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7 COORDINATION AND INTERFACE

7.1 General Coordination Requirements

- 7.1.1 The Contractor shall be the lead coordinator for all works, properties, other contracts, relevant landowners, agencies, and authorities that have an interface with his Works in accordance to the coordination requirements defined in **Appendix L** of the General Specification.
- 7.1.2 The Contract Price is deemed to include all necessary provisions for liaison, reconciling and making amendments to design, securing approvals and all other items necessary for completion of the Works at the interfaces.
- 7.1.3 The Contractor shall allow sufficient periods for obtaining all necessary approvals and clearances from any interfacing party, utility companies, and statutory authorities in his programme. No extensions of time shall be granted due to the Contractor's failure to complete the interface proposals and secure all necessary approvals in a timely manner.
- 7.1.4 The Contractor shall coordinate all construction works that affect access to and operation of adjacent lands, existing facilities and new developments. The Contractor shall maintain access to all adjacent lands, properties, and existing facilities.
- 7.1.5 The Contractor shall liaise with interfacing contractors immediately upon the Award of Contract on the site access, workspace requirement, sequence of works and/or traffic diversion of the existing road network, to ensure the access and diversions are synchronised. In the event that the interfacing Contracts are awarded after the Award of Contract, the Contractor shall engage with the Authority and/or the Authority's appointed consultants until such time as the interfacing Contracts are awarded.
- 7.1.6 Upon completion of the Works, the Contractor shall coordinate any reinstatement and landscaping plans with the relevant landowners, agencies and authorities and obtain their approval. The Contractor shall carry out a site survey of all the existing facilities to record its existing condition for purposes of permanent reinstatement. Both soft and hard copies of this record shall be submitted to the Engineer. The Contractor shall liaise and coordinate with the interfacing party including but not limited to the affected landowner, agencies and authorities at his own time and cost. The Contractor shall include in his contract, the time and cost for provisions of temporary alternative to facilities and all reinstatement works for areas affected by him.

- 7.1.7 The Contractor shall coordinate and interface their design and construction works with the Interfacing Contractors/Parties including but not limited to the parties identified in **Appendix A** of the Particular Specification. These Interfacing Contracts may commence before or during the period of this Contract and may run concurrently with it for all or part of the Contract period. No claim will be accepted for such coordination and interfacing with additional contractors or other parties not previously identified but necessary for the completion of the Works in accordance with the Authority's requirements. The Contractor shall be responsible for the coordination of the System-Wide Contractors (SWC) and other Interfacing Contractors/Parties in respect of their activities within the Works area.
- 7.1.8 The Contractor shall indemnify the Authority against all costs, charges, expenses and the like resulting from his failure to properly coordinate the Works and the interfaces, as required by the Contract, with all other parties including but not limited to the Interfacing Contractors/Parties as shown in **Appendix A** of the Particular Specification. This shall also include the coordination of traffic and utility diversions.
- 7.1.9 The Contractor shall give adequate notice to the Engineer when specific actions are required by others without which the Works cannot be executed on schedule. The notification shall identify the current status of the affected design interface and/or construction and any assistance requested of the Authority/Engineer.
- 7.1.10 In the event that the Contractor requires specific actions by others without which, the Works cannot be executed on schedule, the Contractor shall report the status and his coordination with the Interfacing Contractors/Parties to the Engineer in a timely manner.
- 7.1.11 Schedules of other interfacing parties, agencies, government departments and statutory boards are provided in **Appendix A** of the Particular Specification. The Contractor shall carry out all necessary coordination and interfacing with these and any other parties necessary for the satisfactory completion of the Works.
- 7.1.12 In the event that the Contractor, Interfacing Contractors/Parties and Authority's appointed contractors do not agree on the coordination of the works, the Engineer's decision shall be final. The Contractor shall not be entitled to claim for any time and cost incurred arising from any such Engineer's decision.
- 7.1.13 As a result of coordination, the Contractor and the Interfacing Contractors/Parties may come to an agreement to propose changes to the work sequence subject to the Engineer's acceptance. The Contractor shall demonstrate that the proposed change has no adverse effect or reduction in the standards of quality or safety, design intent and at no cost and time implication to the Authority.

- 7.1.14 The Contractor shall coordinate with the SWC to ensure that the designated access routes are adequate for the delivery and future replacement of the E&M equipment.
- 7.1.15 The Contractor shall minimise the impacts of construction (noise, vibration and dust) on adjacent properties or stakeholders through appropriate design and provision of temporary construction hoarding, noise barriers, and road decking, to meet the concerns of affected stakeholders.
- 7.1.16 The Contractor shall design, supply and fix all penetrations, openings, sleeves, multiple cable transits (MCTs), cable ducts/cable draw pits with associated drainage and covers at entrances, plinths, stumps, lifting hooks, lifting beams, inserts, cast-in items, cable troughs, trenches, chases, drainage for troughs in the trackbed and other provisions/attendance required for all Interfacing Contractors to carry out their works.
- 7.1.17 The Contractor shall provide all necessary attendance and documents, including coordination with other parties, to ensure timely obtaining of the Temporary Fire Permit(s) (TFP) and Temporary Occupation Permit(s) (TOP), in advance of Substantial Completion of the whole of the Works, and all necessary actions, including coordination with other parties, to obtain the Fire Safety Certificate (FSC) and the Certificate of Statutory Completion (CSC) within six (6) months from the date of TOP.
- 7.1.18 Upon issuance of a Temporary Fire Permit (TFP), the Fire Protection System will be armed. The Contractor shall provide the necessary trained manpower (which may be part of his security personnel) to man the Fire Detection/Protection System of the related Stations 24 hrs daily and to activate the Singapore Civil Defence Force (SCDF) when necessary. In the event that Test Running commences prior to the obtaining of TFP, the Contractor shall also provide the necessary trained manpower to man the Fire Detection System (which is an integral part of the Clean Gas Fire Protection System) for Main Distribution Frame (MDF), Mobile Deployment Space (MDS), Signal Equipment Room (SER) and Communication Equipment/Integrated Supervisory Control System (CE/ISCS) rooms 24 hrs daily and to activate SCDF when necessary. The training will be provided by the Fire Protection System SWC.
- 7.1.19 Coordination with Adjacent Developments and/or Works by Utilities Agencies.
- (a) The Contractor shall closely coordinate and interface with all parties carrying out construction activities for adjacent development and/or utility agencies working in the vicinity of his Works. The coordination process shall include but not limited to sharing of site access, adjustment to the temporary traffic scheme among others; and

- (b) The Contractor shall closely monitor and keep detailed records of these third party works within the influence zone of the Contractor's Works and shall expeditiously highlight to the Engineer any impact resulting from these works on any structure including buildings, tunnels, bridges, roads and utilities amongst others.

7.1.20 The Contractor shall carry out public engagement with all affected stakeholders and relevant agencies prior to commencing his work and regularly during the course of the Works in accordance with **Clause 37** of the General Specification.

7.1.21 The Contractor shall coordinate with the operators and SWC, and the Contractor shall supply and install water points, floor traps and power sockets for maintenance and irrigation at every station entrance.

7.2 **General Interface Requirements**

7.2.1 The Contractor shall coordinate with the Interfacing Contractors on all aspects that may affect his works including but not limited to, pre-construction conditional surveys, ground improvement works, traffic diversions and the instrumentation and monitoring works.

7.2.2 The Contractor shall note and ensure proper and seamless interface with adjacent developments. The Contractor shall liaise with the developers/stakeholders after contract award for detailed requirements. All coordination, attendance, programming and interfacing works are deemed included in his contract price.

7.2.3 The Contractor shall ensure that there are no damages caused to the neighbouring properties by the construction process. The Contractor shall provide both pre- and post-construction surveys and reports to document the surrounding conditions prior and after the construction as specified in **Appendix U** of the Particular Specification. The Contractor shall coordinate with the relevant authorities and stakeholders to obtain all necessary approvals prior to the commencement of construction and upon completion.

7.2.4 The Contractor shall liaise with the Interfacing Contractors on the construction at the interface between adjacent CR205 and CR207 contracts. The Contractor is to closely coordinate with CR205 and CR207 on the waterproofing details at the interface and be fully responsible for the waterproofing works within his scope of Works as shown in the Authority's Drawings and shall ensure that a watertight, durable connection is achieved at the interfaces.

- 7.2.5 The Contractor shall ensure that his construction allows for the combined effects of settlement due to his works and the Interfacing Contractors/Parties' works. The Contractor shall coordinate with the Interfacing Contractors' Qualified Persons (QPs) to jointly establish the zone of influence where structures are affected by both contractors' works and appropriate review levels shall be set and agreed for each of their works so that integrity of the structures is unaffected. The Contractor shall keep settlement within the agreed pre-set review levels. The Contractor shall be responsible for advising the Engineer and the appointed instrumentation and monitoring contractors of all the required instrumentation and monitoring works. Refer to **Clauses 9 and 14** of the Particular Specification.
- 7.2.6 The Contractor shall liaise with Interfacing Contractors/Parties immediately upon the Award of Contract (or award of the interfacing contract if that is later) on the site access and/or traffic diversion of the existing road network, to ensure the access and diversions are synchronized.
- 7.2.7 The Contractor shall coordinate with Interfacing Contractors/Parties on the workspace requirements and sequence of works.
- 7.2.8 Instrumentation and monitoring of the ground and structures between the Interfacing Contractors/Parties are expected. Close coordination to obtain, transfer and exchange monitoring and site investigation data including the encountered ground conditions by each party will be required. The Contractor shall provide access and attendance for Instrumentation and Monitoring Contractors (IMC) appointed by the Authority to enter his site.
- 7.2.9 The Contractor shall carry out a risk analysis against flooding and submit to the Engineer for acceptance before any breaking in/out of any interfacing Earth Retaining and Stabilising System (ERSS) wall is allowed. The Contractor shall take any remedial measures required to protect his site from flooding.
- 7.2.10 At all times, both the Contractor and the Interfacing Contractors/Parties shall ensure that they take suitable measures to prevent any risks of flooding or water run-off to the adjacent contractor's works. The measures shall be to the acceptance of the Engineer. Both the Contractor and the Interfacing Contractors/Parties shall be responsible for their respective temporary drainage systems and flood protection measures to keep their respective work areas dry and free from flooding.
- 7.2.11 The Contractor shall not assume that the adjacent contractor has provided sufficient flood protection measures at the interface. The Contractor shall take adequate measures to ensure his excavation work is free of flooding at all times.

- 7.2.12 The Contractor shall design, supply and construct a temporary bund wall complete with metal fencing, gate and lockset for flood control and prevention of unauthorized access at each of the contract boundaries within the Contract. The Contractor shall submit the above design proposal to the Engineer for acceptance prior to the construction. The Contractor shall remove the temporary bund wall, metal fencing and the gate after the completion of the connecting tunnels and before the SWC access as per the key dates indicated in **Appendix B** of the Particular Specification. The Contractor shall ensure the removal will not impose flood risk to the tunnels subject to the acceptance of the Engineer. The Contractor shall be responsible for the cleaning of the dust and construction debris after removal of the above mentioned installation.
- 7.2.13 Lead Contractors and Integrated Tests
- (a) The Contractor's participation is required in integrated testing. The integrated testing will be led by respective SWC.
 - (b) The Contractor shall also comply with the provision of **Clause 11** of the Particular Specification.
- 7.2.14 The Contractor shall liaise closely with the owners of adjacent private properties on the extent of reinstatement works. The Contractor may in the course of these works be required to execute works beyond the contract boundary encroaching into the adjacent private properties. In cases where the Contractor needs to enter private properties to execute the works, the contractor shall engage the owners and obtain the necessary permission from the owners before entering the private properties at least 4 months before the commencement of the works.
- 7.2.15 The Contractor shall ensure that the reinstatement works does not affect the adjacent private properties' facilities, such as driveways, guard house, bin centre, substation, boundary walls, fencing, access gates (manual or auto), including foundation supports, landscaping, utilities, etc. In the event it does so, the Contractor shall fully reinstate all affected facilities to ensure that they continue to serve its intended function and purpose.
- 7.2.16 The design shall be submitted to the relevant authorities and the Engineer for acceptance
- 7.2.16.1 The Contractor shall note that the adjacent contractors will be required to carry out works within the Contractor's Contract Boundary, and the Contractor shall coordinate, cooperate and allow such access to the adjacent contractor. Such arrangement shall not absolve his legal/statutory and contractual responsibilities.

- 7.3 Interface with Adjacent CRL Contractor: Contract CR205 King Albert Park Station
- 7.3.1.1 The Contractor shall interface with Contract CR205. The Contractor shall launch their Tunnel Boring Machine (TBM) driving towards CR205 and interface with the end wall of King Albert Park Station as indicated in the Drawings.
- 7.3.1.2 TBM shall be docked outside the ERSS end wall of CR205. No provision has been made for the retrieval of the Contractor's TBM and all associated components from within CR205. The Contractor's TBM will be dismantled and retrieved from CR206 launch shaft. The shield skins shall be left in place and the Contractor shall construct the permanent in-situ lining to complete the tunnels.
- 7.3.1.3 The tunnel lining design, ERSS and the interface connection details with CR205 are developed based on following:
- a) The Contractor shall be responsible for completing the ground improvement works for TBM docking at CR205 interface area within three (3) months from the date of taking over the access or as mutually agreed and accepted by the Engineer. The Contractor shall coordinate, agree and sign off with CR205 for the actual date of completion work for ground improvement works and for planning of the sequence of the tunnel drives subject to the Engineer's acceptance. The Contractor shall refer to the Authority's Drawings for his scope and the interfacing details.
 - b) The Contractor shall be responsible for completing the permanent tunnel lining and waterproofing through the abandoned TBM shields up to the location of the Contract Limits as shown in the Authority's Drawings. This shall include temporary ground support to ensure the stability of the ground and the water tightness of the interface at the unsupported gap between ERSS and front shield once the cutter head is dismantled but before the permanent tunnel lining is completed. Upon completion of the permanent tunnel lining, CR205 will construct the cast-in-situ RC ring beam/tunnel eye, including waterproofing for the permanent end wall of CR205 as shown in the Drawings.
 - c) The Contractor shall coordinate with CR205 for the access and working area required for breaking through of the ERSS end wall of CR205. The Contractor shall complete the required works at the interfacing area as shown in the Authority's Drawings within three (3) months from the date of taking over the access or as mutually agreed and accepted by the Engineer. The Contractor shall be responsible for the clearance of all muck and debris arising from ERSS breakthrough.

- d) CR205 will design and install his ERSS end walls with Glass Fibre Reinforced Polymer (GFRP) soft eyes. The Contractor shall coordinate with CR205 for the required size of the soft eyes.

7.3.1.4 The Contractor shall coordinate the interfacing works and instrumentation limits of buildings and structures within the influence zone of both contractors. The Contractor shall be responsible to:

- (a) Carry out the necessary impact assessment incorporating the impact of CR205 works and his Works on each other and the combined impact to the surroundings;
- (b) Obtain the instrumentation plan from CR205 and review it together with the instrumentation provision in CR206 and assess the sufficiency of the instrumentation provision;
- (c) Develop a combined instrumentation plan that provides all necessary information for CR205 works in order to differentiate responsibilities in the event that any instrumentation triggers the recommended limits and submit it to the Engineer for acceptance;
- (d) Propose revision to any trigger limits of instrumentation installed by CR205 if it is deemed necessary, coordinate with and support CR205 to seek the necessary authorities' approvals for such revision. The Contractor shall be responsible for the proposed revision, including but not limited to the design assessments, producing drawings and liaising with relevant authorities, and bear all associated costs;
- (e) Coordinate and compile all readings taken from the instrumentations installed by the IM contractors for both CR205 and CR206, assess in relation to the ongoing works and site conditions by both contractors, and submit a daily assessment report endorsed by the Contractor's QP(D) and QP(Geo), with recommendation on actions required wherever necessary, to QP(S) for approval and the Engineer for acceptance; and
- (f) Coordinate with the adjacent contractor for works at the interface and ensure the proposed sequence of works does not compromise the safety of both CR205 and CR206 works.

7.3.1.5 Buildings, structures, facilities, utilities, etc., at the interfaces may be at risk of damage due to excessive settlement caused by the Contractor or CR205 whether individually or by a combination of these works as combined effects. The responsibility for re-analysis, re submission to the authorities, remedial and protection measures, subsequent repairs, etc., and the way forward as a result of the exceedance of the settlement limits due to the respective Contractors' works are summarised in Table 1 below:

Table 1: Summary of Possible Scenarios for Exceedance of Settlement Limits at Contract Interface CR205/CR206

	Case 1 (CR205 Contractor)		Case 2 (CR206 Contractor)		Case 3 (CR205 and CR206 Contractor)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2
WSL	Exceeded	Exceeded	Exceeded	Exceeded	Exceeded	Exceeded
Exceedance Due To	CR205 works	CR205 works	CR206 works	CR206 works	Concurrent works by CR205 and CR206	Concurrent works by CR205 and CR206
Damage	No	Yes	No	Yes	No	Yes
Actions	(i) CR205 Contractor to reassess and establish new WSL to allow works to proceed; establish new limits for CR206 works to proceed.	(i) CR205 Contractor to reassess and establish new WSL to allow works to proceed; establish new limits for CR206 works to proceed.	(i) CR206 Contractor to reassess and establish new WSL to allow works to proceed; establish new limits for CR205 works to proceed.	(i) CR206 Contractor to reassess and establish new WSL to allow works to proceed; establish new limits for CR205 works to proceed.	(i) Both CR205 and CR206 contractors to reassess and establish new WSL/limits to allow both works to proceed.	(i) Both CR205 and CR206 contractors to reassess and establish new WSL/limits to allow both works to proceed.
	(ii) CR205 Contractor to submit revised WSL to BCA.	(ii) CR205 Contractor to assess damage and propose remedial and protective measures.	(ii) QPs of the respective ST submissions to submit revised WSL to BCA)	(ii) CR206 Contractor to assess damage and propose remedial and protective measures.	(ii) QPs of the respective ST submissions to submit revised WSL to BCA)	(ii) Both CR205 and CR206 contractors to assess damage and propose remedial and protective measures.
		(iii) CR205 Contractor to submit revised WSL to BCA. (iv) CR205 Contractor shall be fully responsible for the remedial and protective measures, any resultant and further damage and repairs to be carried out up to completion of the Works.		(iii) QPs of the respective ST submissions to submit revised WSL to BCA) (iv) CR206 Contractor shall be fully responsible for the remedial and protective measures, any resultant and further damage and repairs to		(iii) QPs of the respective ST submissions to submit revised WSL to BCA) (iv) Both CR205 and CR206 contractors shall be fully responsible for the remedial and protective measures, any resultant and further damage and repairs to be carried out up to completion of the Works.

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				be carried out up to completion of the Works.		
Costs	CR205 Contractor shall bear all cost.	CR205 Contractor shall bear all cost.	CR206 Contractor shall bear all cost.	CR206 Contractor shall bear all cost.	Both CR205 and CR206 contractors shall jointly bear all costs. The costs may be divided proportionately based on evidences and/or justification provided and subject to the approval of the Engineer.	Both CR205 and CR206 contractors shall jointly bear all costs. The costs may be divided proportionately based on evidences and/or justification provided and subject to the approval of the Engineer.

Note: 1. Damage shall also include boundary wall, drains, apron slabs, gates, fencing, landscaping, utilities and services, manholes, inspection chambers, etc., and any affected units within the building.

- 7.3.1.6 The Contractor shall liaise with CR205 to establish and obtain access into the required working area within CR205 boundary (not limited to ground level) to carry out the tunnel interface works. The Contractor shall coordinate with CR205 contractor regarding the actual access dates for the works.

- 7.3.1.7 The Contractor shall be fully responsible to provide all the temporary provisions required for his works, such as, but not limited to, power, ventilation, lighting, access scaffolding, working platforms, drainage pumps, lifting equipment, formwork and falsework to facilitate his works at the interface.

- 7.3.1.8 The Contractor shall indemnify the Authority against all costs, charges and expenses resulting from his failure to properly coordinate the Works and the interfaces with CR205.

- 7.3.1.9 The Contractor shall coordinate with CR205 to ensure the structural finishes levels of the tunnel base slab, structural connections and waterproofing details are consistent at the interface.

- 7.3.1.10 In the event that the Contractor needs to make specific structural provisions to cater for his loading or method of construction, the Contractor shall liaise, coordinate and agree on the cost and time for such provisions with CR205.

- 7.3.1.11 The Contractor shall coordinate with CR205 for all loading and TBM operating parameters pertaining to TBM docking and breakthrough.

- 7.3.1.12 The Contractor shall coordinate with CR205 for his site investigation findings and all geotechnical site investigation information. This provision does not alleviate the Contractor of the responsibility to undertake the necessary site investigation for his Works.

- 7.3.1.13 The Contractor shall provide his site investigation findings and all geotechnical site investigation information to CR205 within one (1) month of completion of the site investigation.

- 7.3.1.14 The Contractor shall coordinate with CR205 for the delivery, storage and removal of materials and equipment necessary for the tunnel break in.

- 7.3.1.15 Unless otherwise specified, the worksite occupied by the Contractor shall be reinstated back to its original condition before handing back to CR205. For any proposed changes to the condition of worksite for handing back, the Contractor shall liaise and agree directly with CR205 subject to the Engineer's approval.

- 7.3.1.16 The Contractor shall remove all temporary provisions that relate to his works, except those that are required to be left in for attendance to the

SWC prior to handing back to CR205 or are otherwise agreed to be left in by the Engineer.

7.3.1.17 The Contractor shall convene a joint inspection with CR205 and the Engineer upon completion of the tunnelling works and prior to handing back of worksite to CR205. Any remedial works agreed shall be completed by the Contractor prior to the handover.

7.3.1.18 The Contractor shall coordinate with CR205 on the integration of the bored tunnel lining with the ring beam. The Contractor shall be responsible for the waterproofing between the tunnel lining and the ring beam as shown on the interface drawings.

7.3.2 The above clauses in no way absolve the Contractor of his responsibilities in relation to providing a safe worksite with all necessary temporary provisions. Any additional temporary provisions that the Contractor needs to provide shall be deemed included in the Contract Price.

7.4 **Interface with Adjacent CRL Contractor: Contract CR207**

7.4.1.1 The Contractor shall interface with Contract CR207. The Contractor shall note that CR207 will be driving TBM towards the end wall of Maju Station as indicated in the Drawings. No provision has been made for the retrieval of the TBM and all associated components from within Maju Station. CR207 will dismantle the TBM and retrieve from CR207 launch shaft.

7.4.1.2 The Contractor shall coordinate with CR207 for the detailed construction sequence at the interface area and provide access for CR207 ground improvement works at the interface. CR207 shall complete the ground improvement works for a time period of up to four (4) months or a mutually agreed date accepted by the Engineer with due consideration for mobilisation and demobilisation where staged access is provided.

7.4.1.3 In the event that CR207 tunnels reach and dock CR206 end wall before the station excavation reaches the formation level, the Contractor shall ensure

- a) Blasting design for the station rock removal account for the consideration of stability and vibration limit of bored tunnels. The Contractor shall obtain the relevant design requirements from CR207.
- b) Impact assessment of the blasting works induced onto the bored tunnels shall be carried out;
- c) Coordination with CR207 such that there will be minimal disturbance/disruption to CR207 works prior to commencement of blasting works.

- 7.4.1.4 The Contractor shall propose on the instrumentation plan, including installation and monitoring of the instruments within CR207 bored tunnels. CR207 shall provide access to facilitate installation and monitoring of the instruments by the Contractor.
- 7.4.1.5 Corresponding to clause 7.4.1.3, the Contractor shall coordinate with CR207 to allow coring through of the end wall immediately and access into their station once it is practically possible and safe to allow CR207 to confirm the wriggle survey of the CR207's bored tunnels.
- 7.4.1.6 The Contractor shall design and install his ERSS end walls with Glass Fibre Reinforced Polymer (GFRP) soft eyes. The GFRP shall be at least minimum tensile strength of 800MPa and designed to ACI 440 or equivalent. The Contractor shall coordinate with CR207 for the required size of the soft eyes.
- 7.4.1.7 The Contractor shall coordinate with CR207 for the access and working area required for breaking through of the ERSS end wall of Maju Station. CR207 will complete the required works at the interfacing area as shown in the Authority's Drawings within three (3) months from the date of taking over the access or as mutually agreed and accepted by the Engineer.
- 7.4.1.8 Upon completion of the permanent cast-in-situ lining inside the TBM skin (left-in-place) by CR207, the Contractor shall construct the cast-in-situ reinforced concrete ring beam and first stage concrete, including waterproofing, between the permanent cast-in-situ lining and the permanent end wall of CR206 as shown in Authority's Drawings. CR207 shall be responsible for the clearance of all muck and debris arising from ERSS breakthrough.
- 7.4.1.9 The Contractor shall liaise with CR207 when planning and implementing any traffic management scheme, including but not limited to traffic diversion to ensure the access and diversions are coordinated. The traffic consultant appointed by the Contractor shall plan and design the traffic management schemes to include a reasonable extent within the CR206 contract boundary to ensure the scheme is coordinated and feasible for both contracts.
- 7.4.1.10 The Contractor shall coordinate the interfacing works and instrumentation limits of buildings and structures within the influence zone of both contractors. The Contractor shall be responsible to:
- (a) Carry out the necessary impact assessment incorporating the impact of CR207 works and his Works on each other and the combined impact to the surroundings;
 - (b) Obtain the instrumentation plan from CR207 and review it together with the instrumentation provision for CR206 to assess the sufficiency of the instrumentation provision;

- (c) Develop a combined instrumentation plan that provides all necessary information for CR207 works in order to differentiate responsibilities in the event that any instrumentation triggers the recommended limits and submit it to the Engineer for acceptance;
- (d) Propose revision to any trigger limits of instrumentation installed by the adjacent contractor if it is deemed necessary, coordinate with and support CR207 to seek the necessary authorities' approvals for such revision. The Contractor shall be responsible for the proposed revision, including but not limited to the design assessments, producing drawings and liaising with relevant authorities, and bear all associated costs;
- (e) Coordinate and compile all readings taken from the instrumentations installed by the IM contractors for both the CR206 and CR207, assess in relation to the ongoing works and site conditions by both contractors, and submit a daily assessment report endorsed by the Contractor's QP(D) and QP(Geo), with recommendation on actions required wherever necessary, to QP(S) for approval and the Engineer for acceptance; and
- (f) Coordinate with CR207 for works at the interface and ensure the proposed sequence of works does not compromise the safety of both CR206 and CR207 works.

