Systems Review and Audits.

The audit schedule, audit findings, details of any non-conformances and follow-up/close-out actions are maintained by the company Managing Director and shall be made available to the Designated Employers Representative upon request.

9.2 Internal Project Audits

In addition, at the discretion of the Managing Director/Project Manager, project specific audits may be conducted. The audit findings, details of any non-conformances and follow-up/close-out actions are maintained by the Managing Director and shall be made available to the Designated Employers Representative upon request.

9.3 External Quality Audits

Delatim Limited recognises that the Designated Employers Representative has the right to audit all aspects of this project. Delatim Limited shall provide all reasonable cooperation in relation to any such inspection/audit. External audits of our Business Management System is annually undertaken under our ISO accreditation.

9.4 Audit Schedule

During the course of this contract several audits will be undertaken. Delatim will draw up a formal audit schedule with the customer to undertake audits for quality and health & safety. These audits will be at least quarterly and reviewed within project meetings. The schedule will have the ability to be flexible in its auditable subject matter and when required have its frequency review dependent on outcomes of audits.

9.5 Internal Project Review

During the course of this contract several project reviews will be undertaken. A template project review meeting agenda is used to review the performance of Delatim. During the course of the contract Delatim will monitor and record it's performance through our project performance matrix's chart Section 8 – Safe Systems of Work – Part 9 Project Management. This matrix contains KPI's either contained within the contract or agreed with the customer on contract start up.

10. REPORTING METHODS

10.1 Statistical Techniques

Due to the nature of this project, sampling techniques are not anticipated to be used. However should the need arise, sampling procedures shall be in accordance with BS6001: 1972, Table 2-A and 2-B.

10.2 **Contractual Documentation**

The scope of contractual documentation to be provided under this contract is detailed in customers Master Service Agreement (MSA)/ Spares and Support Agreement (SSA).

11. **PROJECT GOVERNANCE PLAN**

A project governance plan has been produced for this project it should be read in conjunction with this Quality Plan as it indirectly provides processes and procedures that have an influence on quality processes. Please refer to document number DEL-ITT-DOC-5709.

Transport for London
Saloon CCTV System for Central Line 92 TS

Title:

Project Health, Safety & Environment Plan

Document No & Revision:

DEL-ITT-PLN-5750 R1

Date:
14-07-2017

		Signature	Date
Prepared by:	[redacted]		12-07-2017
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1. ABBREVIATIONS

ALARP	As Low As Reasonably Possible
APD	Asset Performance Directorate
BTP	British Transport Police
CAD	Computer Aided Design
CCTV	Closed Circuit Television
CDF	Cutting, Drilling, Fixing
CDM	Construction, Design, Management
CMS	Cable Management System
COTS	Commercial off The Shelf
DMP	Design Management Plan
DVR	Digital Video Recorder
EMC	Electromagnetic Compatibility
FAT	Factory Acceptance Testing
IDC	Inter Discipline Check
IP	Internet Protocol
ITP	Inspection & Testing Plan
ITT	Invitation to Tender
JNP	Jubilee, Northern Piccadilly
LAN	Local Area Network
LUCC	London Underground Control Centre
LUL	London Underground Limited
MAID	Mandatory Asset Information Deliverables
NVF	Network Video Recorder
ORR	Office of Rail Regulation
PAP	Project Assurance Plan
QUENSH	Quality, Environment, Safety and Health
SDC	Single Design Check
SOW	Scope of Works
SDP	Service Demarcation Point

2. MANAGEMENT OF THE WORK

The production of this plan, risk and impact assessments and method statements is the responsibility of Delatim Limited. All personnel shall carry out their roles in accordance with the CDM Regs, QUENSH and LU Standards.

2.1 Key Responsibilities of Principal Contractor

Delatim Limited as Principal Contractor and in compliance to the CDM Regulations is responsible for site safety and will manage this site by:

- The Notification to the HSE (F10) is updated and displayed. (Project Manager)
- Ensuring personnel are informed of the risks to their health, safety and welfare arising from the works on the project through a project induction and providing all with adequate information and training. (Information to be taken from this CPP, site specific method statements, risk assessments and COSHH assessments)
- Ensuring works carried out by sub-contractors are, so far as reasonably practicable, carried out without risks to health and safety. (Monitored through supervision and site inspections)
- Ensure sub-contractors are informed of the minimum amount of time which will be allowed for planning and preparation prior to works commencing.
- Emergency procedures for dealing with and minimising the effects of injuries, fire and dangerous/damaging occurrences are in place. (Informed through depot/project induction, details from method statement and briefing when signing in)
- Ensuring all suitable emergency equipment is in place including fire and first aid. (SPC responsibility of SPC when setting site up. Checked through planned inspections.
- Arrangements for reporting under RIDDOR are in place.
- Ensuring suitable arrangements for the provision and maintenance of welfare facilities are in place.
- Facilitate co-operation and co-ordination between persons concerned in the project.
- Make and maintain arrangements for consulting with workers or their representatives on matters of health, safety and welfare.
- Ensuring depot/site rules are in place and communicated.
- Providing all sub-contractors access to relevant sections of this Plan in order to adequately prepare for the work
- Updating the health and safety file provided by the Principal Designer.
- Monitoring arrangements for legal requirements and health & safety rules in place
- Taking all reasonable steps to ensure only authorised people are allowed onto the worksites and to protect the general public from the hazards present in the worksite.
- Ensuring competence checks are made to all site personnel.

2.2 Health & Safety Goals

The project will be delivered in accordance with the company's Health & Safety and Environmental Policies and will have the following objectives: -

1. To prevent by all practicable means, the number of accidents, dangerous incidents, damage to property, and hazards regarding health and safety at the place of work.
2. Minimise the environmental impact by controlling waste, preventing pollution and using energy efficiently.
3. To meet any London Underground Goals set for the project.

All project works carried out by Delatim Limited are undertaken in accordance with the Business Management Systems (BMS). The BMS contains all company policies and procedures applicable to the running of the project.

2.3 Arrangements

2.4 Liaison on Site

The Delatim site representative has overall responsibility for the day to day running of the worksite and for the implementation of the requirements and controls detailed in this plan.

The site representative ensures all members of the working parties are fully briefed on the contents of this plan and each specific method statement.

Briefings will include:

- Depot Induction
- Project Induction
- Signing in arrangements
- Emergency procedures
- Boundary of site
- Authorised safe access/egress routes
- Authorised walking routes
- Possession limits/isolation limits (where required)
- Any special working arrangements.
- Hazards associated with the depot activities
- Welfare arrangements
- Depot/Site Rules

2.5 Access/Egress

Access to and in the depot is on authorised walkways only. Staff to report and sign in with the DDM daily.

2.6 Project Induction

All members of the working party will be subject to a Project Induction. The induction will include:

- An overview of the project
- General Health & Safety
- Depot risks including train movements and machinery
- Site Specific Risks
- Access/Egress
- Restrictions affecting site work
- Site rules
- Wearing of mandatory PPE
- Mobile phones
- Permit to work systems
- Emergency arrangements
- Reporting of accidents and incidents
- Reporting of unsafe conditions/acts
- Drugs and Alcohol policy
- Welfare
- Storage
- Waste
- Housekeeping

2.7 On Site Training

All site personnel will hold a valid Rail Sentinel ICI-LU card. Operatives will keep their Rail Sentinel ICI-LU card with them at all times whilst in the depot. The card will be inspected by the Delatim Site representative prior to work commencing.

Prior to work commencing all operatives will be briefed on the contents of their method statement and will sign a briefing sheet confirming they have received and understand the method of works, associated risks and the control measures utilised for the task.

Copies of all specific training/competence requirements will be detailed in the task method statements. Records of training and competence will be retained by Delatim in the project filing system with copies of specific qualifications held by the Delatim site representative in the site file.

[redacted]

2.8 Welfare Facilities

Subject to agreement, the depot welfare facilities may be used by all operatives. Welfare facilities Eating or drinking will be prohibited in all other part of the depot.

2.9 First Aid

At least one member of the working party will hold a valid first aid qualification. The first aider will normally be the Delatim Site Manager. The identity of the first aider for each working shift will be communicated to all members of the working party during the pre-start method statement briefing held at the start of every working shift.

A suitable (50 person) first aid box and accident book will be kept on site by the Delatim site manager. The Delatim Site Representative will keep a record of all first aider certificated operatives and copies of all certificates will be held in the site file

Details of Nearest Hospital are
Charing Cross Hospital
Fulham Palace Road
London
W6 8RF

Tel: 020 3311 1234
2.5 miles
Open 24 hours

West Middlesex University Hospital
Twickenham Road
Isleworth
Middlesex
TW7 6AF

Tel: 020 8560 2121
2.8 miles
Open 24 hours

Ealing Hospital
Uxbridge Road
Southall
Middlesex
UB1 3HW

Tel: 020 8967 5000
3.1 miles
Open 24 hours

2.10 Accident Reporting and Investigation

2.11 Accident / Incident Reporting

All incidents (including Near Misses), no matter how trivial they seem at the time, must be reported to the London Underground Depot Manager who will in turn report them to the London Underground Incident Reporting Line (0844 292 0 292)

In case of accident or incident on site the following steps are to be taken.

- Ensure the safety and wellbeing of any injured persons and make all assets safe
- Report the accident / incident to the Site Representative
- Site Representative shall be responsible for ensuring that any accidents / incidents are reported to the Delatim HSE Manager.
- Site Representative shall also be responsible for ensuring that any accidents / incidents are reported to the Depot Manager who will in turn report the incident to the incident line and inform the LU HSE Manager.
- All incidents (including near misses) must be reported as soon as possible and within a maximum time limit of 24 hours of incidents occurring

2.12 Risk Assessments and Method Statements

All method statements will be prepared checked by the Delatim Project Manager.

2.13 Work Permits and Licences

All work within the operational Depot must be carried out with the appropriate authority obtained from the Depot Manager.

All LU licenses and permits as detailed in QUENSH shall be obtained as necessary for the works, those likely to be required for the project include (not limited to):

- Storage of materials
- Hot works Permits

All permits required shall be detailed in the task specific method statements and risk assessments.

2.14 Fire and Emergency Procedures

2.15 Fire

In the event of the alarm being raised all personnel will be required to stop what they are doing and make their way to the staff assembly point as detailed within the depot fire plan.

The depot induction will detail escape routes, position of fire points and the location of the SAP (Staff Assembly Point).

Task specific method statements will detail any additional fire control measures necessary including the use of fire points and fire watchmen if hot works are involved,

2.16 Emergency Procedures.

As per the Depot emergency procedure.

All new personnel to the depot are to be informed of the evacuation procedure.

In the event of an emergency evacuation, all personnel will evacuate the work areas by the nearest safe exit and meet at the designated rendezvous point as described in the depot emergency procedure.

2.17 Mobile Phones on Site

A mobile phone will be carried by the Delatim site representative at all times to aid communication, call emergency services and notify incidents etc as quickly as possible.

Mobile Phones will not be prohibited from the working party, but as part of the briefing, the site representative will detail their safe use during the works.

2.18 Personal Protective Equipment

All personnel shall be provided with the necessary PPE as identified in this plan, risk assessment and any associated task specific method statements.

