PARTICULAR SPECIFICATION

APPENDIX AN

SCOPE OF WORKS AND REQUIREMENTS FOR FIRST-MILE-LAST-MILE (FMLM) SCHEME

SCOPE OF WORKS AND REQUIREMENTS FOR FIRST-MILE AND-LAST-MILE (FMLM) SCHEME

1.1 INTRODUCTION

1.1.1 The FMLM scheme shall be implemented for the MRT Stations under the Contract. The FMLM scheme includes construction of linkways and commuter infrastructure as shown on the Tender Drawings. Covered linkways, footpaths, cycling paths and shared paths are to be completed with necessary markings, logos and signage in accordance to LTA Standard Details of Road Elements (SDRE). The commuter infrastructure to be provided in this Contract includes the following where applicable:

i. The design and construction of the Cycling Path Network (CPN) and covered linkways includes civil & structural works, foundations, electrical & mechanical works, all ancillary works and all necessary adjustment at the site;

ii. Construction of 2.4m wide and minimum 2.4m clear height covered linkways and a 2m wide cycling path as shown on the Tender Drawings with brushed cement screed floor finishes and columns to be painted with anti-stick paint finish for proposals under LTA jurisdiction. Those covered linkways on other stakeholder's jurisdiction (HDB/Town Councils/JTC etc) shall have the floor finishes to match existing;

iii. Construction of 3.6m wide and minimum 2.4m clear height shared covered linkways as shown on the Tender Drawings together with the reconstruction of new covered drain (where required) to support the covered linkways with brushed cement screed floor finishes and columns to be painted with anti-stick paint finish for proposals under LTA jurisdiction. Those covered linkways on other stakeholder's jurisdiction (HDB/Town Councils/JTC etc) shall have the floor finishes to match existing;

iv. Construction of minimum 2.4m wide temporary covered linkways with brushed cement screed floor finishes;

v. Construction of dedicated cycling paths which are abutting footpaths that are not sheltered to be constructed to a width of 2m with brushed cement screed floor finishes to be completed with necessary high strength coating, markings, logos and signage in accordance to LTA SDRE and other standard. The abutting footpath will have a minimum width of 1.5m;

vi. Construction of shared paths that are uncovered are to be constructed with a width of 2.5m with brushed cement screed floor finishes to be completed with necessary markings, logos and signage in accordance to LTA SDRE;

vii. Construction of shared paths that are covered are to be constructed with a minimum clear width of 2.5m. This clear width shall not be reduced by any covered linkway structure or footing. Design of the covered linkway to be submitted and cleared by authority;

viii. For cycling paths which are on the fire engine access, similar markings need to be provided to shared uncovered paths in accordance to LTA SDRE. Details shall be discussed further with the Authority upon award of the Contract and reflected in the Traffic Plan Layout (see **Clause 1.2.2.iii.**);

ix. For shared or cycling paths which are to be converted to PCN in the future, please widen footpath to required width without adding SDRE markings, logos and signage. Details shall be discussed further with the Authority upon award of the Contract and reflected in the Traffic Plan Layout (see **Clause 1.2.2.iii.**);

~~x.~~ Cycling path marking is to be drawn to allow for sufficient taper (a minimum of 1:3);

xi. For stretches of cycling path network that require path extension, the extensions are to be in matching tiles/material finish to tie back with existing abutting path to the requirement and acceptance of the Engineer;

xii. Construction of 450 mm wide apron/cut-off concrete drain with galvanised steel grating along the covered linkways where applicable;

xiii. Construction of 5 m wide (clear width excluding columns) high covered linkways with raised zebra crossing / kerb ramps;

xiv. Construction of pedestrian waiting area (size subject to site conditions) with brushed cement screen floor finishes;

xv. All proposed covered linkways and pedestrian waiting area except high covered linkways shall be of a cantilever structure system, unless there are site constraints; and subjected to approval by authority;

xvi. When the cycling path approaches a bus shelter/ taxi stand, access points to developments or connecting footpath / ramps / staircases (eg. from office accesses) the Contractor is to propose proper mitigation measures for these conflict areas to alleviate potential dangers;

xvii. The cycling path is to route behind the bus / taxi shelter to avoid conflicts between cyclists and commuters boarding / alighting from the buses or taxi. Proper advisory signs (e.g. Give way to Pedestrians) and road markings (strips) are to be proposed at these conflict zones according to SDRE

xviii. There shall be no columns/hard structures within the clear width of the footpath/cycling path/covered linkway;

xix. Cycling path lightings to be sited alongside the cycling path are not included in this Contract. However, where lighting poles are proposed within NParks' planting strip, the Contractor's QP shall provide all the necessary cycling path foundations design and heavy duty UPVC pipes of 100mm diameter for cycling path lighting with cable warning slab. The design of the footing shall reduce the encroachment into the planting strip and to the Authority's acceptance. Each foundation shall include 4 nos. of 18mm diameter J-bolt complete with washers and nuts of stainless steel grade SS 316;