7.4.1.11 Buildings, structures, facilities, utilities, etc., at the interfaces may be at risk of damage due to excessive settlement caused by the Contractor or CR207 whether individually or by a combination of these works as combined effects. The responsibility for re-analysis, re submission to the authorities, remedial and protection measures, subsequent repairs, etc., and the way forward as a result of the exceedance of the settlement limits due to the respective Contractors' works are summarised in Table 2 below:

Table 2: Summary of Possible Scenarios for Exceedance of Settlement Limits at Contract Interface CR206/CR207

	Case 1 (CR206 Contractor)		Case 2 (CR207 Contractor)		Case 3 (CR206 and CR207 Contractor)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2
WSL	Exceeded	Exceeded	Exceeded	Exceeded	Exceeded	Exceeded
Exceedance Due To	CR206 works	CR206 works	CR207 works	CR207 works	Concurrent works by CR206 and CR207	Concurrent works by CR206 and CR207
Damage	No	Yes	No	Yes	No	Yes
Actions	(i) CR206 Contractor to reassess and establish new WSL to allow works to proceed; establish new limits for CR207 works to proceed.	(i) CR206 Contractor to reassess and establish new WSL to allow works to proceed; establish new limits for CR207 works to proceed.	(i) CR207 Contractor to reassess and establish new WSL to allow works to proceed; establish new limits for CR206 works to proceed.	(i) CR207 Contractor to reassess and establish new WSL to allow works to proceed; establish new limits for CR206 works to proceed.	(i) Both CR206 and CR207 contractors to reassess and establish new WSL/limits to allow both works to proceed.	(i) Both CR206 and CR207 contractors to reassess and establish new WSL/limits to allow both works to proceed.
	(ii) CR206 Contractor to submit revised WSL to BCA.	(ii) CR206 Contractor to assess damage and propose remedial and protective measures.	(ii) QPs of the respective ST submissions to submit revised WSL to BCA)	(ii) CR207 Contractor to assess damage and propose remedial and protective measures.	(ii) QPs of the respective ST submissions to submit revised WSL to BCA)	(ii) Both CR206 and CR207 contractors to assess damage and propose remedial and protective measures.
		(iii) CR206 Contractor to submit revised WSL to BCA. (iv) CR206 Contractor shall be fully responsible for the remedial and protective measures, any resultant and further damage and repairs to be carried out up to completion of the Works.		(iii) QPs of the respective ST submissions to submit revised WSL to BCA) (iv) CR207 Contractor shall be fully responsible for the remedial and protective measures, any resultant and further damage and repairs to		(iii) QPs of the respective ST submissions to submit revised WSL to BCA) (iv) Both CR206 and CR207 contractors shall be fully responsible for the remedial and protective measures, any resultant and further damage and repairs to be carried out up to completion of the Works.

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				be carried out up to completion of the Works.		
Costs	CR206 Contractor shall bear all cost.	CR206 Contractor shall bear all cost.	CR207 Contractor shall bear all cost.	CR207 Contractor shall bear all cost.	Both CR206 and CR207 contractors shall jointly bear all costs. The costs may be divided proportionately based on evidences and/or justification provided and subject to the approval of the Engineer.	Both CR206 and CR207 contractors shall jointly bear all costs. The costs may be divided proportionately based on evidences and/or justification provided and subject to the approval of the Engineer.

Note: 1. Damage shall also include boundary wall, drains, apron slabs, gates, fencing, landscaping, utilities and services, manholes, inspection chambers, etc., and any affected units within the building.

- 7.4.1.12 The Contractor shall liaise with CR207 to establish the required working area within CR206 contract boundary (not limited to ground level) and provide access for CR207 contractor to carry out their tunnel interface works. The Contractor shall coordinate with CR207 contractor regarding the actual access dates for the works.
- 7.4.1.13 Respective contractors shall be fully responsible to provide for themselves all the temporary provisions required, such as, but not limited to, power, ventilation, lighting, access scaffolding, working platforms, drainage pumps, lifting equipment, formwork and falsework to facilitate their own works at the interface.
- 7.4.1.14 The Contractor shall indemnify the Authority against all costs, charges and expenses resulting from his failure to properly coordinate the Works and the interfaces with CR207.
- 7.4.1.15 The Contractor shall coordinate with CR207 to ensure the structural finishes levels of the tunnel base slab, structural connections and waterproofing details are consistent at the interface.
- 7.4.1.16 The Contractor shall coordinate with CR207 for all loading and TBM operating parameters pertaining to TBM docking and breakthrough.
- 7.4.1.17 The Contractor shall provide his site investigation findings and all geotechnical site investigation information to CR207 within one (1) month of completion of the site investigation.
- 7.4.1.18 The Contractor shall coordinate with CR207 for the delivery, storage and removal of materials and equipment necessary for the tunnel break in.
- 7.4.1.19 The Contractor shall convene a joint inspection with CR207 and the Engineer upon completion of the tunnelling works and prior to handing back of worksite to CR206.
- 7.4.1.20 The Contractor shall design and construct the ring beam to enclose the face of the bored tunnel lining. The Contractor shall coordinate with CR207 on the integration of the bored tunnel lining with the ring beam. The Contractor shall be responsible for the waterproofing between the tunnel lining and the ring beam as shown on the interface drawings.
- 7.4.2 The above clauses in no way absolve the Contractor of his responsibilities in relation to providing a safe worksite with all necessary temporary provisions. Any additional temporary provisions that the Contractor needs to provide shall be deemed included in the Contract Price.

7.5 Interface with Advance Utilities Contract CR2016

- 7.5.1.1 Contract CR2016 is the design, construction, supervision and completion of water pipes diversion, sewer pumping main diversion, diversion of existing utilities to common utilities corridor, drain diversion, **ground levelling** and other associated works along Clementi Road/ Clementi Forest. The Contractor shall liaise, coordinate and take into account CR2016's works when planning the Works.
- 7.5.1.2 The Contractor shall note that **CR2016 will complete the ground levelling works at 18 mSHD including tie-in with adjacent road levels for the worksite Area A** as per the site possession date in PS Appendix B Key Dates. The Contractor shall liaise and coordinate with CR2016 for the condition of worksite Area A handover.
- 7.5.1.3 The Contractor shall note that the use of land area in **worksite Area A** as shown in the Authority's Drawings would only be **made accessible from 1 March 2024 onwards**. The Contractor shall make allowance for the works interfacing with CR2016 in his programme to possess part of or the whole of Area A from 1 March 2024 onwards, subject to interfacing with CR2016 and the Engineer's acceptance.
- 7.5.1.4 The Contractor shall **liaise and coordinate with CR2016 for worksite planning and ensure that the required hoarding and noise barriers are in place for his works. The Contractor shall maintain the hoarding and the noise barrier until the completion of the Works.**
- 7.5.1.5 The Contractor shall refer to **Clause 16** of the Particular Specification for the coordination with the CR2016 contractor for utilities diversion works.
- 7.5.1.6 The Contractor shall **coordinate with CR2016 for the as-built slope design along Clementi Forest. The Contractor shall take over and maintain the slope, inclusive of drain holes installed by CR2016 on the slope, until completion of the reinstatement works.** The Contractor shall also remove the temporary works not limiting to shotcrete, soil nail, etc installed by CR2016 and reinstate the slope to the satisfaction of the land owner and the Engineer.
- 7.5.1.7 The Contractor shall take the necessary measures to protect and monitor the slopes stability during the underground station construction works. Any modifications to the existing slope or measures to ensure the slope stability are deemed included under the Contract Price.
- 7.5.1.8 The Contractor shall note that CR2016 utilities, drainage and traffic diversion works are on-going when the Contractor is on-board. The Contractor shall liaise and coordinate with CR2016 for their schedule of works.

- 7.5.1.9 The Contractor shall note that any ongoing Advance Utility Diversion Works that continues beyond **30 Dec 2024**, the Contractor shall be required to take over from CR2016 to continue to liaise and coordinate with the utility agencies including providing attendance so as to enable the utility agencies to complete the remaining advanced diversion works. The cost for the aforesaid attendance, coordination and liaison works by the Contractor is deemed to be included in the Contract Price.
- 7.5.1.10 The Contractor shall be liable for and shall indemnify the Authority against all costs, charges, expenses and the like sustained by the Authority or no claim for extension of time and/or additional costs by the Contractor will be accepted by the Authority arising out of or in association with the Contractor's failure to discharge his obligations as specified hereinabove.
- 7.6 **Interface with PUB DTSS Contractor**
- 7.6.1 The Contractor shall note that PUB's contractor are constructing Deep Tunneling Sewerage System (DTSS) 2.1 m diameter link sewer along Clementi Road. The Contractor shall coordinate with PUB's contractor for their sequence of works and scheduled timeline.
- 7.6.2 The Contractor shall note that the existing 600mm diameter pumping main run across the proposed underpass structures. The pumping main will be decommissioned by PUB DTSS Contractor upon completion of the DTSS 2.1m diameter link sewer. The Contractor shall liaise with and co-ordinate with PUB DTSS Contractor on the decommissioning works.
- 7.6.3 Prior to the underpass construction works, the Contractor shall coordinate, verify and ensure that the existing 600mm diameter pumping main has been decommissioned and properly sealed off to his satisfaction.
- 7.6.4 In the event the existing 600mm diameter pumping main has not been decommissioned in time for his Works, the Contractor shall design and divert the existing 600mm diameter pumping main subject to approval from relevant agencies. All cost and time is deemed to be included in the Contract Price.
- 7.6.5 The Contractor shall decommission the existing 525 mm diameter sewer pumping main upon the completion of the DTSS 2.1 m diameter link sewer.
- 7.6.6 The Contractor shall comply with the minimum setback from the proposed sewers (refer to PUB WRN requirement on the sewer/pumping main setback) and ensure that CR206 works does not impact the operation of DTSS link sewer.

7.7 Provision For Future Interfaces

- 7.7.1 The Contractor shall note that there will be future development above the station. The Contractor shall refer to **Appendix BH** of the Particular Specification for a description of the future development; as well as the design requirements and interfacing provisions for integration with the said future development.
- 7.7.2 The Contractor shall consult and coordinate with URA, NParks, the Authority and all relevant agencies to confirm and comply with all interfacing requirements to finalise the station design for the Authority's / agencies' acceptance.
- 7.7.3 The Contractor shall make provisions for structural support and all interfacing requirements. The loading provisions indicated in the Authority's Drawings are for reference only. The Contractor shall be responsible to liaise with relevant agencies and stakeholders on the detailed provision requirements (both loading and location) and to provide all necessary interfacing works for the future developments interfaces.
- 7.7.4 For all stump columns provision above the station roof slab, the Contractor shall ensure coupler provision is provided for the future development connection.
- 7.7.5 The Contractor shall work with the relevant agencies, the Authority and stakeholders for the requirements of the KOPs for future developments breakthrough and integration.
- 7.7.6 The Contractor shall work with the relevant agencies, the Authority and stakeholders to finalise the details, as well as knock out zones within the ERSS wall for future developments connections and provide column stumps where necessary at future developments interface.
- 7.7.7 **The Contractor shall prepare a detailed Development Interface Report (DIR) as stipulated in Clause 9 of the Particular Specification.**
- 7.7.8 The Contractor shall coordinate and provide all interfacing requirements in the Works as provision to enable the construction and integration of the future developments interfaces. The Contractor shall indemnify the Authority against all costs, charges and expenses resulting from his failure to do so properly
- 7.7.9 **Interface with Ki Residences developer**
- 7.7.9.1 The Contractor shall note that Ki Residences developer will be carrying out road works for the construction of Brookvale Drive junction. The

Contractor shall coordinate with Ki Residences developer on, but not limited to, sharing of site access, access into worksite and road reinstatement interfaces.

- 7.7.9.2 The Contractor shall ensure smooth interface when tying-in the road levels and furniture between his temporary traffic scheme and Brookvale junction.
- 7.7.10 **Interface with MINDEF and DSTA Maju Camp**
 - 7.7.10.1 The Contractor shall coordinate and interface with MINDEF and DSTA Maju Camp on the works that affect their premises and amenities. The Contractor shall interface and coordinate with MINDEF and DSTA on the possession of worksite as indicated in the Authority's Drawings. The Contractor shall refer to **Appendix BH** of the Particular Specification for the requirement to carry out of works within Maju Camp.
 - 7.7.10.2 The Contractor shall construct temporary and permanent retaining structure to facilitate the construction of Entrance 3. The Contractor shall relocate and maintain the security fence affected by Entrance 3 worksite and reinstate the security fence upon completion of the Works. The location of the temporary and permanent security fence shall be agreed with the Engineer, MINDEF and DSTA. The Contractor shall ensure that access to the carpark lots at Maju Camp shall be maintained at all times during construction.
 - 7.7.10.3 Prior to the modification/ temporary diversion affecting Maju Drive, the Contractor shall construct additional access way from Maju Camp carpark towards Brookvale Drive as shown in the Authority's Drawings. The Contractor shall liaise with MINDEF and DSTA on the requirement of the access. This access shall be maintained at all times during construction works and reinstated upon completion of the Works.
 - 7.7.10.4 The Contractor shall coordinate with MINDEF and DSTA for the relocations and reinstatement of all ancillary structures affected by Entrance 3 works including but not limited to bulk water meter chamber, internal sewer inlet chambers (IC), sentry post, carpark lots, drainage, landscaping, lamp post, trees, CCTVs, surveillance and networks equipment, etc. The final locations of the ancillary structures shall be agreed with the Engineer, MINDEF and DSTA. The Contractor shall engage MINDEF and DSTA appointed contractor for the relocation of Maju Camp's security systems (e.g CCTVs, surveillance and networks equipment, etc). All ancillary structures, facilities, amenities, landscaping, etc, removed for the purpose of the Works shall be fully reinstated to Maju Camp's satisfaction upon the completion of the Works.

- 7.7.10.5 The Contractor shall liaise with MINDEF and DSTA to obtain information for the existing structures, facilities, utilities, and services that will be affected by his Works. When such information is not available, the Contractor shall plan and conduct suitable site investigations, including but not limited to trial trenches, geophysical surveys to obtain such information.
- 7.7.10.6 The Contractor shall adhere to the security requirement imposed by MINDEF and DSTA.
- 7.7.10.7 The Contractor shall coordinate and seek approval from MINDEF and DSTA to confirm the fencing design and any security measures
- 7.7.10.8 The site hoarding shall be independent from Maju Camp security fence.
- 7.7.10.9 The Contractor shall obtain NParks' written approval before felling any affected trees within Maju Camp.
- 7.7.10.10 The Contractor shall ensure that his works will not cause any adverse impact to Maju Camp's camp operations. Construction access via Maju Drive is not allowed.
- 7.7.10.11 Upon completion of Entrance 3 at Maju Camp, the Contractor shall arrange site inspection with the Engineer, DSTA/MINDEF, SLA and the relevant authorities before commencement and after completion of the reinstatement works. The Contractor shall reinstate the work areas with the following considerations:
- All temporary works shall be removed and the reinstated area shall be free of encumbrances;
 - The reinstated driveway, green verge, carpark lots, etc shall tie-in with existing Maju Camp level.
 - The reinstated structures and ancillary facilities affected by works shall meet DSTA and MINDEF's requirement for operations and activities; and
 - The reinstatement works shall not result in any remnant land outside MINDEF's fence.
- 7.7.11 **Interface with MOE and SIM/SUSS**
- 7.7.11.1 The Contractor shall note that some of the work areas for the construction of the Entrance 2 are located close to and/or within SIM/SUSS. The Contractor shall only take site possession of the Entrance 2 worksite on the date specified in **Appendix B** of the Particular Specification The Contractor shall interface and coordinate

with SIM/SUSS on the possession of worksite as indicated in the Drawings.

- 7.7.11.2 The Contractor shall coordinate and interface with SIM/SUSS on the works that are affecting their premises and amenities including but not limited to the following:
- (a) The Contractor shall relocate all ancillary structures affected by Entrance 2 worksite including but not limited to bulk meter chamber, fire hydrant, internal sewer inlet chambers (IC), carpark variable message sign (VMS), drainage, landscaping, lamp post, trees, CCTVs, bus stop lightning protection system and street furniture. The location of the ancillary structures shall be agreed with the Engineer and SIM/SUSS.
 - (b) The Contractor shall remove the Pedestrian Overhead Bridge (POB), staircases, lifts and other associated structures along Clementi Road as shown on the Authority's Drawings. The Contractor shall coordinate with SIM/SUSS for the removal of POB. The Contractor shall be required to provide a temporary at-grade signalized pedestrian crossing to the acceptance of the Engineer prior to the demolition of the POB and shall maintain this temporary facility until the underpass is open for public access.
 - (c) The Contractor shall liaise and coordinate with SIM/SUSS to remove the existing canopy shelter connecting the existing POB to SUSS. The Contractor shall decommission, remove and/or divert any affected utilities services, lightings, lightning conductors, CCTVs, etc. The Contractor shall provide temporary shelter to replace the canopy shelter.
 - (d) The Contractor shall design, coordinate, and construct a new canopy shelter to ensure a seamless connection between the new PUDO, the existing covered linkway along the ramp and SIM/SUSS Blk C. The Contractor shall also reinstate any existing structures that are affected by his demolition and reconstruction works of the Canopy.
 - (e) The Contractor shall coordinate with SIM/SUSS and the Authority to design and construct a sheltered shared path between the new PUDO and Entrance 2, including a Pedestrian Priority Zone (PPZ) at the existing bus stop. He shall consider the interfacing requirements between the sheltered shared path, PPZ, existing bus stop and barrier-free pedestrian access to SIM/SUSS.

- (f) The Contractor shall coordinate with SIM/SUSS and the Authority to design and construct a new sheltered barrier-free pedestrian connection between Entrance 2 (Level 2) and SIM Blk A.
- (g) Any addition and/or alteration works that arise from the above-mentioned scope shall be deemed included in the Contractor's Works and to the Engineer's acceptance as well as to SIM/SUSS's satisfaction.
- (h) All facilities, amenities and landscaping, etc. removed for the purpose of the Works shall be fully reinstated to SIM/SUSS's satisfaction upon the completion of the Works;

7.7.12 Interface with Far East Flora

- 7.7.12.1 The Contractor shall coordinate with Far East Flora for any works affecting their area. The access to Far East Flora shall be maintained at all times during construction works.

7.8 Interfaces with Adjacent Stakeholders: General Requirements

7.8.1 Interface with All Stakeholders/Landowners

- 7.8.1.1 The Contractor shall engage and keep all stakeholder/landowners apprised of the status of the Works. Such stakeholders/landowners include Utility Agencies on the utility gap, PUB(WRN) crossing over/under sewer pipes, RWRL on the roadwork and furniture, NParks, restaurants, schools, childcare, condominiums, church and all other stakeholders/landowners as necessary.
- 7.8.1.2 The Contractor shall keep the stakeholders/landowners' accesses open and safe at all times.
- 7.8.1.3 The Contractor shall take in feedback from above stakeholders/landowners and address their concerns as required.
- 7.8.1.4 Where the nearest row of glass facade, partitions and doors of the adjacent building is deemed to be within the zone of influence of the excavation worksite, the Contractor shall coordinate with the stakeholder for permission to install necessary measures to prevent the glass from shattering, for example with the use of suitable lamination. The Contractor shall arrange to replace any damaged glass panels as soon as possible, at his own cost.
- 7.8.1.5 The Contractor shall liaise and coordinate with all future developer/contractors/agents in all aspects of Works, including but not limited to, worksite access, working arrangement, construction sequence, temporary traffic management and all other interfacing requirements to ensure full compatibility at all stages of the Works.

7.9 Interface with NParks Contractors

- 7.9.1 The Contractor and his landscape architect shall be responsible for the design of the location of planting areas and obtain NParks' approval for Planning and Building Plan submissions.
- 7.9.2 NParks shall complete the planting within state land, including the road reserve, where the planting is maintained by NParks. The Contractor shall be responsible for all planting in private land, and state land where the planting will not be maintained by NParks.
- 7.9.3 The Contractor shall carry out all enabling works to facilitate NParks to carry out the planting works. Such provisions shall include but are not limited to the following:
- (a) Site clearance and excavation within the verge area and centre median along the proposed road;
 - (b) Compaction of ground in preparation for receiving of trees from NParks/term contractor(s), including excavation of holes to receive tree species, in accordance with NParks' requirements;
 - (c) Carry out close turfing;
 - (d) Design and construction of trellises in accordance with **Clause 9** of the Particular Specification;
 - (e) Provide access to NParks and his contractor for the planting works and provision of excavation for tree plantings where instructed by the Engineer;
 - (f) Design, construction, completion and commissioning of irrigation systems;
 - (g) Coordinate with authorities and relevant agencies for associated works involving landscaping including but not limited to installation of CCTVs, external works such as lamp-posts, OG boxes and underground services to avoid clashing with the landscaping works; and
 - (h) All necessary enabling works carried out by the Contractor for the landscaping and planting shall be deemed to be included in the Contract Price.
- 7.9.3.2 The Contractor shall indemnify the Authority against all costs, charges and expenses resulting from his failure to properly coordinate the Works and the interfaces with the NParks contractor in a timely manner.

- 7.9.3.3 Upon completion of the landscaping and tree planting works, the Contractor shall coordinate with NParks contractor or LTA term contractor to ensure timely handover of the completed works to NParks. The Contractor shall comply with the **Appendix AB** of the Particular Specification on the handing over of horticulture and hardscape. The Contractor shall indemnify the Authority against all costs, charges and expenses resulting from his failure to properly coordinate and hand over the Works and the interfaces to NParks in a timely manner.
- 7.9.3.4 The Contractor shall refer to **Table 3** below for a summary of scope of works for planting between the Contractor and NParks.

Table 3 - Scope of Works for Planting

S/N	Description of Landscape Works		Scope of Installation	Scope of Maintenance
1	Within Road Reserve	Landscaping (including tree planting) within road reserve that is maintained by NParks reflected in the station's and tunnel's BP submission plan	<ul style="list-style-type: none"> Landscaping scheme to be designed by NParks NParks to plant greenery within road reserve CR206 to excavate to 1m soil depth along planting verge and 600mm at service verge before handing over to the Specialist Sub-contractor (SS) for Approved Soil Mix (ASM) backfill 	<ul style="list-style-type: none"> NParks to maintain greenery within road reserve
2		Trellises along covered linkways (CLW) from station entrance to first transport node (i.e. bus bay, taxi bay, PUDO) reflected in the station's BP submission plan and Tunnel's BP submission plan where applicable	<ul style="list-style-type: none"> Trellis nylon cables and hooks to be installed by CR206 CR206 to handover trellis system for NParks to carry out planting 	<ul style="list-style-type: none"> NParks will maintain the plantings and trellis nylon cables only Covered Linkway by LTA

S/N	Description of Landscape Works		Scope of Installation	Scope of Maintenance
3	On State / NParks Land (Outside Road Reserve) – Cont'd		<p>Within other land (not maintained by NParks)</p> <ul style="list-style-type: none"> CR206 to share the landscaping scheme provided by NParks to relevant landowners to seek their concurrence on the scheme CR206 to coordinate with the landowners on the scheme and reinstatement. These works will not be carried out by NParks <p>Within state land (maintained by NParks)</p> <ul style="list-style-type: none"> Landscaping scheme to be designed by NParks NParks to plant greenery within state land CR206 to excavate to 1m soil depth along planting verge and 600mm at service verge before handing over to the Specialist Sub-contractor (SS) for Approved Soil Mix (ASM) backfill 	<ul style="list-style-type: none"> NIL
4		<p>Green roof on station entrances*</p> <p>CR206 shall design dedicated access for NParks to carry out maintenance for the green roof. CR206 shall ensure access provision is coordinated with PTS and Operator, and comply with PTS requirement.</p>	<ul style="list-style-type: none"> CR206 to propose the type of Green Roof system and get agreement from NParks CR206 to provide and install the green roof system including the vegetation and water irrigation system 	<ul style="list-style-type: none"> NParks to maintain the whole green roof system including the plants, substrate and irrigation system PTO will provide for the use of water and electricity <p>*Irrigation provision and system shall be submitted to NParks for further coordination and agreement</p>

- 7.10 **Interface with SingPost**
- 7.10.1 The Contractor shall coordinate and obtain approval from the Authority's Public Transport Security (PTS) department, SingPost and any other authorities and/or agencies for positioning/relocation of the post boxes/letter boxes affected by the Works, subject to acceptance from the Engineer.
- 7.11 **Interfacing with Street Lighting and Traffic Signals Contractors**
- 7.11.1 The Contractor shall carry out coordination, supply, installation testing and commissioning of street lighting and traffic signals, including new and diverted lighting and signals, laying of underground power and communication cables, installation of OG and control boxes etc. The Contractor shall engage LTA's specialist term contractors via the respective LTA divisions for the works. All costs associated with the works shall be deemed to be included in the Contract Price.
- 7.12 **Interface with Authority's Consultants and Others**
- 7.12.1 **Interface with Contract M&E Consultants & Authority's In-house Designers**
- 7.12.1.1 The Authority has appointed CR2007 consultant and Authority's In-house Designers to carry out M&E design which includes the design of the Environmental Control System (ECS), Fire Protection System (FPS) and Electrical Services (ES) for station, tunnels, etc.
- 7.12.1.2 The Contractor shall coordinate and interface with Authority's In-house Designers on the design requirement of the ECS, FPS and ES. The Contractor shall interface with SWC in accordance with Clause 11 of the Particular Specification.
- 7.12.1.3 The Contractor shall coordinate and interface with CR2007 consultant on the design requirements and the development of lighting design for all the public areas and above-ground structures. The lighting design shall be integrated with the overall architectural design of the station.
- 7.12.1.4 The Contractor shall coordinate and interface with CR2007 consultant and Authority's In-house Designers on the design requirements for air circulation fans (e.g. High Volume Low Speed (HVLS) fans, ceiling fans, wall-mounted fans) at station concourse and platform public area. The Contractor shall design, supply and install the necessary support for the air circulation fans.

- 7.12.1.5 The Contractor shall interface with ECS SWC on the installation of the HVLS fans. The Contractor shall incorporate and take into consideration the requirement of ceiling height and ceiling panel cut out for the HVLS safety/stabilization cables secure to the structure, in the design development of the ceiling height and ceiling panels.
- 7.12.1.6 The Contractor shall coordinate with Authority's In-house Designers and the SWC to incorporate all structural requirements, not limited to imposed loads, support systems, foundations and connections of Thermal Storage (TES) Tank to the permanent structure, in Contractor's design. The TES tank will be supported on the main structural slab which is to be designed and built by the Contractor. The TES tank will be supplied and installed by the SWC.
- 7.12.1.7 The Contractor shall interface and coordinate with the Authority's In-house Designers for the Tunnel Ventilation System and Power Supply System (High Voltage & Traction Power) on the design requirements for station and tunnels.
- 7.12.1.8 The Contractor shall incorporate and take into consideration the M&E requirements in the design development of the station.
- 7.12.1.9 The Contractor shall coordinate and interface with CR2007 consultant and Authority's In-house Designers to obtain the required design interfacing information to enable him to meet his Pre-Final, Final and Updated Final Design Submission key dates.
- 7.12.1.10 The Contractor shall interface and coordinate with CR2007 consultant and Authority's In-house Designers for the Tunnel Ventilation System on the TVS design requirement for station and tunnels including Tunnel Booster fan niche locations and details.
- 7.12.2 **Interface with Environmental Monitoring and Management Programme (EMMP) Auditor (CR2009)**
- 7.12.2.1 The Authority will be appointing Consultancy Services (Auditor) to carry out environmental audits (for all assessed environmental parameters) throughout the construction and commissioning phases to assess the Contractor's EMMP performance and to verify that the Contractor is implementing and complying with the mitigation measures outlined in the EMMP, Authority's requirements and authorities' and/or agencies' requirements. The environmental audit shall comprise of on-site, documentation and system audit of Contractors' EMMP works.