Mandatory PPE for the site is:

Safety Helmet	BS EN 397
Hi –Vis Jacket	BS EN 471
Safety Boots (with steel toe-cap and mid-sole protection)	BS EN 345

In addition to the above, the gloves and glasses must be also be worn at all times except:

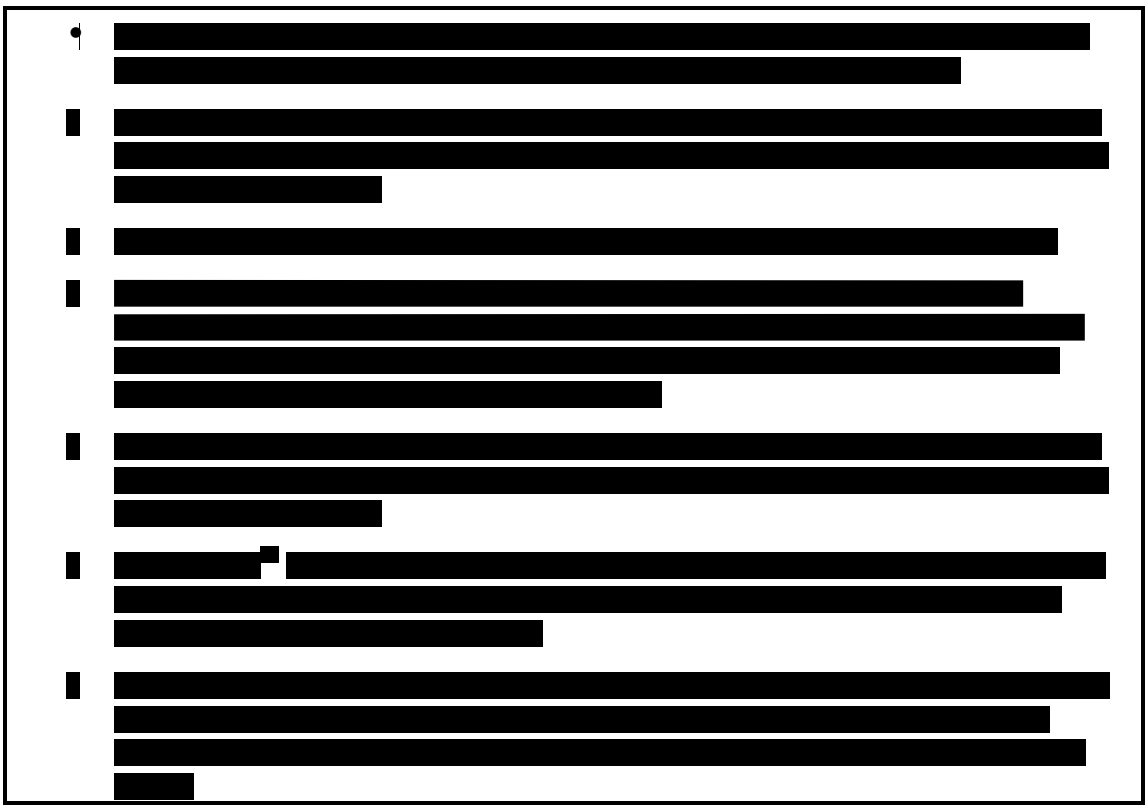
- Terminating fibre optic cables.
- Gloves need not be worn when undertaking surveys or inspections where writing reports, taking photos are being undertaken.

2.19 Drugs and Alcohol

Delatim will ensure all staff and sub-contractors are made aware of the Delatim & LUL Drugs and Alcohol Policies. This information will be included in the site induction.

Delatim also have an annual random Drugs and Alcohol Testing programme for all sites.

[redacted]



Anyone taking either prescribed or over the counter medicines must report this to the Delatim Site Representative or their SPC who will then record this and seek advice accordingly

Any breach of these requirements will result in permanent removal from site.

2.20 **Discipline**

2.21 **Site Rules**

All site personnel must comply with Delatim's site rules that include:

- Do not report to work under the influence of alcohol and/or drugs.
- Report any medication you have taken.
- Do not start work without a SSOW and task briefing.
- Only smoke in designated areas.
- Always carry with you all certificates and permits required to undertake your task.
- Immediately report any accident/Incident or Close Call to your supervisor.
- Never leave the site without first informing your supervisor.
- Obey all instruction given to you by your supervisor or any Delatim Representative.
- Always wear all the correct PPE when on site.
- No vehicles shall be allowed to reverse without a trained Banksman.
- No use of "prohibited articles": portable radios (except authorised), MP3 Players.
- Food and drink only to be consumed in site welfare facilities.
- Specific permits and licences to be in place for related activities before commencement of such works e.g. hot works; confined space; permit to dig; storage; hoardings.
- Scans to be carried out for embedded and or hidden services before any drilling or digging is carried out.
- Behaviour on site, including entering and leaving site to be appropriate to prevent offence or nuisance to the general public or our neighbours to minimise noise. Anti-social behaviour shall not be tolerated.
- Work environment / storage area to be kept tidy and clear of redundant materials.

- Access routes to be kept clear at all times.
- All warning and hazard signs to be adhered to.
- Comply with London Underground and Delatim policies and procedures inclusive of drug and alcohol.
- Report to the any damage seen or caused to the rail infrastructure.
- Plant shall not be left unattended with the keys in the ignition.
- Follow the emergency procedures.
- General public shall be treated with respect.
- Personal hygiene shall be maintained when working to prevent catching leptospirosis.
- No plant, machinery or vehicles shall be left running unnecessarily.
- Do NOT Take pictures of depot staff
- Go on or near the track;
- Do not attempt to access the traverser.
- Do Not approach any areas with screens erected for cutting and welding.
- Do NOT Touch or tamper with any part of the trains unless authorised.

Yellow Card
A yellow card is deemed as a verbal warning to an operative who has made a minor offence. It shall remain on that person's record for ninety days.

A yellow card may be given if a site operative is found to be:
- Not wearing the full PPE requirements of their project
- Wearing PPE incorrectly
- Undertaking an Unsafe Act
- Leaving a site condition unsafe (ie poor housekeeping)
- Horseplay

If a person receives a second yellow card within 90 days then this is deemed as a serious verbal warning and the person is issued a Red Card.

Red Card
A red card is deemed as a written warning and shall be issued for a serious site offence such as:
- Already been issued with a yellow card within 90 days
- Insubordination
- Fighting / Assault
- Misuse of equipment

A Delatim employee (Not supervisor) given a red card may immediately be sent home from site and will be required to report to the Delatim Office in Woolwich the following (Working Day/night) for an interview.

A contractor (Not supervisor) who receives a red card shall be immediately evicted from the site and the respective employer will be informed.

2.22 **Co-operation & Co-ordination**

Delatim will co-operate and co-ordinate all its works with that of the Client, maintenance staff and any other contractors who interface with these works.

3. **CONTROLLING SIGNIFICANT SITE RISKS**

3.1 **Safety Risks**

The significant items identified for activities during design phase are:
- Live Rails
- Train Movements
- Working at Height.
- Use of access platforms.
- Manual Handling

- Waste
- Individual Health Risks – as detailed below (Noise/Vibration, Lead Paint, Asbestos Etc)

3.2 Live Rails

The depot is an operational site where trains operate and rails must be deemed “Live” at all times. Always use authorised walking routes

3.3 Train Movements

The depot is an operational site where trains may be shunted in any direction at any time. Do not cross between trains or directly in front of or behind a train. Always use authorised walking routes

3.4 Working at Height/ Use of Access Platforms

Mobile Towers will be the key equipment to use when working at height the towers will be erected by PASMA trained operatives.

Each task specific method statement will detail the safe system of work to be adopted for that task.

The Delatim Site Representative will keep a record of all PASMA certificated operatives and copies of all certificates will be held in the site file

3.5 Manual Handling

Where manual handling cannot be eliminated by utilising mechanical means a manual handling assessment will be carried out for each individual task detail control measures in place to minimise manual handling risk.

3.6 Waste

In general, waste will be minimal but any waste generated will be double bagged and removed at the end of the shift. The bagged waste will be taken back to Delatim’s compound for disposal by registered waste management contractor. (Delatim are certified as Waste Carriers – License Number CB/KN5215UP)

3.7 Health Risks

Safe systems of working to control the hazards associated with these risks shall be detailed in the relevant task specific method statement.

3.8 Asbestos

London Underground’s infrastructure is known for asbestos being historically present. Such examples of asbestos usage includes: -

- Glazing rope seals.
- Flash Guards to switch gear.
- Panel Linings
- Ducting
- Steelwork Fire Protection or boarding hidden behind suspended ceilings.

Asbestos is a subject discussed and communicated to Delatim operatives as part of the toolbox talk manual. A record of operatives who have undertaken the toolbox talk will be held in the site representative s file. The toolbox talk will include what to do if you discover asbestos (as noted below):

If you think that you have discovered asbestos, the following actions must be taken:

- Stop work immediately
- Remove all staff to a safe position
- Contact the Station Supervisor who will contact the LUL Asbestos Control Unit (ACU) immediately.
- Record the names of all staff who were in the area (including any LUL staff and other contractors
- Ensure that this information is recorded in the site files for health record purposes
- Do not re-enter the area until given permission to do so by ACU

3.9 Noise and Vibration

The project involves a small amount of drilling which may cause increased noise within the depot. When carrying out these tasks, tools with low noise and vibration will be used. The allowable levels of noise and duration the tools can be used will be specified within the safe system of work. The noise levels and vibration levels will be monitored by the Delatim Site representative and will be recorded throughout the task and will be recorded on attached registers (see appendix).

The following controls will be utilised to manage Noise and Hand/Arm Vibration Syndrome (HAVS):

- Switching off plant and equipment when not in use
- Monitoring Noise Levels
- Regular checks on plant and equipment to ensure its well maintained.
- All Delatim Operatives to complete an annual HAVS assessment
- Daily HAVS register will be completed (see attached appendix)
- Selection of correct tools for each activity

3.10 Working Hours Policy

In order to prevent fatigue, this company complies with the requirements of Network Rail and Tfl's Working Hours Policies. Delatim has set the following working time limits set limits:

All employees and contractors carrying out safety critical work will work within the following guidelines:

a) No more than 12 hours to be worked per turn of duty.
b) No more than 72 hours to be worked per calendar week (Sunday to Saturday).
c) A minimum rest period of 12 hours (11 hours on LUL) between booking off from a turn of duty to booking on for the next turn.
d) No more than 13 turns of duty to be worked in any 14-day period. (On LUL no more than 6 in 7 days or 12 in 14 days).
e) No more than 14 hours door to door. (Total time from leaving place of rest (ie Home/hotel) undertaking work and returning to place for rest)

Note 1. The above restrictions do not apply to employees who carry out safety critical work and, following a normal rostered duty, are required to carry out other duties which are non-safety critical, e.g. Trade Union meeting or training.

Note 2. When returning from a non-safety critical duty to a safety critical duty, a 12-hour rest period must be achieved prior to booking on.

All employees and contractors carrying out non-safety critical work on the Railway Infrastructure will work within the following guidelines:

a) No more than 12 hours to be worked per turn of duty.

b) No more than 72 hours to be worked per calendar week (Sunday to Saturday).
c) A minimum rest period of 10 hours shall be taken between booking off from a turn of duty to booking on for the next turn.
d) No more than 13 turns of duty to be worked in any 14-day period.

3.11 Excessive Working Hours

Delatim recognises that under exceptional circumstances, an exceedance may be necessary. In the event of this situation occurring, the Site Manager will consider the following control measures and consequences before the Project Manager approving the exceedance:

- Consider scaling down works to ensure that excessive working is not necessary.
- Conduct and record a risk assessment, or ensure a risk assessment is conducted by a competent person and recorded, to determine the risks introduced by the exceedance (See Appendix A) and identify the suitable control measures to be introduced.
- Consult with the client to establish the potential consequence of the exceedance.
- Agree control measures with the client to minimise the risks introduced by the exceedance.
- Take into consideration the travelling time both to the site of work and the distance/time to return home.

When an exceedance is considered unavoidable the Project Manager will consider the following control measures to be implemented prior to the exceedance occurring:

- Removal from safety critical duties/working on or about Network Rail infrastructure.
- How individuals will get home upon completion of the shift.

Under exceptional circumstances, the person in charge of the works may request authorisation to exceed working hours. The authorisation MUST be confirmed and recorded on the Exceedance of Working Hours form (BMS/10/2/FM1) prior to the exceedance taking place and each operative must be interviewed and the interview form completed and signed. (BMS/10/2/FM2)

Authorisation can only be given by the Managing Director or the Project Manager or a delegate nominated in writing, for exceedance of Working Hours.

4. HEALTH AND SAFETY FILE

The Construction (Design & Management) Regulations 2015 require a Health & Safety File to be maintained throughout the life time of the project. Delatim Limited will, as Principal Contractor, record all documents, information and manuals for submission to the Client for inclusion in the MAID (Mandatory Asset Information Deliveries Products) Information.

4.1 Storage of Information

Information collected for inclusion in the health and safety file shall be stored in the project filing system held at Delatim's project office.

5. PLAN APPROVAL AND REVIEW

This Plan will be checked by the Delatim HSQE representative and approved by the Delatim Managing Director. No works shall commence on site until formal approval of this plan.

This plan is a live document and will be subject to review throughout the duration of the project. Updated revisions will be subject to review and approval. Revisions should reflect any changes to the ongoing health, safety and welfare arrangements.

6. ENVIRONMENT

6.1 Planning

6.2 Legal and Regulatory Requirements

The works shall be carried out in accordance with environmental legislative and regulatory requirements, LU Standards and best practice.

The key pieces of environmental legislation that shall apply to the project shall be:

- Control of Pollution act 1974 – regarding statutory nuisance provision: noise/vibration and nuisance emissions during construction type works (e.g. Dust)
- Environmental Protection act 1990, EPA (Duty of Care) regulations 1991 as amended and special waste regulations as amended regarding waste management (also applicable are the environmental protection (disposal of polychlorinated biphenyls & other dangerous substances) regulations 2000
- The wildlife and countryside act 1981 as amended and conservation regulations 2000 regarding protected species and site
- Water Resources Act 1991 – regarding protection of controlled waters

Where required, Delatim will liaise and obtain consents/authorisations from the necessary statutory bodies. The Project Manager will advise LU of any consents/authorisations which are required for specific work locations.

