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EMPLOYER'S REQUIREMENTS

APPENDIX 6

PROVISIONS FOR INTERFACE CONTRACTORS

The Contractor shall provide the following provisions that shall not be taken as exhaustive. The Contractor shall design, supply and fix these provisions by himself, as defined in the tables below unless otherwise stated. The Contractor shall also meet obligations set forth in the tables of Clarification of Design, Supply and Fix Items and other schedules as specified in the Contract. The Contractor shall allow for protection of the Interface Contractors' installations from damages possibly caused by the Contractor's activities in the vicinity. The Contractor shall, during its co-ordination with the Interface Contractors, obtain specific requirements for Interface Contractors interface coordination and shall incorporate/consider them into its design and construction of the Works.

Any disagreement between the Contractor and the Interface Contractors as to the scope and extent of the work specified in the table below shall be referred to the Engineer.

1 GENERAL

1.1 PROVISIONS FOR INTERFACE CONTRACTORS' WORKS

Spaces in ceiling, under floors, corridors, passageways, ducts, trenches, voids, recesses etc. shall be allowed in stations and tunnels for installation of Interface Contractors' plant, equipment and services in such a manner that there is sufficient space for maintenance and future replacement of such plant, equipment or service. Access panels, manholes, hatches, access ladders, handrails, service walkways, platforms etc. shall be provided to facilitate maintenance and replacement, and recesses for housing Interface Contractors' plant or equipment and services shall be provided so as to avoid obstruction to escape routes. Structural provisions for Interface Contractors' works shall be made to meet the expected working loads.

1.2 FACILITIES FOR INTERFACE CONTRACTORS' EQUIPMENT

It is envisaged that Interface Contractors' plant and equipment will be delivered through entrances, airshafts and other access openings. The Contractor shall programme its Works to facilitate Interface Contractors' delivery with clear passage. Clear passage shall also be provided for future replacement. The provisions for the plant/equipment delivery and future replacement shall include but not be limited to the following:

1) Ground preparation for lifting crane access to the entrances, draught relief airshafts and other access openings.
2) Erection of temporary staging able to withstand the expected working loads, in the airshafts and other access openings for delivery of equipment.
3) Provisions of lifting hooks and bolts, pulling hooks and bolts for all hatches and shaft locations along the delivery and future replacement routes, within and in front of plant rooms and equipment rooms, and above major items of plant and equipment such as transformers. Structural provisions shall meet the expected working loads.
4) Provisions of temporary structural openings where required.
5) Provision of doors of adequate dimensions in plant rooms and equipment rooms and along the routes for plant/equipment delivery and future replacement.

6) Co-ordination with Interface Contractors to determine the requirements, quantity and exact location of the provisions including the lifting and pulling hooks, bolts and beams.

1.3 ELECTRICAL AND PLANT ROOM LOCATION

Electrical plant rooms and equipment rooms shall not be located below any 'wet' rooms. Pipes that carry water or other liquid shall not pass through electrical plant rooms and equipment rooms, and shall not be routed above electrical and electronic panels. Provision of waterproofing floor membrane in 'wet' rooms and sealing of Interface Contractors' fixings, such as anchor bolts, to ensure that water-tightness shall not be compromised.

Where necessary for Interfacing Contractors, the Contractor shall provide plinths (whether concrete beams or steel I-beams) for Interface Contractors' plant and equipment.

1.4 PROTECTION FROM WATER INGRESS

All 'wet' rooms shall have kerbs or sunken floors or floor traps/drain points or both. 'Wet' rooms are rooms that contain water tanks or are likely to have wet floor in the usage of the rooms; for example; tank rooms, pump rooms, toilets, washrooms and cleaner stores.

Seepage protection shall be provided along the station perimeter walls of all habitable rooms such as Station Office, Control Room and concourse, as well as electrical plant or equipment rooms. All possible measurers shall be provided to prevent seepage of water.

1.5 PLANT ROOM DOORS

All plant room and equipment room doors shall open inwards unless otherwise specified.

1.6 SELF-CLOSING DOORS AND DOOR SEALS

Self-closing doors opening outwards shall be provided at exits from the inert gas-protected rooms and areas. Door seals and fixings including ceiling panels provided by the Contractor shall be capable of withstanding the forces imposed during discharge of the inert gas, so as to prevent the escape of inert gas.

1.7 MANHOLES AND INSPECTION CHAMBERS

There shall be no manhole or inspection chamber opening for plumbing, drainage or sanitary purpose in the electrical plant rooms and equipment rooms Such as, substation rooms and rooms for signal equipment and communication equipment.

1.8 TEMPORARY OPENINGS

The Contractor shall facilitate the Interface Contractors with necessary temporary wall openings in rooms such as those for signal equipment and communication equipment and uninterrupted power supply to Interface Contractors including those for installation of CP106's temporary air-conditioners. Making good of such provisions shall also be the responsibility of the Contractor.

1.9 SAFETY REQUIREMENTS AND PROVISIONS

Kerbs around transformers and the like shall be painted with 45 degrees stripes of 100 mm wide, alternate yellow and black.

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De-mountable panels (fire-rated and gas-tight) facing the railway track for trackside plant rooms and equipment rooms shall be provided as required; the size and materials are to meet the applicable statutory requirements.

Access cat ladders and step irons shall be provided within sumps, water tanks, et al. to enable safe access to all equipment and plant in accordance with the applicable statutory requirements.

1.10 EMBEDDED AND EXPOSED FIXINGS AND SERVICES REQUIREMENTS

Embedded cable pipes and ducts, embedded inserts, cable and pipe sleeves, embedded fixings, MCTs, cable crossings and pulling chambers with drainage and removable covers, trenches and floor recesses with removable covers and drainage, equipment plinths, kerbs around floor openings, structural openings for plant, equipment and services and other miscellaneous provisions shall be made.

Cable trenches with grating covers or chequered plates shall be provided in all electrical and substation plant rooms.

Cable basements beneath substation rooms, switch-rooms and equipment rooms (where necessary) shall be completed with access hatches, cat ladders and drainage.

Voids under platform shall be complete with top access, maintenance space, escape route and drainage, etc., for the Interface Contractors' installation of services.

Rooms for station control; plant rooms; equipment rooms; enclosures for equipment, plant and services at surface level; voids, pits and risers for equipment, plant and services; air plenums including those formed as part of the concrete structure; concrete structure; concrete water tanks; lift shafts; and ventilation air shafts.

1.11 OTHER SPECIAL PROVISIONS

Other specials provisions listed below shall be made by the Contractor for the Interface Contractors:

1) Anti-skid paints on plant room floors, for direction arrow signs indicating route of escape.
2) Anti-dust paints and sealants, and floor hardeners (non-metallic type where necessary) for equipment rooms and plant rooms such as rooms for signal equipment and communication equipment, substation rooms and switch-rooms.
3) Oil-resistant floor finishes within such rooms as lift motor rooms and transformer rooms in which oil is stored and used as a working fluid in plant and equipment.
4) Anti-acid paints in rooms for battery.
5) Integration of wall, ceiling and floor finishes, and doors with equipment, fittings and miscellaneous items.
6) Provisions for installing temporary services; such provisions include drilling or blind holes for bracket and equipment fixings.
7) Double slabs in localized areas of lowered soffit and raised floor slab, niches, recesses, recesses with doors, cut-outs, etc. for CP106's services, plant and equipment;

1.12 TUNNELLING INTERFACES

It is envisaged that CP102 contractor's TBMs will be launched at (or retrieved through the openings in) the south end of North Avenue Station box and break through the diaphragm wall by utilizing the TBM cutter head. The CP101 Contractor shall, in coordination with CP102, design the North Avenue Station

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box and programme his Works to facilitate and enable the CP102 contractor's TBM launching (or retrieving) at North Avenue.

1.13 TRACK WORKS ACCESS POINTS INTERFACES

The track work access shall be provided to the CP106 contractor for loading and unloading track work materials. The detailed requirements are described in the following Clause 3.2 TRACK WORKS ACCESS POINTS.

2 CLARIFICATION FOR IDENTIFYING INTERFACES

Interfaces are identified in the tabular form in this Section. The Contractor shall expand these tables as needed to monitor the progress on the part of the Interface Contractors, as it is the Contractor's responsibility to develop Interface Schedules in accordance with his interface management plan. The interfaces in these tables are intended for Bidders' reference at the Tender Stage. The Contractor shall identify other interfaces which are not identified in these tables but essential for the smooth completion of Metro Manila Subway Project Phase 1 and include them in the Interface Management Plan. The Contractor shall provide the information as the delay of schedule due to the absence of Interface Contractors.

Table 2-1 External Interface Matrix

	Civil Works								
	CP101 / (Depot)	CP102	CP103	CP104	CP105	CP108	CP109	CP107 Rolling Stock	NSRP-S
CP106 E&M / Track Work	V	V	V	V	V	V	V	V	V
CP107 Rolling Stock	V	V	V	V	V	V	V		V
NSRP-S							V	V	

Interfaces between MMSP and NSRP-S

Rolling Stock
Signaling
Telecommunication
Track Work
Power/OCS
Civil/Tunnel

NSRP-S project general consultant GCR shall lead the integration work for interoperability between MMSP and NSRP-S, MMSP-GC will support it.

The following shall be read in conjunction with the tables:

1) Interface Contractors of the Contract Packages CP101 - CP105, CP108 & CP109, CP107 & CP106 and CP NS-01(NSRP-S), respectively; and
2) "Fix" means complete and proper installation in the correct place, without defects including tests where necessary.

The column headings are defined:

Interface Description : Identifies what the Interface is about, which the Contractor is the provider and

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which the Contractor has the requirement for the Interface.

Design : Identifies who is responsible for the interface design (Contractor mentioned first shall be the Lead Contractor (LC)).

Supply : Identifies who provide the materials or the works area.

Fix : Identifies responsibility for building, installing, etc.

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3 GENERAL SCOPE OF INTERFACE

No.	Interface Description	Design	Supply	Fix	Remarks
1	E&M Railway Systems	CP106	CP106	CP106	Design, supply and fixing of E&M Railway Systems shall be responsibility of CP106 except where otherwise specified in this table.
2	Penetrations with sleeves & bushing	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP106 to provide their requirements, including size, material and location.
3	Box outs - full or part depth.	CP106/ CP101-CP105, CP108 & CP109/	CP101-CP105, CP108 & CP109/	CP101-CP105, CP108 & CP109/	CP106 to provide their requirements, including size and location.
4	Recesses and trenches formed in screed or finishes for CP106 services.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 to provide their requirements, including size and location. Civil works contractors to provide adequate thickness of screed or finishes as well as to provide removable or hinged covers and frames (where required) in finishes over recesses- trenches.
5	Excavation, backfill, compacting, turfing and finishes of trenches in earth, pavement, road and below drains for CP106 services.	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide location of services. Civil works contractors to co-ordinate and agree on size and location. Any specific protection such as cable slabs to be supplied and installed by CP106.
6	Cable pipes, ducts etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement and road, also Pulling chambers (where required) with covers. Pulling chambers to be provided with drainage.	CP106	CP106	CP101-CP105, CP108 & CP109	CP106 to provide requirements. CP106 to provide pipes, ducts and draw wires. Civil works contractors to co-ordinate and agree on size and location. Civil works contractors to provide pulling chambers where required. Civil works contractors to ensure cable pipes, ducts etc. are protected from ingress of water.