- 7.12.2.2 The audits shall be conducted at least twice per year, unless otherwise stated by the Authority. Additional audits may be required at key construction stages. The Contractor shall facilitate, provide attendance and all necessary access for the Auditor to carry out their audit safely.
- 7.12.2.3 The Contractor shall ensure that all findings are closed out timely up to the Auditor's satisfaction and in compliance with the approved EMMP.
- 7.12.3 **Interface with Instrumentation and Monitoring Contractors and Geotechnical Database Contractor**
- 7.12.3.1 The Contractor shall interface with the Instrumentation and Monitoring (IM) contractor as outlined by **Clause 14** of Particular Specification and the Authority's appointed contractor for Geotechnical Database (GDB).
- 7.12.3.2 The Contractor shall facilitate to provide all necessary access to the IM contractor to carry out the instrumentation and monitoring works safely and timely.
- 7.12.3.3 The Contractor shall work with the IM contractor and GDB contractor to determine the format of construction data for uploading to a designated server.
- 7.12.3.4 The Contractor shall render full support and assistance for public relation matters for the IM contractor.
- 7.12.4 **Interface with Public Transport Operators (PTO)**
- 7.12.4.1 The Contractor shall liaise and coordinate with CRL PTO, who will be appointed by the Authority, prior to the completion of the Works. The Contractor shall provide all necessary attendance to the representatives of the PTO to facilitate their inspection of the completed works, prior to handing over of the Works.
- 7.12.5 **Interface with Utility Agencies**
- 7.12.5.1 The Contractor shall note that utility agencies may be carrying out works in the vicinity during the Contract Period.
- 7.12.5.2 The Contractor shall coordinate with the utility agencies and where applicable, make allowance for the works in his programme, make necessary provisions and provide attendances for the utility agencies to carry out their works.
- 7.12.5.3 All necessary enabling works carried out by the Contractor for the utility diversions shall be deemed to be included in the Contract Price.

- 7.12.5.4 Please refer to **Clause 16** of the Particular Specification for other requirements.
- 7.13 **Interface with System Wide Contractors (SWC) and Other Interfacing Contractors**
- 7.13.1 **General**
- 7.13.1.1 In the event that the SWC are not on board during the course of the contract, the Contractor shall liaise and coordinate with the Authority's E&M Interfacing Parties until the SWC are appointed.
- 7.13.1.2 The SWC shall be responsible for the design and installation of the principal components of E&M railway systems for the CRL. The E&M systems are indicated in **Appendix A** of Particular Specification.
- 7.13.1.3 The Contractor shall interface with SWC to gather all pertinent requirements of E&M and incorporate them into the construction and work with the SWC to ensure all the civil provisions as necessary to facilitate the construction of the various E&M systems are met. The Contractor shall sign off the Interface Control Document (ICD) prepared by SWC for the Integrated Supervisory Control System (ISCS) relating to designed control points to security shutter, fire shutters, pumping system etc.
- 7.13.1.4 The Contractor shall provide a door/gate schedule, indicating doors and gates that are fitted with Access Management System (AMS) and indicate clearly on drawings the active door leaf. The Contractor shall identify and provide a list of AMS doors and gates to be unlocked, along with the means of escape path, as stipulated in the prevailing Code of Practice for Fire Precautions in Rapid Transit System. The Contractor shall coordinate with the AMS System-wide Contractor on the mounting details of the AMS devices on the doors/gates, as well as obtaining the necessary certifications for the fire-rated doors.
- 7.13.2 **Interface with Overhead Conductor Rail (OCR) Contractor**
- 7.13.2.1 The Contractor shall coordinate and provide the following information to OCR Contractor to facilitate OCR installation:
- (a) Station trackway longitudinal section drawings;
 - (b) The concrete thickness and rebar locations and density for trackway;
 - (c) Any changes to the tunnel roof and trackway, soffit design proposed by the Contractor;

- (d) As-Built drawings for trackway; and
 - (e) All other information and drawings as required by OCR Contractor.
- 7.13.2.2 The Contractor shall allow OCR contractor to drill in station trackway for mounting of OCR equipment. The Contractor shall coordinate with OCR Contractor and agree on the location and drilling method statements.
- 7.13.2.3 The Contractor shall provide the “drilling zone” information for trackway to ensure OCR Contractor’s drilling does not damage any reinforcement bar.
- 7.13.2.4 The Contractor shall attend and sign off as a witness to a hole drilling demonstration conducted by OCR Contractor, and ascertain the method of drilling is correct before the OCR Contractor can proceed to commence the drilling activity.
- 7.13.2.5 The OCR Contractor shall immediately notify the Civil Contractor if there is any water seepage, crack or defect associated to the drilled hole on the concrete segment. The Contractor shall immediately rectify any water seepage.
- 7.13.3 **Interface with Trackwork Contractor**
 - 7.13.3.1 The Contractor shall coordinate with Trackwork contractor on the final position of sump pit opening within the station trackway. Where the information has not been provided or finalised at the end of CCSM coordination, the Contractor shall make provisions in their design and construction methodology to align the final position of the sump pit openings at the civil first stage/ trackwork concrete interface at sections of canted track respectively. All time and cost required shall be deemed to be included in the Contract Price. The Contractor shall submit his proposal for the Engineer’s acceptance.
 - 7.13.3.2 The Contractor shall coordinate with Trackwork contractor for provision of drainage outlets along the station trainway to facilitate drainage of cable troughs crossing the track. The proposed position of the drainage outlets shall be positioned near to drainage collector pits. All time and cost required shall be deemed to be included in the Contract Price. The Contractor shall submit his proposal for the Engineer’s acceptance.
 - 7.13.3.3 The Contractor shall make provisions for the following:

- (a) Two 300mm diameter tremie access openings, one in each bound of track shall be provided as agreed with the Trackwork contractor to facilitate delivery of track bed concrete via concrete tremie pipes provided by the Trackwork contractor;
- (b) The tremie access openings are required to remain in place from the Basic Structure Completion until completion of Trackwork contractor's works;
- (c) The tremie access openings shall be located so as to provide straight delivery from ground level to a point over the centre of each track at each end of the station/cut and cover box and launch shaft. Tremie pipe routing shall be coordinated and shall not be located within the E&M plant rooms. The location of the tremie access openings at ground level shall be such that concrete trucks have 24 hours uninterrupted access to the tremie access openings and a suitable turning area for vehicle movement;
- (d) After the concreting of the track bed has been completed, the Contractor shall undertake the sealing and making watertight the tremie access openings to the acceptance of the Engineer;
- (e) All drainage pipes (exposed and embedded) and cable troughs within the trainways and tunnels shall be plugged and temporary drainage shall be provided for the installation of trackworks. The Contractor shall conduct flow test for drainage pipes and submit the reports for acceptance of the Engineer;
- (f) The Contractor shall provide adequate area near/ adjacent to the tremie pipe access to accommodate Trackwork contractor's vehicular movements of concrete trucks, concrete pump, generator sets, etc. The area shall be able to hold at least two (2) concrete trucks at any one time;
- (g) The Civil contractor shall note the design interface between Trackwork and Signalling contractor may not be completed in time for his casting of 1st stage concrete and cross passage. In particular, the track cant design can only be completed after provision of speed profile information by the Signalling contractor and this may affect the sump pit opening centreline and cross passage finish level. The Civil contractor shall mitigate this impact through his design and construction methodology to allow provision of track cant information at a later stage by the Trackwork contractor to avoid abortive impact to his Works; and

- (h) The Civil contractor shall also note the CCSM coordination between Trackwork and SWC may not be completed in time for his casting of 1st stage concrete. In particular, late request for cable trough routing through the trackbed may require additional drainage outlet in Civil's 1st stage concrete in the station trainway. The Civil contractor shall provide mitigation measures through his design and coordination with Trackwork contractor to avoid abortive impact to his Works.

7.13.4 **Attendance and Provisions for System-Wide Contractors**

7.13.4.1 Scope of Attendance

The Contractor shall provide attendance to the SWC and other Interfacing Contractors/Parties. The required attendance shall include but not be limited to the management, coordination, provision, operation and maintenance of the following facilities:

- (a) Security at site including SWC storage area, if required;
- (b) Utility Services;
- (c) Storage area inside station and ground level with proper shelter, if required;
- (d) Provision of temporary services in the Permanent Works and subsequent removal;
- (e) Coordination of access to the Permanent works;
- (f) Provision of attendance for works at the escape/ventilation shafts, fire exits and other exit points as necessary;
- (g) Share high level working platforms and scaffolds with SWC at no cost when these facilities are available based on agreed CIP;
- (h) Provision of robust temporary removable shelters over temporary openings on station roof slabs, station entrances, vent shafts and escape shafts to eliminate the risk of water ingress into the station or damage to the services/equipment; and
- (i) Control of parking within the worksite.

7.13.5 **Coordination and Management**

7.13.5.1 General

- (a) The Contractor shall lead and be responsible for detailed coordination of his construction activities with those of the SWC, adjacent civil contractors, other interfacing contractors, Authority's Consultants and in-house designers, utility companies, statutory authorities, all other third parties like private contractors and private owners whether or not specifically mentioned in the Contract;
- (b) The Contractor's Project Coordinator shall be responsible for the coordination of the SWC and other Interfacing Contractors in respect of their activities within the Works area; and
- (c) The Contractor shall ensure that works are sequenced such that completed works are not disturbed or damaged by subsequent works. The Contractor shall ensure that his programme reflect the sequence of works and interfaces with SWC.

7.13.5.2 The Contractor shall develop and implement procedures for the management, operation and maintenance of the facilities provided to SWC's and other Interfacing Contractors to the acceptance of the Engineer. The Procedures shall include but not be limited to the following:

- (a) Site safety and security including emergency services;
- (b) Roads, signage, lighting and site access;
- (c) Environmental control;
- (d) Drainage;
- (e) Waste disposal;
- (f) Services and supply of water and electricity utilities;
- (g) Communications (directory);
- (h) Fire Drill and Casualty Evacuation;
- (i) Welfare facilities;
- (j) Car Park; and
- (k) Organized site visits for guests and the media, as invited by the Engineer.

7.13.5.3 The procedures shall be submitted to the Engineer for acceptance at least two (2) months prior to the installation of the facilities for the SWC.

Comments from the Engineer on the procedures shall be incorporated into the procedures and the revised procedures shall be submitted within one (1) month of receipt of the comments. The procedure shall be updated and revised as required during the course of the Works.

7.13.6 Tunnel and Trainway Washing

- 7.13.6.1 The Trackwork contractor will be carrying out the washing of the tunnels and trainways during the period between the completion of TRIP and Traction Power on. The Contractor shall coordinate with the Trackwork contractor for the tunnel washing and provide five (5) workers, as and when requested by Trackwork contractor, to support the washing of the completed tunnels within the Contract Limit including supply of water and removal of contaminated water. In addition, the Contractor shall also be responsible for clearance of all sump pits, and clearing all waste and surplus materials until the Completion of the whole of the Works.

7.13.7 Interface with Environmental Control System (ECS) Contractor

- 7.13.7.1 The Contractor shall coordinate and interface with ECS SWC on the installation of the air circulation fans (e.g. High Volume Low Speed (HVLS) fan, ceiling fan, wall-mounted fan). The Contractor shall incorporate and take into consideration the requirement of ceiling height and ceiling panel cut out for the HVLS/ceiling fan safety/support/stabilization cables (where applicable) which will be secured to the structure, in the design development of the ceiling height and ceiling panels.
- 7.13.7.2 The Contractor shall coordinate and interface with LTA in-house designer on the design requirements for Centralized Ceiling Fan (CCF) at station entrances. The Contractor shall design, supply, and install the necessary support to facilitate the installation of CCF by ECS SWC.
- 7.13.7.3 The Contractor shall interface with ECS SWC on the installation of CCF. The Contractor shall incorporate and take into consideration the requirements of ceiling panel cut-out for the CCF safety / support / stabilization cables (where applicable), secure to the structure, in the design development of the ceiling panels.
- 7.13.7.4 The Contractor shall coordinate and interface with LTA in-house designer and the ECS SWC to incorporate all structural requirements, not limited to imposed loads, support systems, foundations and connections of Thermal Energy Storage (TES) tank to the permanent structure, in the Contractor's design. The TES tank will be supported on the main structural slab which is to be designed and built by the Contractor. The TES tank will be supplied and installed by the SWC.

- 7.14 Works Train Operations and Track Related Installation Programme (TRIP)**
- 7.14.1 The Engineer is responsible for the control and management of access and safe working within the Defined Area (DA). The rules and procedures for working in the Defined Area will be specified in the Works Train Manual. These rules and procedures for working in the Defined Area will be based on the Works Train Manual (Generic) which is available for reference and viewing only at the Authority's Tender Division.
- 7.14.2 "Defined Area" refers to tracks that are controlled by the Authority's Works Train Office for running consist or electric trains. For mainline, it comprises of the track way and includes the area one metre from the station's platform edge. The mainline is divided into sectors to control track access.
- 7.14.3 All requests for access to the Defined Area shall be submitted by a Lead Person-In-Charge (LPIC), who has been trained and qualified by the Works Train Office. The application for DA access shall be discussed through regular weekly meetings held at the Works Train Office which the Contractor's LPIC shall attend. The Works Train Office will then publish a weekly Notice prior to access for Defined Area works. Priority will be given generally in accordance with the TRIP indicated in Schedule B and the Test Running Programme to be developed with the Contractor. Access to Defined Area will also be restricted due to operation of consist or Train Test Running activities.
- 7.14.4 The Contractor's Lead Person-In-Charge (LPIC)/ Person-In-Charge (PIC) shall be responsible for the conduct and safety of his work party in the Defined Area. The Engineer will maintain a register of the LPICs/ PICs. LPICs/ PICs found contravening the requirements of the Works Train (WT) Manual published by the Engineer will have their names removed from the register. All work platforms/temporary fixtures erected within the Defined Area shall be such that they can be removed easily and quickly (within 15 to 20 minutes) for consists and Testing train to pass.
- 7.14.5 The Contractor shall have sufficient staff to attend the Works Train Manual Course conducted by the Authority's Works Train to qualify them as Lead Person-In-Charge (LPIC) and Person-In-Charge (PIC). This is to facilitate the LPIC to coordinate with the Authority's Works Train Office, interfacing contractors and scheduling his PICs to carry out their installation works within the DA accordingly.
- 7.14.6 Only one consist will be allowed to operate within one sector at any one time. When no works train is deployed in a sector, non-exclusive

pedestrian access will be allowed, subject to coordination during the weekly notice meeting.

- 7.14.7 Access to the Defined Area and rooms containing energised switchgear and equipment will be highly restricted. It shall be limited to periods arranged with the Engineer in advance through regular works train meeting chaired by the Authority's Works Train Manager. In addition to the above requirements, the work party may be accompanied by the Engineer's PIC for Defined Area works after Final Gauging or DC energisation. The Contractor is therefore advised to complete all his works before Final Gauging or DC energisation.
- 7.14.8 The Contractor shall note that the Authority will provide works train to the SWC contractors for track related installation works in accordance with the Track Related Installation Programme (TRIP). The SWC contractor will be allocated six (6) days of work in the tunnel sectors shown for each work week as indicated in the TRIP. Normal working hours will be from 0800 hours to 2000 hours which includes movement to and from the staging area. Extended working hours may be allowed at the discretion of the Authority.
- 7.14.9 The Contractor may have to share his work sectors in the mainline with other system-wide contractors provided that such sharing does not result in an unsafe situation. The Authority reserves the right to adjust the Programme, including requiring work to be carried out beyond normal working hours from time to time and the Contractor shall not be entitled to claim for any additional payment pursuant to such adjustments.
- 7.14.10 The Authority may allow the Works Train consist to be used for the delivery of Plant to the stations. However, the operation costs may be deducted from the Contractor's progress payment. If such acceptance is given, the Contractor shall be solely liable and shall indemnify the Authority against any claims for injury to persons and/or loss or damage to Plant and property.
- 7.14.11 The Contractor shall coordinate with the Works Train Office to design, supply, install and maintain temporary fencings with minimum height of 2.4m for the Works Train operation. The temporary fencings shall be erected along the buffer corridors of both bounds of the platform, with each end installed with a gate, door closer, emergency break-glass and one-way access lockset for access control to prevent unauthorised access from the station onto the tracks. The temporary fencings shall be rigid, complete with toe boards to prevent objects from falling off onto the track. The gap of the fencings shall not be greater than 25mm sq. The Contractor shall also provide frequent maintenance to the fencings and access control system to ensure the system is usable in cases of

emergency. These fencings shall be completed one month prior to the Authority's Works Train taking over of the Defined Area.

- 7.14.12 Where necessary, the Contractor shall coordinate with the relevant parties and Works Train Supervisory Staff to relocate the temporary works related to Works Train operations such as hoardings, fencings, WTSS lighting/power supply/telephone points, etc. so that all permanent works are not affected on site. The Contractor is deemed to have included these in his Contract Price.
- 7.14.13 The Contractor shall provide three numbers of 230V, single phase 13 ampere double switch socket outlets, light fittings and one telephone line for The Authority's Works Train staff at the platform level. The Contractor shall coordinate with the Works Train Office for the location and also cater for shifting or relocation such that permanent works are not disrupted. The Contractor shall include this in his Contract Sum.
- 7.14.14 The Contractor shall conduct regular inspections together with the Works Train staff along the DA boundary to temporary seal up (with materials complying to the confined space requirements) all gaps, openings, cross passages, escape shafts, etc. in the tunnel and station platform within their contract boundary.
- 7.14.15 The Contractor shall be responsible for the cleaning his DA work sectors and remove all his construction equipment, material, scaffolding, debris, etc. after the works.
- 7.14.16 The Contractor shall remove all temporary installations upon completion of Works Train Operations, Test Running activities and seek the Engineer's direction prior to handing over to the Operator. The Contract Sum shall be deemed to have included all costs associated with the above including running costs such as electricity, water and telephones, unless otherwise specified.
- 7.14.17 Working in the Defined Area (Before DC Power On)
 - 7.14.17.1 The Contractor's LPIC/PIC is responsible for booking-in and out his work party using Works Train Office prescribed forms. These shall be done at the stations and the Works Train Office for mainline and depot accesses respectively. This requirement applies notwithstanding to the access that has been allocated in the Notice. The Works Train Office shall have the right to reject all requests for access that is not reflected in the Notice.
 - 7.14.17.2 The Contractor's LPIC/PIC shall be responsible for the conduct and safety of his work party. The Authority will maintain a register of LPICs/PICs. Any PICs/LPICs found contravening the requirements of

the Works Train Manual or Operation Circulars published by the Works Train Office will have their names struck off the register.

- 7.14.18 Working in the Defined Area (After DC Power On)
 - 7.14.18.1 In addition to the requirements as specified in 7.14.17 above, the work party may be accompanied by the Engineer's PIC.
 - 7.14.18.2 Subsequent to power-on, access to rooms containing energized switch gear and equipment will be severely restricted. Access will be subjected to the Engineer's acceptance and to the availability of authorised staff of the Engineer who may be required to supervise the work within the room.
- 7.14.19 Works in Station Platform
 - 7.14.19.1 The tunnel section adjacent to the station platform including the area of the platform one metre from the platform edge will be designated as a distinct sector.
 - 7.14.19.2 All working platforms and temporary fixtures erected within this sector shall be such that it can be removed easily and quickly for the passing of works trains.
 - 7.14.19.3 Possession given to the Contractor for cable laying will normally exclude the station platform sector. Works Train Office will manage the movement of works trains into the platform sectors of stations.
- 7.15 **Brackets**
 - 7.15.1 Tunnel Brackets (inclusive of accessories)
 - 7.15.1.1 The Contractor shall determine the numbers of tunnel brackets required to the SWC and install tunnel brackets provided by the SWC in the tunnels and trainways, to support services installed by SWC. All bolts installed must be properly tightened and torque readings are to be submitted to the Engineer for acceptance.
 - 7.15.1.2 The Contractor shall design, supply and install brackets at the corner areas of cut and cover boxes (including stations) to support services installed by SWC. Where necessary the Contractor to provide the concrete columns to support these brackets.
 - 7.15.1.3 The Contractor shall also conduct site pull-out test to the anchor bolts of the tunnel brackets in the tunnels and the trackway in accordance with the test frequency as provided in **Appendix D** of the Particular Specification. Reports of the pull-out tests shall be submitted to the Engineer for acceptance.

- 7.15.1.4 The Contractor shall liaise and agree with the SWC to determine the number of brackets required for his installation and shall make available a reasonable minimum quantity of spare brackets. The Contractor shall keep an accurate record of all brackets and accessories delivered to him and return any unused brackets and accessories in good condition upon completion of the installation works. The Contractor shall ensure the brackets are properly stored at Site under the environmental condition as recommended by the SWC before installation.
- 7.15.1.5 The Contractor shall coordinate with the SWC on the proposed delivery schedule of the brackets and give at least six (6) months prior formal notice in writing.
- 7.15.2 Brackets on Undulating Surfaces
 - 7.15.2.1 For wall surface finish in the tunnels/trainway, the Contractor shall make good the surface such that it is ready and acceptable by SWC; to receive the installation of SWC brackets, services, equipment and devices. This includes but not limited to the provision of mounting base at bracket locations. In addition, the Contractor shall ensure that the completed tunnel wall does not protrude beyond the design wall face.
 - 7.15.2.2 The Contractor's rectification of diaphragm walls may be by means of trimming/building up the wall surface. In case of extreme undulations, he shall design, supply and fix additional supports in the form of channels and brackets, to the acceptance of the Engineer.
- 7.15.3 Common Services Brackets
 - 7.15.3.1 Congested service spaces that may require the use of common services brackets. When producing Pre-Final, Final and Updated Final Design CCSM, the Contractor shall lead in coordinating with SWC contractors on the locations and positions of the common services brackets where the use of common services bracket is essential. Common services brackets shall be provided when ECS Contractor's service blocks two or more other Interfacing Contractors from installing their own support system or as determined by CCSM. The Contractor shall liaise with the Interfacing Contractors on the location of such brackets and will pass detailed information on such brackets to the ECS Contractor, who is responsible for designing, supplying and fixing the common service brackets.
- 7.15.4 Shared Brackets and Hanger Rod Supports

- 7.15.4.1 The Contractor shall lead and coordinate with the Interfacing Contractors for all cable containments routings and containments positions and in full compliance with the requirement of Services Zone Approach. The Contractor shall liaise with the Interfacing Contractors on the location of the shared brackets and hanger rod supports and shall pass relevant information to the SWC, who is responsible for designing, supplying and fixing the shared brackets and hanger rod supports. The cable containments routings and positions shall follow but not limited to the following requirements:
- (a) All cable containments belonging to the same Interfacing Contractors shall be grouped within their zone to allow the use of same bracketing system to reduce the number of hanger rods suspended from soffit;
 - (b) All fittings (e.g. cable containments tee and elbow) used in CCSM shall be the approved fittings as per Interfacing Contractors' material submissions;
 - (c) Cable containments routing shall run as straight as possible without offset (both horizontal and vertical). Where offset cannot be avoided, the routing and arrangement of offsets shall be highlighted to the Engineer for acceptance; and
 - (d) Cable containments positions and space between layers shall allow cable containments tee-off crossing each other with minimal offsets required.
- 7.15.4.2 When producing the Pre-Final and Final Design CCSM, the Contractor shall identify areas of services congestion where the use of shared bracket and hanger rods is essential. The Contractor shall coordinate and optimize the use of shared brackets and hanger rod supports through re-routing and re-grouping of SWC's services which shall be agreed by the respective SWC.
- 7.15.4.3 The Contractor shall model the bracketing system (i.e. hanger rods and brackets) in CCSM at the congested areas with services crossing to identify potential clashes between services and brackets. The locations of bracketing system to be modelled shall be proposed by Contractor and subject to acceptance of the Engineer.
- 7.15.5 Bracket Integrated with Steel Structure

- 7.15.5.1 The Contractor is responsible for designing the mounting of SWC equipment/ devices on steel structures. The Contractor shall coordinate with the SWC on the mounting detail and shall provide the secondary members / brackets that are integrated or directly connected to the main steel structure. The Contract Price is deemed to include all associated design and Works.
- 7.15.5.2 For steel structures including but not limited to entrances, Pedestrian Overhead Bridges, covered linkways, bus shelters, pick-up/drop-off (PUDO) points, steel lift shafts etc, the Contractor shall coordinate with the SWC on the mounting detail of SWC services/ equipment/ devices. The Contractor shall design, supply and install additional structural steel members / steel brackets to integrate with the main steel structure which are required for the mounting of SWC services/ equipment/ devices and provide openings on structural steel members for SWC services routing, etc.
- 7.15.5.3 Where there is no structure available for the mounting of SWC brackets/ services/ equipment/ devices (e.g. cantilever support for the Passenger Information Display (PID) mounting system at platform and entrance level), the Contractor shall design, supply and install additional structural steel members / brackets to integrate with his architectural design for the mounting of SWC services/ equipment/ devices.
- 7.15.6 Brackets at Sharp Recess Corner
- 7.15.6.1 At locations where there is a step in profile on plan along the walls of the trainways, the Contractor shall coordinate with the SWC to provide a concrete chamfer across the step to facilitate and smoothen the laying and installation of their services. The size and extent of the chamfer shall be gradual to allow adequate bending and turning radii of the cables. The Contractor shall interface with SWC to propose the details of the concrete chamfer for the Engineer's acceptance and ensure any reinforcement for fixing of the chamfer is duly incorporated into the wall construction. If the provision of chamfer is not possible, the Contractor shall consider concrete stumps or pillars for mounting tunnel brackets.
- 7.15.7 Lightning Protection
- 7.15.7.1 The Contractor shall liaise and coordinate with SWC on the provision for the bonding to the copper/aluminium tapes, heavy duty uPVC pipes, earth rods, watertight earth pits and earth studs integrated with the steel structure for the connection/bonding of the completed lightning protection system.