Consent/Permission/ Notification	Regulator	Comments	Responsibility
Section 61 agreement re: noise and vibration	London borough council (environmental protection officer)	Formal application required 28 days prior to works intended to be covered by agreement	Project Manager
Consent for working on or near to protected site (e.g. Site of special scientific interest) or protected species	English Nature /DEFRA	Written approval for assent required. Licences for working near to protected species, e.g. Badgers, may be required.	Project Manager
Notification of sites of removal of hazardous waste	Environment Agency	Pre-notification of site to the environment agency	Project Manager
Maintenance of waste records	Environment Agency	Maintenance of register of hazardous waste Recorded of all waster transferred	Project Manager or delegate

6.3 Environmental Considerations During Design

Environmental consideration will be given during the design phase with regards to sustainability and the control of noise, within the constraints of imposed standards and specifications Examples of considerations are as follows:

- Use of sustainable materials where possible and appropriate
- Use of RoSH compliant materials

6.4 Protected Species

No sites have been identified as being significant with regard to potential impact.

6.5 Significant Sites

No sites have been identified as being significant with regard to potential impact.

6.6 Tree Preservation Order (TPO)

No TPOs have been identified that could impact upon the project.

6.7 Conservation Areas

No areas have been identified as conservation areas that could impact upon the project.

6.8 Historic and Archaeological Sites

No areas have been identified as heritage sites.

6.9 Noise and Vibration

It is not anticipated that noise levels will be excessive however an assessment will be made of the works that are being conducted and the potential that the works have to cause significant noise and/or vibration, if this is the case notification will be given to the local authority of the proposed works and under permitted development rights then it will be simply necessary to show that the contractors are using best techniques to minimise noise levels.

6.10 Japanese Knotweed

The rail network has been extensively invaded by Japanese Knotweed. It is not anticipated that this will be encountered on this project.

6.11 Further Aspects Identified

No areas have been identified.

7. ENVIRONMENTAL OBJECTIVATES AND TARGETS

Delatim is committed to conducting our business in an environmentally responsible manner. We accept that we have a responsibility for the environment and sustainability, which should be influence, incorporated and promoted within our operations and the services we provide.

Delatim shall develop project environmental objectives and targets where appropriate which consider legal and other requirements and the project significant aspects and impacts. The objectives and targets shall also consider technological options, company financial, operational and business requirements, in addition to views of interested parties. The objectives and targets shall be consistent with Delatim's environmental policy, including a commitment to prevention of pollution.

7.1 Register of Significant Environmental Aspects and Impacts

Delatim, as Principal Designer will maintain a register of all aspects and the associated impacts.

8. WASTE MANAGEMENT

8.1 General

Delatim will ensure that any waste generated from site will be dealt in the appropriate way, in order to ensure compliance with UK waste management legislation. The applicable legislation is as follows:

- Control of Pollution (Amendment) Act 1989
- Controlled Waste Regulations 1992
- Environmental Protection Act 1990 (Part II)
- Environmental Protection (Duty of Care) Regulations 1991

8.2 Removal of Waste from Site

Any waste will be removed from site and returned to the Delatim store. Here it will be classified and separated and transferred to an appropriate skip. Licensed contractors are used to remove waste from the store.

8.3 Recycling and Re-use of Materials

Delatim is committed to recycling and re-use of materials where possible. If appropriate, materials stripped out from site will be offered back to the relevant maintainer for spares. Assets in good condition that are not required by the maintainer are kept back for future use in enabling works.

Electronic equipment which cannot be reused, generally due to life expiry, is recycled using a specialist waste contractor.

9. IMPLANTATION AND OPERATION

9.1 Structure and Responsibility

Delatim Project Personnel

Project Personnel are responsible for:

- Undertaking work in accordance with this plan.
- Identifying and reporting any problems or complaints to the Project Manager
- Identifying and reporting any new or unusual environmental issues, which may be significant to the Project Manager.

9.2 Checking and Corrective Actions

9.3 Monitoring and Measurement

Environmental issues are included in checklists for site inspections. Daily site surveillance and weekly formal inspections shall be undertaken by the Project Site Representative.

Where required, noise or other emissions such as discharges to water will be monitored as agreed with statutory bodies. This plan will be updated to reflect requirements once consultations with the relevant statutory bodies and surveys have been completed.

Project specific Environmental performance indicators will be set and forwarded to LU if required.

The Project HSQE Manager shall undertake regular site inspections and internal audits to ensure that the projects performance is in line with LU Environmental objectives

9.4 Non-Conformance and Corrective and Preventative Action

Non-compliance/conformance, corrective and preventative actions are recorded on the Delatim database and monitored.

9.5 Records

The Project Manager shall maintain records to verify environmental compliance during the course of this project:

- Site inspections
- Details of any reported non-conformances and corrective and preventive actions taken

- Environmental accident and incident reports, and corrective and preventive actions taken
- Controlled waste transfer notes and hazardous waste consignment notes
- Details of any complaints and follow up actions taken
- Records of communications with external parties including any consents/permissions obtained.

9.6 Audits

Delatim shall undertake regular audits to ensure that environmental management is being carried out in accordance with specified instructions and procedures. An audit programme is included in the project Environmental Management Programme.

The Delatim Project Manager and project personnel shall co-operate with any Environmental Audits undertaken by, or on behalf of LU.

10. MANAGEMENT REVIEW

A review of Delatim environmental management issues is undertaken at Project HSQE Meetings and Management Review Meetings. Issues arising from the project shall be raised at these meetings and appropriate actions agreed.

11. APPENDIX A - HEALTH AND SAFETY POLICY

The Organisation is fully committed to achieving and maintaining the highest standards of Health and Safety for its Employees, Visitors and the General Public by creating a safe working environment at all times and at the same time minimising the environment impact to employees and others caused by our works.

OBJECTIVES

Our objectives are to identify and minimise the risk of injury and health hazards of the persons who are affected by the Company's activities and to provide the appropriate Welfare facilities that are required and identified by the Organisation, Legislation and Employees. Our objectives are:

1. To reduce by all practicable means the number of accidents, dangerous incidents, damage to property and hazards regarding Health and Safety at the place of work.
2. Minimise the environmental impact by controlling waste, preventing pollution, using energy efficiently and acting as good neighbours.

POLICY

In order to achieve these objectives the Organisation will:

- Comply with all the applicable laws and regulations and any other requirements to which the Company subscribes and to provide a Safe Working Environment.
- Strive to continually improve the Health & Safety and Environment performance of the organisation.
- Provide safety advice and expertise to assist all the Staff and Employees to undertake their work in a safe and responsible manner.
- Provide, develop and maintain procedures as a framework and guide for safe and responsible working practices.
- Maintain a copy of the Company Safety Policy and Company Safety Procedures that are available to all staff and whoever and require that it is properly maintained and readily accessible.
- Require all staff to be aware of their safety and environmental responsibilities, and to comply with the Organisation and procedural arrangements detailed in individual responsibilities.
- Require each Supervisory level to be responsible for identifying and, in conjunction with the Safety Adviser, provide relevant safety training for all operatives and staff.
- Require to give staff the necessary authority and responsibility to implement the Company Safety Policy throughout its operations.
- The Company reminds all Employees that they have a responsibility not only for their own safety, but also for that of their colleagues and others by undertaking their work in a safe and responsible manner.

[redacted]

[redacted] **4th January 2017**

12. APPENDIX B - DELATIM ALCOHOL & DRUGS POLICY

This statement sets out the Delatim Limited Policy in respect of any employee or contractor carrying out safety critical activities or Sentinel Competence Card holders whose proper performance of their duties is or may be impaired as a result of drinking alcohol or taking drugs. Acts of Parliament, Regulations, Codes of Practice, Guidelines and readily available education materials support it.

Delatim have taken into account the-

- Transport and Works Act 1992
- Health and Safety at Work Act 1974
- Road Traffic Act 1988
- Misuse of Drugs Act 1971
- Management of Health Safety at Work Regulations 1999
- London Underground Ltd Standards
- Network Rail Standards
- Network Rail (Highspeed) Standards.

Provided that employees and contractors adhere to the provisions of this policy and fully co-operate with the Company's pre-employment, planned, unannounced or "for cause" alcohol and drugs screening arrangements they will normally be able to demonstrate compliance with the above statutory provisions.

Co-operate with the Company's pre-employment, planned, unannounced or "for cause" alcohol and drugs screening arrangements

Policy

Delatim will take all reasonable steps to ensure that employees/contractors are made aware of the contents of this statement together with relevant sections of Acts of Parliament and the implications therein. Furthermore as a reasonable employer Delatim will have in place procedures to prevent in so far as is reasonably practicable an offence under the above mentioned Statutory Provisions and a process to measure the effectiveness of such procedures.

It is a requirement of DElatim that no employee or contractor shall:
Report or endeavour to report for duty having just consumed alcohol or being under the influence of drugs.
Report for duty in an unfit state due to the use of alcohol or drugs
Be in possession of drugs or alcohol in the workplace, including locker rooms or in vehicles
Consume alcohol or drugs whilst on duty.

Alcohol Consumption Guideline

Delatim adopt the Statutory Guidelines enforced by the Police for the maximum amount of alcohol in the bloodstream. This currently is 80mg/100ml of blood. Certain activities undertaken with Clients are classed as "Safety Critical" e.g. LUL works. The level of alcohol in the blood is reduced in this instance. The allowable levels for works of this nature are contained in the Guidance for Contractors LUL Drugs and Alcohol Policy.

Prohibited drugs

Include as a minimum the following drugs or drug groups: -

- Cannabis
- Cocaine
- Amphetamines
- Barbiturates
- Benzodiazephines
- Dextrapropoxyphene
- Methadone

Opiates.

It should also be noted that the abuse of other legal substances such as glue or solvents is prohibited under this Policy.

In addition many medicines obtained with or without prescription can affect performance at work and employees must not report for duty if affected by such medicines. Examples include Tranquillisers, Sleeping Pills, and Antihistamines for Hay Fever and some cough cold remedies.

On being prescribed medicines individuals must always seek advice from their doctor as to the effect the medicine may have on their performance. In the case of non-prescribed medicines always read the instructions carefully and seek the advice of a pharmacist.

Employees should contact their HR Manager in confidence if they believe they have or are developing alcohol or drugs related problems.

Employees should contact their HR Manager in confidence if they believe a work colleague has alcohol or drugs related problems which may compromise safety.

Should an employee be found in breach of this Policy normal disciplinary procedures may result in charges of Gross Misconduct and dismissal. In the case of a “relevant person” who is found to be in breach of the Company’s Alcohol and Drugs Policy it should be stressed that only in exceptional circumstances will summary dismissal not be applied.

Should subcontractor personnel be found in breach of this Policy the individual will be prohibited from further work with the Company.

The Company will ensure that details of the individual and breach of the Company’s Alcohol and Drugs Policy are reported immediately to Network Rail/London Underground Ltd as required and reserves the right to inform the Police of any such behaviour or of any suspicions in respect of the use or possession of illegal substances.

Any employee who has declared an alcohol or drugs dependency problem will be assisted where ever possible by the Company to address the problem. However, any such declaration will not confer immunity from disciplinary action for any breach of this Policy.

[redacted]

[redacted] **4th January 2017**

13. APPENDIX C – ENVIRONMENTAL POLICY STATEMENT

Delatim Limited recognise the importance of maintaining our operations to ensure the Safety of the Environment. The Company recognises that effective management of our Environment makes good business sense and will be a fundamental and integral part of our business strategy.

To ensure we achieve these standards, procedures will be implemented to include the following:

- Being aware of how our activities impact the environment, to seek and minimise adverse effects by means of the best practices and available techniques, not entailing excessive cost, through a Policy of Quality, Health and Safety, and Environmental improvement in the workplace, control of pollution and care for the local Environment
- Comply with our legal responsibilities and play a part in future legislation.
- Comply with LUL and Network Rail Environmental Policies
- Conserve the use of resources, particularly those that are scarce or non-renewable, including the following.
    a. to avoid waste and encourage conservation, re-use and re-cycling. e.g. Conservation and Waste disposal Management
    b. to preserve, restore and enhance the built and natural heritage.
    c. to encourage the sustainable use of land based resources and certified timber and wood products.
    d. to reduce air, land and water pollution e.g. toxic chemical sprays, motor exhaust etc.

- Being sensitive to the Environmental concerns of our Clients and Community through which we operate and responding to them.
- Adopting Environmental objectives to continually improve our Environmental performance and
  monitor the progress of achievement.
- Using Supplies and Practices and a proper regard for the way we operate by disposing of waste materials as required by current legislation and to communicate this policy to all our Staff.
- To meet this commitment, the company will operate under the control of an Environmental System laid down in the ISO 14001:2004 series of standards. It is the Company's objective to seek to operate this Environmental Policy continuously and to implement and operate fully the **ISO 14001:2004** Standard through registration and annual review.