xx. For level difference of more or equal to 0.45m, a railing is required. The minimum railing heights are as follows – (i) 1.1m next to pedestrian footpaths (ii) 1.2m next to cycling paths, and (iii) 1.4m next to stretches of cycling path with higher safety risk (e.g. cycling path along vehicular bridge going across an expressway). Latest standards for the railing will be provided after tender is awarded;

xxi. An absolute minimum of 0.5m lateral clearance is required from the cycling path to any obstacle (for example, retaining structures, trees, lampposts, OG box etc.);

xxii. All proposed covered linkways (including high covered linkways and pedestrian waiting area) shall come with reinforced concrete slab and structural footings;

xxiii. Where proposed covered linkway columns are affecting tree roots, minimum 4.5m span (column to column) covered linkways shall be proposed and submitted for NParks approval;

xxiv. Provision of rest area to comply with BCA requirements where necessary and design shall be in accordance to details shown in the Authority Drawings;

xxv. Provision of 2.4m wide covered linkway with vertical trellises to NParks approval on to the covered linkways in accordance to details shown in the drawings. The structure shall be designed to support additional loading of vertical planting;

xxvi. Provision of directional signages and information maps to be provided along the covered linkway, where applicable;

xxvii. The proposed location of works noted in the Drawings are indicative and for tender purposes. The Engineer's approval should be sought for any deviation from the Drawings due to site constraint, etc.; and

xxviii. The Drawings for the standard design elements are indicative. Contractors shall propose better or equivalent design proposal to complement with the built environment of that particular locations.

1.2 SCOPE OF WORKS

1.2.1 The scope of works for covered linkways shall include but not limited to the following:

i. The Contractor is advised to acquaint himself with the actual site conditions and allow for any contingency with regard to the means of access and any special site restrictions.

ii. The Contractor shall not disrupt the functions and operations of existing security cameras, CCTVs, advertisement panels or a bus arrival panels in their construction. The Contractor shall engage LTA Public Transport Security if the security cameras, CCTVs need to be relocated permanently or temporarily.

iii. Where covered linkway alignment is unable to avoid existing tree trunks or branches, the Contractor shall propose localised notches in the roofs of the covered linkways of the original standard widths, to NParks' and Authority's approval.

iv. Where covered linkway alignment is unable to avoid tree roots that are too large and have expanded above the natural grade, the Contractor shall propose a raised footpath to bridge and pass over the roots where necessary, to NParks' and Authority's approval. Ramps complying with BFA requirement are to be constructed to match the existing footpath to the "elevated footpath".

v. Where footpath extension is necessary, the Contractor shall design suspended RC slab with dowel bars placed at key joints connected to the existing covered drain or over open drain. Footings of the proposed covered linkway shall be designed to avoid damaging to the retained trees. The use of strip footings and beams, suspended floors shall be explored and constructed above the affected tree root. All the above works shall be deemed to be included in the Contract Price.

vi. The Contractor shall remove and relocate / replace OG boxes, street lightings, street furniture, signage, auto-teller machines, telephone booths, advertisement panels and landscaping, sculpture, letter boxes etc. that are affected by the Works. The Contractor shall liaise with the appropriate agencies (e.g. SMRT/SBST, SingTel, StarHub, town councils, etc) regarding the new locations for the above facilities affected by the Works. The Contractor shall propose and meet all the design requirements (e.g. power supply, supporting fixtures, proposed materials, etc.) as stipulated by the agencies and shall submit the endorsed design to the Engineer for approval. All the above works shall deem to be included in the Contract Price.

vii. The Contractor shall appoint his QP and/or PE to prepare the design and shop drawings including all electrical installations required. The Contractor shall also submit such drawings, specifications, samples, manufacturer's literature, performance data and test results, and cost proposal and other information as are necessary for the evaluation by the Engineer prior to commence of his works.

viii. Where works within the HDB precincts, Conservation areas or any other private development interface areas require design and material to match existing, the Contractor shall submit such drawings, specifications, samples, manufacturer's literature, performance data and test results, and cost proposal and other information as are necessary for Engineer's approval.

ix. The Contractor shall engage the services of CCTV specialist contractor for CCTV survey (pre & post) on the existing sewer lines along the proposed covered linkway when direction is given by NEA.

x. The Contractor shall work closely with the Authority for verification of all dimensions on Site upon issuance of Works Order. The Contractor shall maintain close dialogue with the Authority in identifying constraints on Site, proposing construction feasibility at each location and be responsible to clarify on any discrepancies.

xi. The Contractor shall ascertain, determine and verify the locations of all services in the vicinity of the Works and co-ordinate with utility agencies for the diversion of affected services and the laying of new services. The Contractor shall purchase Sewer Interpretation Plan / Drainage Interpretation Plan, services drawings from the relevant authorities to determine the location of the underground utility services.

xii. The Contractor shall carry out detailed topographical surveys and condition surveys for the extent of the FLM facilities and to submit to the Authorities in DGN format for approval prior commencement of design.