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No.	Interface Description	Design	Supply	Fix	Remarks
7	Telephone and Power intake entry pipes and ducts, draw wires, manholes, waterproofing sealing for manholes, entry points and concrete haunching for pipes and ducts.	CP106/ CP101-CP105, CP108 & CP109	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide requirements, including size and location. CP106 to provide pipes, ducts and draw wires Civil works contractors to coordinate and agree on size and location. Civil works contractors to provide manholes, waterproofing sealing for manholes, entry points and concrete haunching for pipes and ducts where required. Civil works contractors and CP106 to co-ordinate and agree on size and location. Covers and frames in finishes over (pull, junction and surface) boxes, chasing and subsequent sealing by mortar or equivalent by Civil works contractors.
8	Conduits, (pull, junction and/or surface) boxes, sheet metal trunking and ducting, which are cast into concrete and including draw wires. Cast-in conduits shall be adopted in all areas except the equipment and plant rooms in the stations.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 to provide requirements, including size and location. CP106 to provide the required cast-in materials. Civil works contractors and CP106 to co-ordinate and agree on size and location. Protection of all ends and joints by Civil works contractors. Conduits assembled by Civil works contractors. Fixing of conduits to the re-bar by Civil works contractors shall be under CP106 supervision and jointly inspect before casting.
9	Cast-in sockets including bolts, nuts, washers, packing and shims.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 to provide requirements, including size and location. CP106 to provide cast-in materials. CP101 to co-ordinate and agree on size and location.
10	Drilling for anchors for CP106 equipment	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 co-ordinate with Civil works contractors on location, size and drilling method. CP106 to provide materials.

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No.	Interface Description	Design	Supply	Fix	Remarks
11	CP106 cable and pipe support systems within the Stations and depot and CP106 equipment rooms complete with anchors, nuts, bolts, washers, etc.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	CP106 to co-ordinate with Civil works contractors for design of CSD's / SEM's.
12	Grouting under CP106 machine beds.	CP106	CP106	CP106	
13	Sealing of gap between CP106 equipment, and wall and floor finishes.	CP106	CP106	CP106	Bedding or trims to be designed, supplied and fixed by CP106. Sealing material shall maintain the fire rating of the compartment where applicable.
14	Curbs around oil transformers, oil collecting pit, inspection cover and associated drainpipe.	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide requirements, including size and location. Civil works contractors and CP106 to co- ordinate and agree on size and location. Covers and frames in finishes over (pull, junction and surface) boxes by Civil works contractors. Protection of all ends and joints by Civil works contractors.
15	Chequered plate cover for cable and pipe trenches in plant room	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	Covers flush with finished floor level.
16	Power cabling from electrical equipment e.g. isolators earthing switch to all CP106 equipment control panels. Control and monitoring cabling from all control panels up to interface terminal boxes (ITBs).	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	Isolators and associated cabling from power supply source to the isolators to be provided by Civil works contractors. Location of isolator and pump control panel to be coordinated by Civil works contractors with CP106. CP106 to provide cables from isolator to his equipment and make connections.
17	Cables, antennas, platform indicators, signage, graphics & advertising panels.	CP106	CP106	CP106	Be supplied and installed by CP106.

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No.	Interface Description	Design	Supply	Fix	Remarks
18	Earth Mat System	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 to co-ordinate for the design and agree on size and location Station Earthing Mesh shall be below 1 Ohm.
19	Curbs around floor openings for services access.	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide dimensions and locations. Civil works contractors and CP106 to co-ordinate and agree on dimensions and locations
20	Opening for carrying in or out of CP106's Equipment in station or substation etc.	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 shall coordinate and agree on size and location for design of CSD & SEM drawings. CP106 to confirm the opening and access closure design (including its associated supporting structure) on whether it shall be permanently closed or demountable for future heavy maintenance.
21	Entrance to carry in CP106's Equipment	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 shall coordinate and agree on size and location
22	All equipment plinths (whether concrete or I-beams) as required by CP106.	CP106 / CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide requirements, including sizes and locations of the concrete plinths, pockets, and loading for mounting of equipment. Civil works contractors and CP106 to co-ordinate design and agree on sizes and locations of the concrete plinths and pockets.
23	Cavity walls in non-public rooms and areas (if any)	CP101-CP105, CP108 & CP109 /CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors to provide space and access and other requirements for cavity walls. Civil works contractors and CP106 to coordinate design and agree on space, access provision, and cavity walls.

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No.	Interface Description	Design	Supply	Fix	Remarks
24	All cable recess, troughs, ducts, pipes and trenches either across track or parallel to track, within and/or on track-bed concrete for all trackway. Removable or hinged covers for the above- mentioned items.	CP106 / CP101-CP105, CP108 & CP109	CP106 / CP101-CP105, CP108 & CP109	CP106	CP106 to provide requirements. Civil works contractors to co-ordinate with CP106. Civil works contractors to provide pipes, covers etc. for CP106 requirements, CP106 to provide pipes covers etc. for Civil Works Contractors requirements.
25	Extended portion of sumps, drained manholes and drained pulling chambers within and/or on track bed concrete. Removable or hinged covers for the items.	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Interface specification and CP106 to review and comment if required
26	All cable recess, troughs, ducts, pipes, ducts, pipes and trenches, either across track or parallel to track, beneath track bed concrete for all trackway (with draw wires if necessary).	CP101-CP105, CP108 & CP109 /CP106	CP106	CP101-CP105, CP108 & CP109	CP106 to provide requirements, including size and location draw wires. Civil works contractors and CP106 to co-ordinate design and agree on space, access provision, and cavity walls. Civil works contractors to protect the water ingress. Civil works contractors to co-ordinate with CP106.
27	Portion of sumps, drained manholes and drained pulling chambers beneath track bed concrete.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Interface specification and CP106 to review and comment if required
28	Common services brackets.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors to co-ordinate with CP106. And to be reflected in CSD drawings.
29	Lifting points (eye bolts or similar) for CP106 Equipment installation and replacement	CP101-CP105, CP108 & CP109 /CP106	CP106	CP101-CP105, CP108 & CP109	CP106 to provide requirements and supplying eye bolts or similar, Civil works contractors and CP106 to co-ordinate and agree on size and location.

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No.	Interface Description	Design	Supply	Fix	Remarks
30	Air conditioner and/or Ventilator for CP106's Equipment Rooms.	CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 to co-ordinate and agree on size/capacity and location.
31	Leakage water from ceiling of electrical plant room & electronic equipment rooms	CP101-CP105, CP108 & CP109 / CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 shall provide the space and access route and other requirements for leakage water treatment. Civil works contractors to co-ordinate for the design and agree on the space and access provision, and cavity walls.
32	Removal of waste from work site.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors to make available refuse bins/skips in Stations and remove waste from site. CP106 to place their waste in bins. Waste from tunnel and viaduct to be placed in bins/skips located in Stations. The dealing of large size of waste such as packaging materials by CP106 that shall be removed by CP106.
33	Ventilation Fans within the tunnel section throughout the line	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Interface specification and CP106 to review and comment if required.
34	Earthing System	CP101-CP105, CP108 & CP109 / CP106	CP101-CP105, CP108 & CP109 / CP106	CP101-CP105, CP108 & CP109 / CP106	Civil work Contractors and CP106 Contractor shall coordinate and agree on the size and location Civil work Contractor shall supply the earthed main cable for station, depot, RSS, TSS, and ER respectively. CP106 contractor shall execute the final earthing connection in the station, depot, RSS, TSS, and Equipment Room etc., respectively. Earthing conductor must be able to withstand the CP106 system short-circuit fault level. Civil works provide adequate earthing connections and links at appropriate locations and station

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No.	Interface Description	Design	Supply	Fix	Remarks
					levels for future System Earthing.
35	The foundation of equipment in Sig-Telecom room, TSS, RSS, ER, STER, DEGR, and other CP106's Equipment Room.	CP101-CP105, CP108 & CP109 / CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors and CP106 Contractor shall coordinate and agree on the size and location.
36	Fire extinguishing and all Firefighting facilities for CP106's Equipment Room. All Firefighting and extinguishing facilities design concept shall be unified between all the Contractors.	CP101-CP105, CP108 & CP109 / CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors and CP106 Contractor shall coordinate and agree on the size and location.
37	Prevention of fire spread and water leakage by Multi Cable Transit (MCT) in all openings of cable entrances to building fire walls, floors	CP101-CP105, CP108 & CP109 / CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors shall complete the work to meet the tasks.
38	Prevention of fire spread and water leakage by Multi Cable Transit (MCT) in all openings of cable entrances to panels /cubicles	CP101-CP105, CP108 & CP109 / CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors shall complete the work to meet the tasks.
39	Temporary Service: power outlets in stations/rooms and tunnel sections and building at depot area etc.	CP106 & CP107/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors and CP106 & CP107 Contractor shall coordinate and agree on the power requirement capacity, size and location.

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No.	Interface Description	Design	Supply	Fix	Remarks
40	Temporary Service: Lighting including emergency lighting in stations/rooms and tunnel sections and building at depot area etc.	CP101-CP105, CP108 & CP109 / CP106 & CP107	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors and CP106 & CP107 Contractor shall coordinate and agree on the Lux, size and location.
41	Temporary Service: Water and toilet and drainage in stations and tunnel sections and building at depot area etc.	CP101-CP105, CP108 & CP109 / CP106 & CP107	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors and CP106 & CP107 Contractor shall coordinate and agree on the size and location.
42	Temporary Service: Communications; Telephones, with unique numbers, shall be located as a minimum requirement at the following locations in a suitable housing with adequate lighting, signage and Site-specific directory: 1)Contractor's Site offices; 2)Engineer's offices; 3)Medical facilities; and 4)In the tunnels at 250 m intervals and at each end of the stations.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	The communications system shall be for the use of the Civil work Contractors, the Engineer and all Interface Contractors.
43	E&M system integration testing	CP106	CP106/CP107	CP106/CP107	CP107 to supply support & staff during required testing in depot and mainline.
44	Trial Run	CP106/CP107	CP106/CP107	CP106/CP107	CP106 and CP107 to supply support & staff during required testing in depot and mainline.