It is the Company's belief that, in applying these standards, it will be able to meet the requirements of its Customers and Industry.

[redacted]

[redacted] **4th January 2017**

Transport for London
Saloon CCTV System for Central Line 92 TS

Title:

Project Governance Plan

Document No & Revision:

DEL-ITT-DOC-5709 R2

Date:
11-10-2017

		Signature	Date
Prepared by:	[redacted]		11-10-2017
Checked by:	[redacted]		11-10-2017
Approved by:	[redacted]		11-10-2017

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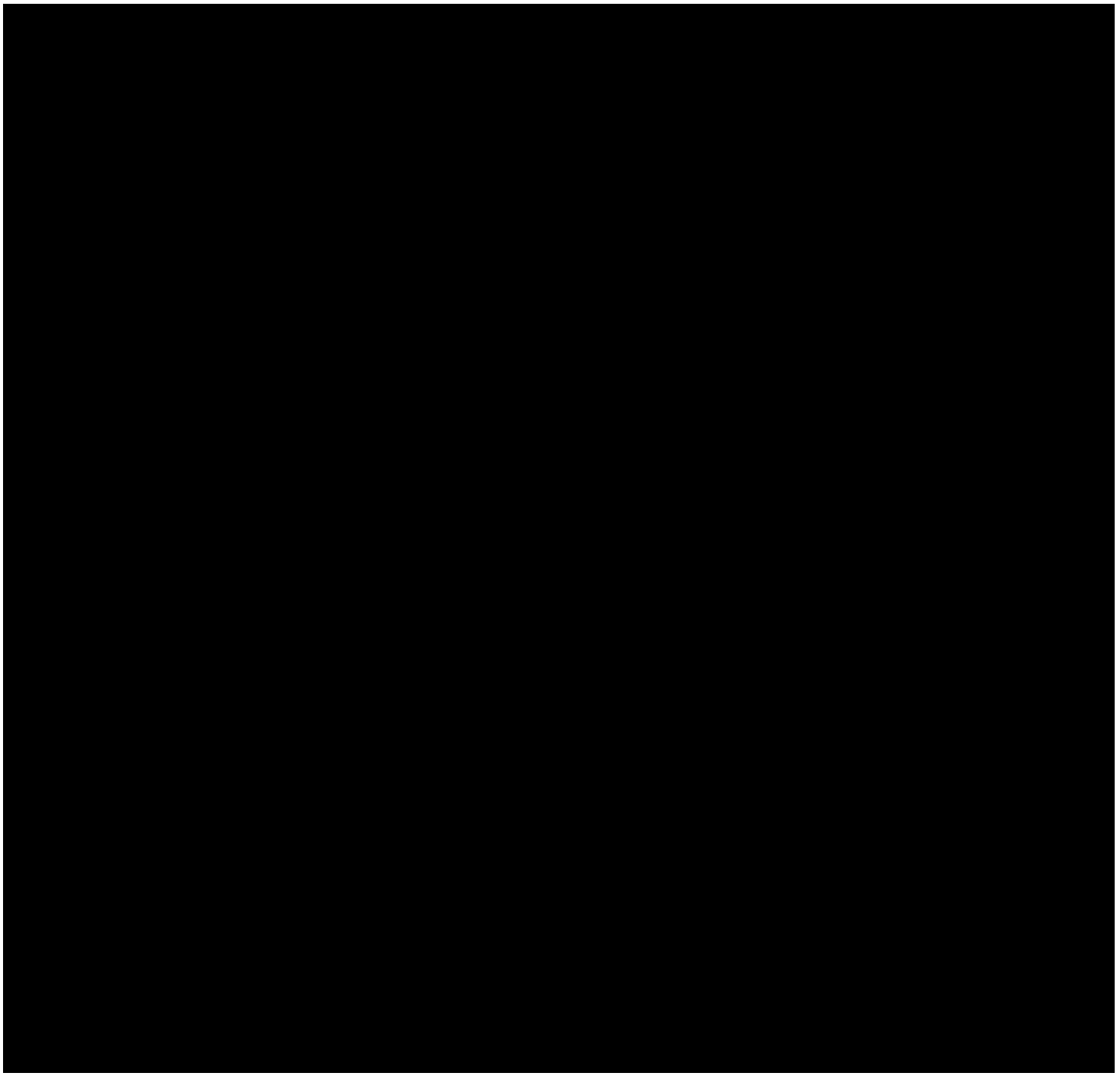
1. **ABBREVIATIONS**

ACHP	ASSET COMMISSIONING HANDOVER PLAN
BMS	BUSINESS MANAGEMENT SYSTEM – Delatim Limited
CC	CONTRACTORS' COMMUNICATIONS
CCTV	CLOSED CIRCUIT TELEVISION
CE	COMPENSATION EVENT
CEO	CHIEF EXECUTIVE OFFICER
COSHH	CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH
CV	CURRICULUM VITAE
DVR	DIGITAL VIDEO RECORDER
EW	EARLY WARNING
FAT	FACTORY ACCEPTANCE TEST
ISO	INTERNATIONAL ORGANISATION FOR STANDARDS
PPE	PERSONAL PROTECTIVE EQUIPMENT
PMT	PROJECT METHODOLOGY
RFI	REQUEST FOR INFORMATION
RFP	REQUEST FOR PROPOSAL
RIDDOR	REPORTING OF INJURIES, DISEASES & DANGEROUS OCCURRENCES REGULATIONS
SAT	SITE ACCEPTANCE TEST
SIT	SITE INTEGRATION TEST
TQ	TECHNICAL QUERY

2. ESCALATION

Typical project situations requiring escalation include conflicting resource demands threatening project staffing, group dependencies not being met, scope disagreements, and issues with functionality of the project's deliverables nearing release time.

It is for these reasons that when staff or customers require urgent action that they have the means of escalating their issues / concerns. Delatim Limited has an escalation process available to view on contract award. A summary of which is provided in Section 29.



Escalation Notes

Please refer to Point 28 Escalation below for detail on the Escalation process. The TIER process depicted above is to demonstrate that

3. PROJECT DOCUMENTATION

The following documentation listed below is planned to be submitted to LU, with the list broken down into key project phases. The five key phases for this project are: Specification Design Review (SDR), Concept Design Review (CDR), Detailed Design Review (DDR), Porotype Design Review (PDR) and Production Readiness Review (PRR). Full details of Delatim Limited Project Realisation Project Process forms a part of our ISO 9001:2008 Quality Manual.

Specification Design Review (SDR)	
Engineering Plan	First Draft
Requirements Management Plan	Final Issue
Risk Register	First Draft
Engineering Safety Management Plan	Final Issue
Quality Plan	First Draft
Manufacturability Plan	First Draft
Obsolescence Management Plan	First Draft
Product Specification	First Draft
Software Design Development Document	First Draft
HMI Concepts – Maintainer Interface Alarm Strategy	First Draft
Interface Control Plan	First Draft
Interface Definition Document	First Draft
Design Management and Assurance Plan	Final Issue
Weight Management Plan	Final Issue
Weight Declaration	First Draft
Configuration Management Plan	First Draft
RAM Strategy Plan	Final Issue
EMC Strategy & Control Plan	First Draft
Software Management Plan	First Draft
HF Integration Plan	First Draft
Test Plan	First Draft
Concept Design Review (CDR)	
Engineering Plan	Review & Update
Risk Register	Review & Update
Quality Plan	Review & Update
Manufacturability Plan	Review & Update
Obsolescence Management Plan	Review & Update
Product Specification	Review & Update
Software Design Development Document	Review & Update
HMI Concepts	Review & Update
Interface Control Plan	Final Issue
Interface Definition Document	Review & Update
Weight Declaration	Review & Update
Configuration Management Plan	Review & Update
EMC Strategy & Control Plan	Final Issue
Software Management Plan	Final Issue
HF Integration Plan	Final Issue
Test Plan	Review & Update
Engineering Safety Management Report	First Draft
Design Calculations	First Draft
Declaration of Design Performance	First Draft
Register of Non-Metallic Components	First Draft
RAM Report	First Draft
Installation Requirements and Constraints	First Draft
Reliability Management Plan	Final Issue
Human Factors Report	First Draft
Type Test Specifications	First Draft
System Test Specifications	First Draft

Maintenance Documentation	First Draft
Software Change Log	First Draft
Detailed Design Review (DDR)	
Engineering Plan	Review & Update
Risk Register	Review & Update
Quality Plan	Review & Update
Manufacturability Plan	Review & Update
Obsolescence Management Plan	Review & Update
Product Specification	Review & Update
Software Design Development Document	Review & Update
HMI Concepts	Review & Update
Interface Definition Document	Review & Update
Weight Declaration	Review & Update
Configuration Management Plan	Final Issue
Test Plan	Final Issue
Engineering Safety Management Report	Review & Update
Design Calculations	Review & Update
Declaration of Design Performance	Review & Update
Register of Non-Metallic Components	Review & Update
RAM Report	Review & Update
Installation Requirements and Constraints	Review & Update
Human Factors Report	Review & Update
Type Test Specifications	Final Issue
System Test Specifications	Final Issue
Maintenance Documentation	Review & Update
Physical and Functional Configuration Specifications	Final Issue
EMC Test Specification	Final Issue
Train Prototype Test Specifications	First Draft
Prototype Production Plan	First Draft
Training Matrix	Final Issue
Maintainability Demonstration Plan	Final Issue
Software Change Log	Review & Update
Prototype Design Review (PDR)	
Engineering Plan	Final Issue
Risk Register	Review & Update
Quality Plan	Review & Update
Manufacturability Plan	Review & Update
Obsolescence Plan	Review & Update
Product Specification	Review & Update
Software Design Development	Review & Update
HMI Concepts	Final Issue
Interface Definition Document	Review & Update
Weight Declaration	Review & Update
Engineering Safety Management Report	Review & Update
Design Calculations	Review & Update
Declaration of Design Performance	Review & Update
Register of Non-Metallic Components	Review & Update
RAM Report	Review & Update
Installation Requirements and Constraints	Review & Update
Human Factors Report	Review & Update
Maintenance Documentation	Review & Update
Train Prototype Test Specifications	Review & Update/ Final Issue
Prototype Production Plan	Review & Update/ Final Issue

Physical & Functional Configuration Audit Report	First Draft
EMC Technical File	First Draft
EMC Compliance/ Safety Case Documentation	First Draft
Type Test Reports/ Certificates	Final Issue
System Test Reports/ Certificates	Final Issue
Training Material	First Draft
Prototype CRS	Final Issue
Prototype CTC	Final Issue
Maintainability Demonstration Report	First Draft
Software Change Log	Review & Update
Production Readiness Review (PRR)	
Risk Register	Final Issue
Quality Plan	Final Issue
Manufacturability Plan	Final Issue
Obsolescence Management Plan	Final Issue
Product Specification	Final Issue
Software Design Development Document	Final Issue
Interface Definition Document	Final Issue
Weight Declaration	Final Issue
Engineering Safety Management Report	Final Issue
Design Calculations	Final Issue
Declaration of Design Performance	Final Issue
Register of Non- Metallic Components	Final Issue
RAM Report	Final Issue
Installation Requirements and Constraints	Final Issue
Human Factors Report	Final Issue
Maintenance Documentation	Final Issue
Physical & Functional Configuration Audit Report	Final Issue
EMC Technical File	Final Issue
EMC Compliance/ Safety Case Documentation	Final Issue
Training Materials	Final Issue
Maintainability Demonstration Report	Final Issue
Software Change Log	Final Issue
Train Prototype Test Specifications (AC Traction Train)	Final Issue
Train Prototype Test Reports/Certificates	Final Issue
Routine Production Test Specification	Final Issue
Pre-Installation Test Specification	Final Issue
Pre-Installation Test Equipment Product Specification	Final Issue
Post-Installation (Commissioning) Test Specifications	Final Issue
Production Plan	Final Issue
Physical & Functional Configuration Specifications and Audits	Final Issue
Fleet Fit CRS	Final Issue
Fleet Fit CTC	Final Issue
Test Rig Specification	Final Issue
PC Specification	Final Issue

4. PROJECT RISK ASSESSMENT, EVALUATION & MONITORING

Project Risk Assessments/Hazard ID – Design Assessments, Evaluations and Monitoring are undertaken from the very start of the project using our standard Risk Assessment Format "5 by 5 matrix" (see below). Risk Assessments are undertaken (dependent on Project Type) during the following Project Stages:

- Tender / Quotations
- Survey
- Design
- Material Purchase
- Material Build
- Methodology of Works – Method Statement
- Installation
- Test & Commissioning
- Training
- Project Completion – Final Review

The Assessment, Evaluations and Monitoring Stages above can be altered / added to, to fall in line with customer reporting.