xiii. The Contractor shall carry out trial trenches - to determine the existing services and location of services by licensed cable detection worker for the purpose of feasibility studies. He shall submit reports that include drawings and photographs. All affected area shall be satisfactorily reinstated to match existing and handed over to maintenance authorities/agencies. The cost shall be deemed included in the Contract Price.

xiv. The Contractor shall submit the notional GIS Data Hub plans within 3 months after the award of the Contract. The final GIS Data Hub endorsed plans and colour photographs, in accordance with the Specification for each location shall be submitted upon completion.

xv. The Contractor shall construct new covered linkways including all necessary connections between different structures in the Works and modifications to existing bus shelters where necessary. The Contractor shall liaise with bus shelters maintenance contractors and operators where interfacing with such bus shelter occurs. Contractor is to remove and replace existing bus shelters facilities if affected by the proposed works.

xvi. The Contractor shall demolish, remove, reconstruct or relocate, where necessary or as directed by the Engineer, existing railings, signboards, bus stop posts, bollards, drains, drop-inlet chambers, pedestrian gratings, affected by the Works to new locations and complete with new footings.

xvii. The Contractor shall investigate the site and propose retaining walls if necessary to retain the existing slope and earth that is affected by the proposed covered linkway alignment.

xviii. The Contractor shall provide light fittings, OG boxes and all other electrical works including provision of a comprehensive plan/section layout indicating the proposed locations of conduits, lightning tape, junction boxes, etc., obscured and concealed to the satisfaction of the Engineer. All electrical wirings and conduits shall be concealed. Those covered linkways / high covered linkways which are to be handed over and maintained by town councils / operators, Contractor to liaise with respective party for power supply.

xix. The Contractor shall obtain, liaise and co-ordinate with the respective agencies/ stakeholders/ town councils / operators, etc. for clearance, approval and handing over.

xx. The Contractor shall provide full height hoarding for proposed works within 50 m – 100 m to the MRT stations up to the nearest bus shelters, taxi shelters and pick up points with signboard and LTA logo.

xxi. The Contractor shall engage Signage specialist to design and provide new signage as required under the Transit Signage Manual.

xxii. The Contractor shall make good, re-grade, rectify or replace all works affected or damaged during the course of the Works including drains, staircase, footpaths, pavements, gratings, kerbs, turfing, railings, bus poles, fencing, posts, gates, boundary walls, etc. to the satisfaction of the Engineer and hand over to relevant authorities.

xxiii. The Contractor shall ensure that all necessary precautions are undertaken for safe navigation and passage of commuters at the commuter facility during the replacement and modification period. The Contractor shall also ensure that adequate lighting level of 30 lux at a uniformity of 0.3 shall be maintained during this period. Where any defect is reported that require urgent attention such as total lighting failure or the defect is endangering public safety, the Contractor shall respond and rectify the defect within two (2) hour of notification by the Engineer or LTA Commuter Facilities and Systems Management (CFSM) term contractor. If the Contractor fails to respond and rectify the defects, the Engineer shall have the right to make good and recover from the Contractor all costs incurred plus 20% administrative charge.

xxiv. The Contractor shall provide proper and adequate supervision during the execution of the Works and shall employ a competent representative or foreman sufficiently fluent in the English Language to supervise the Works and able to receive and act on instructions given by the Authority. Any instructions or directions given by the Authority to such representative, foreman or deputy shall be deemed for all purposes of this Contract to have been given to the Contractor.

xxv. No works shall be covered up or put out of view without the acceptance of the Authority. The Contractor shall give notice and full opportunity for the examination and measurement of any work which will be covered up or put out of view.

xxvi. Upon completion of the Works, the Contractor shall make arrangement to handover the commuter facility installation works to the LTA CFSM. The Contractor shall be liable for all defects to the electrical services at these commuter facilities till the end of the Defects Liability Period (DLP).

xxvii. The Contractor shall be responsible for protecting all existing services in the working area and keeping them clean, operational and in good condition. Any damage to the existing services, fixtures, ceilings or equipment shall be made good at the Contractor's cost to the Authority's satisfaction.

xxviii. The Contractor shall liaise and coordinate with LTA CFSM to submit all necessary applications such as shut down, termination works, re-wiring works at existing POB that affected by the Works. The Contractor shall prepare method statement, drawings, and installation details endorsed by PE/LEW for approval by S.O. prior to commencement of work.

xxix. The Contractor shall liaise and coordinate with SP Services Ltd, SP PowerGrid Ltd and makes all necessary applications, pay and arrange all tests as required by these Authorities to ensure installation is approved and supply turned on expeditiously.

xxx. The Contractor shall provide appropriate measures for the avoidance of danger to persons utilising the commuter facilities and shall maintain at his own cost for all lights, security personnel, fences, warning signs, watching, etc when and where necessary or required by the Engineer.