- 7.15.7.2 The Contractor shall liaise and coordinate with SWC for location of earth stud integrated with the steel structure for connection/bonding of lightning protection down conductor.
- 7.16 **Interface with Water Handling Equipment (WHE) Contractor**
- 7.16.1 A separate contract for the supply and installation of Water Handling Equipment (WHE) shall be called by the Authority. The Contractor shall coordinate with the WHE on all relevant matters relating to the supply and installation of WHE including but not limited to the locations of the pumps and pump discharge connections, pump motor control panel, sump pit and pump sump cover requirement.
- 7.17 **Interface with SWC for Signalling and Platform Screen Doors including End Return Doors**
- 7.17.1 The Contractor shall liaise and coordinate with the SWC on all aspects of safety precautions/ requirements (e.g. touch voltage, end wall, door swing direction and similar) that the Contractor must provide for and take into account when completing the detailed design of and constructing (including all insulation tests) the architectural finishes in the vicinity of the platform screen doors.
- 7.17.2 The Contractor shall liaise and coordinate with the SWC to ensure that the design of the Platform Screen Doors (PSD) and End Return Doors (ERD) relates to the station's interior finishes. The PSD and ERD shall be coordinated with the modules and datum of the interior wall-cladding panels that are consistent line-wide.
- 7.17.3 The Contractor shall ensure that the platform edge and buffer area are built to required structure gauge clearance with respect to as-built track center line before installation of any channel, pipe sleeves or coring for full height platform screen doors and including end return door. The cast-in channel, pipe sleeves or coring shall be set out based on as-built track center line with survey taken by the Contractor and verified by Authority's surveyor.
- 7.17.4 The Contractor shall provide top support (horizontal beam, transom, etc. for the mounting of the PSD and ERD.
- 7.18 **Interface with SWC for Passenger Service Center (PSC) and Station Master Room (SMR)**
- 7.18.1 The Contractor shall refer to **Clause 10** of the Particular Specification.
- 7.19 **Provisions to SWC & Other Facilities**

- 7.19.1 **Water Supply**
- 7.19.1.1 The Contractor shall engage a licensed plumber to apply for temporary water supply from PUB, submitting all necessary applications, information, plans and fees. If such connections are not available, the Contractor shall supply his own water trailers and tanks.
- 7.19.1.2 The Contractor shall as a minimum requirement install, maintain and supply a 100mm diameter temporary water pipe at mains pressure for the nonexclusive use by the SWC. The water supply shall be located near the main works access to the station or as otherwise accepted by the Engineer. The Contractor shall pay for all PUB supply and usage charge for the temporary water supply.
- 7.19.1.3 The Contractor shall complete his domestic water supply and sanitary plumbing installations and related building finishes for the permanent water supply. The Contractor's licensed plumber shall make the necessary application to PUB so as to enable the water supply to be turned on by the Water-On key date given in the Schedule of Key Dates in **Appendix B** of the Particular Specification. The Contractor shall ensure that there are no non-potable water pipes (including sprinkler and dry riser pipes) running above portable water, as per PUB requirements.
- 7.19.1.4 The Contractor shall assist the Authority in the opening of account(s) for the permanent PUB water supply (including NEWater). The PUB connection charges shall be paid by the Authority.
- 7.19.1.5 The Contractor shall provide attendance to SWC for the usage of the permanent water supply for their testing and commissioning works. This shall include the recording of the usage whereby the SWC shall pay for his own use of water.
- 7.19.1.6 For all landscaping at ground level at every station entrance, the Contractor shall design, supply and install tap points for watering plants and fix taps with locking devices to prevent unauthorised usage of water.
- 7.19.2 **Temporary Doors and Ironmongery**
- 7.19.2.1 Where secure rooms are required for SWC's storage and installation works, prior to the installation of permanent doors, permanent demountable panels or shutters and their associated ironmongery (including hinges, bolts, drop bolts, handles, locks and the like), the Contractor shall supply and install temporary doors, hoarding and ironmongery until the permanent doors, demountable panels, shutters and ironmongery are installed. Temporary lockset and keys shall be provided for both temporary and permanent doors. The Contractor shall ensure no common key access system is adopted for the plantrooms, unless otherwise agreed by the Engineer.

- 7.19.2.2 When permanent doors are installed, the Contractor shall provide temporary locksets for the doors until instructed to provide permanent locksets prior to handing over to the PTO.
- 7.19.2.3 When permanent doors are installed and SWC are still working, the Contractor shall provide temporary protections to the installed permanent doors at his own costs.
- 7.19.3 **Storage of Materials by System Wide Contractors**
- 7.19.3.1 The Contractor shall provide an area for storage of materials required by each SWC. The size of the storage area and permissible loading to be applied shall be agreed with the SWC and subject to the acceptance of the Engineer. This area shall be protected from flooding and inclement weather and shall be sited at a location agreeable to the SWC and the Engineer. The Contractor and the respective SWC shall be responsible for the safety and security of the materials stored within the works site.
- 7.19.4 **Access for System Wide Contractors and Interfacing Contractors/ Parties**
- 7.19.4.1 The Contractor shall liaise with the SWC, Interfacing Contractors/Parties (if any) and other authorities to allow access at appropriate times within the programme to ensure completion of the Works by the Basic Structure Completion (BSC) key dates.
- 7.19.4.2 For the period after the tunnels and trainways have been released to SWC for trackwork construction until completion of the Works, the Contractor shall allow SWC safe access from ground level for the delivery of materials and equipment to the trackway. The Contractor shall coordinate with SWC on any temporary structural openings required for work access. Such openings required could be through slabs, walls and floors. The dimensions and schedule to be agreed with the SWC.
- 7.19.4.3 At least one (1) month prior to access being required by SWC and other contractors (if any), the Contractor shall submit to the Engineer for acceptance a safe access procedure. This shall detail the arrangements that will be made on Site to ensure that such personnel requiring access are able to work in a safe environment.
- 7.19.4.4 The Contractor shall design, supply and construct a temporary fencing along the buffer corridor at both platform ends with gate and lockset for access control before traction power-on. The Contractor shall submit the design proposal to the Engineer for acceptance prior to the construction.

- 7.19.4.5 Upon Completion of the whole of the Works, the Contractor shall remove all the temporary fencings and barriers. The Contractor shall be responsible for the cleaning of the dust and removal of construction debris after the Works.

7.19.5 Temporary Services and Utilities

- 7.19.5.1 All temporary services shall remain in place even after the equivalent permanent service has been installed and commissioned; they shall only be decommissioned upon instruction or acceptance of the Engineer.
- 7.19.5.2 The Contractor shall ensure designated openings and MCTs are allocated to facilitate the routing of the temporary cables. No sharing of the openings and MCTs allocated for the permanent services is allowed for the temporary services. Upon the removal of temporary services, the Contractor shall seal up all the openings and apply necessary waterproofing to ensure water-tightness.
- 7.19.5.3 The Contractor shall ensure that the temporary services do not interfere with the Permanent Works or prevent the installation and testing of the permanent services including where such services are installed by others. Where necessary the Contractor shall temporarily divert or relocate the temporary services during the course of the works with all associated costs deemed included in the Contract Price.
- 7.19.5.4 The Contractor shall clearly label his temporary cables along their length, to avoid the risk of removing a permanent cable once the works are completed.
- 7.19.5.5 On subsequent removal of the temporary communication system, formal notice shall be given to Fire Safety and Shelter Department (FSSD). This will ensure that FSSD is aware of the tunnel facilities should they need to access the tunnels in the event of a fire emergency.

7.19.6 Temporary Power Supply

- 7.19.6.1 The Contractor shall make provision for temporary power supply for the various SWC until CWW according to the requirements as shown in the table below:

Contract	Isolators	Remark
Signalling / PSD	400V, 60A TPN	<p>Provided at each end of each level of the station, under-platform and incidental space (except ground level) Exact location subject to acceptance by the Engineer.</p> <p>Provision will be in the form of isolators with ratings as shown.</p>
ISCS	230V, 30A SPN	
MMS	230V, 30A SPN	
Comms	400V, 60A TPN	
AMS	230V, 30A SPN	
FCIS	230V, 30A SPN	
AFC / GTM	230V, 30A SPN (Concourse only)	
Lifts	400V, 60A TPN	
Escalators	400V, 60A TPN	
TVS / ECS	400V, 60A TPN	
FPS	400V, 60A TPN	
ES	400V, 60A TPN	Additional 1 no. of 400V, 60A TPN for every CAT A room, UPS, EPS and DB rooms
OCR	400V, 60A TPN	Provided at each end of platform at trackway. Exact location subject to acceptance of the Engineer. Temporary power supply for OCR shall be tapped from separate power source
WHE	230V, 30A SPN	To provide 2 Nos, single phase, 13A switch socket outlet in each plant room where pumps will be installed
Power	400V, 60A TPN	To provide an additional 1 no. of 400V, 60A TPN for every CAT A room
PSC/SMR/TSO Architectural Works	400V, 30A TPN	Exact locations subject to acceptance by the Engineer.

Contract	Isolators	Remark
Temporary Tunnel Ventilation System	6nos. 400V, 100A TPN	4 nos. at western end and 2 nos. at eastern end of station either concourse or platform to be decided by the Engineer.
Temporary Aircon	1 no. of 400 V, 60A TPN in all CAT A rooms, UPS rooms, EPS rooms and DB rooms	
The Contractor shall supply and install meter boards at the above locations at his own cost. He shall then charge SWC for the electricity used at prevailing power supply rates (plus taxes) except for SWC (TVS & ECS)'s Temporary Tunnel Ventilation System.		

- 7.19.6.2 In the event that the power turn-on is not achieved in accordance with the key date given in **Appendix B** of the Particular Specification, the Contractor shall coordinate and provide temporary power supply to SWCs to facilitate their testing and commissioning works at his own cost.
- 7.19.6.3 The Contractor shall provide to the Interfacing Contractors/Parties and SWC by Tunnel BSC, 230V, single phase, 16 ampere industrial type switched socket outlets at 50m intervals along one side of tunnels for the common use of all SWC. At ventilation / escape shafts, the Contractor shall provide one (1) 400V, 30A TPN isolator and two (2) 230V 16 ampere industrial type switched socket outlet located at the mid-level and top level of each shaft.
- 7.19.6.4 The works shall include LEW attendance, submissions to agencies/authorities, fire protection and extinguishing system, cabling termination works and provision of isolators adjacent to the SWC (TVS & ECS)'s Motor Control Centre (MCC) for the TTVS. The Contractor shall coordinate with the SWC (TVS & ECS) on the location of the isolators along the tunnel or at the adjacent/nearby station.
- 7.19.6.5 The Contractor shall include the cost of all other temporary supplies to the tunnels, Works-train supervisory staff (WTSS) office at platform level, and the Temporary Tunnel Ventilation System (TTVS) installed by SWC (TVS & ECS) within the Contract Price.

- 7.19.6.6 The Contractor shall provide temporary power supply and outlets for use by the Interfacing Contractors. The Contractor shall allow costs for all connection fees charged by SP PowerGrid Ltd for temporary power supply or alternative sources as part of the Contract Price.
- 7.19.6.7 The Interfacing Contractors/Parties shall, unless otherwise specified herein, be responsible for the cost of all electricity that they use. Such costs where they are to be borne by the Interfacing Contractors/Parties shall be determined by metering. The Contractor shall keep proper records of meter readings every month for verification by the SWC. All records shall be submitted to the Engineer for review. In the event of dispute between the Interfacing Contractors/Parties and the Contractor, the Engineer's resolution shall be deemed final.
- 7.19.6.8 All costs for installation and maintenance of temporary power supply to the isolators shall be borne by the Contractor. The Contractor shall bear the cost of all electrical power consumption for his construction works up to Completion of the Whole of the Works (CWW).
- 7.19.6.9 All portable hand-held tools and portable hand-lamps used shall be supplied from a 110-volt supply. The Contractor may obtain the supply via the 110-volt outlets of a mobile purpose built assembly housing a suitably rated double wound 230/110 volt insulated transformer with the centre point of the 110-volt winding earthed. All connections shall be by industrial sockets. Such assembly or other suitable means shall be provided by the Contractor and shall be examined and endorsed fit for use by the Contractor's Licensed Electrical Worker. The Interfacing Contractors/Parties will provide at their own costs such assembly or other suitable means if they require a 110-volt supply.
- 7.19.6.10 For testing and commissioning purposes, the Contractor and the Interfacing Contractors/Parties may use the permanent power supply. If the permanent supply is not available, the Contractor and SWC shall, at his own cost, make other arrangements for the provision of such supply. The cost of power supply shall be borne by the Interfacing Contractors. The non-availability of permanent power supply shall not be a valid reason for failure of the Contractor to proceed with the Works.
- 7.19.6.11 The Contractor shall provide an alternative power source and all accessories required to operate the temporary electrical supply installation if power supply from SP PowerGrid Ltd is not available.
- 7.19.6.12 The Contractor shall provide the temporary power supply and make it available to all the SWC daily on a 24-hour basis from the BSC date until Completion of the Whole of the Works.

- 7.19.6.13 The temporary electrical installations provided by the Contractor shall comply with all local regulations governing temporary power supply including the latest edition of SS CP88: Temporary Electrical Installation for Construction and Building Sites. The Contractor's LEW shall liaise with the Interfacing Contractor's LEWs and carry out regular inspection and be responsible for his own temporary electrical installations.

7.19.7 **Temporary Lighting**

- 7.19.7.1 The Contractor shall supply, install and maintain in good working condition all temporary lighting during the works and provide temporary background lighting for Interfacing Contractors as stated below, within the Contract Limits. Temporary lighting shall be provided until Completion of the Whole of the Works (CWW).
- 7.19.7.2 The Contractor's LEW shall carry out site inspection on monthly basis to check on the condition of the temporary lighting provision in the Station and Tunnel. Any findings of the unsafe condition of the temporary lighting shall be dealt with and rectified immediately. Inspection report with photos shall be submitted to the Engineer on monthly basis.
- 7.19.7.3 Tunnel, cross passages, station box, cut and cover box (inclusive of trackways), ventilation shafts and all rooms:
- (a) Lighting shall be provided by heavy-duty LED lighting of IP65 fitted with polycarbonate diffusers or a similar system to the acceptance of the Engineer. LED lighting shall comply with IEC 62031, IEC 60598-1, IEC 62384 and IEC 61347 requirements as a minimum;
 - (b) All connectors shall be of Bi-pin moulded plastic type non-flammable, with quick connect sockets for the connection of cabling, to BS EN 1875-3, EN60400 and designed to retain positively the lamp caps independently of the contact springs. Terminal block used shall be spring clamp with high contact pressure type which can accommodate various wire sizes;
 - (c) Lighting units shall be located on the side of the tunnel on which any walkway is located;
 - (d) Temporary lighting shall provide a minimum lighting of 100 Lux at floor level in accordance with BS6164;
 - (e) Emergency lighting (as described in LTA M&W) shall be to a minimum lighting level of 15 Lux at floor level and shall be frequently tested;

- (f) Task lighting shall be provided by the SWC requiring such lighting; and
- (g) There shall be a minimum of two lights per cross passage, escape shaft and its adits, plantroom or room.

7.19.8 **Surface Lighting (including Works Area)**

- (a) The Contractor shall provide, install and maintain in good working condition suitable background lighting for use when natural light is insufficient;
- (b) Background lighting shall have minimum lighting level of 15 Lux at floor level and shall be to the acceptance of the Engineer;
- (c) The Contractor shall provide, install and maintain road lighting to a level accepted by the Engineer;
- (d) The perimeters of the Works area shall be adequately illuminated for security purposes to the acceptance of the Engineer; and
- (e) All care should be taken to divert or screen worksite floodlights such that they do not shine directly into adjacent developments and road users.

7.19.9 **Temporary Ventilation**

- 7.19.9.1 The Contractor shall provide, install and maintain in good working order a temporary ventilation system for all works in enclosed spaces or where hazardous materials are used. Full details of any temporary ventilation system shall be proposed by the Contractor for the acceptance of the Engineer at least 60 days prior to installation of the system.
- 7.19.9.2 It will not be acceptable to exhaust hazardous or objectionable fumes, smoke, stale air and the like from one part of the Works area into another. The temporary ventilation facilities shall be designed as a total system and shall remove all unsatisfactory air away from the Works area. In some instances, this may require separate task ventilation with air conveyed directly to the surface and away from the Works. Fresh air intake shall be separated from exhaust air. Fans shall be enclosed in suitable noise enclosures of sufficient size to facilitate air flow.
- 7.19.9.3 The Contractor shall ensure that the airflow rate of the ventilation system comply with the relevant statutory requirements.
- 7.19.9.4 Temporary ventilation for tunnel shall be provided by the Contractor until the Tunnel Basic Structure Completion date and if necessary, until the

commissioning of the Temporary Tunnel Ventilation System (TTVS) by the ECS contractor.

- 7.19.9.5 A temporary tunnel ventilation system (TTVS) will be installed by the SWC (TVS & ECS) before the commencement of track laying and removed by the SWC (TVS & ECS) before the final gauging starts. The Contractor shall supply and install the cast-in Acrylonitrile Butadiene Styrene (ABS) pipes (within the first stage concrete) for the under track crossings of the power and control cables for the temporary tunnel ventilation fans. The Contractor shall coordinate with SWC (TVS & ECS) for the requirements e.g. exact size, quantity and locations of the ABS pipes. The Contractor shall design, supply, install and maintain the power supply to the appropriate rating within the work areas to the isolators at platform level at both ends of the station for the TTVS power supply.
- 7.19.9.6 Temporary ventilation for the station and ventilation shafts shall be provided by the Contractor until the Completion of the Whole of the Works.
- 7.19.10 **Temporary Communications**
- 7.19.10.1 The Contractor shall supply a common communications system during the course of the Works as and when required by the Engineer.
- 7.19.10.2 Telephones, with unique numbers, shall be located as a minimum requirement at the following locations in a suitable housing with adequate lighting, signage and a site specific directory:
- (a) The Contractor's site offices;
 - (b) Authority's Offices;
 - (c) Medical facility;
 - (d) In the tunnels at 100m intervals and at each end of the station and any cut and cover box; and
 - (e) Works Train Supervisory Staff office at platform level.
- 7.19.10.3 In general, the telephone system shall remain in place and be operational until the Completion of the whole of the Works, or later if requested by the Engineer. The Contractor shall also provide and develop a directory for the telephone system including all emergency telephone numbers at each telephone location.
- 7.19.11 **Temporary Drainage**

- 7.19.11.1 The Contractor shall design, supply, install and maintain in good working order all necessary temporary drainage facilities during his works and during the works of SWC and other Interfacing Contractors/Parties until Completion of the whole of the Works. The Contractor shall be responsible to obtain the necessary design clearances from the relevant authorities.
- 7.19.11.2 The Contractor shall make provision for taking all water collected within the subsurface works, at the permanent sumps and any temporary sumps created by the Contractor to the discharge point on the surface without causing disruption to other Interfacing Contractors/Parties. Care shall be taken to avoid damage to permanent sumps. Permanent drainage pipes shall not be used to convey water from the excavation or any other construction activities. Where there is risk of this occurring the Contractor shall propose and implement preventive measures (such as plugging of pipes and other protection measures) to the satisfaction of the Engineer.
- 7.19.11.3 The Contractor shall not allow any water from his Site to enter any adjacent premises/ public amenities/ public facilities/ Interfacing Contractors/Parties' site. The Contractor shall determine all drainage control measures at the Contract interfaces, which will be subject to the acceptance of the Engineer.
- 7.19.11.4 The discharge of all water from the Works area shall comply with PUB regulations and shall be to the acceptance of the Engineer. Particular attention shall be paid to the requirement for silt traps and settlement tanks throughout the Works area.
- 7.20 **Works Areas**
- 7.20.1 The Contractor shall construct the works areas required for use by SWC and maintain the works areas in good order.
- 7.20.2 The setting up of the Site shall include, but not be limited to:
- (a) Erection of the site hoarding with lockable gates;
 - (b) Earthworks where required;
 - (c) Environmental Control Measures (ECM);
 - (d) Design, installation and maintenance of surface water drainage;
 - (e) Design, installation and maintenance of sewerage where required;
 - (f) Design, provision and maintenance of all temporary services;

- (g) The provision of all suitable hard standing for the SWC storage and crane parking where required; and
- (h) Loading areas as required.

7.21 **Site Offices for System-Wide Contractors**

- 7.21.1 The locations of site offices for the SWC shall be coordinated and submitted for the acceptance of the Engineer. The Contractor shall provide six (6) offices each of floor area 24 sq m for use by the SWC as directed by the Engineer.
- 7.21.2 The Contractor shall provide the offices with air conditioning, lighting and at least three (3) numbers of 13 ampere switched socket outlets and a telephone line. The Contractor shall be responsible for the running costs of the offices and for the general upkeep and maintenance services. The SWC shall pay the telephone bill. The offices shall be available three (3) months before the Basic Structure Completion Date. The Contractor shall pay all TOL fees and charges levied by the relevant authorities for the entire duration of occupation of the land used for the offices and any ancillary use until it is handed over to the relevant authorities.
- 7.21.3 When the offices are vacated, the Contractor shall have all services disconnected, offices dismantled and removed off site, reinstate the ground to the required levels, and lay topsoil and turf the area to the acceptance of the Engineer before handover to the respective landowners. and the ground reinstated. The reinstatement shall be in accordance with **Clause 17** of the Particular Specification.

7.22 **E&M Equipment Delivery and Future Replacement Routes**

- 7.22.1 The Contractor shall coordinate with SWC to ensure that the designated routes are adequate for the delivery and future replacement of the E&M equipment and Mechanical, Electrical and Plumbing (MEP) Modular Units in the station and track. The Contractor shall coordinate the delivery route and future replacement routes on separate drawings, models and shall submit to the Engineer for acceptance.
- 7.22.2 The Contractor shall coordinate with SWC the routes and sequence of construction for equipment and MEP Modular Units delivery as planned which include but not limited to:
 - (a) The mode and location of supply of equipment to the site;
 - (b) The method of unloading;

- (c) The route of the equipment and MEP Modular Units (Prefab MEP plant modules, MEP service modules etc) from point of unloading to final position, including any temporary openings is to be provided in the station box structures, plant room floors, plant room walls, etc. The Contractor shall coordinate with the SWC and programme his construction activities for such opening provision to facilitate the delivery of equipment and MEP Modular Units by SWC;
- (d) The lifting/ pulling requirements throughout the route and the method of transport;
- (e) The weight of the equipment and its effect on the design loads for the capacity of lifting/ pulling hooks, lifting beams etc., either temporary or permanent; and
- (f) The protection required for equipment, MEP Modular Units and structure/finishes.

7.22.3 The lifting/pulling hooks, beams and other provisions shall be designed and developed by the Contractor for the Engineer's acceptance. The Contractor shall further coordinate with SWC to produce these drawings and Models for the Engineer's acceptance. The Contractor shall provide all additional requirements as requested by the SWC. Such costs shall be deemed included in the Contract Price.

7.22.4 Fixed lifting/pulling points shall be provided for installation and replacement of major pieces of equipment. Each lifting/ pulling point identified shall be tested to 1.5 times safe working load and certified by a Professional Engineer (PE) and/or Authorised Examiner (AE) and copies of such certificates should be submitted to the Engineer for record. The locations of all lifting/pulling points shall be coordinated with and agreed with the SWC. In all cases, location and safe working load shall be coordinated and agreed with the SWC. The Contractor shall also carry out testing for all existing lifting points and provide replacements if necessary.

7.22.5 The equipment dimension and weight shall be stated in the Equipment Delivery and Future Replacement Route Drawings and Models. The Contractor shall demonstrate that the structural slab is able to withstand equipment loading during delivery. If necessary, the Contractor shall provide the necessary temporary supports for the supporting structures and structural slab.

- 7.22.6 The Contractor shall coordinate with the SWC for the crane parking positions to deliver materials and equipment. The Contractor shall ensure that the crane parking positions are designed/adequate for the SWC lifting works. All temporary provisions, including but not limited to steel plates, compaction of soil, shifting of hoardings/barricades etc., to ensure that the base is adequate for the lifting works are deemed to be included in the Contract Price.
- 7.23 **Coordinated Combined Services Model (CCSM), SEM and Conduit Management Model/Drawings**
- 7.23.1 General Requirements
- 7.23.1.1 The Contractor shall lead, coordinate, control and be responsible for the production of Pre-Final, Final and Updated Final Design CCSM to meet the dates specified in **Appendix B** of the Particular Specification and in accordance with the BIM requirements in **Clause 21** of the Particular Specification for both station and tunnels. The Contractor shall submit signed off CCSM, SEM drawings and conduit management model/drawings generated from CCSM model and submit together with the Final and Updated Final Design CCSM submission.
- 7.23.1.2 Where the SWC contract has yet to be awarded, the Contractor shall coordinate with the Authority's Consultants and In-house Designers until such time when the SWC is available. The Authority's Consultants and In-house Designers will provide information, non-BIM 2D sketches, drawings or model to the Contractor. The Contractor shall incorporate and model the information provided into the development of the CCSM.
- 7.23.1.3 The Contractor shall coordinate with all Interfacing Contractors/Parties and produce the Service Zone Model six (6) months before the Pre-final CCSM submission for the acceptance of the Engineer. The Service Zone Model is the model to show the service zone of P&D, Electrical, ECS, FPS and System services along the corridor areas. All Zones shall be differentiated in various colours for each different discipline. All disciplines and Interfacing Contractors/Parties shall design and route their services within the assigned zones.
- 7.23.1.4 The Contractor when preparing the installation routing of SWC services shall consider both the dimensions of the SWC services and the cable support brackets, levels and access for installation. The Contractor shall also take into account his own support brackets, levels and access for installation of his architectural finishes

- 7.23.1.5 The Contractor shall produce the Pre-Final Design CCSM in accordance to the accepted Service Zone Model, and base on the information provided by Interfacing Contractors/Parties at the information exchange cut-off. The Contractor shall ensure their CCSM model are in full compliance with the requirement of Services Zone Approach. All E&M services and equipment shall be accessible for maintenance. The Contractor shall also properly group the services in order to minimize the number of hanger supports from the soffit. The typical Service Zone Approach is shown in **Figure (a)** for reference.