Standard Matrix

			Severity				
			Slight	Minor	Serious	Major	Catastrophic
			1	2	3	4	5
Likelihood	Highly improbable	1	1	2	3	4	5
	Remote	2	2	4	6	8	10
	Occasionally	3	3	6	9	12	15
	Regularly	4	4	8	12	16	20
	Frequently	5	5	10	15	20	25

Calculation of Risk

	Rating		Risk Strategy
VH	20+	Very High	Intolerable Risk
H	12-20	High	Intolerable Risk (Review Current Control Measures)
M	6-10	Medium	Tolerable Risk Implementing Current Control Measures
L	1-5	Low	Tolerable Risk

1. DESIGN/DESIGN REVIEW

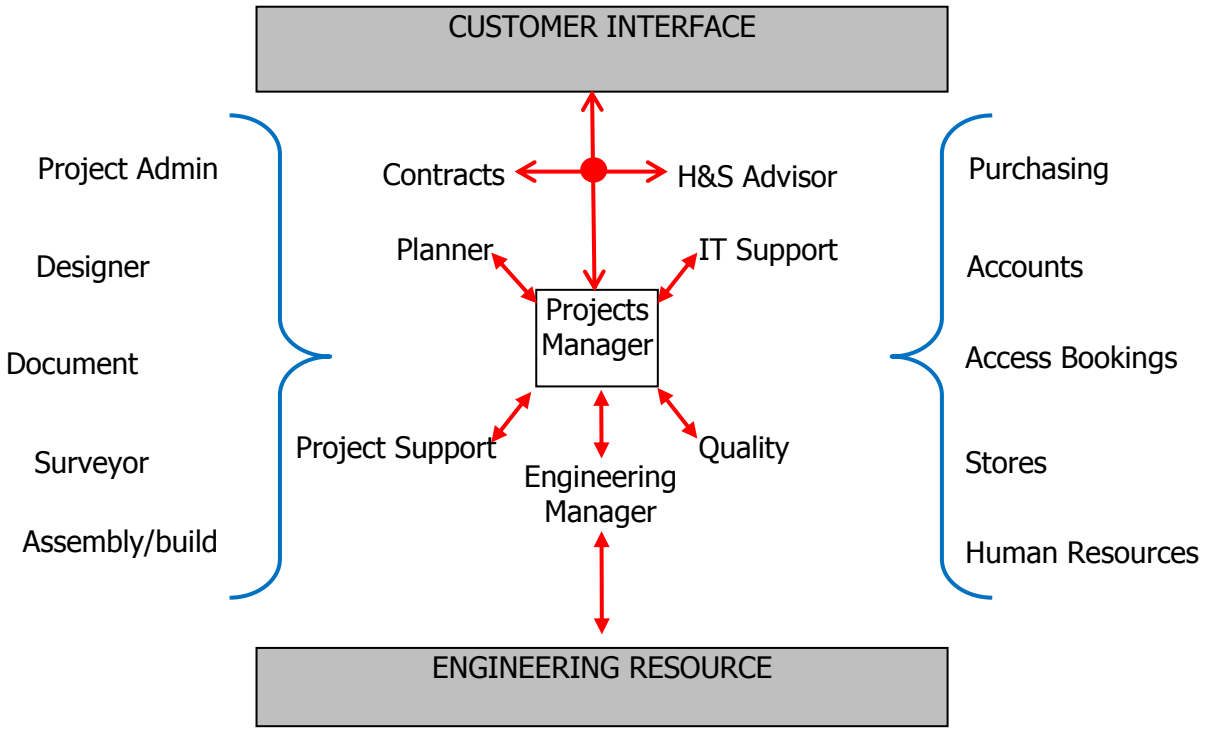
Each Stage will consist of many elements such as Survey Reports, Video Print Reports, Planning Reports, Equipment Specifications, Feasibility Reports, Design Risk Assessments, Design Document, System Layouts / Schematics, Cable Schedules, Test Schedules, Electrical Load Calculations, ACHP, Quality Plan, Health & Safety Plan, FAT, SAT, SIT, Non Conformity Assessment / Submissions Method Statements etc.

During the course of the design phase, Delatim Limited will issue documentation when completed to seek approval / sign-off. Please refer to the design phases / project plan.
On completion of the design, Delatim Limited will undertake a design review which will be checked against the customer's scope, specification, current standards and equipment specifications and issue a report detailing any recommendations that Delatim Limited feels the customer may wish / need to know before proceeding with the Project.

2. DEVIATION FROM DESIGN / SCOPE OF WORKS

Delatim will advise Transport for London should there be a requirement to change any parts of the design. No works will commence on elements of the design that require change unless authorised by the customer in writing. Please also refer to the change control procedure below (point 23 below).

3. Resource Organogram – (Company)



4. [redacted]

5. PROJECT MOBILISATION

On receipt of the order or instruction to proceed with the project, Delatim will undertake an internal project mobilisation meeting. This mobilisation meeting will normally be held within a few days of the start of the project with the objective of setting out all of the project criteria to the project management / delivery team. A Project Mobilisation Template - Meeting Agenda is used for this meeting.

6. PROJECT MEETINGS

Regular internal project meetings are held at site to update all staff working on the project. Also regular project meetings are held with our customers to update them on the project progress (TBA on frequency). These meetings are proposed to be held at the customer/customers representatives offices.

On-site meetings (where required) are held to either show progress, detail any deviations required and undertaken, along with discussions with other Sub-contractors.
For this project, Delatim Limited propose monthly meetings until on-site works commence, then fortnightly site meetings with Delatim on site management staff.

7. PROJECT STATUS/REPORTING

Delatim Limited has several methods of reporting project progress internally and externally to our customers. The following are proposed:-

- Engineers are issued daily / weekly instructions in writing of the work / task to be undertaken. This form also acts as a report back to Delatim Limited Project Management on what work / task was given and what work / task was carried out / completed.
- Project update / progress reports will be issued fortnightly to customer/customer representative detailing project progress, two week look ahead work / task, risk to programme, environmental health and safety, finance and outstanding urgent issues.
- The Project Programme is updated fortnightly and issued before the project meeting. See point 27 below Implementation Plan (Project Program).

Delatim Limited project team can adapt an existing project reporting form or generate a new form to meet Transport for London requirements should our standard format not be acceptable.

8. PROJECT COMMUNICATIONS

Project communications will be communicated in either or all of the following ways unless stipulated differently within agreed Terms and Conditions of Contract;

8.1 Verbally

Verbally - by telephone / face to face – confirmed if required in writing for any agreements, actions, commercial or contractual obligations

8.2 Electronically

- Email – confirmed if required in letter or Contractor's Communication format. Please refer to Communication Templates (general).
- Contractor's Communication – formal process of communicating in writing, linking to a Communication Register. Technical Queries (TQ), Contractor Communications (CC), Compensation Events (CE) and Early Warnings (EW).
- Web Based Server – facility to upload project documentation for all parties to review and / or approve. Also used to store large files such as designs drawings etc., which would normally be issued electronically on a storage media due to the size.

8.3 Post

Correspondence that is required to be on full company letter headed paper or by the very nature of importance to the project will be issued by post. In all cases when documentation is posted, Delatim will inform the customer either by e-mail or verbally.

All the above communications will be recorded on a Project Communication Register (Document No. TBA) and reviewed at progress meetings.

9. ENVIRONMENTAL COMMUNICATIONS

Environmental, external and internal communication have different levels of importance and therefore a separate process is followed for these. This will be made available upon request.

10. HEALTH & SAFETY COMMUNICATIONS

Health, Safety & Environmental, external and internal communication have different levels of importance and therefore a separate process is followed for these. This will be made available upon request.

11. DOCUMENT FORMAT / TOOLS

The following documentation format will be used in this project. Should the customer require other formats or versions, Delatim will be happy to discuss this.

Document Type	Format
Text - Letters, reports etc.	Microsoft Word 2007 & 2010

Finance – Spreadsheets etc.	Microsoft Excel/Word 2007 & 2010
Portable Document Format – pdf files.	Adobe Acrobat Pro
Project Programmes	Microsoft Projects 2007 & 2010 & P6
Drawings	Auto Cad, Micro Station, Visio
E-mails	Microsoft Outlook 2007 & 2010
Internet	Internet Explorer/Mozilla Fire Fox
Web Server	TBA

12. PROJECT DELIVERABLES

This statement covers the design and supply of main equipment;

1. Phase 1 – Main Equipment – Design Submission
2. Phase 2 – Supply of Test Rigs
3. Phase 3 – Approval to Supply First in Class Equipment
4. Phase 4 – Assistance with First in Class and Second in Class Installations
5. Phase 5 – Approval for Roll-Out of Delivery (Main Equipment)
6. Phase 6 – Batch Delivery of Main Equipment
7. Phase 7 – Training
8. Phase 8 – Software Implementation
9. Phase 9 – Bringing into Beneficial Use each Train Unit
10. Phase 10 – Project Completion

12.1 Main Equipment – Design Submission

Examples of documentation proposed to be submitted (This is not exhaustive list):

- Equipment Data Sheets
- Equipment/certification Test Documentation
- System Configuration Drawings
- System Schematics
- Any 3D Bracket Designs
- System Architecture
- Other Equipment Interfaces
- System Kit Parts List
- O&M Documentation
- Maintenance Documentation – VMI,VMP,VM
- Software/Maintenance Syllabus

12.2 Supply of Test Rigs

[redacted]

12.3 Approval to Supply First in Class Equipment

Working with Transport for London, Delatim will supply documentation detailed above, for the purpose of obtaining first in class main equipment approval. Factory Acceptance Testing (FAT) is purposed to be undertaken at Delatim's offices in London to assist with this approval process.

12.4 Assistance with First in Class Installations

Working with Transport for London, Delatim will provide installation technical support for the first in class fitment. Upon completion of installation.

12.5 Approval for Roll-Out of Delivery (Main Equipment)

Delatim will work with the Transport for London to ensure any modification to design/lessons learnt are taken into consideration on Transport for London's final detail design for roll-out. [redacted]

12.6 **Batch Delivery of Main Equipment**

[redacted]

12.7 **Training**

There is a requirement for multi levels of training dependent on the area of involvement with the supplied systems. Training is broken down into relevant courses to cover the different working areas such as:

a) End user for downloading processing and preparing evidence.
b) Installation and commissioning of systems.
c) Health monitoring and maintenance.
d) Management of Hard drives and manual downloading.

The different modules are delivered with a mixture of classroom based training using demonstration equipment to give hands on tutoring and assessment of delegates, or on Train training for maintenance and fault finding tasks. By using the different methods of training delegates can sit relevant modules giving scope to build knowledge for their work environment, this targets the needs rather than trying to teach all to everyone.

The use of written manuals and questionnaires means the delegates are assessed and any areas that need clarification are -re-covered before the training is completed. The marked questionnaire can then remain on the delegates training file as proof of competency.

12.8 **Software Implementation**

[redacted] Software will be loaded onto the hardware, for the purpose of undertaking a Factory Acceptance Test, this FAT will need to be planned into Transport for London implementation plan. Transport for London may elect to undertake the deployment of software prior to roll-out for the benefit of when a train is installed Transport for London is able to view data. Or Transport for London may elect to undertake the deployment of the software after initial first of class fitment.

Delatim will work with Transport for London in providing the necessary information for them choose on how and when the software is to be implemented.

12.9 **Project Completion**

To complete the project (after all equipment has been provided) a lessons learnt project meeting is offered to the customer as a means of going through all the elements of the project before a completion certificate issued.

13. **HEALTH & SAFETY – GENERAL BMS SECTION 1 THROUGH TO SECTION 10**

All Delatim Limited personnel are given health and safety guidance and training within their induction course. All CVs are studied to identify the needs of the individual in order to maintain the appropriate level of knowledge for the position applied for.

All mandatory and industry courses are provided for staff, engineers and management alike, to standardise the health and safety knowledge and understanding throughout the company. Specific training is given to complement the scope of work and to conform to our customer's rigorous guidelines and health and safety regulations. The Office Projects Administrator maintains all personnel training records, booking initial, renewal, specialist and required courses such as drugs and alcohol testing to certify Delatim Limited's commitment to competency and training in all aspects of health and safety. First aid training is provided to personnel to maintain the requirements of the health and safety (first aid) regulations, and at least one nominated person per crew of two / four will be first aid trained. Manual handling training is provided internally by the health and safety advisor to all levels of employees.

Continuation and refresher training is provided in the form of industry standard courses, with detailed safety procedures in every method statement and toolbox talk. Weekly and monthly meetings facilitate urgent health and safety training needs/concerns and notify staff of any changes or new procedures.

To ensure that Delatim Limited sites are safe sites for all, safety inspections and audits are carried out weekly and monthly and any breakdown or non-compliance of safety procedures is identified and actioned immediately.