xxxi. Upon completion of the Works and prior to handing over of the installation to the Authority, the Contractor shall test and commission the whole installation as well as sub-systems and make good any defects to the acceptance of the Authority. The Contractor shall carry out progressive testing if directed by the Authority. The types and methods of testing shall include but not be restricted to those specified in the DCPS. All test results shall be recorded and submitted to the Authority for acceptance and all test instruments used shall be properly calibrated. The Contractor shall provide all testing instruments and all labour.

xxxii. The Contractor shall take all necessary precaution not to disturb the surrounding neighbourhood and provide necessary safety measures to ensure safety of the public. The Contractor shall make due allowance in this tender for all possible delays and/or inconvenience arising from the use of the access as no claim or compensation of any kind shall be entertained with regards to such delays and/or inconveniences.

xxxiii. The Contractor shall ensure that the occupants in the neighbouring schools, institutional and buildings can continue their normal functioning throughout the duration of the Works.

xxxiv. The Contractor is advised that there may be other contractors, Government or Statutory Bodies working in the same area. The Contractor shall ensure that there is no interference with the works of such other contractors, Government or Statutory Bodies and shall maintain close liaison with them in order that his own works can progress in a smooth and satisfactory manner. The Contractor shall carry out and complete the works or any part thereof, in such order and manner as may be agreed to by the Engineer from time to time.

xxxv. All other works and ancillary services or related to the full completion of the Works in accordance with the Authority's requirements.

xxxvi. Construction, management and quality of the Works shall comply with **Annex A** for Appendix AN;

xxxvii. The Contractor shall engage an Arborist as the Worksites may contain a number of trees, which include mature specimens, which should, wherever possible be preserved. The Works shall include the trial trench to confirm the location of existing tree roots. Their preservation and their removal from areas ultimately occupied by the Permanent Works, will involve a combination of measures which could include (without limitation): protection; removal and transplanting at other locations; removal and temporary transplantation at nurseries before final transplanting close to their original location and only where there sound reason for so doing, tree felling with or without replacement with new specimens. The Arborist shall provide expert report / advice and carry out negotiations with NParks, HDB, Town Councils or other relevant authorities in relation to all matters in connection with the removal, replacement and preservation of trees. The Aborist shall also advise the Authority, whether the proposed covered linkway are affecting matured trees.

xxxviii. The Contractor shall note that if he wishes to relocate any existing linkway structures during the works, he must be satisfied with the quality and suitability of the material for re-use and all re-use shall be subject to Engineer's approval. The Engineer's approval will not relieve the Contractor's obligation under the Contract.

xxxix. During modification to existing POB, the Contractor shall ensure at all time, that the existing POB/ linkway shall be lighted up from 7 pm to 7 am. Temporary supply and lightings with proper hoarding and housekeeping shall be provided at the work sites affected by the Works.

1.2.2. The scope of works for cycling paths shall include but not limited to the following:

i. The Contractor shall design and construct Cycling Path Networks (CPN), including submission to relevant authorities for obtaining all necessary approvals, permits to commence works and Certificate of Statutory Completion.

ii. For cycling paths built on concrete pavements, the Contractor is required to apply coating with coloured high strength coating system or equivalent (colour: RAL 3011 or any colour scheme at the discretion of the Authority) over the concrete pavement with bicycle logos and marking according to SDRE painted at intervals which is to be evaluated and approved by the Engineer. The generic specs for the high strength coating system are attached in **Annex B**.

iii. A traffic plan, or separate plan, with all cycling path markings and signage in accordance to SDRE guidelines should be submitted to LTA Active Mobility Group (AMG) for approval or endorsement prior to implementation.. The plan should show all markings and signage that will be implemented, in their correct locations.

iv. The Contractor shall design and build all earth retaining structures, slope trimming and backfilling works.

v. Design and construction of new and affected drainage system and reinstate the affected area to the Engineer’s acceptance including handing over to relevant authorities.

vi. All works for the drainage systems including structural design, obtaining approval from relevant authorities, construction and handing over to relevant authorities.

vii. Proposed mitigation measures to bus stops and potential conflict zones such as traffic crossings, shared paths, footpaths and cycling paths near amenities and development accesses where high pedestrian, cyclist and vehicle volume is anticipated.

viii. To widen the existing pedestrian crossing along the cycling path network to the width 5m and to provide all the necessary civil works (road markings, kerb-cut ramps, tactiles, provision of the conduit piping for

relocation of affected traffic light and street light). See Drawings listed in **Annex A**.