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No.	Interface Description	Design	Supply	Fix	Remarks
45	Lifting Beams	CP106/CP 101	CP101	CP101	CP106 to provide the lifting requirement to CP101 and CP101 shall co-work with CP106 to supply Lifting facility and implement the required CP106 equipment delivery.
46	Cable conduits, ducts, surface boxes, etc for CP106 embedded into concrete	CP106/ CP101	CP101	CP101	CP106 to provide requirements.
47	CP106 Cables duct bank, ducts, conduits etc. in Depot area.	CP101/ CP106	CP101	CP101	CP106 to provide requirements. Including High and Low voltages power cables and respective system cables.
48	Cable troughs, cable bridges, cable posts and supports along the main line tracks, in depot yards etc.	CP106/ CP101	CP101	CP101	CP106 to provide requirements.
49	Under Track Crossing (UTX)	CP101-CP105, CP108 & CP109 /CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide the requirement to Civil work packages and Civil Contractors to develop the design of UTX for CP106 to review prior the installation.
50	CP106 Low voltage, S&T (signalling & telecom) equipment Earthing etc.	CP106/ CP101	CP101	CP101	CP106 to provide requirements.
51	Dedicated Optical fiber cable ducts / inside depot area to connect all building within depot and connect tunnel portal for tunnel section connectivity.	CP101/ CP106	CP101	CP101	CP106 to provide requirements for cable route.
52	Construction of transformer rooms for OCC, Workshop, TC, PRI, DB1, DB2 & LRW	CP106/ CP101	CP101	CP101	CP106 to provide requirements.
53	Construction of Generator Rooms for OCC, TC and PRI	CP106/ CP101	CP101	CP101	CP106 to provide requirements.

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No.	Interface Description	Design	Supply	Fix	Remarks
54	Construction of TSS in the Depot	CP106/ CP101	CP101	CP101	CP106 to provide requirements.
55	Protection/Control of the stray current within the depot and mainline.	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide requirements.
56	Earthing System inside the transformer rooms, generator rooms and TSS	CP106	CP106	CP106	
57	Earthing Rods/Mats for transformer, generator rooms and TSS (below ground level)	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide requirements.
58	400V (3-Phase) and 230V (1-Phase) Distribution System	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	
59	Cable Management System (CMS) from secondary (LV side) of transformers and generators to 400V Switchboard	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	
60	Earthing for 400V (3-Phase) and 230V (1-Phase) Distribution System	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	

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3.1 TRACKWAY STRUCTURE; CIVIL

No.	Interface Description	Design	Supply	Fix	Remarks
1	Design and construction of structural connection between Contractors structures	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 Contractor to provide the track bed/slab track connection design requirements to Civil work Contractors. CP106 and Civil work Contractors shall consider rail structure behavior into the analysis.
2	Design and installation of H-Beam, including hole boring, anchor bolt+ Concrete post supporting H-Beam and reinforced concrete slab base of LRS-Light Repair Shop building.	CP101/CP106	CP101	CP101	CP101 Contractor to coordinate with CP106 for design and installation.
3	JIS50N Rail + Bolt, nuts, clip fastenings, setting out of rail vertical and horizontal alignment and installation of tracks at LRS – Light Repair Shop building.	CP106	CP106	CP106/CP101	CP101 to bore holes on H-Beam only. CP106 Contractor to provide and fasten JIS50N at LRS – Light Repair Shop Building.
4	Design and Construction of Pit Track at Work shop	CP106/CP101	CP106/CP101	CP101	CP101 to construct Reinforced concrete Slab for Pit Track. CP106 Contractor to provide and install JIS50N at Work shop.
5	Car Wash Shop at Depot: Concrete Base and wall sides concrete.	CP101/CP106	CP101	CP101	CP101 Contractor to coordinate with CP106 for design and installation.

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No.	Interface Description	Design	Supply	Fix	Remarks
6	Initial concrete slab at the invert of tunnel including installation of shear connector bars	CP101/CP106	CP101	CP101	CP101 to coordinate with CP106 in this initial concrete slab cast in situ including installation of shear connector bars

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3.2 TRACK WORKS ACCESS POINTS

No.	Interface Description	Design	Supply	Fix	Remarks
1	Provision of works area on the ground level at transition U-shape structure section at the Depot for delivery of track work material and equipment.	CP106/ CP101	CP101, Provide works area only	N/A	The Contractor (CP106) to coordinate works area with Civil works contractors
2	Provision of work areas on the ground level at underground track at Cut and Cover Structure for delivery of track work material and equipment.	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 Provide works area only	N/A	The Contractor (CP106) to coordinate works area with Civil works contractors
3	Provision of works area on the ground level section for delivery of track work material and equipment.	CP106/ NSRP-S	NSRP-S Provide works area only	N/A	The Contractor (CP106) to coordinate works area with Civil works contractors; if case occurred
4	Provision and maintenance of access openings at follow location on the roof slab and concourse slab Including provision of working areas and necessary supporting structures inside the station box and ground level for delivery, loading and unloading of track work material, sleepers and associated equipment.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 Including works area	CP101-CP105, CP108 & CP109	CP101- CP105, CP108 & CP109 contractor to coordinate access openings and works area with track works contractor CP106 CP106 to confirm location and working space CP101- CP105, CP108 & CP109 to close these openings at the agreed time and period with CP106 CP106 to confirm the opening closure design (including its associated supporting structure) on whether it shall be permanently closed or demountable for future heavy maintenance.

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No.	Interface Description	Design	Supply	Fix	Remarks
5	Provision of access openings, works area, piping line, and necessary supporting structures for concreting works from ground surface, through roof slab, intermediate slab until reaching track slab level The position and dimension of the access openings, works area and piping line shall be agreed by the Contractor and Interface contractors to suit his construction sequence and schedule, for example, the Contractor may provide appropriate rectangular openings or embedded pipes through the Roof slab, Concourse slab, or other intermediate slabs/walls. Then later CP106 may use these openings as the access route of concrete pipes for placing concrete of the track works	CP101-CP105, CP108 & CP109, CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101- CP105, CP108 & CP109 to provide works area inside station box, ground level and opening for CP106 works CP106 to confirm design requirement CP101- CP105, CP108 & CP109 to close these access openings at the agreed period with CP106 CP106 to confirm the opening closure design (including its associated supporting structure) on whether it shall be permanently closed or demountable for future heavy maintenance.

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3.3 THE WORKS AND OTHER RELATED PROJECTS

No.	Interface Description	Design	Supply	Fix	Remarks
1	Study of the detailed design and construction method and procedure for the Depot in consideration of neighboring construction for bridge structures and embankment of an expressway construction project	CP101	CP101	CP101	CP101 shall coordinate with on the expressway project (Segment 8.2) with NLEX and agree on the Depot design and construction method/procedure.
2	Study of the detailed design and construction method and procedure for Quirino Highway Station in consideration of the development plan on the station.	CP101	CP101	CP101	CP101 shall coordinate on the development plan with HBC and consider the influence of the new building on the station structure design and construction method/procedure.
3	Study of the detailed design and construction method and procedure for North Avenue Station in consideration of the development plan on the station.	CP101	CP101	CP101	CP101 shall coordinate with on the development plan with Department of National Defense (DND) / Armed Forces of the Philippines (AFP) and agree on the station structure design and construction method/procedure, if required.
4	Study of the detailed design and construction method and procedure for North Avenue Station in consideration of neighboring construction for bridge structures and box culverts of a grade-separation project of North Avenue and Mindanao Avenue Intersection.	CP101	CP101	CP101	CP101 shall coordinate on the intersection grade-separation project (MMICP) and agree on the design and construction method/procedure of North Avenue Station, if required.
5	Study of the detailed design and construction method and procedure for North Avenue Station in consideration of the neighboring construction for bridge structures of MRT Line 7 Project.	CP101	CP101	CP101	CP101 shall coordinate on the MRT Line 7 construction project and agree on the design and construction method/procedure of North Avenue Station, if required.

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No.	Interface Description	Design	Supply	Fix	Remarks
6	Study of the detailed design and construction method and procedure for Stations in consideration of the neighboring construction for bridge structures of other Projects and other facilities.	CP102-CP105, CP108 & CP109	CP102-CP105, CP108 & CP109	CP102 - CP105 , CP108 & CP109	CP102- CP105, CP108 & CP109 shall coordinate on the other interface construction projects and agree on the design and construction method/procedure of stations, if required.

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3.4 TUNNELING & E&M RAILWAY SYSTEMS

No.	Interface Description	Design	Supply	Fix	Remarks
1	Design, supply and fixing of Railway Systems; except where otherwise stated in this Contract	CP106	CP106	CP106	Except anchor and bracket by Civil Contractors CP101- CP105, CP108 & CP109
2	Design supply and fixing of Trackwork System; except where otherwise stated in this Contract	CP106	CP106	CP106	Internal CP106
3	Cast-in Anchor plug and anchor bolt in tunnels for Rigid Suspension System (RSS).	CP106	CP106	CP101-CP105, CP108 & CP109	Contractor to coordinate CP106 and agree size and locations. Anchor plugs and anchor bolts shall be supplied by CP106.
4	Cast-in Anchor plug and anchor bolt in tunnels for CP106	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 to provide the requirements, including size and locations and anchoring materials to the Contractor. Contractor to co-ordinate CP106 and agree size and locations.
5	Drilling and Fixings for brackets and hangers for cable and supporting structure for tunnel lighting, fire main, socket outlets, drainage pipes	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	All trackside brackets, bolts, anchors, nuts, washers, packers, shims and the like shall be the Contractor responsibility.
6	Drilling and Fixings for brackets and hangers for cable and supporting structure for CP106 cables and equipment	CP106	CP106	CP106	All trackside brackets, bolts, anchors, nuts, washers, packers, shims and the like shall be CP106's responsibility
7	Cable brackets and hangers, and pipe brackets attached to walkway structure (if any)	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil Contractors to coordinate CP106 on the requirement.
8	All cable recess, troughs, ducts, pipes and trenches, either across track or parallel to track, in track bed concrete.	CP106	CP106	CP106	CP106 to coordinate internally.