Delatim Limited has gained ISO 18001: 2007 Occupational Health and Safety Accreditation along with RISQS audited and CHAS.

14. DOCUMENT CONTROL - BMS – SECTION 1 PART 6

Delatim Limited has a Document Controller monitoring and logging all in-coming / outgoing project related documents. These include those issued and received by:- Post, Fax & E-mail. The Document Controller also records internal documents within Delatim Limited.

All project related documents and policy / procedure documents are stored on our server using approved procedures. All project related and policy / procedure documentation contains detail as described within our quality manual as shown below;

- Created by – Author.
- Document Number.
- Issue Revision Number.
- Date.
- File Name & Path.

Delatim Limited has gained ISO 9001: 2008 Quality Management System Accreditation.

15. CHANGE CONTROL

The Change Control Process follows basic project management protocols for when there is a change within an agreed document, plan or contract. If no contractual change control process is outlined within the terms and conditions of contract, Delatim will use our method of change control below.

15.1 Documentation

All Delatim Limited project documentation has an issue revision number. When an issued document is required to be revised, the revision number is incremented by one i.e. 01, 02, 03 etc.

15.2 Contractual Change Control

Another requirement of monitoring change control within a project is when changes in a project causes a change in agreed contractual obligations. These changes are normally associated with units of time or financial in terms of project value, therefore change control - variations to contract can result in either of the following:

- Time
- Value
- Time & Value

Should there be a requirement for changes within a project, Delatim Limited manage change control through Contractors Communications (CC), Compensation Event (CE) Early Warning (EW), Technical Queries (TQ).

In the absence of a contractual Change Control Process outline in the contract between parties then we propose to use our standard change control procedure (briefly outlined below) as follow.

15.3 Delatim Identification of a requirement for change

1. Delatim Limited will issue a Contractors Communication (CC) outlining the reason for a change (time or value or both) as a request to Transport for London to formally request a change to the agreed contract.
2. Transport for London requests Delatim Limited to submit formally a detailed reason and results of the change either; by a revised implementation plan for changes in time (agreed completion date) or quotation if the scope/value of the project has changed (increased or decreased) or both via an agreed Compensation Event (CE) form (or form BMS-1-19-FM1).

3. Transport for London consider the submitted changes and issues Delatim Limited the results of their investigations/considerations.
4. On agreement the contract is agreed to be altered to fall in line with the agreed changes.

15.4 Transport for London Identification of a requirement for Change

1. Transport for London requests Delatim Limited to submit formally either; a revised implementation plan for changes in time (agreed completion date) or quotation if the scope/value of the project is likely to change due to changes that Transport for London has identified, or both. The submission by Delatim Limited is undertaken utilising the CE form (or form BMS-1-19-FM1).
2. Transport for London considers the submitted changes and issues Delatim Limited the results of their / considerations.
3. On agreement the contract is agreed to be altered to fall in line with the agreed changes.

The above process can be changed or Delatim can use the Transport for London method of communication / contractual changes should this be required.

16. ON SITE WORKING CONTROL PROCEDURES

Working under the Transport for London permit to work process Delatim Limited has its own work instructions to ensure all engineers work to the same procedures. [redacted]

17. PROJECT FINANCE

To ensure that the project progresses as planned, Delatim Limited in conjunction with Transport for London, will agree on a payment structure / profile (if not stated within an award of contract or tender documentation). Delatim Limited normally operates a request for payment application procedure on a monthly basis or four weekly period basis. Delatim Limited also has its own application for payment certificate ("Approval to Invoice") scheme which when signed by the customer allows Delatim Limited to invoice for approved / completed works, either as part / interim payment or payment in full.

18. ENVIRONMENTAL PROJECT CONSIDERATIONS

Delatim Limited defines environmental objectives that set out a framework for the continual improvement of the system the company has in place. These improvements are measured and audited as set out in our Business Management System. The company procedures requires the company to undertake a project review on the impact on the environment along with other environmental activities.

Delatim Limited has gained ISO 14001:2004 Environmental Management System Accreditation.

19. IMPLEMENTATION PLAN (PROJECT PROGRAM)

On contract award Delatim Limited would provide a proposed Implementation Plan, document number (TBA). To ensure that Delatim Limited facilitates Transport for London requirements in time frame to review submitted documentation (as outlined above), Delatim Limited's response to implementation plan is based on a ten (10) day Transport for London approval time frame, not including any ROGS process.

20. ESCALATION

The flow chart contained within section 6 details the key members of staff involved in the is project and the tiered approach employed to escalate issues within Delatim.

There are 5 tiered levels to the escalation process which originate for level 1 site based staff through to level 5 which is the company managing director.

Dependant on the type of issue staff are to escalate their concerns to the correct member of staff who sits in the tier above them, this generally only applies to Tier 1 escalation.

Staff are required to raise their issues to the Tier above via email clearly stating what the issue is and the impact it is/will have on the project. The email shall give as much information as possible and

advise that this issue is being raised as part of the escalation process and will be required to be respond to within the SLA time frames.

In instances where the appropriate member of staff for the Tier above is not available such as annual leave or training the issue is to be escalated to the next Tier above advising on the non-availability of the correct member of staff.

The process also allows for the client to use the same escalation process to raise external issues regarding the project.

20.1 Service Level Agreements (SLA)

The following SLA's apply to the response time's that are required to be maintained as part of this project escalation plan.

- Tier 1 to Tier 2 – 3 Days
- Tier 2 to Tier 3 – 3 Days
- Tier 3 to Tier 4 – 2 Days
- Tier 4 to Tier 5 – 1 Day

20.2 Escalation Principles and Philosophy's

Delatim applies the following principles and philosophy's to the escalation process and the plans are project based so as to ensure the correct personal are involved for each project.

- During the initial stages of the project, the plans are properly defined, agreed upon and an escalation matrix with escalation contact points and escalation paths is agreed.
- All project stakeholders are then made well aware of the escalation process – which issues should be raised to whom, and within which time frame they are to be responded to (SLA's)
- Delatim creates a project culture where people genuinely believe it's OK to escalate the issues timely to the next level of management without any fear or aggravating the issue.
- When staff are escalating they are encouraged to: analyse the situation with data points and make sure they have done their part of the job well before escalating.
- Wait for the Service Level Agreements (SLAs) of the other party for responding. For example, if the SLA to respond is 3 days, it is not right to escalate the issue before 3 days.
- Where there is no response from the other party in the SLA period, staff are advised at first to send a formal and gentle reminder that the SLA has expired.
- Staff are encouraged avoid the Cry-Wolf scenario. Avoid frequent and un-necessary escalation.
- Arrange a separate meeting/call or an explicit email to escalate the matter, and ensure that it has been kept focused to the specific issue (one escalation at a time). Not to group escalations together to avoid confusion.
- The escalation should only address the stakeholders that are required and should not involve everyone unless required.
- Escalation meeting/call/email should be focused on the issue in hand.
- The escalation background should be clearly explained highlighting the correct data and showing the severity of the situation (high/medium/low) and solutions should be suggested to resolve the situation.

- When forwarding issues higher up for their information this could be preserved as upward delegating. Delatim staff are encouraged to have the right intentions to solve the matter themselves.

- Delatim's process for document escalation via e-mail is to highlight data points, and mark all necessary actions with action-owners.

- Delatim's staff are encouraged to reach out to peer managers for similar escalation situations to get lessons learned out of past experiences.

- If a first escalation fails, staff have the firmness to escalate it to the next level to make it higher and wider.

20.3 **Corrective Measures**

If the data and communication plan fails the following corrective measures will be put into place:

- Emergency Meeting will be held
- Corrective plan will be created
- Revised Risk Register
- Actions Allocated
- Regular Meeting to be held until issues are resolved

21. **LESSONS LEARNT**

To ensure continuous improvements, Delatim Limited will hold (usually with the customer) a project based lessons learnt meeting. The output from this meeting will be a lessons learnt report.
This report examines the whole project (including contract award) and provides a review of what worked well (positives) and areas that need improvement (negatives). It is intended to provide guidance for future projects on measures that should be undertaken to minimise the likelihood of 'Lessons Learnt' Issues reoccurring.

The Agenda for the lessons learnt meeting is the template form. This form - document number DEL-MOBSTAT-TEM-4719-01 - can be found on Delatim Limited Server and is available on request.

22. **QUALITY**

Delatim Limited defines quality objectives that set out a framework for the continual improvement of the Business Management System the company has in place. These improvements are measured and audited as set out in our Business Management System. These audits include the required six procedures as detailed by the standard and several more that integrate into Health, Safety & Environmental practices / company works instructions. These procedures/processes ensure that project realization and ultimately customer satisfaction are controlled from enquiry through to project handover.

Delatim Limited has gained ISO 9001: 2008 Quality Management System Accreditation.

23. APPENDIX A – RACI MATRIX

Transport for London
Saloon CCTV System for Central Line 92 TS

Title:

RACI Matrix

Document No & Revision:

DEL-ITT-DOC-5737 R1

Date:
12-07-2017

		Signature	Date
Prepared by:	[redacted]		12-07-2017
Checked by:	[redacted]		14-07-2017
Approved by:	[redacted]		14-07-2017

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RACI Matrix

	Communications Director	Operations/ Project Manager	Design and Assurance Manager	Technical/ Project Engineer	Design Engineer	CAD Designer	Health & Safety Officer	Projects Administrator	Document Controller
Project Initialisation									
Internal Project Kick Off Meeting	I	RA	C	C	C	C	C	C	I
Internal Review of Scope	C	C	RA	C	C	I	I	I	I
Internal Review of Programme	I	RA	C	C	I	I	I	I	-
Resource Allocation	RA	C	I	I	I	I	I	I	I
Documentation (Template Alignment Review)	-	C	-	-	-	-	I	R	A
Internal Risk Review	I	C	C	C	C	C	RA	I	I
Staff Mobilisation	A	R	C	C	C	C	C	I	I
Client Kick of Meeting	R	A	C	C	I	I	I	I	I
Progress Meetings	A	R	C	C	I	I	I	I	-
Risk Meetings	C	A	C	C	I	I	R	I	-
Specification Design Review (SDR)									
Engineering Plan	I	I	R	A	C	C	I	I	I
Requirements Management Plan	A	R	C	C	I	I	I	I	-
Risk Register	I	C	C	C	I	I	RA	-	-
Engineering Safety Management Plan	I	I	R	C	C	C	A	-	-
Quality Plan	I	C	RA	C	C	I	-	I	I
Manufacturability Plan	I	A	R	C	I	I	I	I	I
Obsolescence Management Plan	C	A	R	I	-	-	-	I	I
Product Specification	I	A	R	C	I	-	-	I	-
Software Design Development Document	I	A	C	R	-	-	-	I	-
HMI Concepts – Maintainer Interface Alarm Strategy	I	I	C	RA	-	-	-	-	-
Interface Control Plan	I	I	C	RA	-	-	-	-	-
Interface Definition Document	I	I	C	RA	I	-	-	-	-
Design Management and Assurance Plan	I	C	RA	C	C	C	C	I	I
Weight Management Plan	I	C	R	A	C	C	-	I	I
Weight Declaration	-	I	C	RA	I	I	-	-	-
Configuration Management Plan	-	C	I	RA	I	I	-	-	-
RAM Strategy Plan	I	A	I	R	-	-	-	I	-
EMC Strategy & Control Plan	C	A	-	R	I	-	-	I	I
Software Management Plan	C	A	-	R	-	-	-	I	I
HF Integration Plan	I	C	R	A	I	-	-	I	I
Test Plan	I	A	C	R	I	I	-	I	I
Survey Method Statement/Risk Assessment	I	C	I	I	I	I	RA	I	I
Survey									
Survey's	I	C	A	R	C	C	C	I	I
Concept Design Review (CDR)									
Review & Update Engineering	I	I	R	A	C	C	I	I	I