~~ix.~~ To widen existing mid-block crossings along the cycling path network to bicycle crossing according to SDRE inclusive of markings and to provide all the necessary civil works (road markings, kerb-cut ramps, tactiles, provision of the conduit piping for relocation of affected traffic light and street light).

x. To widen and raise zebra crossing to 5m at unsignalised junctions along the cycling path network.

xi. To study and implement the removal slip roads and traffic islands where it would be deemed unsafe for cyclists and pedestrians, including conducting traffic simulation if necessary. Clearance of schemes with relevant LTA divisions is required.

xii. To work with Intelligent Transport System Operations (ITSO) to provide civil works (road markings, kerb-cut ramps, tactiles, etc) for pedestrian/ zebra/road facilities at areas specified by the Engineer.

xiii. The Contractor shall provide and make available all necessary conduit pipes and crossing for the cabling works, including the supply and laying of RED cable warning slab, road markings, kerb-cut ramps, tactiles etc. where specified and replacing existing affected road markings, signboards, etc. The Contractor shall be responsible for the safekeeping and protection of any controllers, cables, detector loops or other equipment connected with traffic light installation within the Site. The Contractor shall co-ordinate with PowerGrid and Singtel for the above.

xiv. To raise/relocate any traffic signs affected by the construction/reconstruction of kerbs and footpaths/cycle path to the requirement and acceptance of the Engineer.

xv. To reinstate road and road markings (both flexible and rigid pavement), footpaths, kerbs and other road related facilities affected by laying of underground services and handing over to relevant land owners.

xvi. To engage Auxiliary Police to control and manage the traffic for all traffic diversions/reinstatement/new junctions works. They are to ensure the safety of all motorists and pedestrians. All costs shall be borne by the Contractor.

xvii. To maintain accessibility to vehicles and pedestrians to car parks, buildings etc. at all times. The Contractor is to propose any alternative

access arrangements to the Engineer for approval if any existing access is affected.

xviii. To propose and design for the modifications of existing staircase structures and installation of bicycle wheeling ramps deemed necessary in the development of the CPN.

xix. To obtain clearance from relevant authorities/land owners such as Singapore Land Authority (SLA), Town Council, Housing Development Board (HDB), NParks, Urban Redevelopment Authority (URA), etc. for approval to build cycling path before commencement of works.

xx. To raise/lower/relocate the affected service manholes, fire hydrants, underground services, valve boxes or drainage service manholes. The Contractor shall prepare drawings of affected manholes/valves/services and liaise with the relevant authorities to carry out the works and upon completion to hand over the works to the requirements and acceptance of the authorities. All cost shall be borne by the Contractor.

xxi. To propose/replace existing chequer plate gratings with partial-leave/ 3-leaves grating concrete in-fill grating at locations of the cycling path network and affected footpaths. The spacing of drain gratings required shall be based on the internal width of the closed drain as indicated by the Code of Practice (COP) for Surface Water Drainage. The Contractor is to prepare drawings of the proposed concrete in-fill gratings and to liaise with the relevant authorities to replace/seal-off the affected gratings.

xxii. To remove/reinstate/replace/transplant affected vegetation/trees due to construction works in accordance to the requirements of the relevant agencies. The Contractor shall obtain and prepare drawings of affected vegetation/trees and to liaise with the relevant authorities (NParks, Town Council, etc.) for approval to carry out the works and upon completion to handover the works to the requirements and acceptance of the authorities. All cost shall be borne by the Contractor.

xxiii. To demolish and reconstruct affected staircases/ramps/retaining walls/ covered linkway (including decommissioning and commissioning of lightning protection system), where required including obtaining the necessary approval from relevant parties and handing over upon completion of works.

xxiv. To relocate affected sign posts, signboards, CCTVs, all road sidetable fixtures, bollards, underlights, spotlights, earth electrode inspection pits etc. where required under the Contractor’s cost, including obtaining the

necessary approval from relevant parties and handing over upon completion of Works.

xxv. To install dowel bars for all connections between new cycling path and existing footpath to QP's design and subject to the Engineer's approval.

xxvi. To ensure a gradient of 1:40 for the proposed cycling path/footpath such that surface water can be discharge properly. The Contractor is required to re-construct/re-surface the existing footpath to meet the required gradient for surface water discharge where deem necessary by the Engineer.

xxvii. All other works and services ancillary or related to the full completion of the Works in accordance with the Employer's requirements.

xxviii. To schedule "Milling and Patching" works within one week after completion of underground PVC & GI pipes laying.

xxix. To make good all surrounding, including road surfaces, drains, concrete slabs, gratings, kerbs, pavements, tiles, turfing, railing, staircases, footpaths, boundary walls, drains, etc., affected or damaged during the course of construction, and reinstatement of tiles finishing are to match with existing tile surfaces.

xxx. Design, supply and installation of new bicycle racks as specified in Clause 10 of the Particular Specification. The standard detail of the bicycle rack is attached in Drawings listed in **Annex A**.

xxxi. If proposed CPN or other road works affect existing bicycle parking yellow boxes and their corresponding QR codes, please reinstate the bicycle parking box in accordance to the Particular Drawings listed in **Annex A**. The Consultant shall inform the Authority to install a new QR code in the reinstated bicycle parking box.

xxxii. Provide the necessary wayfinding signage to bicycle parking locations. These wayfinding signage could come in the form of a directional signage or a bicycle parking map. The final design and dimensions of the bicycle parking map would be provided upon award of the contract. Please refer to **Appendix AP** for the dimensions and design of the directional signage. The contractor is to measure the distance to be indicated on the bicycle parking map.