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No.	Interface Description	Design	Supply	Fix	Remarks
9	Removable covers for cable recess/troughs/trenches at track bed concrete.	CP106	CP106	CP106	On track bed concrete, cover to be installed only after cables are laid.
10	All cable recess, troughs, ducts, pipes and trenches, either across track or parallel to track, in base slab and first stage concrete of the cut and cover tunnels. Including cable ducts and pipes rising from base slab.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 to provide requirements, including size and location. CP106 to provide relevant materials. Contractor CP101 and CP106 to co-ordinate on the design and agree on space.
11	Portion of sumps, drained manholes and drained pulling chambers beneath track-bed concrete.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	
12	Track-bed concrete in bored tunnels and surface drain at both side of track-bed concrete	CP106	CP106	CP106	The Contractor and CP106 to agree the size of surface drain. The connection detail and material to the sump is arranged by the Contractor.
13	Cable ducts and pipes within bored tunnel maintenance path concrete structure and up to a suitable termination point above maintenance path concrete structure.	CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 to provide the requirement including size and location The Contractor to co-ordinate and agree the size and location.
14	1st stage concrete (Underground Stations, bored tunnels and cut and cover tunnels)	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Including all tunnel sumps and cast in pipes. Requirements for track bed depth to be agreed with CP106
15	Track bed - starter bar within 1st stage concrete if required (Underground Stations, bored tunnels and cut and cover tunnels)	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide the requirement including size and location. Contractor to co-ordinate and agree the size and location/arrangement. Contractor to cut, bend and install.
16	Track bed - concrete (Underground stations and cut and cover tunnels)	CP106	CP106	CP106	CP106 to place concrete. Contractor to co-ordinate access

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No.	Interface Description	Design	Supply	Fix	Remarks
17	Surface drain at underground station and cut and cover tunnel	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	The Contractor to design and construct surface drain up to each sump location
18	Other Track-bed cast-in item within 1st stage concrete.	CP101-CP105, CP108 & CP109 and CP106	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	Contractor and CP106 to co-ordinate and agree on size, location and arrangement.
19	As-built Alignment Modification	CP101-CP105, CP108 & CP109 and CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors shall survey as-built alignment of bored tunnels. And Civil works contractors shall redesign as-built alignment coordinating with CP106 if necessary. Then, CP106 shall design track bed based on the as-built alignment designed by Civil works contractors.
20	Space for railway system equipment inside the Tunnel	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 Contractor will provide the space requirements of railway system equipment inside the tunnel to CP101 Contractor for the design of tunnel structure.
21	Space for side walkway	CP101-CP105, CP108 & CP109 and CP107	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP107 Contractor will provide the structure gauge of the rolling stock for Civil works Contractor to design the evacuation side walkway.
22	Provision of access and works area to launch or retrieve CP102 contractor's TBM and complete tunnel connection into North Avenue Station	CP101	CP101 Slab openin g and area	CP102	TBM contractor (CP102) to provide information of reasonable size for slab opening. CP101 to design Slab opening to accommodate the TBM retrieval CP101 to provide works area at track slab level and ground level and opening for access.
23	Provision of a concrete wall that CP102 TBM can cut through, or that an opening can be made in advance by CP102	CP101	CP101	CP101	TBM contractor (CP102) to provide information of glass fibre reinforced plastic design details and glass fiber Material for use by the Contractor The Contractor (CP101) to design

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No.	Interface Description	Design	Supply	Fix	Remarks
	Provide glass fibre reinforced concrete or the equivalent over the tunnel area				and install.
24	Provision of work areas and temporary water supply for soil improvement works (if required) by CP102 (Water consumption charge shall be paid by CP102)	CP102	CP102/ CP101 Provide works area	CP102	TBM contractor (CP102) to provide requirement for works area. The Contractor (CP101) to provide works area at south end of North Avenue Station box for TBM contractor (CP102)
25	Provision of temporary footings to support crane to retrieve (or unload) TBM or check design of diaphragm wall	CP102	CP102/ CP101 Provide works area only	CP102	TBM contractor (CP102) to provide requirement for works area. The Contractor (CP101) to provide design information of diaphragm wall and works area at south end of North Avenue Station box for TBM contractor (CP102)
26	Under Track Crossing (UTX)	CP101-CP105, CP108 & CP109 /CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide the requirement to Civil work packages and Civil Contractors to develop the design of UTX for CP106 to review prior the installation.

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4 STATIONS E&M FACILITIES

No.	Interface Description	Design	Supply	Fix	Remarks
1	Structure of pit, piping space and opening (slab, beam, etc.)	CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 Contractor shall coordinate to design the size of the pit, wiring space and opening based on equipment provided by CP106 Contractor
2	Room Temperature Control and Air supply/Exhaust	CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 Contractor shall coordinate to design the size of the room for the air supply/exhaust system.
3	Air conditioner and/or Ventilation system for Signal/Telecom Room, AFC Equipment Room, Train Operation Room, BMS Equipment room etc.	CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 Contractor shall coordinate to design the size of the room for the air supply/exhaust system.
4	Supporting structure	CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 Contractor shall prepare the supporting structure to sustain equipment designed by CP106
5	H/V Power supply including piping and wiring work	CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 Contractor shall coordinate to design the size of the room for the air supply/exhaust system.
6	Generator's Room Chimney, Air Supply/Exhaust	CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 Contractor shall coordinate to design the size of the room/duct for the air supply/exhaust system including the preparation of the Generator's Chimney.
~~7~~	~~Lighting and Socket Outlets at Tunnel area and underground station area~~	~~CP106~~	~~CP106~~	~~CP106~~	~~CP101-CP105, CP108 & CP109 and CP106 Contractor shall coordinate to design the size of the system and the locations.~~
8	Power cable connection between the Contractor and Interface Contractors	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 /CP106	CP101-CP105, CP108 & CP109 Contractor shall supply and install the cable between CP101-CP105, CP108 & CP109's equipment and CP106's equipment up to CP106's equipment. CP106 shall connect cables on connecting terminal
9	Communication, signaling and control cable connection	CP101-CP105,	CP101-CP105,	CP101-CP105,	CP101-CP105, CP108 & CP109 Contractor shall supply and install

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No.	Interface Description	Design	Supply	Fix	Remarks
	between the Contractor and Interface Contractors	CP108 & CP109 /CP106	CP108 & CP109	CP108 & CP109 /CP106	the cable up to CP106's equipment. CP106 shall connect cables on terminal
10	Prevention of fire spread and water leakage by Multi Cable Transit (MCT) in all openings of cable entrances to building fire walls and floors	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work contractors are responsible for it and reported if any occurred.
11	Prevention of fire spread and water leakage by Multi Cable Transit (MCT) in all openings of cable entrances to panels /cubicles	CP106	CP106	CP106	CP106 are responsible for it and reported if any occurred.

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4.1 TRACK WORKS

No.	Interface Description	Design	Supply	Fix	Remarks
1	Temperature stress of Long rail	CP106	-	-	Civil Work Contractors shall consider temperature stress in his structural design.
2	Provision of drainage plan at tunnel section and underground station area	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors and CP106 Contractor shall coordinate and agree on drainage plan (CP106 design concrete bed for track based on the drainage plan).
3	Provision of turnout plan (expansion of construction gauge at point machine)	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	Civil work Contractors and CP106 Contractors shall coordinate and agree on the size and location of expanded construction gauge due to point machine
4	Connection of ladder for turnout area (passage way in tunnel section) with invert at track level	CP106	CP101-CP105, CP108 & CP109	CP106	Civil work Contractors and CP106 Contractors shall coordinate and agree on location and size of connection of ladder with invert at track level. CP106 Contractor shall design evacuation way of ladder location so that the ladder can be replaced for maintenance.

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4.2 (A) SIGNALING - CIVIL

No.	Interface Description	Design	Supply	Fix	Remarks
1	Structural drawing for Signaling Equipment's, Cable trough and plumbing installed along trackside on the mainline, Tunnel and in the Depot	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Detailed Permanent Way (P-Way) drawing with signaling equipment * CBTC antenna pole, Radio device, Track transceiver, Impedance bond, Point machine, Location cases, Distribution box, Signal, Signage and Repeater for TASC.
2	Space, Specification and cable route of CER & CUR in Depot and in OCC	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Floor space of CER, CUR; cable trays, cable entry/exit points in OCC and cable ducts within the depot area.
3	Space and Specification of Control Room in OCC, and cable route	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Layout of OCC control room, cable trays and cable ducts
4	Space and Specification of SER, SUR in stations, and cable route	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Floor space of SER, SUR; at each station, cable ducts and cable trays
5	Space and Specification of BMS in stations, and cable route	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Floor area of BMS at each station, cable duct
6	Platform emergency stop plunger installation and wiring route	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Platform layout drawing with position of plunger units

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4.3 (B) SIGNALING - ROLLING STOCK

No.	Interface Description	Design	Supply	Fix	Remarks
1	ATP/ATO equipment for onboard/ground radio bi-directional data transmission.	CP106/ CP107	CP106	CP107	Interface specification including timing.
2	Mounting ATP/ATO equipment Discussion between Signaling and Rolling Stock will determine the location and mounting arrangement of ATP/ATO equipment in the vehicle.	CP106/ CP107	CP106	CP107	ATP/ATO equipment drawing
3	Two 2.4 GHz radio Antenna per VOBC for VOBC to VCC communications.	CP106/ CP107	CP106	CP107	Antenna drawing
4	1) Balise for train position correction of tachometer 2) Balise for ORP	CP106/ CP107	CP106	CP107	Interface specification including timing
5	DMI as a Train Number setting device	CP106/ CP107	CP106	CP107	DMI drawing
6	EMC between onboard and secondary train detection system	CP106/ CP107	CP106	CP107	Using frequency, tolerant noise level etc.
7	EMC between onboard equipment and CBTC system	CP106/ CP107	CP106	CP107	Using frequency, tolerant noise level etc.

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4.4 TELECOMMUNICATION

No.	Interface Description	Design	Supply	Fix	Remarks
1	Telecommunication equipment room in stations and OCC Telecommunication UPS room in stations and OCC	CP106 CP101-CP105, CP108 & CP109	CP106 CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109, CP106	Room area space, Cable access routes /through, air-conditioning.
2	Equipotential grounding	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	The equipotential grounding of station and OCC shall be carried out by Civil and the Architecture section. The grounding wire shall be carried out to the grounding terminal of the Telecommunication equipment room, by the Architecture section. The ground resistance is measured in cooperation with the Power side and the Signal side.
3	Telecommunication cable position in the tunnel	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109, CP106	CP101-CP105, CP108 & CP109, CP106	Telecommunication cable position in the tunnel (1) Optical fiber cable Laying on the side wall of the tunnel (2) LCX cable Laying at a position about 4 m higher from the rail surface (Be able to see the antenna attached to the roof of the train from the LCX cable laying position.) (3) Emergency Telephone (4) Remote Telecommunication Cabinet for Network Connections. (5) MWT Antenna System (6) Power & Data Cable. Please refer the tunnel drawings from CP-101-105,108 & 109 etc. for equipment layout reference.
4	Piping of telephone line such as office	CP101-CP105, CP108 & CP109, CP106	CP101-CP105, CP108 & CP109, CP106	CP101-CP105, CP108 & CP109, CP106	Piping of office etc. of telephone lines shall be implemented by the Architecture section. Wiring shall be carried out by the CP106.