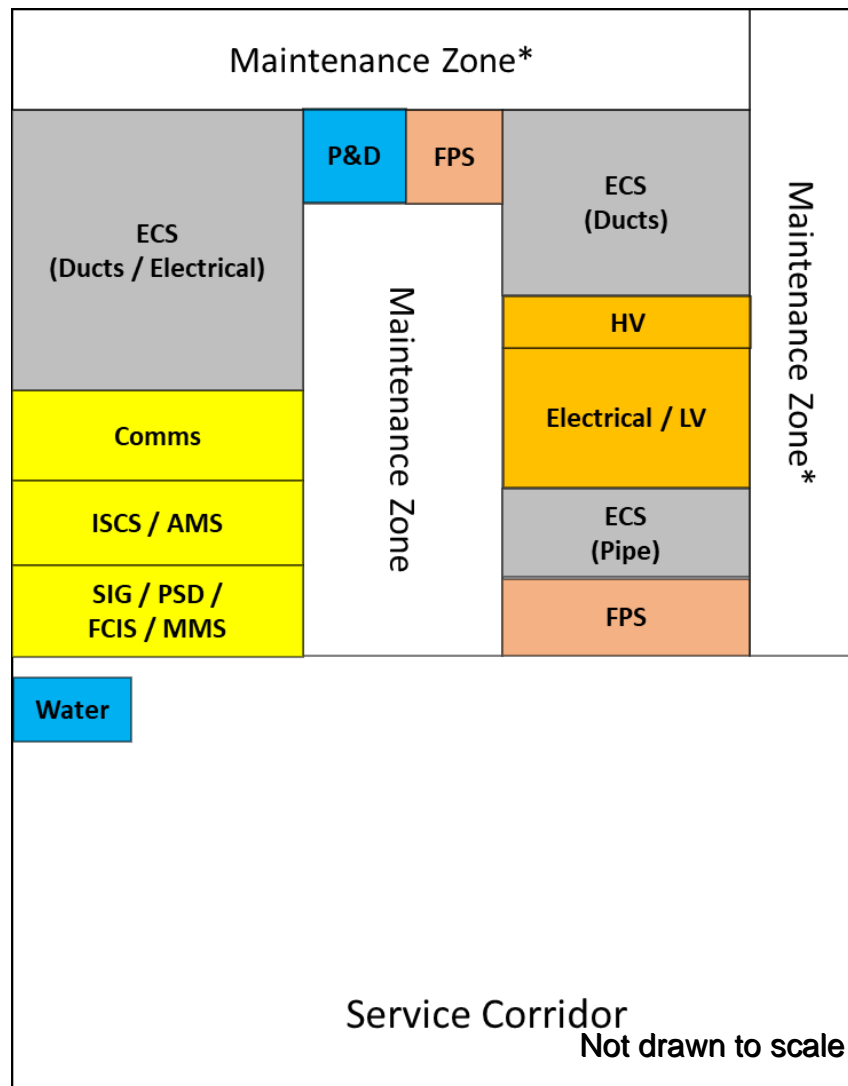


Figure a - Services Zone Illustration

*Note these maintenance zones for soffit and sides are required if the slab/wall is abutting soil.

- 7.23.1.6 When preparing the installation routing of SWC services, the Contractor shall consider both the dimensions of the SWC services and the cable support brackets, levels and access for installation. The Contractor shall also take into account his own support brackets, levels and access for installation of his architectural finishes.
- 7.23.1.7 The Contractor shall update the Final Design CCSM and Reflected Ceiling Plan (RCP) to capture the final installation routing and equipment layout to be installed by SWC. Where the SWC contract has yet to be awarded, the Contractor shall coordinate with the Authority's Consultants and In-house Designers to obtain the required information for the production of CCSM. SEM drawings shall be produced for the purposes of site construction and casting activities; cast-in items and embedded services shall be coordinated as part of the SEM.
- 7.23.1.8 The Contractor shall review and coordinate with Interfacing Contractors/Parties to allocate adequate penetrations, openings, sleeves and other provisions to be reflected in the CCSM and SEM. In the coordination of the CCSM and SEM, common wall openings shall be utilized for cable containments and service penetrations in service corridors, electrical plant rooms etc. to minimize the risk of structure modification at later stage due to the adjustment of services routing. This arrangement is however not acceptable for certain installations such as fire dampers which require a certain specified tolerance.
- 7.23.1.9 The Contractor shall coordinate wall mounted equipment with Interfacing Contractors/Parties to produce a conduit management model and drawings, including elevations within the plant rooms and non-public areas prior to site installation. During the coordination of conduit management, attention shall be given to the neatness and alignment of equipment, cable containment, conduit and/or pipe runs on wall as is appropriate. All cable containment, conduit and pipe runs shall be either vertical or horizontal. Conduit crisscrossing shall be avoided. The conduit management model and drawings shall clearly indicate the proposed position with setting out dimension and size of conduit runs together with the contract number. These conduits management model and drawings shall be submitted together with the Final and Updated Final Design CCSM.
- 7.23.1.10 The raised floor layout for rooms such as PSC/SMR, CE/ISCS and SER shall be finalized and captured in the Final and Updated Final Design CCSM submission. The Contractor shall coordinate with the SWC and make necessary adjustments to CCSM on the cut-out on raised floor leading to respective furniture and equipment in a timely manner for the smooth construction.

- 7.23.1.11 The Contractor shall be responsible for ensuring the correctness of such coordination, and also accommodate any amendments arising from the coordination with SWC, Interfacing Contractors/Parties in developing the Pre-Final, Final and Updated Final Design CCSM for the station and tunnel.
- 7.23.1.12 The Contractor shall coordinate and ensure that all cast in provisions for the under track crossings within first stage concrete/ base slab are clearly reflected in the CCSM models and SEM drawings for both the permanent and temporary services (inclusive of 20% spare provisions for permanent services). All cast in provisions within the first stage concrete/base slab shall be provided by the Contractor. The Contractor shall also ensure no haunching/chamfers at the bottom/top edges of the tunnel at locations where there is any under track crossing.
- 7.23.1.13 The Contractor shall ensure adequate effort is allocated to improve on the presentation, visibility, details elevation with the setting out and size of all SEM elements in the SEM drawings which includes the setting out and sizes of all openings (including conduits and sleeves) cast in items (including lift hooks, pulling hooks, pipes and trays, etc.) and plinths. The setting out of the SEM elements shall be based on and measured from walls/columns/door frame.
- 7.23.1.14 The Contractor shall review and coordinate with the SWC to allocate adequate penetrations, openings, sleeves and other provisions and reflect in the CCSM.
- 7.23.1.15 The Contractor shall coordinate with SWC for the conduit route to the E&M services and shall produce the conduit route drawings / model, including elevations of the conduit route within the plant rooms and other areas prior to SWC's installation during the coordination of conduit management. Common openings for various SWC shall be provided for all conduits' entries. The Contractor shall be responsible for sealing these openings upon completion of works. Attention shall be paid to the neatness and alignment of vertical conduit equipment, cable containment, conduit and/or pipe runs on wall as is appropriate. All cable containment, conduit and pipe runs shall be either vertical or horizontal. Criss-crossing conduit on walls will not be accepted. The concept of conduit management approach will be provided to the Contractor during the project implementation.

- 7.23.1.16 Conduits that run around the downstand beam will not be accepted. The Contractor shall design, supply and install 50mm pipe sleeve opening at downstand beam so that the conduit will penetrate through the beam near the soffit level instead of going around the beam. In the event that the pipe sleeve cannot be provided due to site constraint, the Contractor shall submit the alternative proposal to the Engineer for acceptance. The conduit management model/drawings shall clearly indicate the proposed position with setting out dimension and size of conduit runs together with the contract number. These conduits management model/drawings shall be submitted together with the Final and Updated Final Design CCSM.
- 7.23.1.17 The Contractor shall coordinate with Interfacing Contractors/Parties on the concealment of the services, including conduits, at all above ground structure, external façade of buildings, areas visible to public, offices etc, and rooms with ceiling and/or tiled wall.
- 7.23.1.18 For trackways and tunnels, the Contractor shall provide SEM drawings to the Trackwork contractor who will produce the trackwork CCSM by the date indicated in **Appendix B** of the Particular Specification. The Contractor shall coordinate with Interfacing Contractors/Parties for E&M services routing on the track and trackbed. Troughs within trackbed / base slab shall have drainage provision. The Contractor shall provide and connect the drainage pipes from the troughs to the drainage system. The floor drain shall come complete with dome-type floor drain cover, and shall not be obscured by cables so as to allow easy access for maintenance. Cable pulling chambers (if required) within first stage concrete / base slab shall have drainage provision. The Contractor shall provide and connect the drainage pipes from the pits to the drainage system. The Contractor shall coordinate and show all provisions in the CCSM and SEM drawings. The Contractor shall also plan and submit signed off Final and Updated Final Design CCSM with status report.
- 7.23.1.19 Notwithstanding the CCSM key dates in **Appendix B** of the Particular Specification, the Contractor is required to update CCSM and RCP regularly through coordination working meetings/sessions with Interfacing Contractors/Parties after the Final and Updated Final Design CCSM submission. Incorporation of the SWC requirements may impact on the equipment layout and services routings of other SWC and the Contractors services, the Contractor shall coordinate with any affected SWC and incorporate such changes into the updated CCSM and RCP.

- 7.23.1.20 The Final and Updated Final Design CCSM and SEM drawings shall be agreed and jointly signed off by the relevant Interfacing Contractors/Parties/SWC and the Engineer for the purpose of capturing the latest information provided by Interfacing Contractors/Parties/SWC and the Engineer on equipment selection, maintainability and accessibility requirements, conduits management details, brackets and/or rods support details, and any other late changes through the change control process prior to commencement of any casting.
- 7.23.1.21 The tunnel and station CCSM and SEM updating may be well in advance of the key dates to suit the site programme. In such cases, the Contractor shall prepare Final and Updated Final Design CCSM and SEM drawings in phases as required by the construction programme. These shall be agreed and jointly signed off by the relevant Interfacing Contractors/Parties/SWC and shall be submitted to the Engineer for acceptance if the Interfacing Contractor's installations are to be installed prior to the key dates for the submission of Final and Updated Final Design CCSM.
- 7.23.1.22 The Contractor shall ensure adequate effort is allocated to improve on the presentation, visibility, details elevation with the setting out and size of all SEM elements in the SEM drawings which includes the setting out and sizes of all openings (including conduits and sleeves) cast in items (including lift hooks, pulling hooks, pipes and trays, etc.) and plinths. The setting out of the SEM elements shall be based on and measured from walls/columns/door frame.
- 7.23.1.23 The Reflected Ceiling Plan (RCP) shall be coordinated with SWCs on the equipment layout and cut-outs required on the ceiling panel leading to respective furniture and/or equipment in a timely manner and captured in the Final and Updated Final Design submission. The RCP shall be updated accordingly where changes are required.
- 7.23.1.24 The Contractor shall coordinate with Interfacing Contractors/Parties for the provision of perforated panels for all clean gas protected rooms and electrical rooms with cable chamber.
- 7.23.1.25 A minimum one (1) perforated floor panel to be provided for every 25m² of raised floor area for clean gas protected rooms. The location and exact quantities of these panels are to be coordinated with FPS SWC.
- 7.23.1.26 The perforated panels shall have minimum 25% perforation openings.

7.23.1.27 The Contractor shall take the lead and coordinate with the Interfacing Contractors/Parties for the Model of Equipment Delivery and future replacement route based on the largest SWC equipment. The Contractor shall ensure that a **zero clash** Equipment Delivery and Future Replacement Model is produced. The Contractor shall attach a clash analysis report if there are still clashes when the Equipment Delivery and Future Replacement Routes are submitted. The report shall include but not be limited to:

- (a) Coordination and clash detection between CCSM and Equipment Delivery and Future Replacement Model;
- (b) Identification of all clashes with differentiation of valid and invalid clashes; and
- (c) Coordination and clash detection between temporary King Posts and Equipment Delivery and Future Replacement Model.

7.23.1.28 The Contractor shall take the lead to liaise with all Interfacing Contractors/Parties to develop CCSM for the Passenger Service Centre (PSC), Station Manager Room (SMR), and Ticketing Service Centre (TSC), and submit this together with the Final Design CCSM. The coordination details shall include but not be limited to the services routing above the false ceiling and beneath the raised floor leading to the respective furniture and equipment, cut-outs on the raised floor and structure provisions.

7.24 **Coordination with SWC**

7.24.1 **General**

- (a) To confirm delivery routes and to ensure that all provisions (such as lifting hooks and pulling hooks) required for equipment access, delivery of Plant and future replacement is reflected in the Delivery and Future Replacement Route Drawings. The equipment dimension and weight shall be stated in the Delivery and Future Replacement Route Drawings. The Contractor shall demonstrate that the structural slab is able to withstand equipment loading during delivery;
- (b) To coordinate with the Interfacing Contractors/Parties on attendance, in particular those items specified under Clarification of Design, Supply and Fix items in this Clause; and

- (c) To attend regular coordination meetings convened by other Interfacing Contractors/Parties and the Engineer. The Contractor shall conduct separate meetings with the Interfacing Contractors as necessary to clarify particular aspects of the interfacing requirements of the Works. The party who convenes the meeting shall prepare minutes recording all matters discussed and agreed at the meeting.

7.24.2 **Trackway and Tunnel General Provisions**

- 7.24.2.1 The Contractor shall design, supply, install and maintain the temporary hoardings, fencings, barricades, etc. to ensure no workers can stray into the track defined area at the station buffer corridors to the Engineer's acceptance. The Contractor shall coordinate with the Works Train Supervisory Staff on their requirements for work in the track defined areas.

- 7.24.2.2 Where necessary, the Contractor shall coordinate with the relevant parties and Works Train Supervisory Staff to relocate the temporary works related to Works Train operation such as hoardings, fencings, WTSS lighting/ power supply/telephone points, etc. so that all permanent works are not affected on site. The Contractor is deemed to have included these in his Contract Price.

- 7.24.2.3 The Contractor shall make provisions for drainage in troughs within trackbed and pulling chambers within first stage concrete / base slab. The Contractor shall provide and connect the drainage pipes from the troughs and pulling chambers to the drainage system. The floor drain shall come complete with dome-type floor drain cover and shall not be obscured by cables so as to allow easy access for maintenance. The Contractor shall coordinate and show all provisions and details including troughs on the CCSM and SEM drawings.

7.24.3 **Systems Assurance**

- 7.24.3.1 The Contractor shall attend all Hazard and Operability Studies (HAZOPS) and interface meetings when requested by the Authority. The Contractor shall support the Authority in managing interfaces hazards issued by Interfacing Contractors/Parties and System-wide Contractors (SWC) which relates to interfaces with the Contractor's scope of works. The Contractor is required to review and provide proper mitigation measures to the identified interfacing hazards issued to him via Interface Hazard Requirement Acceptance Form (IRAF). The pro-forma of IRAF and associated Interface Hazard List is shown in Tables 1 and 2 in **Appendix BC** of the Particular Specification.

- 7.24.3.2 As and when necessary, coordination meetings will be arranged by the Authority or Interfacing Contractors/Parties and System-wide Contractors (SWC) issuing the interface hazards to clarify or discuss the identified hazards and hazard mitigating actions. The Contractor shall provide representatives to attend these meetings.
- 7.24.4 **System Interface and Integration Requirement**
- 7.24.4.1 The system or equipment to be supplied by the Contractor may depend on the facilities, equipment or services of the existing systems in order to fulfill the Technical Specification requirements so as to ensure the proper integration of its system into the entire railway network. All interface requirements shall be identified, mutually understood and agreed upon with the affected parties.
- 7.24.4.2 The Contractor shall establish a systematic and structural process to integrate with related E&M systems in this Project to ensure the safe, reliable and efficient operations under both normal and degraded conditions. A thorough verification and validation process shall also be established to demonstrate to the satisfaction of the Engineer that the interface designs are correct and optimum with respect to its system and the overall railway system. The Contractor shall establish control on both the external interfaces with Interfacing Contractors/Parties, other agencies and third parties appointed by the Authority and the internal interfaces of its own system.
- 7.24.4.3 The Contractor shall liaise and coordinate with interfacing contractors, PTO, other agencies and third parties appointed by the Authority and subcontractors to determine the detailed physical and functional interface requirements during the design interface period. The proposed interface shall be subject to the acceptance of the Engineer.
- 7.24.4.4 **System Interface Submission Requirements**
- The Contractor shall submit, but not limited to, the following interface documents to the Engineer for acceptance:
- (a) Interface Control Document (ICD); and
 - (b) Interface Data Document (IDD), if required.
- 7.24.4.5 The ICD shall provide a detailed description of the interfacing design between the interfacing parties. The ICD shall contain at least the following information:

- (a) Abbreviations
- (b) Reference
- (c) Document Scope
- (d) Scope of work and responsibilities
- (e) General Layout
- (f) Interface Hazard Analysis
- (g) Environmental constraints
- (h) Mechanical Interfaces
- (i) Electrical Interfaces
- (j) Functional Interfaces
- (k) Control and monitoring data interfaces
- (l) System Response Time
- (m) Degraded Modes
- (n) Interface Test
- (o) Interface Specification Compliance Table
- (p) Typical Link Data List (if applicable)
- (q) Typical Hardware Data List (if applicable)
- (r) Document Change Notice

7.24.4.6 The Interface Data Document (IDD) submission shall contain the data list between the interfacing contractors. As a minimum, the IDD shall contain the following information:

- (a) Abbreviations
- (b) Reference
- (c) Document Scope
- (d) List of Drawings for Cable Route and Cabling Diagram
- (e) Link Data List and Hardwire Data List
- (f) Total Point Count
- (g) Avalanche
- (h) TVS mode table
- (i) Group Remote Control (GRC) List
- (j) Others
- (k) Document Change Notice

7.24.4.7 All interface documents shall be kept up-to-date throughout all phases of the Project. When changes are made to these documents, the updated version shall be submitted to the Engineer for acceptance, with all changes made clearly highlighted and annotated in the revised documents.

7.24.4.8 All interface design document submissions shall be accompanied with a joint statement with the Interfacing Contractors/Parties, transit operator, other agencies and third parties appointed by the Authority confirming that the said document had been jointly reviewed and agreed upon by all affected parties.

7.24.5 **Coordination with SWC (Lifts & Escalators)**

7.24.5.1 The Contractor shall design the architectural and structural provisions for the lifts and escalators/travellators based on Infrastructure and Civil Design Criteria. The Contractor shall take into consideration in the design, the various dimensions, spaces and structural requirements of lifts and escalators/travellators supplied by the different suppliers in the market.

7.24.5.2 Tenders for the SWC contracts for the supply and installation of Lifts and Escalators/travellators will be called by the Authority. The Contractor shall provide all the necessary information for preparation of these tenders.

- 7.24.5.3 The Contractor shall coordinate with the escalator SWC to ensure precision in interfacing between escalators and adjacent finishes (such as staircases, wall cladding panels). The Contractor shall ensure adequate space is provided for installation of all components. However there shall not be excessive width resulting in gaps in between the components. In the event of any such resultant gaps, the Contractor shall develop the detailing to close up the gaps, to the acceptance of the Engineer. These shall be deemed to be included in the Contract Price.
- 7.24.5.4 The Contractor shall coordinate with SWC (Lifts & Escalators) on the architectural and structural provisions for the lifts and escalators and to carry out any redesign of the architectural and structural elements as required. The Contractor shall accommodate and make any required changes to the lifts' and escalators' beam-to-beam distance / pits / supports as part of his works.
- 7.24.5.5 The Contractor shall coordinate with SWC (Lift) and provide temporary mesh screen or fire rated hoarding at the lift landing door openings and glass lift shaft/hoist way prior to the installation of the glass panels.
- 7.24.5.6 Prior to handing over of basic structure of lift shafts, the Contractor shall ensure that lift landing floor slabs are constructed and the lift shafts are properly protected from inclement weather to allow safe installation and testing of lift equipment.
- 7.24.5.7 The Contractor shall coordinate with SWC (Lift) and ensure that all temporary openings in the lift shafts are properly sealed prior to commencement of lift system testing.
- 7.24.5.8 The Contractor shall provide scupper drains for station entrance escalator upper landings and entrance lift landings; and all landings for lifts and escalators serving pedestrian overhead bridges (where applicable).
- 7.24.5.9 The Contractor shall provide temporary doors with lockset for Escalator Control Panel closets and Lift closets if the permanent doors are not ready prior to commencement of lift / escalator installation works.
- 7.24.5.10 The Contractor shall coordinate with SWC (Escalator) and to provide a robust temporary weather-proof shelter for entrance escalators, prior to the installation of escalators. Similar shelters shall also be provided for any storage of lifts and escalators on ground level if access for any lift and escalator installation is not available by the agreed dates in the CIP.

- 7.24.5.11 The Contractor shall screed the finishing of the escalator pits to fall towards the drain point.
- 7.24.5.12 The Contractor shall provide, coordinate, and agree with Lift & Escalator SWC on all relevant matters relating to the lift and escalator's equipment and design including but not limited to the following:
- (a) Lift
 - (i) Space requirements, including tolerances for construction of the civil works;
 - (ii) Fixing requirements, including lifting structures, working space, etc.;
 - (iii) Loading;
 - (iv) Interface with architectural finishes;
 - (v) Cabling routes;
 - (vi) Information on embedded parts, box-outs, etc.;
 - (vii) Equipment access route and temporary lifting requirements;
 - (viii) Plinths requirement where applicable;
 - (ix) Anchor bolts requirement;
 - (x) Cast-in bolts and hoisting hook/beam requirement including load testing by accredited laboratory;
 - (xi) Cat ladders requirement;
 - (xii) Separator beams requirement;
 - (xiii) Lift shafts and pit requirement;
 - (xiv) Opening for lift shaft ventilation;
 - (xv) Overhead requirement;
 - (xvi) Dry Sump requirement;
 - (xvii) Overhead sheave beams supports;
 - (xviii) Guide rail bracket supports;

- (xix) Door header support;
 - (xx) Sill Support;
 - (xxi) Opening for hall call button and hall position indicator;
 - (xxii) Storage space for lift equipment during delivery and installation;
 - (xxiii) Grouting of door jamb and landing sill after installation by lift SWC;
 - (xxiv) Intermediate emergency door if the distance between consecutive landing door sills exceeds 11m;
 - (xxv) Lift rescue hooks if the distance between consecutive landing door sills exceeds 11m (this distance shall be a maximum of 18m), where applicable;
 - (xxvi) Granite tiles for lift car floor; and
 - (xxvii) Lift closets requirement including backing plates, supporting struts etc.
- (b) Escalator
- (i) Space requirements, including tolerances for construction of the civil works;
 - (ii) Fixing requirements, including lifting structures, working space, etc.;
 - (iii) Loading;
 - (iv) Interface with architectural finishes;
 - (v) Cabling routes;
 - (vi) Information on embedded parts, box-outs, etc.;
 - (vii) Equipment access route and temporary lifting requirements;
 - (viii) Anchor bolts requirement;
 - (ix) Cast-in bolts and hoisting hook/beam requirement including load testing by accredited laboratory;

- (x) Escalator beam-to-beam requirement;
- (xi) Intermediate support(s) requirement;
- (xii) Escalator pit requirement;
- (xiii) ECP closets requirement;
- (xiv) Escalator drainage requirement; and
- (xv) Storage space for escalator equipment during delivery and installation.

7.25 Interface Change Control

- 7.25.1 As the scope of the interfacing works is extensive, the Contractor shall establish an effective control method to keep track of all interface changes. The control method shall not only record the change but shall also trace the impact of such change throughout the system so that the interfacing parties can be notified and the implications to the overall change followed through and evaluated.
- 7.25.2 The Contractor shall ensure that the change will lead to resolution of the problem and no additional problems will be introduced as a result of such change on other Interfacing Contractors/Parties. The impact of such changes shall be properly assessed with respect to scope of work, cost and programme and the result shall be submitted to the Authority and Engineer for acceptance.
- 7.25.3 All such changes, including providing the necessary attendance, re-coordination and redesign input, shall be deemed included in the Contract Price.

7.26 Interface with Instrumentation and Monitoring Contractors and Tunnel Excavation and Monitoring System (TEMS)

- 7.26.1 The Contractor shall interface with the Instrumentation and Monitoring (IM) contractor and the Authority's appointed contractor for Tunnel Excavation and Monitoring System (TEMS) in accordance with **Appendix P** of the Particular Specification.
- 7.26.2 The Contractor shall facilitate and provide all necessary access to the IM contractor so that he can carry out his instrumentation and monitoring works safely.
- 7.26.3 The Contractor shall work with the TEMS contractor to determine format of construction data for the Contractor's uploading to designated server.

7.27 M&E Services and E&M Systems plant rooms (for Station)

- 7.27.1 The Contractor shall interface with relevant authorities, agencies and Interfacing Contractors/Parties to obtain a suitable location and size of land take required for the plant rooms.
- 7.27.2 The Contractor shall incorporate the requirements of the Interfacing Contractors/Parties on plant rooms as well as the Civil and Structural design of the plant rooms layout.
- 7.27.3 The Contractor shall design the appropriate plant room layouts, location and sizes, maintenance accessibility, Equipment delivery routes and any other information necessary for the design of the Building Services, including pumped fire hydrant system (if required).
- 7.27.4 Location & layout of plant rooms shall take into consideration major cables, ducts and pipes routing of M&E Services, E&M Systems and Building Services to allow direct and efficient service routings. It shall also take into consideration the ease of maintainability and replacement of the services.
- 7.27.5 The Contractor shall coordinate with the Interfacing Contractors/Parties and ensure that no cable pulling pit shall be required for all 22kV and traction cables.
- 7.27.6 The Consultant shall coordinate with the Interfacing Contractors/Parties and ensure that the provision of service closets and risers have full accessibility to the services installed within, including high level services, for inspection, maintenance and replacement.

7.28 Design for Operation and Maintenance

- 7.28.1 The design shall take into consideration the maintainability during the service life of all infrastructure assets. All infrastructure assets shall be designed with consideration of the maintenance access to the finishes, services, equipment, bearings etc. and shall ensure that regular maintenance can be carried out safely, easily and efficiently with minimal impact to operations. The designs shall be optimized between cost, performance and risks; for both short term and long term impacts.
- 7.28.2 The design shall take into consideration of LTA RAOM comments and feedback from Public Transport Operators through the Authority.
- 7.28.3 The design and installation of all infrastructure assets shall be to the satisfaction of Public Transport Operators and all relevant Authorities.

7.29 Interface with LTA First Last Mile Scheme

- 7.29.1 The Contractor shall refer to **Clause 10** of the Particular Specification for provision of First Last Mile (FLM) and connectivity requirements to the station and liaise and interface with all consultants and/ or contractors that are appointed separately by the Authority.
- 7.30 **Interface with LTA Active Mobility Group**
- 7.30.1 The Contractor shall refer to **Clause 10** of the Particular Specification on the provision of bicycle parking lots and liaise with AMG on the design, supply and installation of bicycle parking lots. Where applicable, the Contractor shall liaise and coordinate with any Interfacing Contractors/Parties appointed by the Authority under a separate contract for AMG's future infrastructure and cycling path.
- 7.30.2 The Contractor shall coordinate and shall take into account of AMG's interfacing requirements in his programme and site utilization plan such that these interfacing works do not affect the progress of his Works. When requested by the Interfacing Contractor, the Contractor shall coordinate and accede to their request to access or temporarily occupy part of the Contractor's worksite, subject to the Engineer's acceptance, without adversely affecting the Contractor's Works and site security and safety standards & provisions.
- 7.30.3 In the event that the Contractor and the appointed contractor do not agree on the coordination of the works, the Engineer's decision shall be final. The Contractor shall not be entitled to claim for any time and cost incurred arising from any such Engineer's decision.
- 7.30.4 The Contractor shall coordinate with the appointed contractor and take into consideration the appointed contractor's surface runoff in both design and construction of his temporary and permanent drainage works.
- 7.30.5 The Contractor shall liaise and coordinate with the appointed contractor for all interfacing activities. The Contractor shall note that attendance, access and the carrying out of the construction work within the Contractor's worksite by the appointed contractor may be required.
- 7.30.6 The Contractor shall coordinate with the appointed contractor, comply with NParks' requirements and implement effective vibration control measures, structure monitoring and other monitoring as required by relevant authorities for works to be carried out in the vicinity.