xxxiii. The Contractor is to provide artist impressions in A0 size with high resolution to illustrate the design of CPN within the CRL contract, not limiting to junctions, access points to Developments, MRT station, and bus stop areas. All entourages for the artist impression shall be provided by the Contractor and deemed to have been included in the Contract Price. The Authority shall have unrestricted rights to use the final deliverables of the artist impressions supplied by the Contractor.

xxxiv. The Contractor is to provide as-built construction drawings for cycling paths to LTA's Active Mobility Group two (2) months before the path is opened to the public. This is for the gazetting of the new cycling paths asType 3 public paths. The Contractor is also to update and provide the as-built cycling path layer in a GIS-compatible format such as .shp file.

xxxv. The Contractor shall furnish details and arrange for the fabrication and installation of the unique QR code sticker/plate as part of the geo-fencing requirement to LTA's Active Mobility Group two (2) months before completion of the bicycle parking lots in public areas.

1. Number of bicycle lots/ racks / size of yellow bicycle parking box (in mm and number of bikes it is designed to accommodate).
2. Exact location indicated over OneMap as the base.
3. Photo of the exact location where the racks/box will be located.

Blk 215 Ang Mo Kio Ave 1

Outside Blk 215, Ang Mo Kio Ave 1,
Singapore 560215

Annex A

DRAWING LIST

The following drawings shall form part of the Specifications and shall be read in conjunction with the Specifications.

S/NO	Description & Drawing title	Drawing No:
ACTIVE MOBILITY GROUP (AMG)		
1.	Treatment at Major Junction	LTA/SDRE17/21/CYC1.Rev.B
2.	Treatment at Other Junctions	LTA/SDRE17/21/CYC2.Rev.B
3.	Treatment at Development / Carpark Access	LTA/SDRE17/21/CYC3.Rev.B
4.	Treatment at Development / Carpark Access	LTA/SDRE17/21/CYC4.Rev.A
5.	Bicycle Crossing	LTA/SDRE17/21/CYC5.Rev.B
6.	Shared Track	LTA/SDRE17/21/CYC6.Rev.B
7.	Treatment at Bus Stop with Bus Bay	LTA/SDRE17/21/CYC7.Rev.B
8.	Treatment at Bus Stop without Bus Bay	LTA/ SDRE17/21/CYC8.Rev.B
9.	Cycling Pavement Markings Details	LTA/ SDRE17/21/CYC9.Rev.B
10.	Cycling Signs	LTA/ SDRE17/21/CYC10.Rev.A
11.	Cycling Signs	LTA/ SDRE17/21/CYC11
12.	Cycling Track Lighting	LTA/ SDRE17/21/CYC12.Rev.A
13.	Bicycle Rack Layout (Single Tier)	LTA/AMG/0044/2021
14.	Bicycle Wheeling Ramp Detail	LTA/AMU/PL188/BWR/01
15.	Pedestrian Concrete in-Fill Grating For Sump/ Drain	LTA/SDRE14/4/GRA2.Rev.C
16.	Yellow Bicycle Parking Box Standard Details	LTA/AMU/PL216/YB/01
17.	No Riding Signage at Pedestrian Overhead Bridge	LTA/AMU/0060/2016
18.	Typologies Roadside Walking and Cycling Paths	21 sheets

Annex B

SPECIFICATIONS OF COLOURED HIGH STRENGTH COATING SYSTEM

1. GENERAL

1.1 The coloured high strength coating system shall be used to treat and protect surfaces including, but not limited to, the following:

- Asphalt pavements (for schemes like Surface Colour Texturing System, Mandatory Give Way to Buses Zone, etc), or
- Concrete pavements, or
- Footpaths, or
- Coloured cycling paths, or
- Galvanised metal gratings.

1.2 The coating system shall be environmentally safe; non-toxic, does not contain lead, mercury and heavy metals.

1.3 The coating system shall have track record of application in tropical weather conditions.

2. PRODUCT SPECIFICATIONS

2.1 The coloured high strength coating system shall give good skid resistance and exhibit good adhesion / bonding strength with concrete or, tile or, asphalt or metal surfaces.

2.2 The coating system shall possess good colour stability with UV resistance.

2.2.1 For concrete pavements, the colour of the coating shall generally be black or grey in order to provide a good contrast with the white/yellow road markings, unless otherwise specified by the Engineer.

2.2.2 For “Mandatory Give Way to Buses Zone” scheme, the colour of the coating shall be of “BS381C 355 Lemon” or equivalent for the section to be coated yellow, and “BS5252 E53” or equivalent for the section to be coated black.

2.2.3 For metal gratings, the colour of the coating shall be of colour code “RAL 1014, 7046 or Pantone 7501, 422C” or equivalent, unless otherwise specified by the Engineer.

2.2.4 For other colours, the colour code shall be in accordance to requirements specified in the project’s contract specification.