	Communications Director	Operations/ Project Manager	Design and Assurance Manager	Technical/ Project Engineer	Design Engineer	CAD Designer	Health & Safety Officer	Projects Administrator	Document Controller
Plan									
Review & Update Risk Register	I	C	C	C	I	I	RA	-	-
Review & Update Quality Plan	I	C	RA	C	C	I	-	I	I
Review & Update Manufacturability Plan	I	A	R	C	I	I	I	I	I
Review & Update Obsolescence Management Plan	C	A	R	I	-	-	-	I	I
Review & Update Product Specification	I	A	R	C	I	-	-	I	-
Review & Update Software Design Development Document	I	A	C	R	-	-	-	I	-
Review & Update HMI Concepts	I	I	C	RA	-	-	-	-	-
Final Issue Interface Control Plan	I	I	C	RA	-	-	-	-	-
Review & Update Interface Definition Document	I	I	C	RA	I	-	-	-	-
Review & Update Weight Declaration	-	I	C	RA	I	I	-	-	-
Review & Update Configuration Management Plan	-	C	I	RA	I	I	-	-	-
Final Issue EMC Strategy & Control Plan	C	A	-	R	I	-	-	I	I
Final Issue Software Management Plan	C	A	-	R	-	-	-	I	I
Final Issue HF Integration Plan	I	C	R	A	I	-	-	I	I
Review & Update Test Plan	I	A	C	R	I	I	-	I	I
Engineering Safety Management Report	I	A	C	R	I	I	R	I	I
Design Calculations	I	C	RA	C	C	C	C	-	-
Declaration of Design Performance	I	C	RA	C	C	C	C	-	-
Register of Non-Metallic Components	-	C	A	R	C	C	-	I	I
RAM Report	I	C	I	RA	C	C	-	I	I
Installation Requirements and Constraints	I	R	A	C	C	C	C	I	I
Reliability Management Plan	I	C	I	RA	I	I	-	I	I
Human Factors Report	I	A	C	C	C	C	R	I	-
Type Test Specifications	I	C	C	RA	C	C	-	I	-
System Test Specifications	I	C	C	RA	C	C	-	I	-
Maintenance Documentation	I	A	R	C	C	C	-	I	I
Software Change Log	-	C	C	RA	-	-	-	I	I
Detailed Design Review (DDR)									
Review & Update Engineering Plan	I	I	R	A	C	C	I	I	I
Review & Update Risk Register	I	C	C	C	I	I	RA	-	-
Review & Update Quality Plan	I	C	RA	C	C	I	-	I	I
Review & Update Manufacturability Plan	I	A	R	C	I	I	I	I	I
Review & Update Obsolescence	C	A	R	I	-	-	-	I	I

	Communications Director	Operations/ Project Manager	Design and Assurance Manager	Technical/ Project Engineer	Design Engineer	CAD Designer	Health & Safety Officer	Projects Administrator	Document Controller
Management Plan									
Review & Update Product Specification	I	A	R	C	I	-	-	I	-
Review & Update Software Design Development Document	I	A	C	R	-	-	-	I	-
Review & Update HMI Concepts	I	I	C	RA	-	-	-	-	-
Review & Update Interface Definition Document	I	I	C	RA	I	-	-	-	-
Review & Update Weight Declaration	-	I	C	RA	I	I	-	-	-
Final Issue Configuration Management Plan	-	C	I	RA	I	I	-	-	-
Final Issue Test Plan	I	A	C	R	I	I	-	I	I
Review & Update Engineering Safety Management Report	I	A	C	R	I	I	R	I	I
Review & Update Design Calculations	I	C	RA	C	C	C	C	-	-
Review & Update Declaration of Design Performance	I	C	RA	C	C	C	C	-	-
Review & Update Register of Non-Metallic Components	-	C	A	R	C	C	-	I	I
Review & Update RAM Report	I	C	I	RA	C	C	-	I	I
Review & Update Installation Requirements and Constraints	I	R	A	C	C	C	C	I	I
Review & Update Human Factors Report	I	A	C	C	C	C	R	I	-
Final Issue Type Test Specifications	I	C	C	RA	C	C	-	I	-
Final Issue System Test Specifications	I	C	C	RA	C	C	-	I	-
Review & Update Maintenance Documentation	I	A	R	C	C	C	-	I	I
Physical and Functional Configuration Specifications	-	C	A	R	C	C	-	I	-
EMC Test Specification	C	A	C	R	I	-	-	I	I
Train Prototype Test Specifications	I	C	C	RA	C	C	-	I	-
Prototype Production Plan	I	C	A	R	C	C	-	I	-
Training Matrix	I	C	-	RA	-	-	-	I	I
Maintainability Demonstration Plan	I	A	C	R	I	-	-	I	-
Review & Update Software Change Log	-	C	C	RA	-	-	-	I	I
Prototype Design Review (PDR)									
Final Issue Engineering Plan	I	I	R	A	C	C	I	I	I
Review & Update Risk Register	I	C	C	C	I	I	RA	-	-
Review & Update Quality Plan	I	C	RA	C	C	I	-	I	I
Review & Update Manufacturability Plan	I	A	R	C	I	I	I	I	I

	Communications Director	Operations/ Project Manager	Design and Assurance Manager	Technical/ Project Engineer	Design Engineer	CAD Designer	Health & Safety Officer	Projects Administrator	Document Controller
Review & Update Obsolescence Plan	C	A	R	I	-	-	-	I	I
Review & Update Product Specification	I	A	R	C	I	-	-	I	-
Review & Update Software Design Development	I	A	C	R	-	-	-	I	-
Final Issue HMI Concepts	I	I	C	RA	-	-	-	-	-
Review & Update Interface Definition Document	I	I	C	RA	I	-	-	-	-
Review & Update Weight Declaration	-	I	C	RA	I	I	-	-	-
Review & Update Engineering Safety Management Report	I	A	C	R	I	I	R	I	I
Review & Update Design Calculations	I	C	RA	C	C	C	C	-	-
Review & Update Declaration of Design Performance	I	C	RA	C	C	C	C	-	-
Review & Update Register of Non-Metallic Components	-	C	A	R	C	C	-	I	I
Review & Update RAM Report	I	C	I	RA	C	C	-	I	I
Review & Update Installation Requirements and Constraints	I	R	A	C	C	C	C	I	I
Review & Update Human Factors Report	I	A	C	C	C	C	R	I	-
Review & Update Maintenance Documentation	I	A	R	C	C	C	-	I	I
Review & Update/ Final Issue Train Prototype Test Specifications	I	C	C	RA	C	C	-	I	-
Review & Update/ Final Issue Prototype Production Plan	I	C	A	R	C	C	-	I	-
Physical & Functional Configuration Audit Report	-	C	A	R	C	C	-	I	-
EMC Technical File	C	A	C	R	I	-	-	I	I
EMC Compliance/ Safety Case Documentation	C	A	C	R	I	-	R	I	I
Type Test Reports/ Certificates	I	C	C	RA	C	C	-	C	I
System Test Reports/ Certificates	I	C	C	RA	C	C	-	C	I
Training Material	I	C	-	RA	-	-	-	I	I
Prototype CRS	A	C	R	C	C	-	-	I	-
Prototype CTC	A	C	R	C	C	-	-	I	-
Maintainability Demonstration Report	I	A	C	R	I	-	-	I	-
Review & Update Software Change Log	-	C	C	RA	-	-	-	I	I
Test Rigs/Prototyping									
Build Test Rigs/Prototyping	I	A	C	R	I	-	-	-	-
Prototype Installation Support									
SAT Testing	I	A	C	R	I	-	-	-	-

	Communications Director	Operations/ Project Manager	Design and Assurance Manager	Technical/ Project Engineer	Design Engineer	CAD Designer	Health & Safety Officer	Projects Administrator	Document Controller
Production Readiness Review (PRR)									
Final Issue Risk Register	I	C	C	C	I	I	RA	-	-
Final Issue Quality Plan	I	C	RA	C	C	I	-	I	I
Final Issue Manufacturability Plan	I	A	R	C	I	I	I	I	I
Final Issue Obsolescence Management Plan	C	A	R	I	-	-	-	I	I
Final Issue Product Specification	I	A	R	C	I	-	-	I	-
Final Issue Software Design Development Document	I	A	C	R	-	-	-	I	-
Final Issue Interface Definition Document	I	I	C	RA	I	-	-	-	-
Final Issue Weight Declaration	-	I	C	RA	I	I	-	-	-
Final Issue Engineering Safety Management Report	I	A	C	R	I	I	R	I	I
Final Issue Design Calculations	I	C	RA	C	C	C	C	-	-
Final Issue Declaration of Design Performance	I	C	RA	C	C	C	C	-	-
Final Issue Register of Non-Metallic Components	-	C	A	R	C	C	-	I	I
Final Issue RAM Report	I	C	I	RA	C	C	-	I	I
Final Issue Installation Requirements and Constraints	I	R	A	C	C	C	C	I	I
Final Issue Human Factors Report	I	A	C	C	C	C	R	I	-
Final Issue Maintenance Documentation	I	A	R	C	C	C	-	I	I
Final Issue Physical & Functional Configuration Audit Report	-	C	A	R	C	C	-	I	-
Final Issue EMC Technical File	C	A	C	R	I	-	-	I	I
Final Issue EMC Compliance/ Safety Case Documentation	C	A	C	R	I	-	R	I	I
Final Issue Training Materials	I	C	-	RA	-	-	-	I	I
Final Issue Maintainability Demonstration Report	I	A	C	R	I	-	-	I	-
Final Issue Software Change Log	-	C	C	RA	-	-	-	I	I
Train Prototype Test Specifications (AC Traction Train)	I	C	C	RA	C	C	-	I	-
Train Prototype Test Reports/Certificates	I	C	C	RA	C	C	-	C	I
Routine Production Test Specification	I	C	A	R	C	C	-	I	-
Pre-Installation Test Specification	I	C	C	RA	C	C	-	I	-
Pre-Installation Test Equipment Product Specification	I	C	C	RA	C	C	-	I	-
Post-Installation (Commissioning) Test Specifications	I	C	C	RA	C	C	-	I	-
Production Plan	I	C	A	R	C	C	-	I	-
Physical & Functional Configuration Specifications and	-	C	A	R	C	C	-	I	-

	Communications Director	Operations/ Project Manager	Design and Assurance Manager	Technical/ Project Engineer	Design Engineer	CAD Designer	Health & Safety Officer	Projects Administrator	Document Controller
Audits									
Fleet Fit CRS	A	C	R	C	C	-	-	I	-
Fleet Fit CTC	A	C	R	C	C	-	-	I	-
Test Rig Specification	I	C	C	RA	C	C	-	I	-
PC Specification	I	C	C	RA	C	C	-	I	-
Batch Delivery	C	A	I	R	-	-	-	-	-
Installation Support	C	A	I	R	-	-	-	-	-
Test & Commissioning	C	A	I	R	-	-	-	-	-
Training	I	C	-	RA	-	-	-	I	I
Post Design Deliverables									
Project Documentation	I	A	C	C	-	C	-	R	C
O&M Manuals Issue	I	A	C	C	-	C	-	R	C
Test Certificate	-	R	A	C	-	-	I	C	I
Asset List	I	R	A	C	-	-	I	C	I
Project Completion									
Lessons Learnt	C	RA	C	C	C	C	C	C	I

Transport for London
Saloon CCTV System for Central Line 92 TS

Title:

Data & Communication Plan

Document No & Revision:

DEL-ITT-PLN-5740 Rev 02

Date:
11-10-2017

		Signature	Date
Prepared by:	[redacted]		11/10/2017
Checked by:	[redacted]		11/10/2017
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24. ABBREVIATIONS

CCTV	Closed Circuit Television
ITT	Invitation To Tender
LU	London Underground
MTS	Mayor's Transport Strategy
OIL	Outstanding Issues Log
PLN	Plan
RMP	Risk Management Plan
RSR	Rolling Stock Renewals
RVAR	Rail vehicle Accessibility Regulations (2010)
SP	Specification

25. SCOPE DOCUMENT

This document outlines the method of data sharing with and communication between Delatim (the supplier) and London Underground (the purchaser). The plan includes the following sections:

- Methods of Communication;
- Document Control;
- Interface notices;
- Meetings.

Methods of Communication

ASITE

The principal method of data sharing and communication throughout the lifecycle of the project shall be through the online contract management tool 'ASITE'. All documentation will be issued using this project workflow software.

Asite is a cost effective, very flexible solution that will enable all key project personnel (users) of the project team to manage the review of documents and better control project processes - improving response times and reducing errors.

It is simple to use allowing users to view, redlined and print documents by means of an integrated viewer. This is no matter where you are based using only a PC and internet connection. It has been designed around the way in which users collaborate, making it intuitive to use.

Asite automates processes, such as document distribution or the review of design information, improving response times and reducing errors. Completely customisable, templated forms provide the flexibility to reflect the unique processes of the project. It also has an unrivalled ability to link documents, online comments and forms, enabling users to access related documents more easily.

The users can control the information received. Email notifications inform the users of any new actions or important changes. 'Users' own central 'inbox', within Asite, provides a clear overview of users actions and their priority, as well as documents issued to them.

Disputes are minimised through the provision of a complete history of project communications and actions. Asite's highly secure infrastructure ensures that collaboration takes place in a secure environment.

Delatim's key personnel for the project have received ASITE training and are fully conversant with the project workflow software. The key personnel proposed for the project who will require a licence are listed in table 2 below.

Table 8- Delatim ASITE Licence Holders

Name	Title	Trained
[redacted]	[redacted]	Yes
[redacted]	[redacted]	Yes
[redacted]	[redacted]	Yes
[redacted]	[redacted]	Yes
[redacted]	[redacted]	Yes

Email

Email communication shall be used on a daily basis throughout the project as a general means of communication between Delatim's and LU project personnel.