- 7.30.7 The Contractor shall interface with AMG for any commuter facilities' upgrading work and/or cycling path works. The interfacing work to be carried out is not limited to obtaining the as-built drawing and coordinating with AMG prior to commencement of any new cycling path works.
- 7.31 **Interface with LTA Bus Divisions**
- 7.31.1.1 The Contractor shall liaise, coordinate and obtain approval from relevant LTA divisions, including but not limited to Bus Operations (BOPS), Bus Planning (BPL) and Bus Infrastructure Development (BID), before any construction works that potentially affecting the existing bus service route and the bus-related facilities.
- 7.31.1.2 The Contractor shall submit all plans and details for works affecting the bus service route six (6) months prior to any commencement of works.
- 7.31.1.3 The Contractor shall note that passengers on public buses are charged a fare based on the distance travelled. Any road diversion or relocation of bus stops affecting public bus services may have an impact on bus fares. As such, the Contractor shall manage the implementation of the diversions and relocation of the bus stops in order to minimise the impact to passengers' fares.
- 7.32 **Clarification of Design, Supply & Fix Items**
- 7.32.1 General
- Tables 7A, 7B and 7C provide clarification of Items to be designed, supplied and fixed by the Contractor and the various SWC. The Contractor shall coordinate with the relevant SWC and any other parties as required. The Contractor shall make due allowance in the Contract Price for items to be carried out by the Contractor.
- 7.32.2 The numbers and sizes of the penetrations required in the structures including penetrations for the SWC, equipment suppliers and other Interfacing Contractors/Parties shall be determined by the Contractor's coordination with these parties, as applicable, in the process of preparing of the CCSM and SEM Drawings.
- 7.32.3 Table 7D and Figures 1 to 4 provides a Summary of Equipotential Bonding (EPB) Requirements. The Contractor shall coordinate with the relevant SWC as required. The Contractor shall make due allowance in the Contract Price for items to be carried out by the Contractor.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

The following notes apply to Table 7A:

- (a) This table refers to Civil/SWC' requirements that are to be designed, supplied and fixed by the Civil Contractor/TW/SWC as indicated. Trackwork contractor shall be considered as a System-Wide Contractor (SWC or S) where not specifically identified.
- (b) The Civil Contractor and the SWC to coordinate on item type/materials used for suitability of purpose. The SWC cast-in items by the Civil Contractor are to be inspected and agreed by the SWC before casting of concrete commences.
- (c) All design and construction shall be closely coordinated between Civil Contractor and SWC. The nominated designer in this table is responsible for detailing the interface item and for the suitability and adequacy of such detail.
- (d) "Fix" means complete and proper installation in the correct place, without defects including tests where necessary.
- (e) Any disagreement as to the scope and extent of the work specified in this table shall be referred to the Engineer for his decision.
- (f) No drilling will be permitted without the specific acceptance of the Engineer.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
1	C and SWC and TW	C and SWC TW	C and SWC TW	Design, supply and fixing of C / SWC / TW services shall be the sole responsibility of the C / SWC / TW except where otherwise specified in this Table.	
2	C	C	C	Penetrations with cast-in pipe sleeves	SWC to confirm their requirements, including size and location. C to coordinate. C to re-confirm size and location with SWC before construction.
3	C	C	C	Box outs - full or part depth	SWC to confirm dimensions and location and agree with C.
4	C	C	C	Recesses and trenches formed in screed or finishes for SWC services.	SWC to confirm dimensions and location and agree with C. C to provide adequate thickness of screed or finishes. C to provide removable concrete cover or hot-dipped galvanised heavy duty steel removable or hinged covers and frames (where required) in finishes over recesses and trenches.
5	C	C	C	Excavation, backfill, compacting, turving and finishes of trenches in earth, pavement, road & below drains for SWC services.	Any specific protection such as cable tiles to be supplied and installed by SWC. SWC to propose location of services and agree with Contractor. Drainage for the trench shall be supplied and installed by C.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
6	C	C	C	Cable pipes, ducts etc. (including draw wires and sealing of all joints with waterproofing sealant) embedded into concrete, screed or earth. Pulling chambers box (where required) with covers.	SWC to confirm requirements, including size and location. C to ensure cable pipes, ducts, etc. are protected from ingress of water. Pulling chambers box to be provided with drainage. The drainage point shall be maintainable and not obscured by cables. C to check the levels of the pulling chambers box to ensure adequate drainage flow gradient to drain pits / drain point. C shall provide full concrete haunching for all cable pipes and ducts embedded in earth with cable markers. C to ensure the cable entry points into embedded pipes are free from sharp edges to prevent damage to cables.
7	C	C	C	TFCC/MTO Operators, SP Group and SP Gas intake entry pipes and ducts, MCTs for telecom lead-in pipes, draw wires, manholes, waterproofing sealing for manholes, entry points and concrete haunching for pipes and ducts.	C to coordinate with SWC, E&M Consultant, the TFCC/Mobile Telecom Operators (MTO) and SP Group. C to obtain requirements, including size and location etc., to design and construct accordingly. E&M Consultant and SWC to submit design and seek approval from authorities.
8	SWC	SWC	SWC	Conduits, (pull, junction and/or surface) boxes, sheet metal trunking and ducting, which are surface run or concealed in screed or finishes or chased into block work, brick walls or partition wall.	Covers and frames in finishes over (pull, junction and surface) boxes, chasing and subsequent sealing by mortar or equivalent by C according to the LTA M&W.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
9	C and SWC	C and SWC	C and SWC	Conduits, (pull, junction and/or surface) boxes, sheet metal trunking and ducting, which are cast into concrete including draw wires.	Covers and frames in finishes over (pull, junction and surface) boxes by C. Conduits assembled by SWC. Supply of conduits by SWC and fixing of conduits to the re-bar by C shall be under SWC's supervision. Protection of all ends and joints of conduits by C. SWC and C to jointly inspect before casting.
10	SWC	SWC	C	Cast-in sockets including bolts, nuts and washers, packings and shims.	SWC to supply all necessary templates. C to coordinate with SWC on the locations.
11	SWC	SWC	SWC	Drilling for anchors.	SWC to coordinate with C on location, size and drilling method statement. The Engineer will require the SWC to use a rebar scanner.
12	SWC	SWC	SWC	All SWC's cable and pipe support systems within the station complete with anchors, nuts, bolts, washers, etc.	SWC to coordinate with C.
13	SWC	SWC	C	Electrical locking system/sensors and associated cabling (within door) for access management system (AMS) doors.	Suitable interface points shall be agreed between C and SWC.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
14	SWC	SWC	SWC	Grouting under SWC's machine beds.	
15	C	C	C	Isolation / Insulation measures for Platform Screen including insulating membrane beneath platform finish, insulation and surface seal between platform finish and platform screen doors (PSD), platform finish and end returns, insulating membrane within buffer area etc. Insulating the surface of any platform edge columns, walls and doors up to a minimum height of 2.5m from AFFL within vicinity of the insulated platform area.	End Return Panels within 1.8m of the PSD to be floated and coated with an insulating material by C. Insulation tests between platform finish and earth by C and witness by SWC C to coordinate with SWC on the detail at the PSD and platform interface. C to coordinate with PSD SWC on location where insulation membrane is not required. E.g. at footings of PSD structure and end return doors, etc.
16	SWC	SWC	SWC	Top and bottom fixings and insulation at base of PSD and end return door (ERD).	Along platform edge for the entire length of the PSD. Resistance tests between PSD and earth by SWC and C.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
17	SWC	SWC	C	All fixings (i.e. cast-in / surface channel, studs, pipe sleeve, drilling, coring) necessary to secure PSD and end return door to the station structures, including top fixing to structural soffit, beam and frame, and bottom fixing to structural slabs for PSD and ERD.	<p>Along platform edge for the entire length of the PSD including end return.</p> <p>C shall undertake 'as-built' survey on these installed fixings, platform edge and top PSD and ERD supporting beam/structure to substantiate its conformance to the SWC's installation requirements. C to furnish the aforesaid survey data to the SWC (including completion of any remedial works as highlighted by the SWC in the site pre-inspection) at least 3 weeks prior to commencement of PSD installation.</p> <p>C shall coordinate with SWC on locations where 'box- up' provision are required for grouting or securing the PSD and ERD fixings to the station structures.</p> <p>C to identify and mark at site the AFFL at end return area for SWC to set out the bottom of the end return door.</p>
18	C	C	C	Touch voltage insulation between PSD header and architectural panels such as cornice, false ceiling, etc.	C to coordinate with SWC on the air gap clearance and interface between the architectural panels and PSD header.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
19	C	C	C	PSD (including end return) top support framing from concourse slab soffit to top of PSD (3m from Finished Level) including fire resistant board and insulation.	Along platform edge for the entire length of the PSD including end return.
20	SWC	SWC	SWC	PSD to act as an effective smoke barrier complying with BS 7346 "Components for smoke and heat control systems, Part 3 Specification for smoke curtains".	SWC to coordinate with C to facilitate the interface of the smoke barrier with station structures and architectural works. Smoke barrier from a height of 2100mm to 3000mm above platform FFL (including any exposed PSD top fixing).
21	SWC	SWC	SWC	PSD and end return doors.	C to coordinate with SWC about the interface requirements at the PSD, walls and end returns doors.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
22	C	C	C	Sealing of gap between SWC equipment, and wall and floor finishes.	<p>Eg: Headwall and Tail Wall Units, GTM, AFC gates, fire panels, ESP, lift landing doorframe, escalator, end return door (ERD) frame, architectural panels/flooring adjoining to PSD structure, Fire panels etc. Beading or trims to be designed, supplied and fixed by the C. Sealing material shall maintain the fire rating of the compartment where applicable.</p> <p>For sealant used on ERD door frame and PSD structure shall be of non-conductive material with high resistive properties. C shall coordinate with SWC on the type of structural sealant to use.</p>
23	C	C	C	Kerbs around oil transformers, oil collecting pit associated drain pipe.	<p>SWC to confirm requirements, including size and location. C to coordinate.</p> <p>The location of drain point shall not result in any bend of drain pipe from transformer room to oil collecting pit.</p> <p>Oil collecting pit and kerbs around transformer shall be finished with oil resistant membrane and epoxy paint for preventing oil leaking from the oil pit and oil retention sump.</p>

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
24	C	C	C	Chequered plate cover for cable and pipe trenches / pit and spare switchgear panel floor openings	Covers flush with finished floor level.
25	SWC	SWC	SWC	<p>Cabling from isolators to all pump control panels. Control and monitoring cabling from all pump control panels up to interface terminal boxes (ITBs).</p> <p>Cabling from pump control panel to the pump.</p>	<p>Isolators and associated cabling from power supply source to the isolators to be supplied and installed by Electrical SWC. ITBs and associated cabling from ITBs to CE/ISCS room to be supplied and installed by ISCS Contractor.</p> <p>Cabling from isolators to all pump control panels, control and monitoring cabling from interface terminal boxes (ITBs) to all pump control panel and cabling from pump control panel to the pump to be supplied and installed by WHE.</p> <p>Location of isolator and pump control panel to be coordinated by C.</p>
26	SWC	SWC	C	Pipe puddle flanges for E&M services.	SWC (by Interfacing Consultant if SWC not on board) to confirm requirements, including size and location. C to coordinate. C to supply and install.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
27	C	C	C	Openings in ceiling panels & access panels for all SWC equipment where required. (Examples: PA loudspeakers, CCTV cameras, clocks, LCX cables, antennas, light fittings, ECS outlets & inlets, heat & smoke detectors, sprinklers, platform indicators, & signage, graphics & advertising panels, SSO & lightning protection systems.).	SWC to confirm requirement, including size and location of openings. C to coordinate. Equipment supporting system shall be supplied and installed by SWC.
28	C	C	C	Double slabs, localized areas of raised soffit and lowered floor slab, niches and associated cat ladders where required for SWC's equipment, services and air plenum, within station.	C to coordinate with SWC to confirm space and access required for SWC's equipment, services and air plenum, including cat ladder access where required. For CD station, cat ladder inside the vent shaft shall be provided for the access and operation of the ventilation duct air-tight panel door located above 4.5m AFFL. The air-tight panel door will be provided by SWC.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
29	C	C	C	Earth Mat System	<p>C shall be responsible for design, construct, testing and commissioning of the earth mat system for the required electrical system. All the related electrical works shall be supervised and endorsed by C engaged Electrical Professional Engineer. C engaged Professional Engineer shall endorse all require calculations and report, confirming the earth mat design is suitable for the electrical system for Engineer's acceptance prior to any construction of the earth mat system.</p> <p>C to coordinate with SWC on earthing system interface.</p>
30	C	C	C	Kerbs /plinth around floor openings for services penetration.	<p>SWC to confirm dimensions and locations. C to coordinate. Kerbs/plinth around floor openings shall be covered with waterproofing membrane and finished with epoxy paint for preventing water leaking through the gap between the floor and kerbs /plinth to the floor below through the opening.</p> <p>Kerbs/plinth around floor openings for penetration of wet services shall not be combined with kerbs/plinth for dry services.</p>

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
31	C	C	C	All equipment plinths (whether concrete or I-beams) and concrete stumps/foundation where required by SWC (inclusive of plinths for pole / mast such as lighting, VSS, antenna etc and stumps at entrance level and building roof for SWC floor mounted services and etc)	<p>C to coordinate with SWC to confirm requirements, including sizes and locations of the concrete plinths, pockets and stumps, and loading imposed for mounting of equipment.</p> <p>C to coordinate with SWC on the requirement, including but not limited to, location, size and quantity of the foundation for mounting of the services poles.</p>
32	C	C	C	Cavity walls in non-public rooms and areas.	C to coordinate with SWC to confirm space and access provision for services such as condensate pipe to scupper drain etc., and other requirements for cavity walls.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
33	TW	TW	TW	All cable recess, troughs, ducts, pipes, manholes and trenches, either across track or parallel to track, within and/or on trackbed concrete for all trackway. Removable covers for the above-mentioned items	<p>TW to coordinate with SWC to meet the requirements. Contractor to coordinate with TW and provide drainage for all provisions, drainage point shall be maintainable and not obscured by cables.</p> <p>If provision of drainage is deemed not possible, sand shall be provided. SWC to provide sand in-fill where cabling is by the SWC only. TW to provide sand in-fill where cabling by multi-SWC. TW to provide grating with chequered plate cover for manholes.</p> <p>TW to provide grating with chequered plate cover for manholes and all pits on trackway. In area where cables exit from the cover, TW to coordinate with SWC on cut-out size on the cover.</p> <p>TW to provide draw wires and temporary end caps for embedded cable pipes and ducts. TW shall ensure the cable entry points into embedded pipes are free from sharp edges to prevent damage to cables.</p>
34	TW	TW	TW	Extended portion of sumps, drained trough and drained pulling chambers within and/or on trackbed concrete for all trackway. Removable or hinged covers (for sumps) for the above-mentioned items.	<p>TW to coordinate with C and SWC for requirement. TW to provide grating with chequered plate cover for manholes</p> <p>In area where cables exit from the cover, TW to coordinate with C and SWC on cut-out size on the cover.</p> <p>Cover to be installed only after cables are laid.</p>

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
35	C	C	C	<p>All cable recesses, ducts, pipes, chambers and trenches, either across track or parallel to track, beneath trackbed concrete for all trackway in the base slab and first stage concrete for all trackway.</p> <p>Including cable ducts and pipes rising from base slab up to a suitable termination point agreed with SWC/TW</p>	<p>SWC to confirm requirements. C to coordinate with SWC to meet the requirements. C to provide drainage for the provisions and draw wires and temporary end protection for the cable pipes and ducts. The drainage point in cable recesses, chambers and trenches shall be maintainable and not obscured by cables.</p> <p>C shall ensure the cable entry points into embedded pipes are free from sharp edges to prevent damage to cables.</p>
36	C	C	C	Portion of sumps, drained trough and drained pulling chambers beneath trackbed concrete.	C to coordinate with TW Contractor and SWC. C to provide drainage, and nibs beneath trackbed concrete to support the extended portion by TW within trackbed.
37	C	C	C	Raised floor systems , including kerbs at entry steps.	<p>C to coordinate with SWC for equipment loading, equipment mounting and cut-out for cable entry etc. and ensure raised floor can take the equipment and human loading. All cut-out are free from sharp edges to prevent damage to cables.</p> <p>C to coordinate with ECS and FPS SWC on the location and quantity of raised floor perforated panels where required.</p>

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
38	C	C	C	Cabling from isolators to motor control panels of roller shutters and fire shutters. Control and monitoring cabling from shutter control panel up to interface terminal boxes (ITBs).	Isolators and associated cabling from power supply source to the isolators to be provided by SWC. ITBs and associated cabling for the control and monitoring of shutters from ITBs to CE/ISCS room to be provided by ISCS Contractor. Shutter control panel to be provided by C.
39	SWC	SWC	SWC	Passenger information display (PID) mounting support system.	C to coordinate with SWC. Where cantilever support for the PID mounting system at platform level is required, the cantilever shall be designed, supplied and fixed by the C.
40	C	C	C	Reinforced concrete tank. (For fire sprinkler system and/or hydrant system, if any)	Reinforced concrete (RC) tanks (including accessories such as ladders and grab bars, platforms, hand rails, drainage pipes and valves, access hatches and doors) for fire sprinkler system installation shall be by C. C shall provide incoming water pipe up to and include the gate valve adjacent to the tank. All cast-in items within the tank for SWC shall be supplied and installed by C.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
41	C	C	C	Recessed breeching inlet housings and non-recessed breeching inlet cabinets.	SWC to confirm location, agree and coordinate with C. C to provide the recess housing, recess door, cabinet and signages and cast in pipes for earth pits of the breeching inlets.
42	C	C	C	Recessed hosereel and fire extinguishers housings.	SWC to coordinate with C on the location of the hosereels and fire extinguishers. C to provide recess on the wall and partition, signages and access doors for installing the hosereel and fire extinguishers, and to drain residual water from the cabinet.
43	C	C	C	Temporary and permanent lifting points including lifting hooks, eye bolts and lifting beams along the equipment delivery routes and future replacements route as well as those within plant rooms.	SWC to confirm requirements. C to coordinate with SWC for the locations.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
44	C	C	C	<p>Permanent lifting hooks/ beams for the Tunnel Booster Fans (TBFs) and Water Handling Equipment (WHE) to be supplied and installed by the Contractor.</p> <p>The Contractor shall construct the concrete platform for TBF if required, inclusive of the associated access ladders with cage and demountable railings.</p>	SWC to confirm requirements. Contractor to coordinate with SWC for the locations. C to engage Accredited Agencies to carry out testing of the lifting hooks/beams, supervised and endorsed by Mechanical PE engaged by C before BSC.
45	C	C	C	Multi-Cable Transits (MCT) including frames & inserts for cabling and pipes, which are passing through walls and slabs	C shall coordinate with SWC in order to design and provide Multi-Cable Transits (MCT) in accordance with the Specifications. Where SWC conduit passes through MCT's and cables run in the conduit, SWC is to seal between the cable and the conduit.
46	SWC	C	SWC	Tiles for lift car floor	C to coordinate with SWC for the quantity for passenger and fireman lifts.
47	SWC	SWC	SWC	Provision of troughs for services routing in underplatform service duct (UPSD).	SWC to coordinate and agree with C for the location.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
48	SWC	SWC	SWC	Provision of hard hat protection and chequered plate ramp cover for floor mounted services in underplatform service duct (UPSD) or crossing the trackway	SWC to coordinate and agree with C and TW for the location.
49	C	C	C	Provision of temporary rigid fencing along buffer corridor at both platform ends with gate and lockset to prevent unauthorized access from the station onto the tracks prior to DC power-on.	

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
50	C	C	C	Provision of metallic dome cover for drainage point at scupper drains, washing point, station roof and escalator pits.	Provision of metallic dome covers shall apply for within station, trainway and tunnels
51	C	C	C	Proper capping to all drainage points and cable ducts with plug valve/rubber plug.	All capping shall be removed before handover or seeking for Engineer clearance.
52	C	C	C	Line wide design for ticketing machine wall finishes	C shall coordinate with all SWC to ensure no services are exposed. C shall ensure that all interfaces of finishes and setting out of surrounding structures and running of all services shall be determined and agreed by all parties prior to installation of works. C shall design and provide.
53	SWC	SWC	SWC	Passenger Service Centre (PSC) / Station Master Room (SMR) <ul style="list-style-type: none"> • Furniture and cabinetry • Cut-outs in ceiling and furniture for SWC services provisions 	The SWC shall coordinate with the interfacing SWC for all necessary provisions.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
54	SWC	SWC	SWC	Drilling in tunnels for the Overhead Conductor Rail (OCR) supports and/or equipment fixings.	SWC shall use a proper drilling jig, the depth of drilling shall be discussed and agreed with C. SWC to coordinate and agree with C for the location and method statement. If any drilled location is not used, SWC shall made good with a concrete mix or equivalent material to be specified by C.
55	C	C	C	Permanent lifting hooks/ beams for WHE to be supplied and installed by the C.	SWC to confirm requirements. C to coordinate with SWC for the locations. C to engage Accredited Agencies to carry out testing of the lifting hooks/ beams, supervised and endorsed by Mechanical PE engaged by C, before BSC.
56	C	C	C	Design, supply and fixing of Totem Poles for integrate of exit signage /CCTV/ESC signage where mounting of exit sign location happen to be without ceiling or at high void ceiling.	SWC to confirm requirement. C to coordinate, provide and install as per requirement.
57	C	C	C	Design, supply and fix of dog house for services penetration to slab of roof top.	C to coordinate with SWC on location of roof top opening and provide protection ensure water tightness to station.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
58	SWC	SWC	SWC	<p>Design, supply and fixing of Ventilation Duct Hinged-End doors.</p> <p>Ventilation duct hinged-end doors shall be provided at all ventilation supply and exhaust duct openings at the ventilation shafts/ plenums. The ventilation duct hinged-end doors shall be air-tight to prevent direct infiltration of contaminated air through the duct openings into the main shelter area and back-of-house.</p>	C to coordinate with SWC to provide information if needed to facilitate the design.
59	C	C	C	Double slabs, localized areas of raised soffit and lowered floor slab, niches and associated cat ladders where required for SWC's equipment, services and air plenum, within services	C to coordinate with SWC to confirm space and access required for SWC's equipment, services and air plenum, including cat ladder access where required. For CD station, cat ladder inside the vent shaft shall be provided for the access and operation of the ventilation duct air-tight panel door located above 4.5m AFFL. The air-tight panel door will be provided by SWC.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
60	SWC	SWC	SWC	Precast RC Thermal Energy Storage (TES) tank supply and installation.	C shall note that the TES tank will be supplied and installed by the SWC. The TES tank will be supported on the main structural slab which is to be designed by built by C. C shall coordinate with the SWC to ensure that all structural requirements, not limited to imposed loads, support systems, foundations and connections to the main slab are considered and accounted for in C's design.

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
61	SWC	SWC	SWC	<p>Cabling from switch socket outlets to all seepage water holding tank monitoring panels.</p> <p>Monitoring cabling from all seepage water holding tank monitoring panels up to interface terminal boxes (ITBs).</p> <p>Cabling from seepage water holding tank monitoring panel to the water level sensors.</p>	<p>Switch socket outlets and associated cabling from power supply source to the switch socket outlets to be supplied and installed by Electrical SWC.</p> <p>ITBs and associated cabling from ITBs to CE/ISCS room to be supplied and installed by ISCS Contractor.</p> <p>Cabling from switch socket outlets to all seepage water holding tank monitoring panel, monitoring cabling from interface terminal boxes (ITBs) to all seepage water holding tank monitoring panel and cabling from seepage water holding tank monitoring panel to the water level sensors to be supplied and installed by WHE SWC.</p> <p>Location of switch socket outlet and all seepage water holding tank monitoring panel to be coordinated by C. The seepage water holding tank shall be by C.</p>

TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

62	SWC	SWC	SWC	High Volume Low Speed (HVLS) fans.	<p>C shall note that the HVLS fans will be supplied and installed by the SWC. C shall coordinate with the SWC to ensure that all structural requirements, not limited to imposed loads, support systems, foundations and connections to the main slab are considered and accounted for in C's design to facilitate HLVS mounting system by SWC.</p> <p>C to coordinate with SWC to confirm ceiling panel cut out for the HVLS safety/stabilization cables and access required for HVLS fans.</p>
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TABLE 7A - Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Station and Trainway)

63	C	C	C	Removable railing shall be provided in front of wall mount dampers and floor mount dampers.	<p>C to coordinate with SWC for the locations of dampers. The removable railings shall be located at least 0.6m from the dampers. Warning sign indicating the damper may close automatically shall also be provided.</p> <p>For track dampers along buffer area where it may cause obstruction to the access route, demountable wire guards will be provided by SWC in lieu of the removable railing.</p>
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TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

The following notes apply to Table 7B :

- 1) This table refers to Civil/SWC' requirements that are to be designed, supplied and/or fixed by the Civil Contractor/TW/SWC as indicated. Trackwork contractor shall be considered as a System-Wide Contractor (SWC) where not specifically identified.
- 2) The Civil Contractor and the SWC to coordinate on item type/materials used for suitability of purpose. The SWC cast-in items by the Civil Contractor are to be inspected and agreed by the SWC before casting of concrete commences.
- 3) All design and construction shall be closely coordinatedcoordinated between the Civil Contractor and the SWC. The nominated designer in this table is responsible for detailing the interface item and for the suitability and adequacy of such detail.
- 4) "Fix" means complete and proper installation in the correct place, without defects including tests where necessary.
- 5) Any disagreement as to the scope and extent of the work specified in this table shall be referred to the Engineer.
- 6) No drilling will be permitted without the specific acceptance of the Engineer.

TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
1	C and SWC and TW	C and SWC TW	C and SWC TW	Design, supply and fixing of C / SWC/TW services shall be the sole responsibility of the C / SWC / TW except where otherwise specified in this Table.	
2	TW	TW	TW	Design, supply and fixing of trackwork items shall be the sole responsibility of the TW except where otherwise specified in this Table.	
3	SWC	SWC	C	Brackets and hangers for SWC's cable and pipe.	Bolts, anchors, nuts, washers, packers, shims and the like shall be supplied by SWC. SWC to provide the installation method statement to C. C shall ensure all bracket fixings conform to the installation method statements provided. This arrangement shall also apply to trackside brackets to be installed along station trainways.
4	SWC	SWC	C	Drilled in fastenings in Cut and Cover and bored tunnels with precast segments with safe drilling zones indicated by dimples for both temporary and permanent services.	Coordination between SWC and C to agree the location of fixings.

TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
5	C	C	C	Cast-in sockets or blind holes in cut and cover tunnels for both temporary and permanent services. C to ensure that the cast-in sockets, etc. are compatible with bracket fixings, etc. to ensure that corrosion resulting from dissimilar metals will be prevented.	C to coordinate with SWC and agree on the location, bolt size and method statements; to ensure that type of bolt supplied (under item 3 above) matches the fixing provisions throughout the tunnels; and that adequate construction tolerances are allowed between fixing and the mounting slots of the brackets.
6	TW	TW	TW	Removable covers for cable recess/troughs/ trenches at track bed concrete.	
7	C	C	C	Drilling in tunnels for cable and pipe supports and/or equipment fixings.	C to coordinate with SWC and agree on the location, bolt size and drilling method statements; to ensure that type of bolt supplied (under items 3 above) matches the fixing provisions throughout the tunnels; and that adequate construction tolerances are allowed between fixing and the mounting slots of the brackets. All drilling in the tunnels are subjected to acceptance by E.
8	SWC	C	C	Drilling in tunnels after tunnel handover for sundry items and tertiary cable routes.	C to coordinate with SWC and agree on the location, size and drilling method statements including such time when Track-work and SWC have accessed and commenced track laying / installation work.

TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
9	SWC	SWC	SWC	<p>Cabling from isolators to all pump control panels. Control and monitoring cabling from all pump control panels up to interface terminal boxes (ITBs).</p> <p>Cabling from pump control panel to the pump.</p>	<p>Isolators and associated cabling from power supply source to the isolators to be supplied and installed by Electrical SWC. ITBs and associated cabling from ITBs to CE/ISCS room to be supplied and installed by ISCS Contractor.</p> <p>Cabling from isolators to all pump control panels, control and monitoring cabling from interface terminal boxes (ITBs) to all pump control panel and cabling from pump control panel to the pump to be supplied and installed by WHE.</p> <p>Location of isolator and pump control panel to be coordinated by C.</p>

TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
10	TW	TW	TW	All cable recess, troughs, ducts, pipes and trenches, either across track or parallel to track, within and/or on trackbed concrete for all trackway. Removable covers for the above-mentioned items.	<p>SWC to confirm requirements. TW to coordinate with SWC to meet the requirements. Contractor to coordinate with TW and provide drainage for all provisions. At tunnel crossover, sidings and other areas where there is adequate trackbed depth, TW shall provide extended drained trough and drainage pipe within trackbed when required to facilitate the connection to the drainage system by C. The drainage point shall be maintainable and not obscured by cables.</p> <p>TW to provide grating with chequered plate cover for manholes and all pits on trackway. In area where cable exit from the cover, TW to coordinate with SWC on cut-out size on the cover.</p> <p>TW to provide draw wires and temporary end caps for embedded cable pipes and ducts.</p> <p>TW shall ensure the cable entry points into embedded pipes are free from sharp edges to prevent damage to cables.</p> <p>In cable pits adjoining to cable troughs, TW to ensure the supporting steel frames of the grating or chequered plate covers are designed to be removable above the cable troughs so as not obscure the cable installation in the cable troughs.</p>

TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
11	TW	TW	TW	Extended portion of sumps, drained manholes, drained trough and drained pulling chambers within and/or on track bed concrete. Removable or hinged covers (sumps) for the above-mentioned items.	TW to coordinate with C and SWC for requirement. TW to provide grating with chequered plate cover for manholes. In area where pipes exit from the cover, TW to coordinate with C on cut-out size on the cover.
12	C	C	C	All cable recess, ducts, pipes, manholes and trenches, either across track or parallel to track, in base slab and first stage concrete of all track-ways. Including cable ducts and pipes rising from base slab up to a suitable termination point agreed with SWC / TW.	SWC to confirm requirements. C to coordinate with SWC to meet the requirements. C to provide draw wires and temporary end caps for the ducts and necessary drainage. The drainage point shall be maintainable and not obscured by cables. If provision of drainage is not possible, sand shall be provided. SWC to provide sand in-fill where cabling is by the SWC only. Contractor to provide sand in-fill where cabling by multi-SWC. TW to provide grating with chequered plate cover for manholes. C shall ensure the cable entry points into embedded pipes are free from sharp edges to prevent damage to cables.

TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
13	C	C	C	Portion of sumps, drained manholes, drained trough and drained pulling chambers beneath track bed concrete.	C to coordinate with TW Contractor and SWC. Contractor to provide drainage, and nibs beneath trackbed concrete to support the extended portion by TW within trackbed.
14	SWC	SWC	SWC	Cable brackets and hangers, and pipe brackets attached to walkway structure (if any).	SWC to coordinate with TW. Bolts, anchors, nuts, washers, packers, shims and the like shall be supplied by SWC.
15	TW	TW	TW	Cable ducts and pipes rising from the trackbed and behind walkway wall and up to a suitable termination point above walkway agreed with C and SWC.	SWC to define requirements. TW to coordinate with SWC to meet the requirements. TW to provide draw wires and temporary end caps.
16	SWC	SWC	SWC	Sump Pumps control and monitoring system.	C to coordinate between E and SWC for the location of control panels.
17	TW	TW	TW	Design, supply and fixing SCCC jumper box and the 35 sqmm cable connection to the SCCC wire mesh at the gaps.	SWC install the SCCC collection cable between jumper boxes
18	TW	TW	TW	Provision of drainage connection from cross passage/ walkway ramp interface to scupper drain.	C to coordinate with TW.

TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
19	C	C	C	<p>Permanent lifting hooks/ beams for the Tunnel Booster Fans (TBFs), tunnel pumps and WHE to be supplied and installed by the Contractor.</p> <p>The Contractor shall construct the concrete platform for TBF if required, inclusive of the associated access ladders and demountable railings.</p>	SWC to confirm requirements. Contractor to coordinate with SWC for the locations. C to engage Accredited Agencies to carry out testing of the lifting hooks/ beams, supervised and endorsed by Mechanical PE engaged by C, before BSC.

TABLE 7B – Clarification of Design, Supply and Fix Items (Civil/System-wide Interface - Tunnel)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (E = Engineer) (SWC = System-Wide Contractors) (TW = Trackwork Contractor)	REMARKS
20	TW	TW	TW	Design, supply and fixing SCCC drainage terminal box and the 35 sqmm cable connection from the SCCC jumper box to SCCC drainage terminal to the SCCC wire mesh at the Trackbed concrete.	<p>TW to provide grating with chequered plate cover for manholes and all pits on trackway. In area where cable exit from the cover, TW to coordinate with SWC on cut-out size on the cover.</p> <p>TW to provide draw wires and temporary end caps for embedded cable pipes and ducts.</p> <p>TW shall ensure the cable entry points into embedded pipes are free from sharp edges to prevent damage to cables.</p> <p>In cable pits adjoining to cable troughs, TW to ensure the supporting steel frames of the grating or chequered plate covers are designed to be removable above the cable troughs so as not obscure the cable installation in the cable troughs.</p>

TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)

The following notes shall apply to Table 7C:

- (g) This table refers to Civil/SWC's requirements that are to be designed, supplied and/or fixed by the Civil Contractor/SWC/SC as indicated.
- (h) The Civil Contractor and the SWC shall coordinate on item type/materials used for suitability of purpose. The SWC cast-in items shall be inspected and agreed by the SWC before the Civil Contractor commence casting of concrete.
- (i) All design and construction shall be closely coordinated between Civil Contractor and SWC. The nominated designer in this table is responsible for detailing the interface item and for the suitability and adequacy of such detail.
- (j) "Fix" means complete and proper installation in the correct place, without defects including tests where necessary.
- (k) Any disagreement as to the scope and extent of the work specified in this table shall be referred to the Engineer for his decision.
- (l) No drilling will be permitted without the specific acceptance of the Engineer.
- (m) All APS items as listed in **Clause 10** of the Particular Specification shall be designed by the Civil Contractor, supplied and installed by APS contractor.
- (n) All diagrams shown here are for reference to illustrate the differentiation of scope between various interfacing parties and do not describe the details required for the full performance of the works.
- (o) All cabling shall be low-smoke zero Halogen and fire-retardant.

TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (SWC = System-Wide Contractor)	REMARKS
1	C and SWC	C and SWC	C and SWC	Design, supply and fixing of C / SWC services shall be the sole responsibility of the C / SWC except where otherwise specified in this Table.	

TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (SWC = System-Wide Contractor)	REMARKS
2	C	SWC	SWC	<p>Line wide Passenger Service Center (PSC) Station Master Room (SMR):</p> <ul style="list-style-type: none"> • Furniture & Fittings; • Cut-outs in PSC and SMR's ceiling and furniture; • Raised Floor; • Ceiling; • Internal and External Dry Partitions, inclusive at seepage drain, for full containment of PSC/SMR; • Glass Doors; • Chairs; • Glazing; • Steel support structures up to the underside of the slab above PSC/SMR; • External Lit Sign box; • Internal Finishes; and • Cladding for all PSC and SMR partitions 	SWC shall liaise with C for all necessary provisions for installations. All interfaces of finishes, setting out of surrounding structures and running of services shall be determined and agreed by all parties prior to installation of works.

TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)

ITEM NO.	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (SWC = System-Wide Contractor)	REMARKS
3	C	C	C	Line Wide Passenger Service Center (PSC)-Station Master Room (SMR) <ul style="list-style-type: none"> • All Wet Works; • Cladding panels / trims to close up gaps between PSC, concourse ceiling and adjoining walls; • Concrete/brick/block structures enclosing PSC and SMR • Fire Doors; • Fire-rated shutters if/where required; • Service Booms interfacing at the PSC frontage; and • Shutters inclusive channels interfacing at the PSC frontage; 	<p>In principle, C shall determine the footprint of the PSC/SMR, make structural provisions and associated wet works to enable the installation of the PSC/SMR.</p> <p>C shall coordinate with all SWC to ensure no services are exposed. C shall ensure that all interfaces of finishes and setting out of surrounding structures and running of all services shall be determined and agreed by all parties prior to installation of works.</p>

TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)

ITEM	ITEM DESCRIPTION	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (SWC = System-Wide Contractor) (SC = APS Signage Contractor)	REMARKS
4	Power Supply to FCU/Isolator for each lit signage	SWC	SWC	SWC	Electrical cabling and provision of FCU/isolator. The power requirements to be provided by SC and location of FCU/Isolator to be coordinated by C.	Refer to Figure 7C-1 to 7C-5.
5	Power Supply from FCU/Isolator to lit signage	SC	SC	SC	Electrical cabling from FCU/Isolator to the signage including cable termination.	Refer to Figure 7C-1 to 7C-5.
6	Opening of finishes for Signage	C	C	C	Opening and/or cutting of ceiling, wall and floor finishes for installation of signage.	NA
7	Ceiling-mounted signage	SC	SC	SC	First fix of bracket and hanger up to 4m above floor finished level (FFL). Structural steel support from 4m above FFL to slab soffit by C.	Refer to Figure 7C-6 & 7C-7.
8	Wall-mounted signage	C	SC	SC	First fix of bracket and support up to 1m from structural support.	Refer to Figure 7C-8 & 7C-9.

TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)

ITEM	ITEM DESCRIPTION	DESIGN	SUPPLY	FIX	DESCRIPTION (C = Civil Contractor) (SWC = System-Wide Contractor) (SC = APS Signage Contractor)	REMARKS
9	Floor-mounted signage	C	SC	SC	First fix of bracket to floor slab.	NA

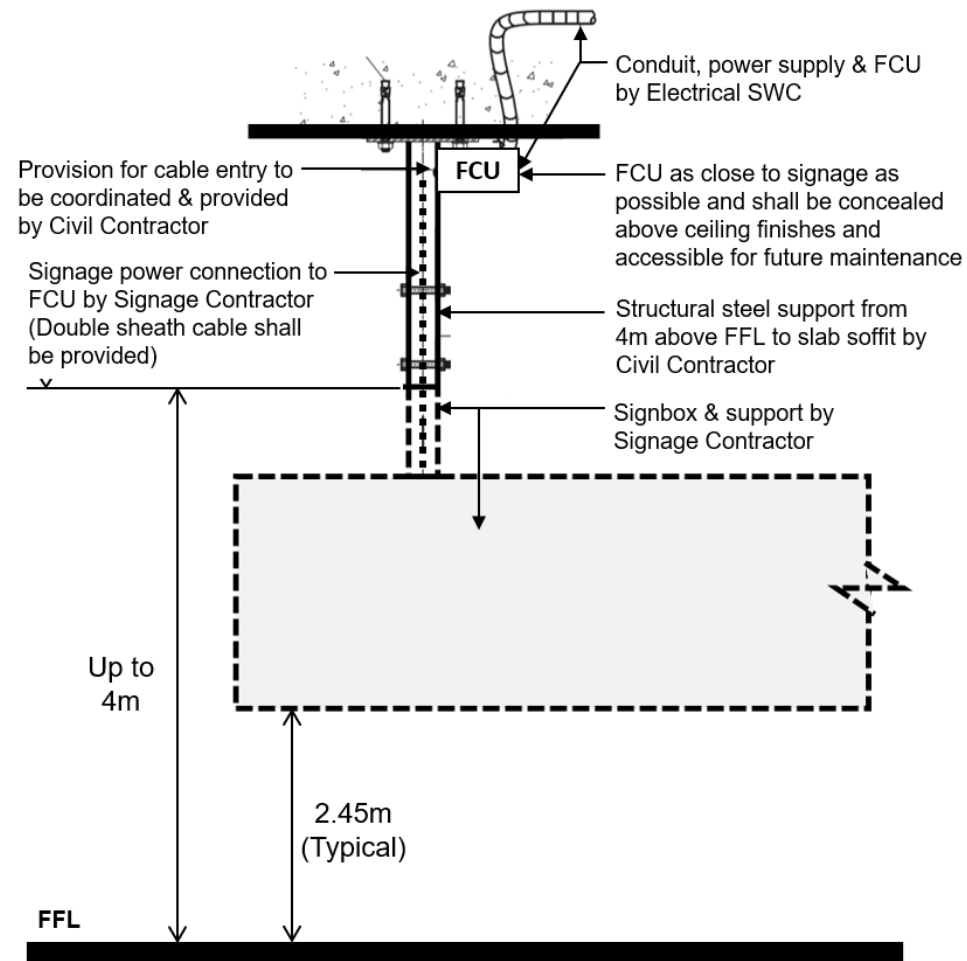
TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)**Figure 7C-1: Diagram for ceiling-mounted signage**

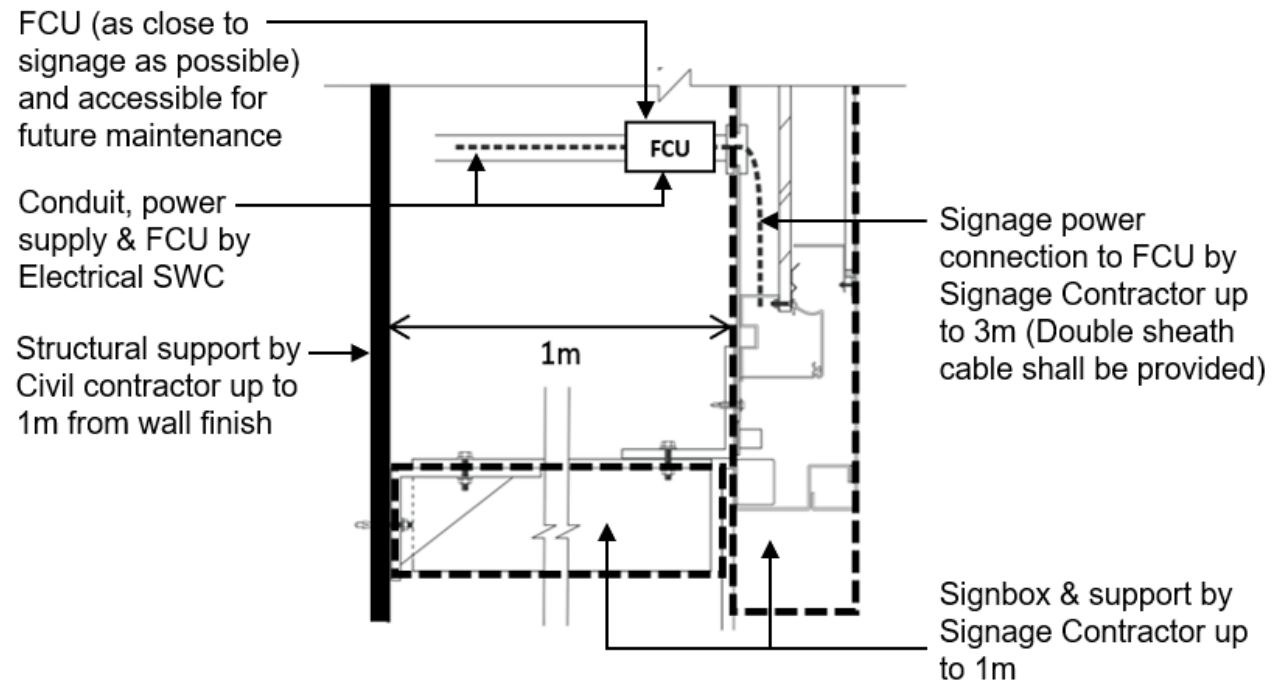
TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)**Figure 7C-2: Diagram for wall-mounted signage**

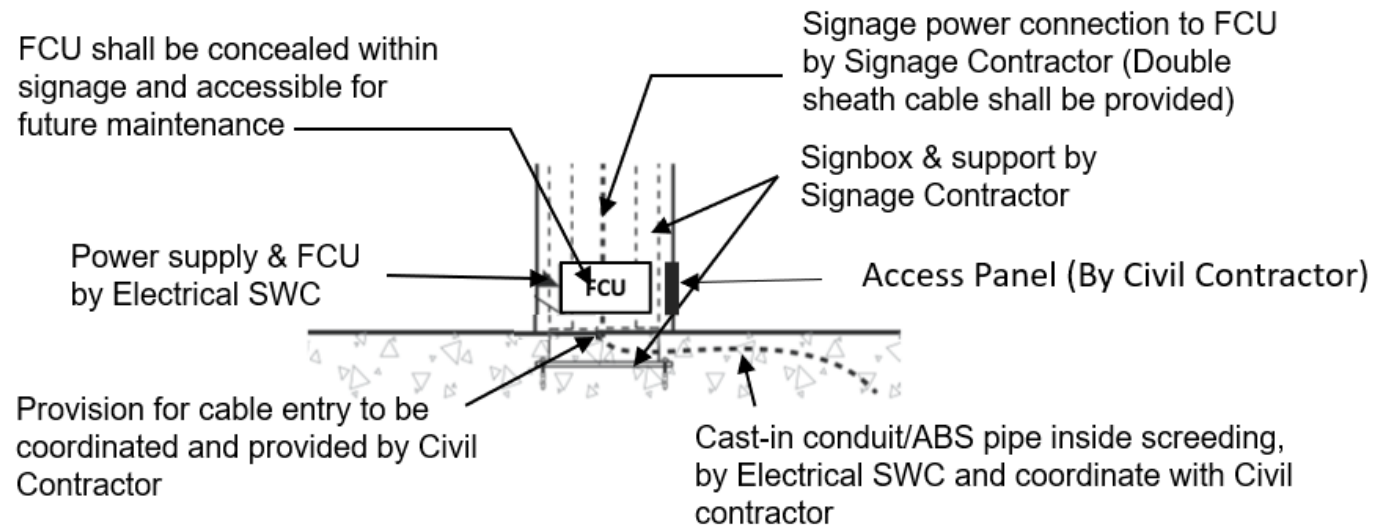
TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)**Figure 7C-3: Diagram for floor-mounted signage**

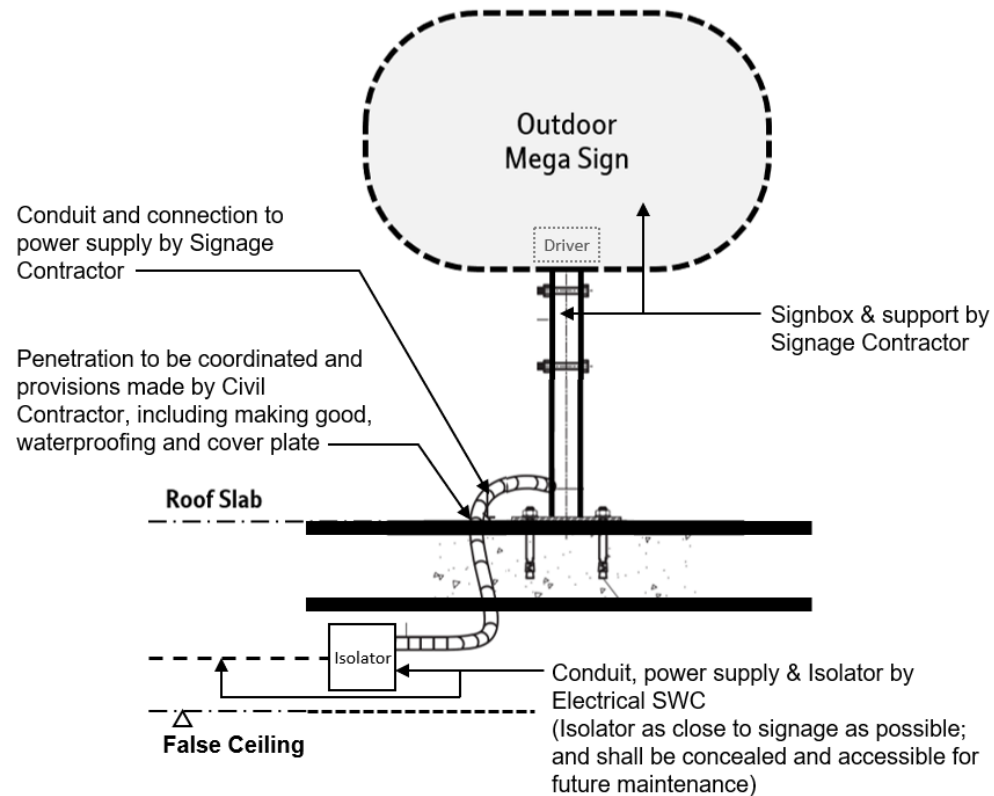
TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)**Figure 7C-4: Diagram for roof-mounted signage**

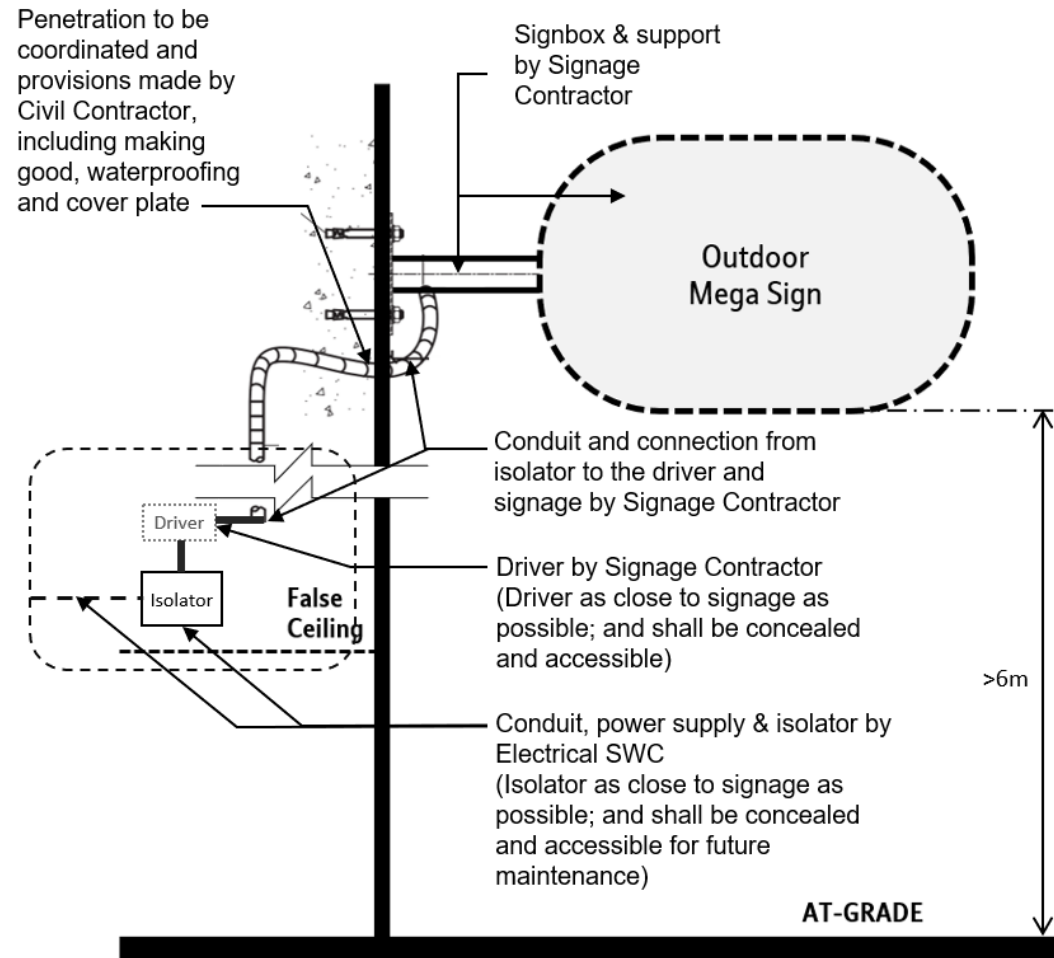
TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)**Figure 7C-5: Diagram for cantilvered signage**

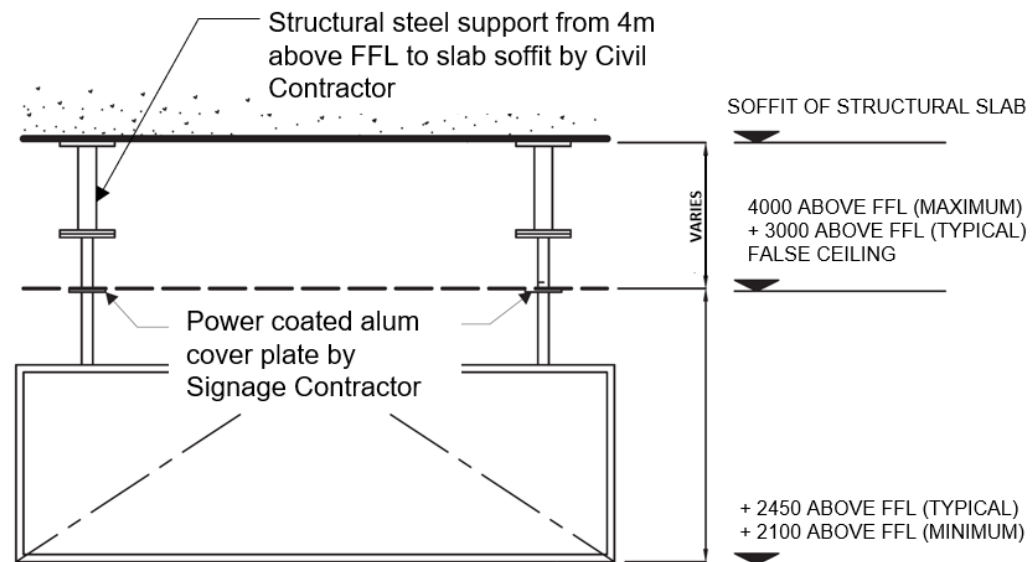
TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)**Figure 7C-6: Diagram for ceiling-mounted signage**