2.3 The coating system shall possess good abrasion resistance, and also good resistance to chemicals, fuels, etc and demonstrate neat and aesthetically pleasant finished surface.

2.4 The applied coating shall have good levelling properties. The treated surface shall be fully coated and the completed work shall not have excessive pin-holes that may cause dirt pick-up / trap dirt.

2.5 The coating shall be laid according to the manufacturer's specified requirements; it shall have sufficient thickness to withstand wear and tear within the warranty period without the need to recoat. However, the applied coating shall have a minimum thickness of 1.0mm. Thickness of the applied coating shall not be more than 3mm thick for footpaths and gratings, and not more than 4mm thick for road surfaces.

3. PERFORMANCE REQUIREMENTS

3.1 Laboratory Tests

Test specimens shall be submitted to a local accredited laboratory for the following tests. The test results shall meet all the minimum requirements, in accordance to the type of substrate of the test specimens, stated in the table below:

S/N	Physical Property	Test Method *	Minimum Requirement			
			Asphalt	**Concrete**	**Tiles**	**Metal**
1.	UV exposure (1000 hours)	(i) ASTM G154-2012a (ii) BS EN 20105-A03(1994)	(i) No cracking, softening, de-bonding, peeling and blistering. (ii) Grey scale 4.5 **			
2.	Skid resistance *** (Wet)	ASTM E303-93(2008)	Footpath: 45 – 60 BPN Carriageway: 55 – 75 BPN			
3.	Abrasion Resistance (1000 cycles)	ASTM D 4060-2010 *A load of 1000g to be applied on Resilient Calibrase wheel No. CS-17*	**≤ 0.12g**			

S/N	Physical Property	Test Method *	Minimum Requirement			
			Asphalt	**Concrete**	**Tiles**	**Metal**
4.	Adhesion strength (After 3 days of cure in air prior to test)	ASTM D 4541-09e1	**1.9 N/mm^2 or at least 70% substrate failure**	**1.9 N/mm^2 or at least 70% substrate failure**	**3.5 N/mm^2 or at least 70% substrate failure**	**7.0 N/mm^2**
5.	Corrosion Resistance (Salt Spray 500 hrs)	ASTM B117:2011	**Not required**			**No rusting and blistering**

Note: The type of substrate of the test specimens has to be in accordance to the intended surface (or equivalent) to be treated.

* The latest revision shall take precedence over the test methods stated in this table

** Grey scale 5 denotes no discolouration; Grey scale 1 denotes severe discolouration
*** The roughness of the coated surface shall not cause safety issue or excessive tyre wear

3.2 Skid Resistance

3.2.1 The Contractor shall conduct a minimum of three skid resistance tests for every 100m^2 or less of treated surface coated with Coloured High Strength Coating System. The skid resistance test shall be carried out using a Portable Skid Resistance Tester, in accordance to the method described in ASTM E 303:93(2008), or using other suitable equipment and methods approved by the Engineer. The results shall be tabulated and reported in British Pendulum Number (BPN) together with a location map of the measurement points.

3.2.2 The Contractor shall conduct a minimum of one skid resistance test for every 10 nos. or less of treated metal gratings coated with the coating system. Test method shall be as described in Clause 3.2.1 of this document.

3.2.3 For coating applied on road, the results of the testing shall be 55 BPN or more before opening to traffic. The measurements shall be taken on wheel path at the locations to be indicated by the Engineer. For coating applied on footpaths and gratings, the skid resistance shall be 45 BPN or more before opening to pedestrian traffic. These BPN values shall not fall below the minimum requirements within the warranty period (as stated in Clause 6.2 of this document). All costs for the required tests, including all necessary road closure, equipment and manpower, shall be borne by the Contractor.

3.3 Pull-off Test on Site

The Contractor shall conduct at least one pull-off test (average reading of three points) according to method described in ASTM D4541-09e1 for each site having a coated area every 100m^2 or less. The test results shall show substrate failure if the high strength coating is applied on existing old surface. If high strength coating is applied on new surface, the average adhesion strength shall meet the strength as specified in Clause 3.1 of this document. The test report shall include diagrams indicating the actual locations of the test points.

3.4 Setting Time

In order to minimise inconvenience to the public, the whole process of applying the coating system shall be completed within 6 hours, including surface preparation, application of the coating and gaining sufficient strength before opening the road / footpath to vehicular/pedestrian traffic respectively.

3.5 Degree of Wear

The durability of the high strength coating system shall be assessed 12 months after application by the wear index test, in accordance to Annex D in SS589:2013. An average of 4 readings is to be taken along the wheel paths or heavily worn area. The wear index shall not be more than 20.

3.6 Samples for Assessment

The Contractor shall submit 3 nos. of samples of the proposed coating system done on the required substrate to the Authority. Should the coating system involve different colour schemes, then 3 nos. of each colour of the coating system shall be submitted.