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No.	Interface Description	Design	Supply	Fix	Remarks
5	Openings in ceiling panels & access panels for all CP106 equipment where required. (Examples: PA loudspeakers, CCTV cameras, clocks, LCX, Antenna system (MMSP railway Radio system, Public Mobile operators)	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide requirement, including size and location of openings. Civil works contractors and CP106 to co-ordinate and agree on size and location. Equipment supporting system and fixings shall be done by CP106.
6.	Foundation for Radio Towers Depot and Mainline	CP101-105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide requirement for foundation of radio tower. Civil to ensure the location near by Telecom Equipment Room and foundation for radio tower. Tower & supporting accessories will be installed by CP106.
7	Millimeter wave communication Tower inside Depot area.	CP101/ CP106	CP101	CP101	CP106 to provide requirement for foundation of radio tower. Civil to ensure the location near by Telecom Equipment Room and foundation for radio tower. Tower & supporting accessories will be installed by CP106.
8	Foundation for CCTV in Depot area	CP101/ CP106	CP101	CP101	CP106 to provide requirement for foundation of CCTV. CCTV & supporting accessories will be installed by CP106.

*Please also referring to CP106 part 2 of ER, Section VI, ERT 3) Telecommunication system, chapter 3.12 Interface requirements

4.5 POWER SUPPLY SYSTEM

No.	Interface Description	Design	Supply	Fix	Remarks
1	Penetrations with sleeves The design shall be watertight and comply with fire design requirement.	CP101-CP105, CP108 & CP109 / CP106	CP106	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 Contractor shall coordinate and agree on the size and location of the penetrations.

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No.	Interface Description	Design	Supply	Fix	Remarks
2	Power cable intake entry and out pipes and ducts, draw wires, manholes, including its cover/protection and waterproofing sealing for man-holes, entry points and concrete hunching for pipes and ducts. The design shall be watertight and shall not allow any transfer of water.	CP106/ CP101-CP105, CP108 & CP109	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide the requirement including size and location. CP106 to provide the pipes, ducts and draw wires, Civil Contractor to coordinate and agree on the size and location. Civil Contractor to provide manholes, entry points and concrete haunching for pipes and ducts where required. Civil Contractor and CP106 to coordinate and agree on size and location. Covers and frames in finishes over (pull, junction and surface) boxes, chasing and subsequent sealing by mortar or equivalent by Civil Contractor.
3	Cast-in sockets including bolts, nuts and washers, packing and shims	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 to provide the requirement including size and location. Civil works contractors and CP106 Contractor shall coordinate and agree on the size and location. CP106 Contractor shall supply all necessary materials and templates.
4	CP106's cable and pipe support systems within the stations complete with anchors, nuts, bolts, washers, etc.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	CP106 shall coordinate with Civil works contractors and agree on the size and location and for design of CSD's/SEM's.
5	Curbs and gutter around fuel tank, oil transformers, oil collecting pit, inspection cover and associated drain pipe.	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide the requirement including size and location Covers and frames in finishes over (pull, junction and surface) boxes, chasing and subsequent sealing by mortar or equivalent by Civil Contractor. Civil works contractors and CP106 Contractor shall coordinate and agree on the size and location.

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No.	Interface Description	Design	Supply	Fix	Remarks
6	Openings in slab, ceiling panels & access panels for all CP106's equipment where required.	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 Contractor shall coordinate and agree on the size and location. Supporting fixtures for CP106's equipment shall be supplied and installed by CP106. CP106 to confirm the opening and access closure design (including its associated supporting structure) on whether it shall be permanently closed or demountable for future heavy maintenance.
7	Leakage water treatment from ceiling of Sig-Telecom room, TSS, RSS ER, STER, DEGR, and other CP106's Equipment Room. No leakage is allowed at all rooms which will be used for CP106's equipment. When the room is located next to the D-Wall, it shall be protected with double wall. No water plumbing utilities can be installed on the ceiling above the planned CP106's equipment location.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 Contractor shall coordinate to provide a double protection design for any possibility of leakage which might affect the equipment performance and functionality, or even damage the equipment. CP106 Contractor shall provide the space and access route and other requirements for Leakage water treatment activity. Civil works contractors and CP106 Contractor shall coordinate for the design and agree on the space and access provision, and cavity walls.
8	Permanent Power Supply	CP106	CP106	CP106	Once Permanent Power Supply is ON, all electricity cost of Permanent Power Supply goes to CP106; including stations, systems and Trainset running test etc.

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4.6 OVERHEAD CONTACT SYSTEM

No.	Interface Description	Design	Supply	Fix	Remarks
1	Cast-in sockets, cast-in bolts and inserts ~~or blind holes in tunnels/on the ground~~ for both CP106 temporary and CP106 permanent services. CP106 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. The design shall not cause any leakage and crack at tunnel area, including its connection to station box structure, station slab, and D-Wall.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	Civil works contractors and CP106 Contractor shall coordinate and agree on the sizes and locations. ~~The sockets, anchor plugs and anchor bolts shall be supplied by CP106.~~ Cast-in socket and cast-in bolts in NATM and Cut-and-cover station box tunnels shall be supplied by CP106. In TBM tunnel sections, CP106 Contractor shall use inserts embedded into segments previously for Rigid Suspension System (RISS) supporting fittings. Civil works contractors and CP106 Contractor shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the brackets.
2	Supporting structure for power, telecom and signaling cable in tunnels for both temporary and permanent services of CP101- CP105, CP108 & CP109 and CP106. CP106 to ensure that the Supporting structure, etc. are compatible with bracket fixings, etc. to ensure that corrosion resulting from dissimilar metals will be prevented. The design shall not cause any leakage and crack at tunnel area, including its connection to station box structure, station slab, and D-Wall.	CP101-CP105, CP108 & CP109 / CP106	CP106	CP106	Civil works contractors and CP106 Contractor shall coordinate and agree on the size and locations. The supporting structures shall be supplied by CP106 Contractor. Civil works contractors and CP106 Contractor shall coordinate and agree that adequate construction tolerances are allowed between the fixing and the mounting slots of the supporting structure.

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No.	Interface Description	Design	Supply	Fix	Remarks
3	Fixing in tunnels/~~on the ground~~ for cable and pipe supports and/or equipment fixings. The design shall not cause any leakage and crack at tunnel area, including its connection to station box structure, station slab, and D-Wall.	CP101-CP105, CP108 & CP109 / CP106	CP106	CP106	Civil works contractors and CP106 Contractor shall coordinate and agree on the location, bolt size and drilling method. CP106 Contractor shall ensure that type of bolt supplied matches the fixing provisions and that adequate construction tolerance are allowed between the fixing and the mounting slots of the brackets.
4	All cable recess, ducts and pipes, either across track or parallel to track, in base slab and first stage concrete of the cut and cover tunnels~~/ground~~ Including cable ducts and cover, and pipes rising from base slab up to a suitable termination point~~. which includes, termination, pulling, provide clamping, testing, and its associated accessories agreed with CP106.~~ CP101- CP105, CP108 & CP109 Contractor shall protect the water ingress and prevent transfer of water.	CP101-CP105, CP108 & CP109 / CP106	CP106	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 Contractor shall coordinate and agree on the size, material and location.
5	All cable recess, ducts, and pipes either across track or parallel to track, beneath track bed concrete for all track ways. (with draw pilot wires if necessary) And removal or hinged covers for the abovementioned items CP101- CP105, CP108 & CP109 Contractor shall protect the water ingress and prevent transfer of water.	CP101-CP105, CP108 & CP109 / CP106	CP106	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 Contractor shall coordinate and agree on the sizes, material and locations. CP106 Contractor shall provide the wiring route schematic drawings. ~~the draw wires~~. ~~CP106 to provide the requirement.~~
6	~~Ceramic~~ Insert for Rigid Suspension System (RISS) in TBM tunnel sections.	CP101-CP105, CP108 &	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109/	CP106 Contractor shall provide the design loading and location for RISS. Civil works Contractor shall design

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No.	Interface Description	Design	Supply	Fix	Remarks
		CP109 / CP106		CP106	~~the ceramic~~ inserts involved into TBM tunnel sections. Civil works contractors and CP106 Contractor shall coordinate and agree on inserts size and location / arrangement.
~~7~~	~~Ceramic anchor for Rigid Suspension system~~	~~CP101- CP105, CP108 & CP109 / CP106~~	~~CP106~~	~~CP106~~	~~Civil works Contractor shall provide concrete strength.~~ ~~CP106 Contractor shall design the ceramic anchor.~~ ~~Civil works contractors and CP106 Contractor shall coordinate and agree on size, location / arrangement and drilling method.~~

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4.7 AFC SYSTEM

No.	Interface Description	Design	Supply	Fix	Remarks
1	Recesses and trenches formed in screed or finishes for CP106 services.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 to provide their requirements, including size and location. Civil works contractors to provide adequate thickness of screed or finishes as well as to provide removable or hinged covers and frames (where required) in finishes over recesses- trenches. CP106 to provide AFC ducting, ducts, conduits and materials to be cast-in the screed.
2	Cable pipes, ducts etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement and road. Pulling chambers (where required) with covers.	CP106/ CP101-CP105, CP108 & CP109 / CP106	CP106	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 Contractor shall coordinate and agree on the size and location. Civil works Contractor shall ensure the cable pipes, ducts, etc. which are protected from ingress of water. Civil Contractor to provide pulling chambers where required. The pulling chambers shall be provided with drainage
3	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.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	Civil works contractors and CP106 Contractor shall coordinate and agree on the size and location. CP106 Contractor shall execute that the finishing work of infilling a gap between a wall and a box/conduit which is installed at the wall to place a cable after chipping the wall.
4	Conduits, (pull, junction and/or surface) boxes, sheet metal trunking and ducting, which are cast into concrete and including draw wires. Cast-in conduits shall be adopted in all areas except the equipment and plant rooms in the station	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	Civil works contractors and CP106 Contractor shall coordinate and agree on the size and location. CP106 to provide the requirement and the required cast-in materials. Civil works Contractor shall execute that the finishing work of infilling gap between a wall and a box/conduit which is scheduled to install at the wall in advance. The protection of all ends and joints shall be executed by Civil works contractors.

