

PART 2: EMPLOYER'S REQUIREMENTS

CHAPTER 3: INTERFACE MANAGEMENT

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1. INTRODUCTION

Interface Management documents for Civil (Stations, Viaduct & At Grade), E&M, Solar, Power Supply, Traction, S&T, Telecom, AFC, Escalators, Lifts, Rolling Stock (RS), Receiving Substation (RSS), Track etc. Contractors of Elevated and At Grade Stations of **BANGALORE SUB-URBAN RAIL PROJECT for CORRIDOR – 2 & 4.**

This document describes the interface responsibilities and obligations of Civil Contractor (Stations & Viaduct) with other system contractors like E&M, Solar, Power Supply, OHE, S&T, Telecom, AFC, Escalators, Lifts, Rolling Stock (RS), Receiving Substation (RSS/TSS), Track etc. and vice versa. All the above "Contractors" have been addressed as "SYSTEM WIDE CONTRACTOR" for all interface purposes wherein any specific mention has not been done except Track Contract.

1.1 GENERAL REQUIREMENTS

S. No.	ITEM DESCRIPTION	DDC / CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
(i)	Work Areas	(i) Civil to provide properly levelled and debris free site storage space and works areas, access to and within the site, offloading and lowering areas for the use of all Contractors subject to availability. (ii) Civil to provide compacted and fully levelled space for movement of Hydra and parking of Cranes for lifting and lowering activities including the space required for crane outriggers.	(i) System wide contractors to advise requirements and date for handover to suit contractor's site program. (ii) System Wide Contractor to coordinate with Civil Contractor for proper Work Areas, Access to/from site and loading / unloading areas.
(ii)	Cranes	Civil to permit use of cranes on site by other Contractors on a mutually agreed rental basis (between SWC & the Crane providers) and subject to the availability of the same at the worksite.	System Wide Contractors to ensure their own arrangements for cranes and other machinery in case of the unavailability of the same with civil contractor.
(iii)	Scaffold	Civil to permit other Contractors the usage of scaffolding erected at site but only within the timings as agreed by the Civil Contractor so that it does not hamper the progress of civil works at mutually agreed terms and conditions.	System Wide Contractors have to arrange their own scaffolding. The usage of scaffolding erected by the civil contractor shall be allowed only during the periods as agreed by the civil contractor, under the supervision of the SHE staff of System Wide Contractors.
(iv)	Medical	As per Conditions of Contract on Safety & Health and Environment.	As per Conditions of Contract on Safety & Health and Environment.
(vi)	Lighting	Civil to provide general lighting to all common / general areas of the worksite till permanent lights become functional in that area or	Task lighting will be the responsibility of the various agencies / system contractors.

S. No.	ITEM DESCRIPTION	DDC / CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
		issuance of Taking over certificate whichever is earlier.	
(vii)	Power	(i) Civil to supply power distribution boards at each end of the concourse and platform. (ii) The energy charge rate per unit of consumption is to be mutually agreed with the system Contractors. (iii) The power supply shall be maintained until one month after energization of the LV system at ASS level or the confirmation from the system Contractors whichever is later. (iv) Thereafter Civil may take power supply at single point from ASS level on chargeable basis from employer, as per the rates conveyed by employer to the contractor for that period and the same shall be re-distributed to all system wide contractors by civil contractor on suitably revised rates. In Elevated station, power distribution board from civil contractor (two nos. at concourse level and two nos. at each platform level).	System Wide Contractors may obtain power supply from civil contractor on mutually agreed basis.
(viii)	Survey and marking	Civil to provide survey/ setting out grid line and level reference for stations and viaduct. Civil Contractor to promptly provide Grid Marking, Finish Floor Level (FFL), Platform Centre & Platform Edge marking at station(s) and Track Centre line marking as required by system wide contractors for ducting, piping, and cable tray work etc. in case the marking gets faded/ erased due to painting or any other work, then civil should restore it promptly. (ones area handover to system contractor its to be maintained by system contractor or it is to be clearly mentioned in tender document of civil contractor to be	