Type of Substrate	**Size of Sample (mm)**
Asphalt (W3B)	300 x 300 x 25 thick
Concrete (Grade C20 or C35)	300 x 300 x 25 thick
Metal	300 x 300 x 3 thick
Tile	300 x 300

4. APPLICATION PROCESS

4.1 Surface Preparation

4.1.1 The Contractor shall examine the road/footpath/grating before the application of the coating to ensure that the substrate is structurally sound and that the surface is suitable for the application of coating.

4.1.1.1 All defective asphalt pavement surfaces shall be repaired and made good before application of the coating.

4.1.1.2 All defects found on concrete/tile substrate, including holes, uneven and damaged concrete/tile surfaces, damaged joints and edges etc, shall be rectified with suitable high strength non-shrink grout rapid hardening material or by other means accepted by the Engineer.

4.1.1.3 Surface of the metal grating shall be free from rust/corrosion. If the gratings to be treated are damaged (such as dented, broken hinge, wobbly), the Contractor shall notify the Authority immediately for a replacement before treatment is carried out. Failure to do so would result in the Contractor bearing the cost of re-coating a new grating.

4.1.2 The Contractor shall supply all labour, plant and necessary equipment to thoroughly clean or grind/roughen the area to be treated, including controlled sweeping, vacuum cleaning, mechanical removal and disposal of dust and all loose materials off the site. The prepared surface shall be reasonably dry, completely free from loose particles, grease, oil stain, corrosive by-products, organic growth or any other external contaminants. The grinder shall be equipped with an effective suction function and water-brush function so as to eliminate pollution by the grinded dust.

4.1.3 All existing road markings within the coating application area shall be erased thoroughly and restored after the application of the coating.

4.1.4 All manhole/valves covers shall be protected with plastic/protective sheets before application of the coating and removed after the completion of the works.

4.2 Application of Coating

4.2.1 The application method for the coating shall be clearly stated in the method statement and submitted to the Authority for each job site. The coating shall be applied according to the manufacturer's instruction (as stated in Clause 2.5 of this document). Application of coating shall be suitable to be done at a surface temperature of 30°C and above.

4.2.2 If spraying method is used, the Contractor shall provide sufficient information in their method statement to justify that it would not cause environmental pollution and affect the road users/vehicles.

4.2.3 If screeding method is used on Surface Colour Texturing System, the Contractor shall ensure that the grooves are not filled

4.2.4 The application of the coating system shall be undertaken by an experienced / appointed applicator in the similar scope specified by the manufacturer. All plant and necessary equipment for the mixing and application of the coating shall meet the requirements as recommended by the manufacturer.

4.2.5 If the coating is to be applied onto concrete, tile and metal substrate, the prepared surface shall be applied with special bonding primer conforming to supplier's / manufacturer's recommendation, spreading it evenly over the entire surface, ensuring complete coverage of the area.

4.2.6 Application of coating for new grating shall be carried out in the factory after galvanising the whole assembly.

4.2.7 The Contractor shall take all necessary precautions to avoid ~~accidental~~ spillage of the coating material into the surroundings and the drainage systems during the application.

4.2.8 Existing detector loops shall be retained and the coating shall not affect the performance of the detector loops. The covered detector loops shall be made visible. The method shall be subjected to Engineer's approval. The Contractor shall take care and in case of any damage to the detector loops, it shall be made good at Contractor's own cost.

4.2.9 All protective measures shall be removed after the application work and the work area shall be opened to traffic within 6 hours including time taken for preparation and application.

5. OTHER REQUIREMENTS

5.1 At the commencement of the contract, the contractor shall submit a test report from an accredited laboratory satisfying the properties requirements stated in Clause 3.1 in this Specification.

5.2 Should the course of work require closure of footpath, the Contractor shall provide an alternative footpath during the period of closure.

5.3 The Contractor shall supply all necessary labour, material and equipment to take coloured digital photographs before commencement and after completion of works and submit to the Authority within one week upon completion of each job site. The Contractor shall also take digital photographs as and when requested by the Engineer. All cost incurred shall be borne by the Contractor.

6. WARRANTY

6.1 Upon award of tender, the successful tenderer shall submit an original deed of warranty from the supplier /manufacturer to cover the quality and performance of the coloured high strength coating system.

6.2 The Contractor shall provide a warranty for the workmanship and the performance of the coating system for a period of:

(i) five (5) years for treated surfaces of footpaths and metal gratings;
(ii) three (3) years for treated surfaces of carriageways

6.3 The coating system shall be covered against any de-bonding, cracking, peeling and blistering due to natural wear and tear from vehicular and pedestrian traffic during the warranty period.

6.4 The warranty shall also cover any defects arising from improper surface preparation and application, or from the use of incompatible or expired material. The performance of the coating shall also adhere to the requirements specified in Clause 3.2.3 and Clause 3.5 of this document during the warranty period. If any defective coated areas are found within the warranty period, they shall be re-coated at Contractor’s own cost, and the extent of re-coating shall be determined by Engineer.