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No.	Interface Description	Design	Supply	Fix	Remarks
					The conduits shall be assembled by Civil Contractor. Fixing of conduits to the re-bar shall be executed by Civil works Contractor under CP106 Contractor's supervision. Civil works Contractors and CP106 Contractor shall implement jointly an inspection before casting.
5	Drilling for anchors	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	CP106 Contractor shall coordinate with Civil works Contractor on the location, size and drilling method. CP106 to provide the requirement and the required cast-in materials.
6	Grouting under CP106's machine beds.	CP101-CP105, CP108 & CP109 / CP106	CP106	CP106	CP106 Contractor Shall coordinate with Civil works Contractor. CP106 to provide the requirement and Civil Contractor provide the design solution.
7	Cable Installation and Routing of Passenger Gates. (AFC)	CP106/ CP101-CP105, CP108 & CP109	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109 / CP106	Civil works and CP106 Contractor shall coordinate and agree on the sizes and locations. CP106 Contractor shall supply Pipe/Sleeve/Condit to Civil works Contractor. Civil works Contractor shall fix Pipe/Sleeve. CP106 Contractor shall provide the passenger gates and carry out cabling. Civil works Contractor shall cover a floor opening and finish the floor between the passenger gates after cable installation work by CP106 Contractor.
8	Frame Works of TVMs, AVMs and ARVCTs	CP106/ CP101-CP105, CP108 & CP109	CP106	CP101-CP105, CP108 & CP109	CP106 Contractor shall provide the frame materials for the finishing works of TVMs, AVMs and ARVCTs. Civil works Contractor shall install the frame materials for finishing works of TVMs, AVMs and ARVCTs.

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4.8 PLATFORM SCREEN DOOR

No.	Interface Description	Design	Supply	Fix	Remarks
1	Penetrations with sleeves	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	Civil Work Contractors and CP106 Contractor shall coordinate and agree on the size and location. CP106 to provide the requirement and the required materials.
2	Box outs – full or part depth	CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil Work Contractors and CP106 Contractor shall coordinate and agree on the size and location.
3	Recesses and trenches formed in screed or finishes for CP106 services.	CP106/ CP101	CP106	CP101-CP105, CP108 & CP109	Civil Work Contractors and CP106 Contractor shall coordinate and agree on the size and location. Civil Work Contractors shall provide adequate thickness of screed or finishes. Civil Work Contractors shall provide removable or hinged covers and frames (where required) in finishes over recesses and trenches. CP106 to provide the required materials.
4	Cable pipes, ducts etc. (including draw wires) embedded into concrete or screed, buried in earth, pavement and road. Pulling chambers (where required) with covers.	CP106/ CP101-CP105, CP108 & CP109	CP106/ CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP106 to provide the requirement and the required materials. Civil Work Contractors and CP106 Contractor shall coordinate and agree on the size and location. Civil Work Contractors shall ensure the cable pipes, ducts, etc. which are protected from ingress of water. The pulling chambers shall be provided with drainage.
5	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.	CP106	CP106	CP106	Civil Work Contractors and CP106 Contractor shall coordinate and agree on the size and location. CP106 Contractor shall execute that the finishing work of infilling a gap between a wall and a box/conduit which is installed at the wall to place a cable after chipping the wall.

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No.	Interface Description	Design	Supply	Fix	Remarks
6	Conduits, (pull, junction and/or surface) boxes, sheet metal trunking and ducting, which are cast into concrete and including draw wires. Cast-in conduits shall be adopted in all areas except the equipment and plant rooms in the stations.	CP106	CP106	CP101-CP105, CP108 & CP109	Civil Work Contractors and CP106 Contractor shall coordinate and agree on the size and location. Civil Work Contractors shall execute that the finishing work of infilling gap between a wall and a box/conduit which is scheduled to install at the wall in advance. Protection of all ends and joints shall be executed by Civil Work Contractor. The conduits shall be assembled by CP106 Contractor. Fixing of conduits to the re-bar shall be executed by Civil Work Contractors under CP106 Contractor's supervision. Civil Work Contractors and CP106 Contractor shall implement jointly an inspection before casting.
7	Cast-in sockets including bolts, nuts and washers, packings and shims	CP106	CP106	CP101-CP105, CP108 & CP109	Civil Work Contractors and CP106 Contractor shall coordinate and agree on the size and location. CP106 Contractor shall supply all necessary materials and templates.
8	Drilling for anchors	CP106	CP106	CP106	CP106 Contractor shall coordinate with Civil Work Contractors on the location, size and drilling method.
9	CP106's cable and pipe support systems within the stations complete with anchors, nuts, bolts, washers, etc.	CP106	CP106	CP106	CP106 Contractor shall coordinate with Civil Work Contractor.
~~10~~	~~Isolation/ Insulation measures for Platform Screen including insulating mat beneath platform finish, insulation and surface seal between platform finish and platform screen doors (PSD)~~	~~CP106/ CP101-CP105, CP108 & CP109~~	~~CP101-CP105, CP108 & CP109~~	~~CP101-CP105, CP108 & CP109~~	~~The PSD insulation mats shall be supplied and installed by Civil Work Contractor.~~ ~~CP106 Contractor shall coordinate with Civil Work Contractor on the details design of the insulation mat.~~
11	Top and bottom fixings and insulation at base of PSD.	CP106	CP106	CP106	The fixing and insulation work shall be executed along the entire length of PSD at a platform. CP106 Contractor shall execute Resistance Test between PSD and

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No.	Interface Description	Design	Supply	Fix	Remarks
					earth and between PSD and a platform.
12	All fixings necessary to secure PSD to the station structures.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	The fixing and insulation work shall be executed along the entire length of PSD at a platform. Civil Work Contractor shall ensure the structure can accommodate the fixing.
13	Touch voltage insulation between PSD header and architectural panels such as cornice, false ceiling, etc.	CP106	CP106	CP106	Civil Work Contractor CP101-CP105, CP108 & CP109 shall coordinate with CP106.
14	End returns (remote from the PSD) and glass panels extended from the ends of the PSD.	CP101-CP105, CP108 & CP109	~~CP106~~ CP101-CP105, CP108 & CP109	~~CP106~~ CP101-CP105, CP108 & CP109	The end returns doors shall be insulated by Civil Work Contractor. Civil Work Contractor shall coordinate with CP106 Contractor about the interface requirements at the PSD.
15	Sealing of gap between CP106 (PSD) equipment, and end returns	CP106	CP106	CP106	Civil Work Contractor shall coordinate with CP106 Contractor about the interface requirements between PSD and end returns. Sealing material shall maintain the fire rating of the compartment where applicable
16	Sealing of gap between CP106 (PSD) equipment, and floor finishes	CP106	CP106	CP106	Bedding or trims shall be designed, supplied and fixed by CP106 Contractor. Sealing material shall maintain the fire rating of the compartment where applicable
17	Sealing of gap between end returns and wall and floor finishes.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Bedding or trims shall be designed, supplied and fixed by Civil Work Contractor. The sealing material shall maintain the fire rating of the compartment where applicable.
~~18~~	~~Platform finishes on top of insulation membrane~~	~~CP101-CP105, CP108 & CP109~~	~~CP101-CP105, CP108 & CP109~~	~~CP106~~	-

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No.	Interface Description	Design	Supply	Fix	Remarks
19	Prevention of fire spread and water leakage by Multi Cable Transit (MCT) in all openings of cable entrances to building fire walls and floors	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil work Contractors and CP106 Contractor shall coordinate and agree on the sizes and locations.
20	Isolation and Insulation measures for the Platform Screen Doors (PSD) including insulating membrane beneath platform finish, insulation and surface seal between platform finish, PSD, and end returns, etc.	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Surfaces of the End Return Doors of the PSD to be insulated and coated with an insulating material by CP106. Resistance and earth tests at platform by CP106. Civil works contractors to co-ordinate with CP106 on PSD- platform interfaces. ~~CP106 to liaise with Civils' Contractor to develop the installation strategy.~~ ~~Installation will be carried out by Civil Contractor under supervision by CP106.~~
21	Top and bottom fixings and insulation at base of PSD.	CP106/ CP101-CP105, CP108 & CP109	CP106	CP106	CP106 to co-ordinate with Civil works contractors. Along platform edge and soffit down-stand beam for the entire length of the PSD. CP106 to provide all supports and fixings. Resistance tests between PSD and earth and those between PSD and platform to be done by CP106. Civil works contractors shall coordinate with CP106 on the construction of platform for the anchor installation.
22	All civil fixings/recesses necessary to secure PSD to the Station structures.	CP101-CP105, CP108 & CP109/ CP106	CP106	CP106	Along platform edge and soffit down-stand beam for the entire length of the PSD. Civil works contractors and CP106 shall ensure the structure can accommodate the fixing. CP106 to provide all supports and fixings.
~~23~~	~~Touch voltage insulation between PSD header and architectural panels such as cornice, false ceiling, etc.~~	~~CP106~~	~~CP106~~	~~CP106~~	~~Civil works contractors to co-ordinate with CP106.~~
~~24~~	~~End returns (remote from PSD) and glass panels~~	~~CP106/ CP101-CP105,~~	~~CP106~~	~~CP106~~	~~Civil works contractors to co-ordinate with CP106 about the~~

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No.	Interface Description	Design	Supply	Fix	Remarks
	~~extended from the ends of PSD.~~	~~CP108 & CP109~~			~~interface requirements at the PSD, walls and end returns.~~
25	PSD weight to be accounted for and the thickness of the platform at the edge to be considered before construction.	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	Civil drawing of platform to specify the weight of the PSD and the layout.
26	Platform structure with PSD	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	(1) The CP106 contractor shall design and construct the drop wall structure between concrete slab and PSD in the range of 210 m on the platform. (2) The weight of the PSD drop wall structure shall be less than 4,500 kg per 20m. The weight shall be supported by concrete slab and not by PSD.