Telephone

Telephone communication shall also be used on a daily basis throughout the project as a general means of communication between Delatim's and LU project personnel.

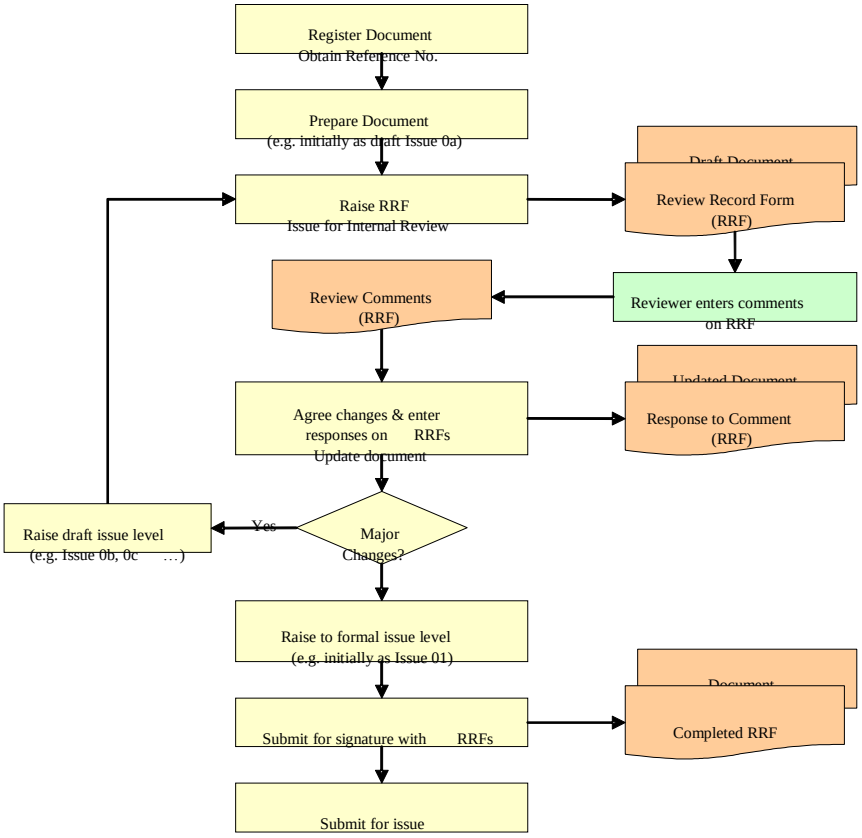
Document Control

Delatim will pre-generate document registers specific for the Saloon CCTV design deliverables. This document register will be populated by Delatim with document numbers issued by LU.
As each design document is prepared, it shall be registered with the Delatim Document Controller, who will liaise with the LUL Document Controller who will assign a document reference number. Document reference numbers will follow the Project's structured number scheme.

A document shall be created at draft 'Issue 0A', and shall remain at letter issue (0B, 0C etc.) until it has been reviewed and is ready for formal issue. It shall then be formally issued at number issue: Issue 01.
The Author of each document has the responsibility to ensure that the document is correctly prepared, reviewed, and passed to the relevant documentation control staff for issue in accordance with appropriate Work Instruction.

Each document shall be reviewed internally by at least the signatories to the document prior to formal issue, following the review process as described in this section and summarised in Figure 1.

Figure 1 – Document Control Process



Signed off documents will be forwarded to the Delatim Document Controller for issue. The Delatim Document Controller will be responsible for controlling the formal issue of documentation.

Interface Notices

Throughout the design and installation phases of the project, should any equipment technical or quality issues become apparent, Delatim will issue LU with an interface notice (through ASITE) requesting that LU, in its sole discretion halt the works until any issues or risks have been reviewed and or resolved.

Meetings

A 2 weekly status review meeting shall be held in a manner, method and location which is agreed by both Parties. These meetings will include, but not be limited to:

- Current project status;
- A four (4) week look ahead review of the project programme;
- Reviewing any outstanding project communications;
- Highlighting any additions to the Delatim Project Risk Register.

A project review meeting shall be held every four (4) weeks from the Commencement Date, in a manner, method and location which is agreed by both Delatim and LU (the "Project Progress Meetings"). Project Progress Meetings will include, but not be limited to:

- A presentation from the Supplier on the current project status;
- A health, safety and environmental review;
- A review of the Contract Programme;
- A review of any outstanding project communications;
- A review of the Supplier Risk Register;
- A review of key performance indicators;
- A review of outstanding issues list;
- A review of the change control log.

Three (3) days in advance of the Project Progress Meetings, the Supplier shall provide the Purchaser with a current progress report containing details of the design, manufacture, supply, testing, development and implementation of all items of Goods and the Services including but not limited to the following:

- A report recording performance against specific key performance indicators, as agreed with LU;
- An updated Contract Programme with a specific report including but not limited to:
    - all changes to critical path from previous update;
    - changes in activity float;
    - Milestone report.
- A brief narrative describing progress since the previous report including photos and videos if required;
- Progressed details and update on all items and infrastructure required to deliver the Goods and the Services (such as all spares, and long lead items).

Where required Delatim may be requested to take part in a further meetings with LU during term of this Agreement, at the LU's discretion. The topics of such meetings will include but are not limited to:

- Reactions to commercial meetings via the ASITE process;
- Arising issues;
- Risk reduction reviews;
- Outstanding Issues List (OIL).

If a Delatim or LU submits an early warning notice to notify each other of a particular risk or issue in advance, then they shall convene a risk reduction meeting within three (3) to five (5) Working Days to formally address and resolve the issue.

A risk management plan (DEL-ITT-RMP-5686) has been issued as part of this ITT submission.

Correct Use of Communication

Type Of Communication	Reason
- Asite	- Early Warning - Design Documentation - Issue Logs

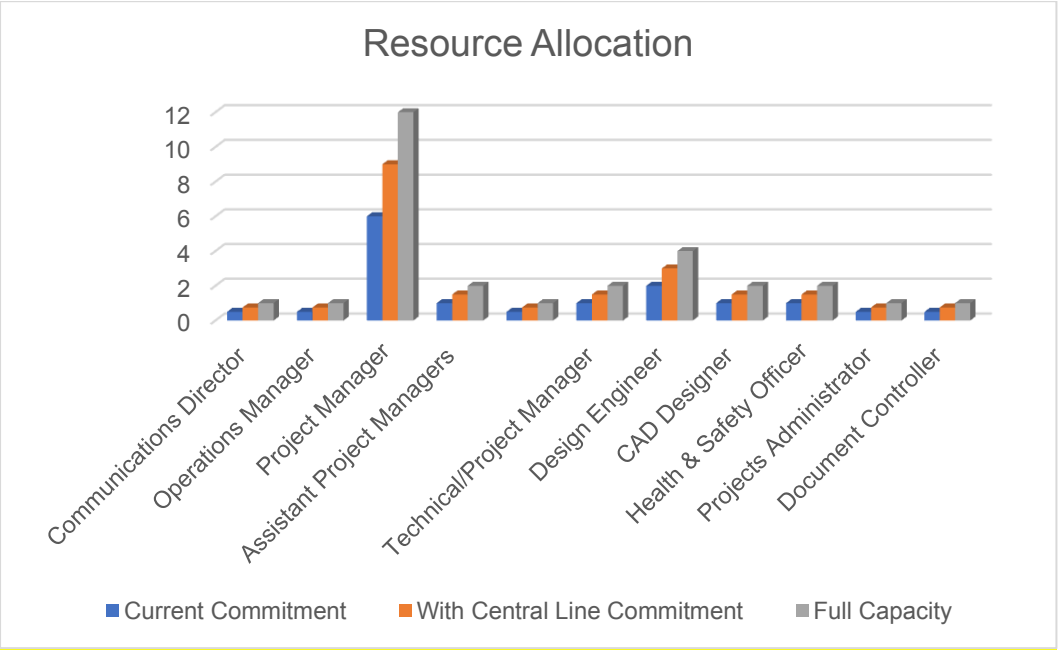
	- Test Results - Reports - Commercial Documentation
- E-Mail	- General Communication: - Project Progress - Obtaining Quotes for suppliers
- Telephone	- Urgent Matters which would be followed up by either Asite or email correspondence - Conference Call – Progress Update

Corrective Measures

If the data and communication plan fails the following corrective measures will be put into place:

- Emergency Meeting will be held
- Corrective plan will be created
- Revised Risk Register
- Actions Allocated
- Regular Meeting to be held until issues are resolved

Resources Allocation



The chart above shows in blue the project teams current commitment. In orange the project team's commitment with the central line project. In grey the project team at projected full capacity. However it is to be noted that the project is to be active over a number of years and the expected management commitment is likely to full once the design and proto type installations are completed. This underlines the importance of the regular review and subsequent planning of the resources with the committed project time taking precedent in the later part of the project duration. The actual commitment required will be assessed during the regular planned meetings and lessons learnt workshops at the key project milestones.

The output of this may determine that either more or less resources are required from this point through to project completion and this will be communicated via the correct communication protocols

as required. The table below outlines the key functions in the initial process of key personnel during the first 12 months of the project.

Resource	Responsible For
Communications Director	Client Kick Off Meeting Project Initialisation Resource Allocation Chair of Lessons Learnt Workshops
Operations Manager	Client Kick Off Meeting Project Initialisation Internal Project Kick Meeting Internal Review of Programme Staff Mobilisation Project Meetings Batch Deliveries Training
Project Manger	Client Kick Off Meeting Project Initialisation Project Meetings Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Assistant Project Manager	Project Meetings Status Reports Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Design and Assurance Manager	Review of Project Scope Design Meetings Test Plans Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Technical/Project Manager	Surveys Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Test Rigs/Prototyping Prototype Installation Support Production Readiness Review (PRR) Installation Support Test and Commissioning Training
Design Engineer	Specification Design Review (SDR)

	Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR) Post Design Deliverables
CAD Designer	Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Health & Safety Officer	Internal Risk Review Method Statements/Risk Assessments Risk Meetings
Projects Administrator	Project Documentation Specification Design Review (SDR) Concept Design Review (CDR) Detailed Design Review (DDR) Prototype Design Review (PDR) Production Readiness Review (PRR)
Document Controller	Project Documentation Documentation (Template Alignment Review)

It can be seen that the project is adequately resourced from the outset and the Governance plan review and escalation process will ensure that the correct resource level is both considered and maintained throughout the project life cycle. This will be ensured by regular assessment and review via Project Meetings, the Tier Management escalation procedure and lessons learnt workshops where all concerned can communicate concerns and identify risks to the resource levels of the project.

PART B: RISK MANAGEMENT

1. GENERAL

1.1 The Purchaser's risk management policy recognises that managing risk is critical to the successful delivery of this Agreement, and the Purchaser has implemented a programme wide risk management framework to enable effective and efficient risk management ("**Risk Management Framework**").

1.2 The Supplier shall carry out its own risk management activities in accordance with the Risk Management Plan to meet the requirements of Schedule 1B.

1.3 The Supplier shall provide assurance to the Purchaser that any risks associated with the Design, manufacture, testing, commissioning, delivery and product Acceptance of all items of Goods under this Agreement are fully recognised, understood and effectively controlled.

1.4 The Supplier shall involve the Purchaser in:

1.4.1 the review and management of all risks identified under this Agreement; and

1.4.2 the implementation of the Risk Management Plan

1.5 The Purchaser shall hold quarterly joint review meetings with the Supplier to review the Supplier Risk Register and discuss any risks that the Supplier is responsible for managing. The Purchaser shall be entitled from time to time to instruct the Supplier to attend additional ad-hoc risk review meetings.

1.6 Any general information related to risk that the Supplier develops pursuant to its obligations under this Schedule 1B Part B shall be in addition to (and will not replace) the Supplier Risk Register. In the case of any conflict between such general information and the Supplier Risk Register, the contents of the Supplier Risk Register will prevail.

1.7 The document titled "DS-07: Risk Management Plan" (set out in Appendix 1 of this Schedule 1B Part B) shall form part of the PEP.

2. RISK MANAGEMENT OBJECTIVES

2.1 The Purchaser's Risk Management Framework aims to ensure that:

2.1.1 any risks associated with the Design, manufacture, testing, commissioning, delivery and Product Acceptance of all items of Goods under this Agreement are identified, assessed and managed by the appropriate people in a consistent and cost-effective manner;

2.1.2 the Supplier, the Purchaser and any other relevant stakeholders (including industry partners and insurers) are provided with appropriate and reliable risk information in order to provide assurance that any risks are being effectively dealt with; and

2.1.3 the Supplier's practices are fully aligned with and demonstrably meet the Purchaser's requirements in relation to risk management.

3. RISK MANAGEMENT PLAN