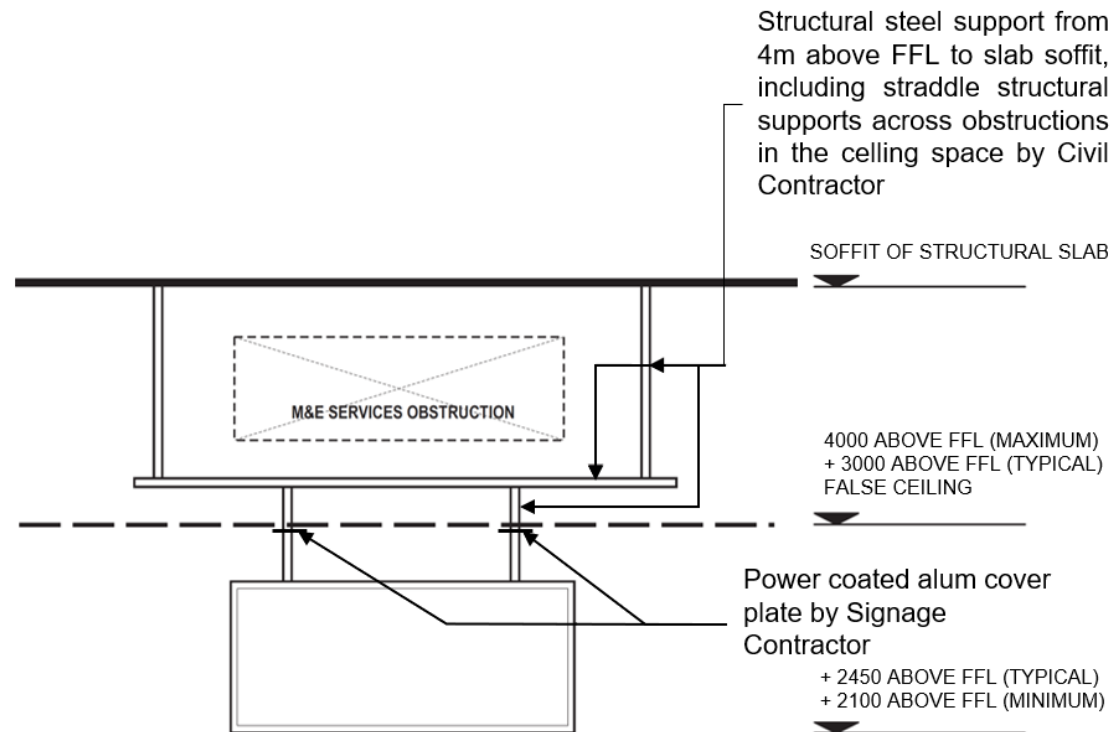
TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)**Figure 7C-7: Diagram for ceiling-mounted signage**

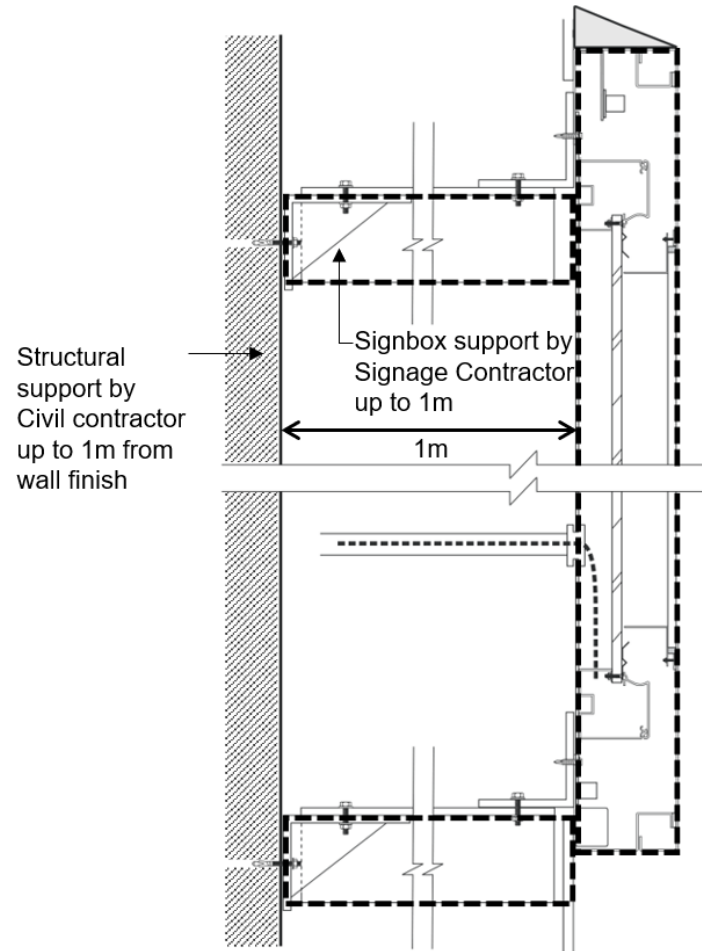
TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)**Figure 7C-8: Diagram for wall-mounted signage (CD Station)**

TABLE 7C - Clarification of Design, Supply and Fix Items (Civil/Architectural/Signage Interface)

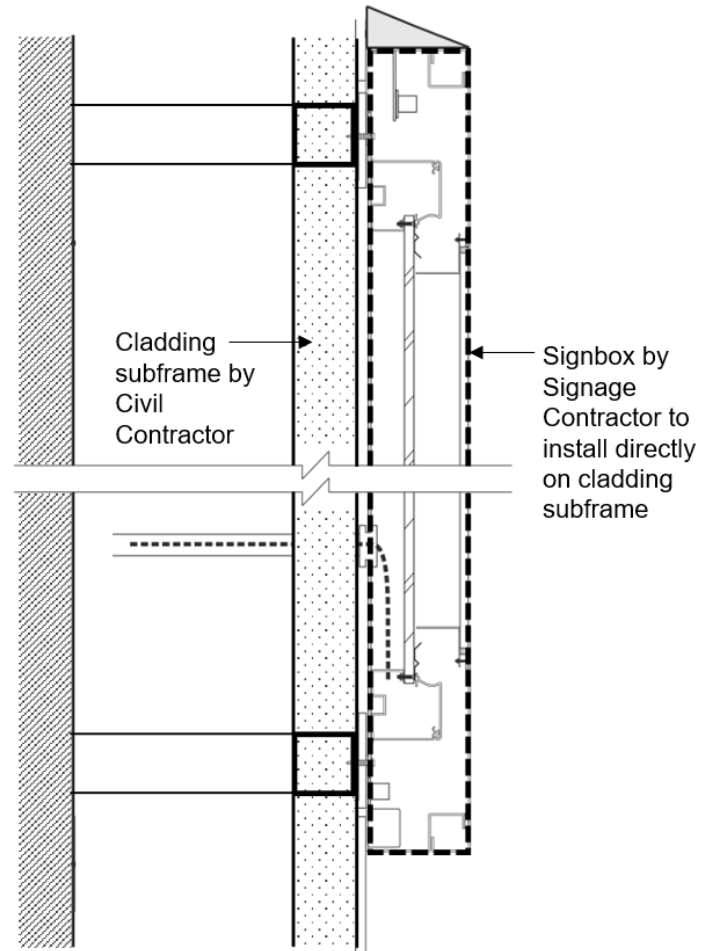


Figure 7C-9: Diagram for wall-mounted signage (Non-CD Station)

TABLE 7D - Summary of Equipotential Bonding (EPB) Requirements

	Metallic Part	Comments	Contractor
1	All incoming and outgoing service pipes such as water, fuel, dry riser, pumping main (refer to note A)	Requires EPB. To be connected by a main EPB conductor to the earthing terminal as stipulated in SS CP5:413-02. See Figure 1. Pipe joints to be checked for electrical continuity otherwise bonding required. Pipes along the trainway to be insulated from its steel brackets to prevent leakage paths for stray currents.	See Note A
2	Metal tanks (refer to note A)	Requires EPB. May be connected electrically to incoming pipe.	See Note A
3	Any metallic catwalks, platforms, handrails, staircases, ladders etc with attached electrical cabling or fittings.	Requires EPB with supplementary EPB conductor connected to exposed conductive part of fitting.	See Note A
4	All metallic cat-walks, platforms, hand-rails, staircases, ladders within 1.8m reach of pipes, tanks, cable trays cable ladders, trunking etc which have EPB (refer to note A).	Requires EPB with supplementary EPB conductor connected to pipes, tanks etc. See Figure 2.	See Note A

TABLE 7D - Summary of Equipotential Bonding (EPB) Requirements

	Metallic Part	Comments	Contractor
5	Any metallic cat-walk, platform, hatch, handrail, staircase, ladder etc, without electrical cabling or fittings and located greater than 1.8m away from pipes, tanks etc. which already have EPB.	No additional EPB required.	
6	Metallic door frames/doors controlled by electromechanical locking mechanism	EPB required with supplementary EPB conductor connected to exposed conductive part of fitting only where voltage rating of lockset exceeds 50V.	See Note A
7	Metallic supports to electrically operated equipment without direct electrical contact with the equipment (refer to note A)	EPB required with supplementary EPB conductor connected to exposed conductive part (related electrical equipment). See Figure 3.	See Note A
8	Electrically operated roller shutters	EPB required with supplementary EPB conductor connected to exposed conductive part (casing of roller shutter motor).	See Note A

TABLE 7D - Summary of Equipotential Bonding (EPB) Requirements

	Metallic Part	Comments	Contractor
9	Metallic wall cladding (excluding VE)	EPB limited to metallic panels and framework components containing, or immediately adjacent to, electrical socket outlet or other sources of electricity. Supplementary EPB conductor connected to exposed conductive part of fitting. See Figure 4. No EPB required for VE cladding. Detail of wall cladding to be examined to ensure electrical continuity throughout.	See Note A
10	Common trunking provided by Civil Contractor	EPB required with supplementary EPB conductor connected to nearest main EPB conductor.	See Note A
11	Raised floor system	EPB required with supplementary EPB conductor connected to nearest earthed part (eg cable tray). Details of floor system to be examined to ensure electrical continuity between panels and between panels and supports.	See Note A
12	Electrical facilities in toilets and shower rooms (e.g. hand-dryer, water heater, extract fan etc)	No EPB required.	
13	Ceiling system	No EPB required.	
14	Blast doors	No EPB required.	

TABLE 7D - Summary of Equipotential Bonding (EPB) Requirements

	Metallic Part	Comments	Contractor
15	Exposed metallic parts of building structure, including roof trusses	EPB required (as per SS CP5). To be connected to earthing terminal. However for roof trusses, may be connected to lightning conductor earth and no further EPB is required. Electrical continuity of structure to be checked.	See Note A
16	Steel support beam to PSD	No EPB required.	
17	Lifting beams and hooks	No EPB required.	
18	Framework of PSC and fixed metallic furniture within	EPB required. To be connected to nearest earthed part (e.g. cable tray).	See Note A

Notes to Table 7D:

- (A) The basis for scope of work of EPB provision is that whoever provides the said equipment or services shall also be responsible for providing the EPB. This shall include design submission, endorsement and submission of as-built drawings.
- (B) EPB = Equipotential Bonding

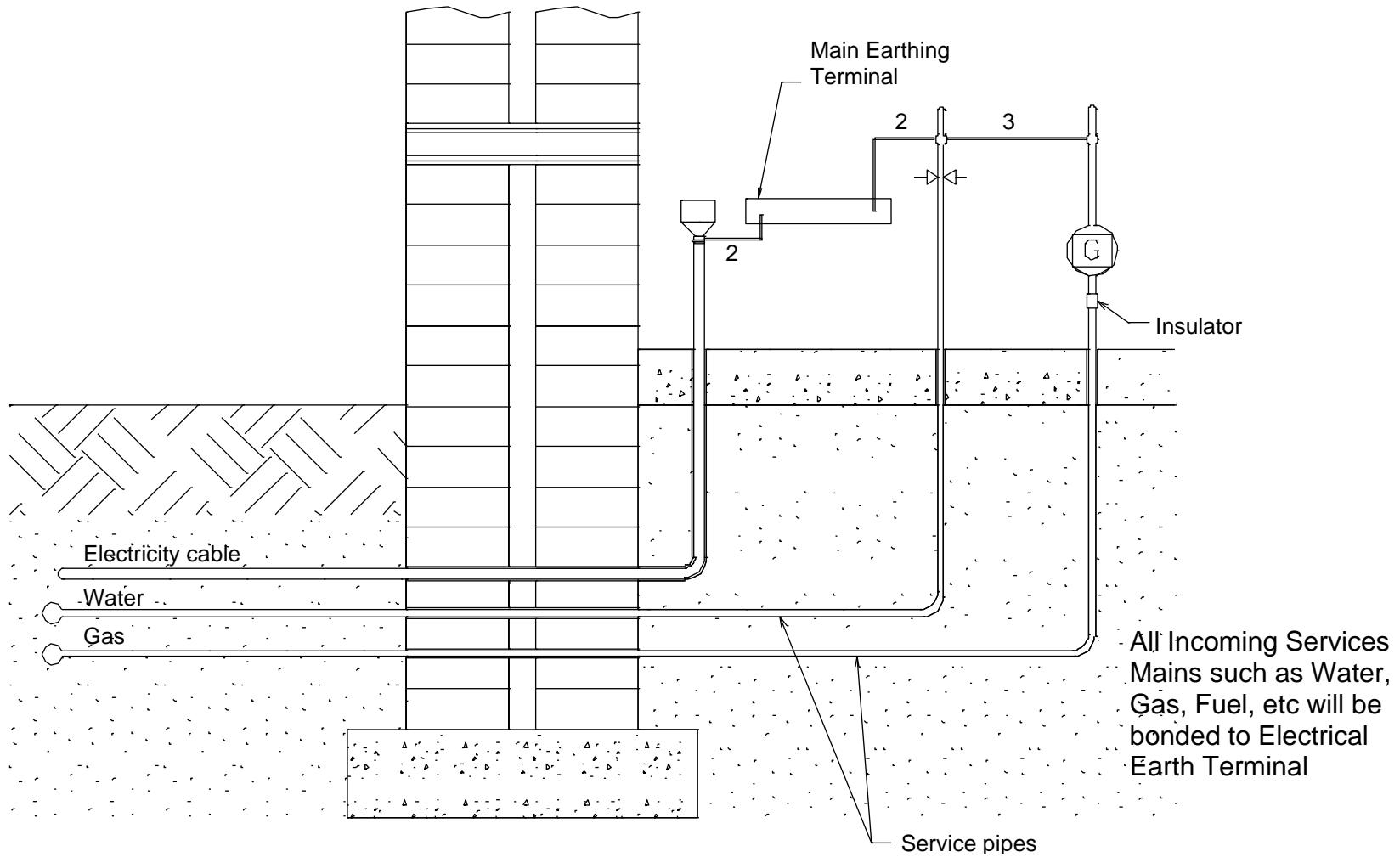
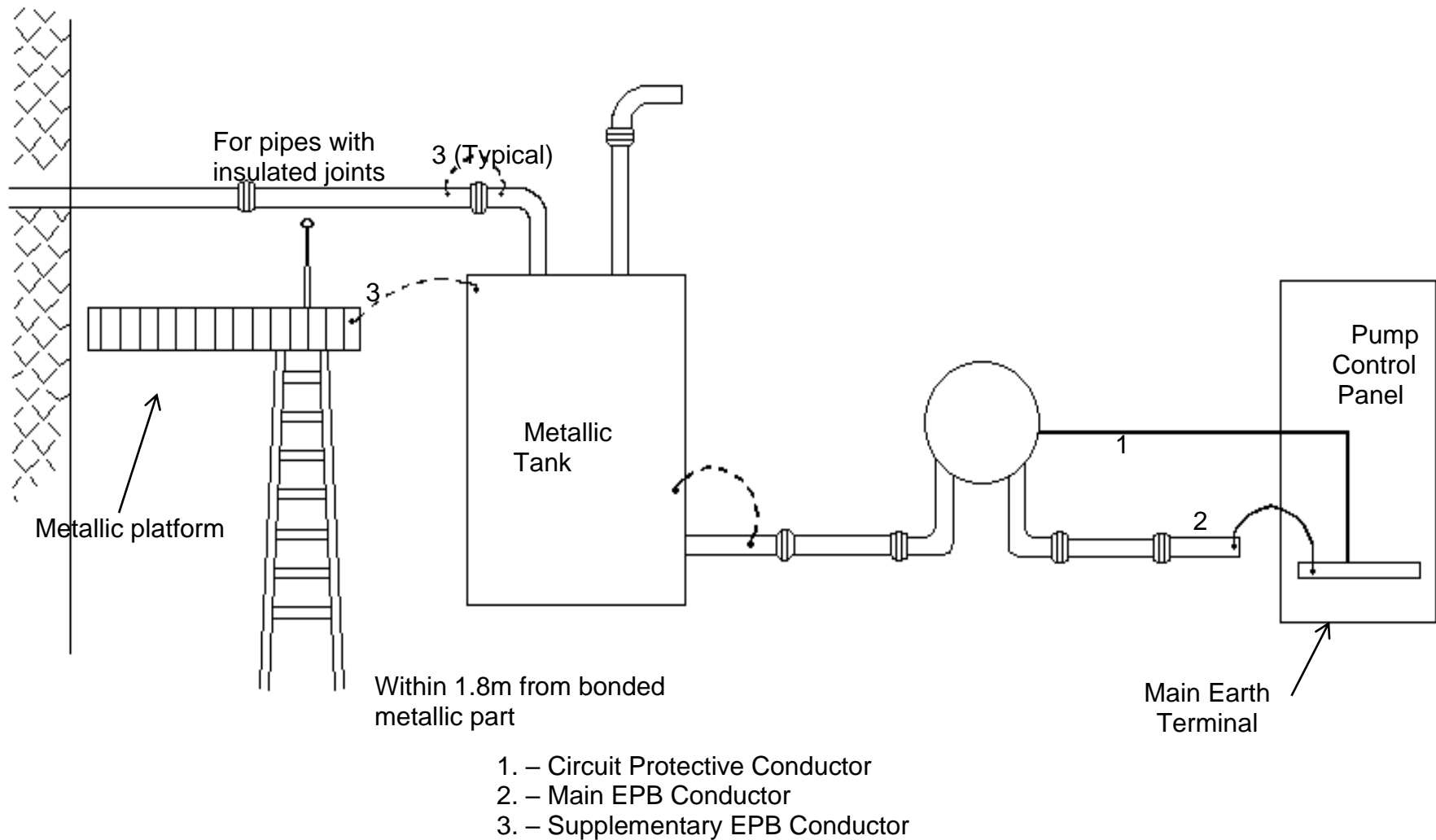
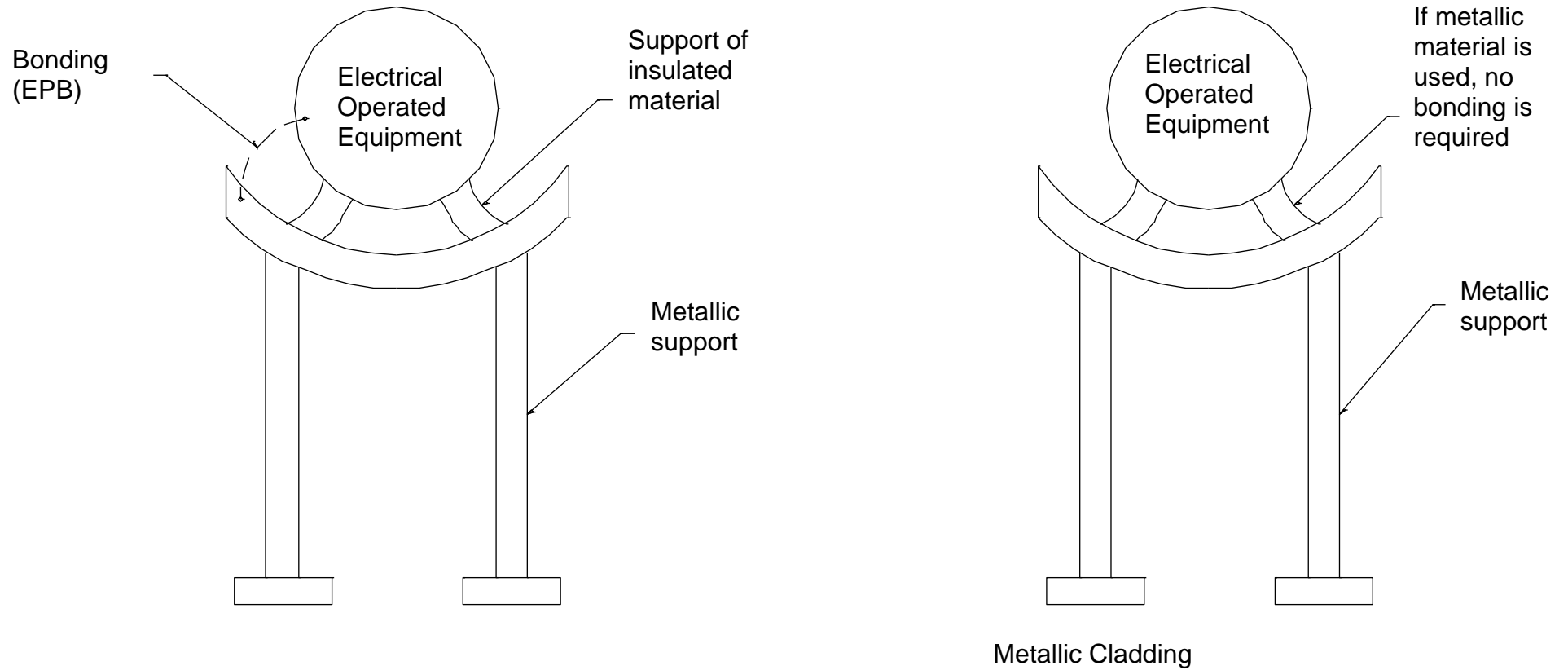


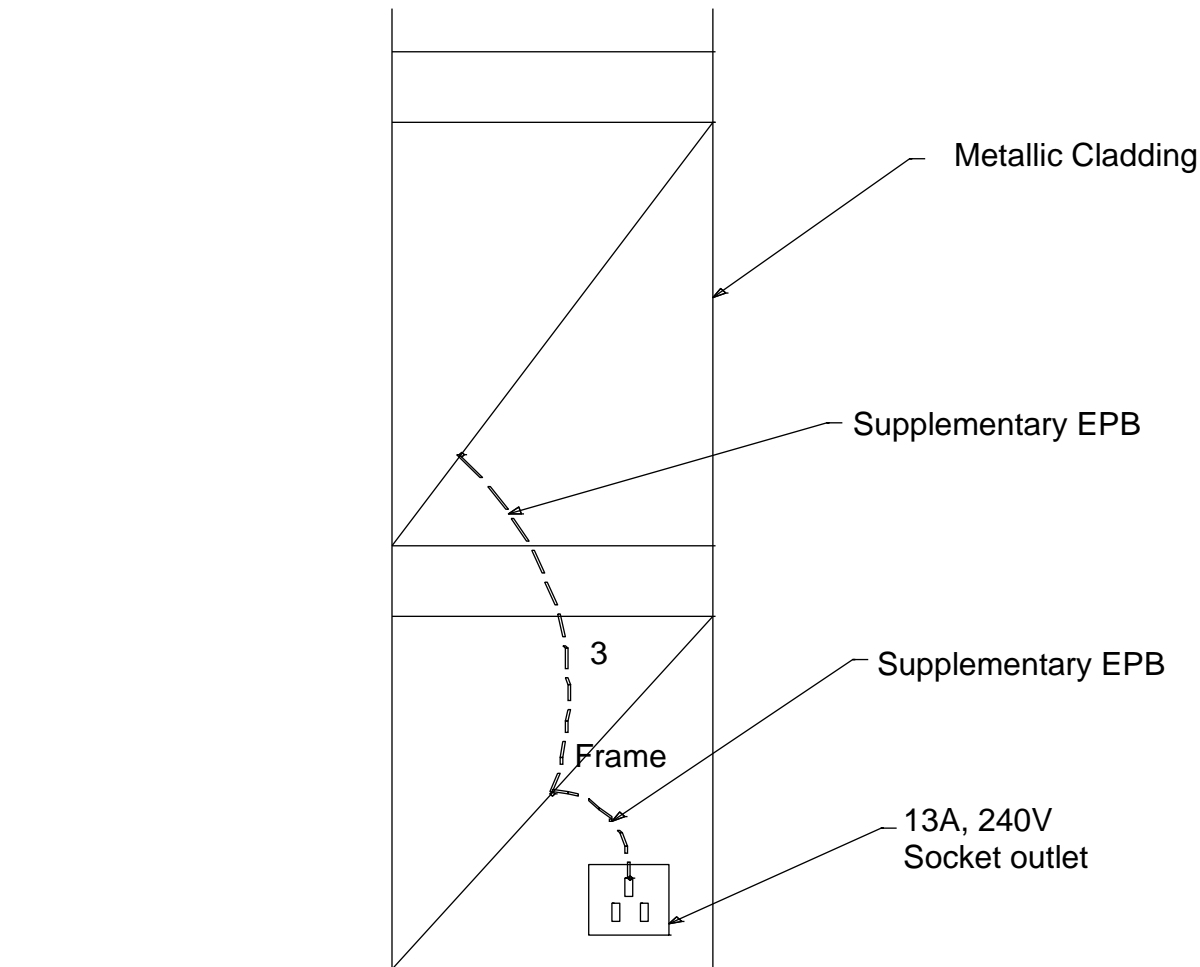
Diagram showing bonding to service (gas, water and electricity)
Figure 1



Exposed Metalwork Including Tank, Catwalk/Platform and Metallic Hatches Nearby To Metallic Tank within 1.8m Reach
Figure 2



**Exposed Metalwork Support For Equipment
Figure 3**



Metallic Cladding / Internal Cladding
Figure 4