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4.9 MAINTENANCE VEHICLE AND DEPOT EQUIPMENT

No.	Interface Description	Design	Supply	Fix	Remarks
1	Depot Equipment: Layout diagram of shops Equipment size Weight Handling for installation at permanent location Power Pneumatic connection Water use, connection Waste water Treatment of waste water Workshop wide summaries of services	CP106 / CP101	CP106 / CP101	CP101 / CP106	CP106 to provide requirements. CP106 to provide pipes, ducts and draw wires. Civil works contractors to co-ordinate and agree on size and location. Civil works contractors to provide pulling chambers where required. Civil works contractors to ensure cable pipes, ducts etc. are protected from ingress of water.
2	Arrangement of Facilities Swap locations of Workshop (WKS) and Light Repair Shop (LRS). ~~Extend LRS building to 420 – 440 m for 2 x 10-car trains / track along stabling tracks for trains to move into inspection/stabling position and out to service next day without routine shunting.~~ ~~Extended LRS with same number tracks to increase train stabling to total 30 x 10-car trains.~~ ~~Combine TC and PRI in same building to gain space at south end of depot.~~	CP106 / CP101	CP106 / CP101	CP101 / CP106	CP106 to provide requirements. Civil works contractors to co-ordinate and agree on size and location. Civil works contractors to coordinate with CP106 to ensure the design to meet the Employer Requirement.
3	Foundation for Automatic Wheel Inspection for diameter, tread – on train wash track	CP106	CP101	CP106	Foundation to be constructed by CP101 and CP106 is responsible for Design of Foundation and equipment installation

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No.	Interface Description	Design	Supply	Fix	Remarks
4	Foundation for Automatic Wheel Inspection for surface damage – on train wash track	CP106	CP101	CP106	Foundation to be constructed by CP101 and CP106 is responsible for Design of Foundation and equipment installation
5	Foundation for Automatic Pantograph Inspection – spanning train wash track and adjacent track	CP106	CP101	CP106	Foundation to be constructed by CP101 and CP106 is responsible for Design of Foundation and equipment installation
6	Foundation for Automatic Undercar blow-down facility – on train wash track	CP106	CP101	CP106	Foundation to be constructed by CP101 and CP106 is responsible for Design of Foundation and equipment installation
7	Depot Road Lighting Lighting Pole, Wiring & Luminaire.	CP106/ CP101	CP106	CP106	CP106 shall responsible for design, supplier and installation as its scope of work. CP106 and CP101 shall coordinate each other to complete the whole road lighting work.
8	Depot Road Lighting Foundation, earthing terminal, duct bank, conduit etc.	CP101/ CP106	CP101	CP101	Road Lighting foundation and locations & cable routing layout are based on design information from CP106. The CP101's work to be confirmed by CP106 on design and installation. The location shall be confirmed with CP106 prior to install.

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4.10 MAINTENANCE MANAGEMENT SYSTEM

No.	Interface Description	Design	Supply	Fix	Remarks
1	The BMS contractor shall define the content of the messages to be sent to MMS system.	CP101-CP105, CP108 & CP109/CP106	CP101-CP105, CP108 & CP109/CP106	CP101-CP105, CP108 & CP109/CP106	CP101- CP105, CP108 & CP109 and CP106 contractors shall be the responsible the interface arrangements. The BMS system will gather data (i.e. number of cycles of operation, powered up time) from a number of other sub-systems such as the Environmental Control System (including HVAC), TVS system, Power Supply etc. and pass the gathered data into the MMS. The MMS shall then use this information to update the usage data for each relevant asset and subassemblies. The BMS shall transfer alarm information data (alarm tag, time, label, description) to the MMS. The MMS shall have customized module developed to allow the operator to filter and select individual or group of alarm to raise "Service Requests" automatically.
2	Maintenance Management System (MMS) consisting of software and hardware for the planning and management of all maintenance work and associated function, including but not limited to following: Assets management, Material Management, Maintenance Schedule, work order, Maintenance Record, failure log etc.	CP106	CP106	CP106 / CP107	CP107 and CP106 Contractors shall coordinate and agree for the MMS requirements and CP107 shall provide all the necessary required data/information for MMS.
3	Building Management system: BMS	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	CP101-CP105, CP108 & CP109	BMS shall provide information to MMS system for any failure & event, is received automatically to MMS system. POI is the output port of the BMS device.

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4.11 INTEGRATED CONTROL AND SUPERVISORY SYSTEM (ICSS)

No.	Interface Description	Design	Supply	Fix	Remarks
1	CP106/ICSS will interface with each Civil contractor on their BMS at the stations.	CP106 / CP101-CP105, CP108 & CP109	CP106	CP106	CP101- CP105, CP108 & CP109 and CP106 contractors shall be the responsible the interface arrangements. Civil/BMS and CP106 Contractors shall coordinate and agree for the ICSS requirements and BMS shall provide all the necessary required data/information for ICSS. The type of protocol and circuit connection at point of interface between ICSS and BMS to be defined as appropriate during the detail design stage by both interface parties. Protocols for any interface communication shall be agreed and tested with common agreement of mutual parties with respect to system interface. Building Management System (BMS) shall provide status and alarm to ICSS for each station to control and monitor the M&E Building Services system/equipment, tunnel ventilation system and elevators and escalators etc.
2	CP106 will provide ICSS at the OCC	CP106 / CP101-CP105, CP108 & CP109	CP106	CP106	ICSS. the indication and alarm plan shall be developed during the detailed design with O&M input.
3	The interface between ICSS and BMS system shall include the following functions as stated on Remarks.	CP106 / CP101-CP105, CP108 & CP109	CP106 / CP101-CP105, CP108 & CP109	CP106 / CP101-CP105, CP108 & CP109	• Monitoring of operational status of building services and control of them for all underground stations & depot area as per designed monitoring and control philosophy. • Monitoring of BMS system at ICSS inside OCC for function of each station from OCC on normal and emergency condition.

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No.	Interface Description	Design	Supply	Fix	Remarks
					• Following Major Equipment status and alarm of BMS shall be transmitting to ICSS.
4	The BMS status signal to be provided to ICSS. The ICSS may have alarm status and control of the following services through BMS system • Fire Detection & Suppression system. • Lift and Escalators • LV station Circuits (i.e. lights, UPS, Diesel generator etc.) • Pump (fire main, sprinkles, drainage water, sewage, etc.) • ECS (air conditioning, heat exhaust, smoke control, etc.) • Intrusion alarms (Building entry, Room entry, etc.) • Tunnel Ventilation system. • Other if any	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109/ CP106	CP101-CP105, CP108 & CP109/ CP106	The Civil Works/BMS Contractor shall provide necessary status signal in the form of requisite number of dry contact or through BMS to system network for the selected M&E Building Services systems/equipment to the ICSS so that the M&E Building Services systems/equipment in the stations and tunnels can be monitored and remote controlled in the OCC through the ICSS. The ICSS shall be capable of receiving the outputs at the interface terminals voltage free contacts.
5	Rolling Stock health status and in-cab video monitoring	CP107/ CP106	CP107/ CP106	CP106/ CP107	Via Millimeter Wave Communication to transmit the status to ICSS Rolling Stock & ICSS both contractors shall be responsible for the interface arrangements with ICSS system.

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4.12 LINEAR HEAT DETECTION SYSTEM (FOR TUNNEL SECTION)

No.	Interface Description	Design	Supply	Fix	Remarks
1	The LHDS System inside tunnel area shall provide monitoring the tunnel temperature. The Tunnel temperature measured by the Tunnel Linear Heat detector will be transmitted to the Civil packages TVS / BMS system at each station.	CP106 / CP101-CP105, CP108 & CP109	CP106	CP106	Protocols for any interface communication shall be agreed and tested with common agreement of mutual parties with respect to system interface. CP101- CP105, CP108 & CP109 and CP106 contractors shall be the responsible the interface arrangements. The type of protocol and circuit connection at point of interface between LHDS and BMS to be defined as appropriate during the detail design stage by both interface parties. Protocols for any interface communication shall be agreed and tested with common agreement of mutual parties with respect to system interface.
2	The LHDS control panel will gather data pass the gathered data into BMS systems at station level.	CP106	CP106	CP106	The LHDS contractor shall define the content of the messages to be sent to BMS system. The BMS and LHDS contractors shall be the responsible the interface arrangements.
3	LHDS Functional Interface Requirement with the BMS.	CP106	CP106	CP106	LHDS shall provide status and alarm to BMS for each station to control and monitor.

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5 ROLLING STOCK

No.	Interface Description	Design	Supply	Fix	Remarks
1	Description of on-board Signaling & Communication Equipment's but not limited to the following: 1) On-board signaling system racks/cubicles 2) Wheel sensors SIG 3) Accelerometer SIG 4) Radar SIG 5) Antenna SIG 6) On boards data communication System (DCS) for CBTC 7) Driver Machine Interface SIG 8) Cables for interlink with signaling equipment 9) Cable connectors for signaling equipment 10) Train Radio- com 11) Antenna- com 12) Antenna cable - com 13) Connectors for communication equipment. The above-mentioned systems and devices from CP106: CBTC and CP NS-01: ETCS respectively.	CP106(CBTC) and CP NS-01(ETCS)	CP106(CBTC) and CP NS-01(ETCS)	CP107	CP107 and CP106 and CP NS-01 Contractors shall coordinate and agree on the size, space and location.
2	Cable description but not limited to the following: 1) Power supply cable for train radio 2) Power supply cable for Signaling & Communication equipment 3) Cables for train lines to signaling equipment Power supply cable for Advertising Equipment. 4) Power supply cable for Advertising Equipment.	CP106 /CP NS-01	CP107	CP107	CP107, CP106 and CP NS-01 Contractors shall coordinate and agree on the size and location
3	Fixtures and Fittings: Disconnection and terminal blocks, device mounting brackets and plates, flexible conduit assemblies complete	CP106 and CP NS-01	CP106 and CP NS-01	CP107	CP107, CP106 and CP NS-01 Contractors shall coordinate and agree on the size and location

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No.	Interface Description	Design	Supply	Fix	Remarks
	with connectors and cables from speed measurement devices to the junction boxes.				
4	Power Supply and Earthing Arrangements: Power supply circuits, including positive and negative poles, for the on- board signaling equipment. Dedicated earthing arrangements for the on-board signaling equipment	CP106/ CP NS-01	CP107	CP107	CP107, CP106 and CP NS-01 Contractors shall coordinate and agree on the size and location
5	Overhead Catenary System (OCS): OCS height, staggering, sag and other required parameters with reference to the Rolling Stock supplied pantograph.	CP107 and CP106	CP106	CP106	CP107 and CP106 Contractors shall coordinate and agree on the OCS height, staggering, sag and other required.
6	Maintenance Management System (MMS) consisting of software and hardware for the planning and management of all	CP107 and CP106	CP106	CP106	CP107 and CP106 Contractors shall coordinate and agree for the MMS requirements and CP107 shall provide all the necessary required data for MMS. CP107 and CP NS-1 shall provide the asset data (register) of rolling stock for MMS.
7	Voltage Drop in Traction System and Rectifier Capacity	CP107 and CP106	CP106	CP106	CP107 and CP106 Contractors shall coordinate and exchange the
8	CP107 shall provide six (6) units of couplers and deliver to the CP106 Contractor	-	CP107	CP106	CP107 & CP106 Contractors shall coordinate and exchange the information for schedule of delivery, location and other related requirements (if any).
9	Speed Meter of Signaling system	CP106 (CBTC) and CP NS-01 (ETCS)	CP106 (CBTC) and CP NS-01 (ETCS)	CP107	Display format (analog / digital) shall be decided by the CP107.

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No.	Interface Description	Design	Supply	Fix	Remarks
10	Switch and button for Signaling system	CP106 (CBTC) and CP NS-01 (ETCS)	CP106 (CBTC) and CP NS-01 (ETCS)	CP107	Type of switch, layout arrangement and data exchange interface shall be coordinated.
11	Audible alarm for Signaling system	CP106 (CBTC) and CP NS-01 (ETCS)	CP106 (CBTC) and CP NS-01 (ETCS)	CP107	Data exchange interface for ATP/ATO shall be coordinated.
12	Impedance between both side wheels for Signaling track circuit.	CP106 (CBTC) and CP NS-01 (ETCS)	CP107	CP107	DC resistance shall be less than 100 μΩ.
13	On board Radio system of Telecommunication system	CP106 (CBTC) and CP NS-01 (ETCS)	CP106 (CBTC) and CP NS-01 (ETCS)	CP107	Contractors shall coordinate power supply, cabling, data interchange with TIS, and location of installation.
14	Radio antenna for Radio system of Telecommunication system	CP106 (CBTC) and CP NS-01 (ETCS)	CP106 (CBTC) and CP NS-01 (ETCS)	CP107	Contractors shall coordinate power supply, cabling, data interchange with TIS, and location of installation.
15	On board CCTV system of Telecommunication system	CP106	CP106	CP107	Contractors shall coordinate power supply, cabling, and location of installation.
16	Millimeter wave transmission system on-board equipment and interface with CCTV, PID, PA and TMS systems etc.	CP106	CP106	CP107	Contractors shall coordinate power supply, cabling, and location of installation.
17	Pantograph	CP106	CP107	CP107	Contractors shall coordinate height of overhead contact line or rigid suspension system, arrangement of overhead contact line or rigid suspension system and characteristics.
18	Buffer Stop of Track Works	CP107	CP106	CP106	CP107 contractor shall provide dimension and weight requirement of rolling stock to

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No.	Interface Description	Design	Supply	Fix	Remarks
					CP106 Contractor for buffer stop design.
19	Testing: Rolling Stock static and dynamic test	CP107	CP107/ CP106	CP107/ CP106	CP106 supply support & staff during required testing in depot and mainline.
20	Maintenance of CP NS-01 equipment	CP NS-01	CP NS-01	CP NS-01	CP NS-01 shall develop maintenance plan for the operator of NSRP-S

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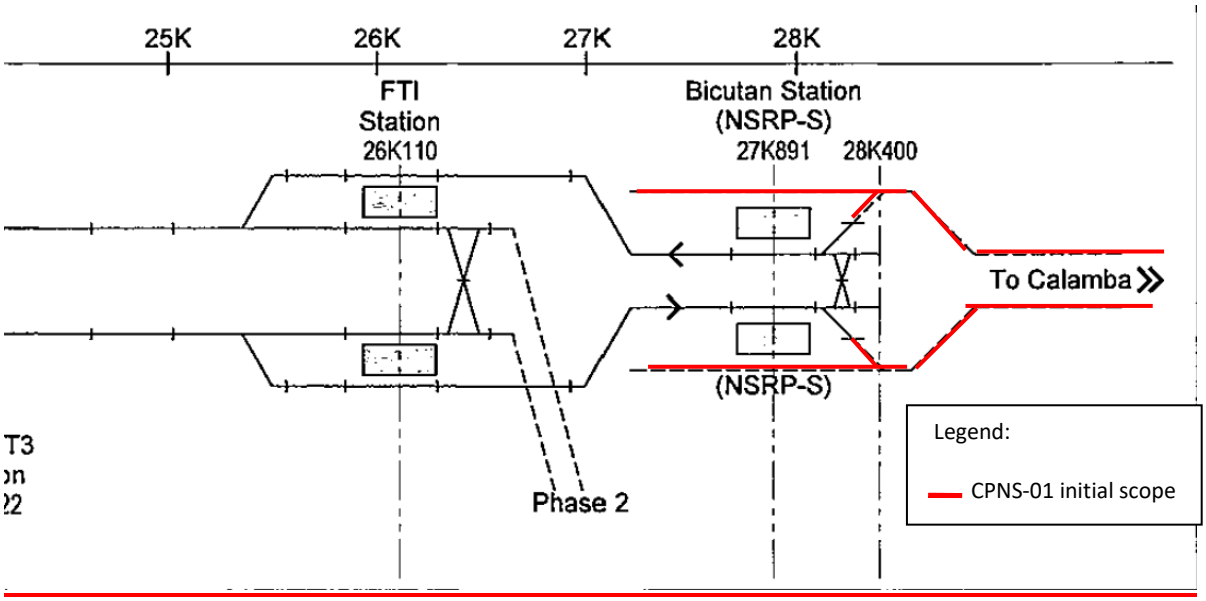
6 NSRP- S LINE & MMSP INTERFACE DEMARCATION



	NSRP-S	MMSP
1.Signalling:		
• CP-107 ETCS on-board equipment.	Will supply, test and commission the on-board ETCS equipment. Will participate in testing and commissioning of MMSP trains.	Will install the equipment on MMSP trains. Will participate in testing and commissioning of MMSP trains for interoperability.
• CP106 CBTC on-board equipment	Will participate in testing and commissioning of MMSP trains for interoperability.	Will supply, install, test and commission the on-board CBTC equipment.
• ETCS wayside equipment	Will supply, install, test and commission the wayside ETCS equipment at Bicutan station	Will participate in testing and commissioning of ETCS enabled trains to mitigate any interfaces issues with NSCR Signaling system.
• CBTC wayside equipment	Will participate in testing and commissioning of CBTC enabled trains to mitigate any interfaces issues with MMSP Signaling system.	Will supply, install, test and commission the wayside CBTC equipment
• MMSP trains coming from Bicutan to Sucat station.	ETCS system will send a slot request to CBTC system to set, lock and detect the points and confirm track occupancy (within CBTC area) in order to set a route when the MMSP train now in ETCS mode has established communication with NSCR OCC through GSM- R. Once	CBTC system will acknowledge the request and provide and fulfil point, track, route set/not set requirement with ETCS system using relay interface

	the slot conditions are met, the ETCS system will then set route from Bicutan to Sucat station.	
• MMSP trains coming from Sucat to Bicutan station	ETCS system will request point, track, route set/not set status, conflicting and opposing route status/exclusive access from CBTC system for route to be set up to the north end of the platform. Once received, the ETCS system will then dispatch the train from Sucat station to MMSP northbound platform of Bicutan station.	CBTC system will acknowledge the request and share/provide point, track, route set/not set status, conflicting and opposing route status/exclusive access with ETCS system using relay interface confirming availability of route to be set up to the north end of the platform.
• MMSP CBTC at Bicutan station.	Provide the slot for CBTC equipment.	Supply and install the equipment.
• MMSP CBTC at FTI station	N/A	Supply and install the equipment.
2.Telecommunication:		
• CP-107 GSM-R on-board equipment	Will supply, test and commission the on-board equipment on MMSP trains.	Will install the on-board equipment on MMSP trains.
• MMSP Millimetre wave telecom at Bicutan station	N/A	Will supply, install and test and commission the equipment.
• Backbone System: OFC	Will provide connectivity to NSCR OCC for Voice and Data Systems, CCTV, PA, PIDS AFC.	Will supply all equipment needed to connect to NSCR Backbone System.
• Radio Systems: GSM-R	Will provide the GSM-R Network connectivity for all Voice and Data within the NSCR Line; GSM-R Radios will be provided at Bicutan Station Controller.	N/A
• Radio Systems: CBTC	Will provide location and space for MMSP Broadband Radio Systems as per request.	Will supply and install, test and commission all MMSP radio system of CBTC.
• Voice and Data System •	Will provide the connectivity for all Voice and Data within the NSCR Line; Tie line to MMSP PABX System.	Will supply, install, test and commission all MMSP PABX System.
• PIDS	Will provide location and space required by MMSP for their PIDS on their Platform also space and location in the common areas between NSCR and MMSP.	Will supply and install, test and commission all MMSP PIDS on the platform and concourse.
• Public Address (PA) System	Common PA System for FTI and Bicutan to avoid	N/A

	overlapping. MMSP PA System will be integrated with NSCR and will be managed by Station Operator for station announcements. Central announcements will be carried out by either MMSP OCC or NSCR OCC.	
• Time Server and Master Clock System	All Clocks will be supplied, installed, tested and commissioned by NSCR	N/A
• MMSP telecom at Bicutan station	Provide the slot for CBTC equipment.	Supply and install the equipment.
• MMSP telecom at FTI station	N/A	Supply and install the equipment.
3.Trackwork (red line marking):		
• Bicutan station track	Supply up to the Bicutan station demarcation line. IRJ will be supplied by NSRP-S.	Supply up to the Bicutan station demarcation line.
• FTI station track	N/A	Supply and install the equipment.
4.Power		
• Bicutan Traction Power supply	NSCR will feed power up to the block joint which acts as the boundary limits for the collection of return current for the respective projects.	MMSP will feed all the way up to the block joint which acts as the boundary limits for the collection of return current for the respective projects.
• Bicutan station Power supply	NSCR will provide complete Non-Traction Power Supply	N/A
• FTI Traction power supply	The traction power supply and its feed are independent of MMSP line. NSCR will provide traction for NS Train Station located at Upper Level.	The traction power supply and its feed are independent. MMSP will provide traction for MMSP Station located at Lower Level.
• FTI station power supply	NSCR will provide non-traction power supply for NS Train Station located at Upper Level.	MMSP will provide non-traction power supply for MMSP Station located at Lower Level.
5.OCS		
• Bicutan station Overhead Catenary System	OCS limit is up to the section gap of the respective OCS system, yet to be finalized.	OCS limit is up to the section gap of the respective OCS system, yet to be finalized.
• FTI station Overhead Catenary System	Overhead Line Catenary System up to tunnel portal OCS at FTI is independent of MMSP line.	Supply and install the equipment up to tunnel portal.
6. PSD		

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• Bicutan station	NSCR will supply PSD equipment for all 4 platforms. PSDs of MMSP platform, when train is in ETCS mode will be operated by NSCR signaling system. Testing and commissioning will be a joint exercise.	PSDs of MMSP platforms will operate through MMSP Signaling System when train is in CBTC mode. Testing and commissioning will be a joint exercise.
• FTI station	NSCR NS01 will supply, install, test and commission PSD equipment for NSCR platforms **with** ETCS signaling system.	MMSP CP106 will supply, install, test and commission PSD equipment for MMSP platforms with CBTC signaling system.
7.AFC		
• Bicutan station	Will supply, install, test and commission AFC equipment.	N/A
• FTI station	Will supply, install, test and commission AFC equipment.	N/A
8.Civil		
• Bicutan station design	JDT Co-Design	JDT Co-Design
• FTI station design	JDT Co-Design	JDT Co-Design
• Bicutan station construction	Full scope	N/A
• FTI station construction	N/A	Full scope

- END OF APPENDIX 6 -