S. No.	ITEM DESCRIPTION	DDC / CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
		restored until completion of system contractor works).	
(ix)	Cleaning	Civil will be responsible for general site & Viaduct cleaning (except for removal of material pertaining to System contractors) and will identify separate designated dump areas for each contractor for material to be deposited prior to removal. In case any system contractor fails to remove his material, the Employer (BI-RIDE) / Employers' representative (GC employee) of respective system wide contractors shall inspect the site jointly and prepare a joint note. After written notice of minimum 3 days to the system contractor to remove his material, thereafter Civil / GC may instruct civil Contractor to remove it and the cost of the same shall be borne by the system contractor as mutually agreed upon by the Employers representative (GC) of various system wide contractors and civil. Civil will hand over the rooms to respective system contractors in properly cleaned condition and after providing proper lockable door & keys in a secured condition.	Once technical room is handed over, the principal system contractor for that room will take over responsibility for cleaning the room. Other system contractors to be permitted to continue their work following a mutually agreed and reasonable sequence on sharing basis without hampering/ damaging the work of any other system contractor. System wide contractor shall be responsible only for cleaning of room/ area after taking over the room / area from civil.
(x)	Security	The verification of any person removing material from site or bringing any material to site, shall be sole responsibility of the contractor to whom the material belongs. The system once approved by the Employer/Employee representative (GC employee) of Civil contractor shall be binding on all system contractors.	System wide contractors have to provide prior authorization in case they have to bring- in/remove any material from worksite. No loading/unloading of material shall be allowed without prior authorization.
(xi)	Safety	As per Conditions of Contract on Safety & Health and Environment.	As per Conditions of Contract on Safety & Health and Environment.
(xii)	Toilet &	As per Conditions of Contract on	As per Conditions of Contract on

S. No.	ITEM DESCRIPTION	DDC / CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
	Amenities	Safety & Health and Environment.	Safety & Health and Environment.
(xiii)	Drainage	Civil Contractor to provide and maintain pump arrangements for all requirements related to station.	E&M contractors will provide permanent feeder for power supply to drainage pump after commissioning of pump panel.
(xiv)	Access Dates	Civil contractor to provide and update System Wide Contractor the access date for various area in station, ancillary building etc.	System Wide Contractor to coordinate and interface with Civil contractor to obtain the access dates for various area in station, ancillary building etc.
(xv)	Civil Drawings	DDC (Civil) to provide the same as requested by System Wide Contractor, any proposed Change in drawings to be promptly communicated by DDC to System Wide Contractor for his consent and subsequent updation of drawings prior to execution of civil works.	System Wide Contractor shall collect Station, Architectural/ Structural drawings and sectional views in the concourse level, platform, interchange, ground level etc. from DDC (Civil). Any proposed design / drawing changes as communicated by civil contractor to System Wide Contractors are to be approved / commented by respective System Wide Contractors promptly prior to execution of civil works. Any proposed Change in system drawings which may affect civil drawings to be promptly communicated by System Wide Contractor to Civil contractor for his consent and subsequent updation of drawings prior to execution of civil works.
(xvi)	Services Requirements	Civil Contractor to carry out works as per requirements of latest approved drawings.	System Wide Contractor to timely provide the room size, door size and finish details for equipment rooms to DDC (Civil) for incorporation in Drawings.
(xvii)	Niches	-Civil Contractor to provide the same as per latest approved drawings. -FHC niches with proper drain arrangement to be provided by civil contractor.	System Wide Contractor to timely provide details of Niches required by them in the station area along with necessary cut-outs.
(xviii)	Site Office and Storage Space	Civil contractor to provide properly levelled and debris free site storage space and Office Space to System Wide Contractor as per the instructions of the Engineer.	System Wide Contractor to coordinate with Civil Contractor for provision of Proper and adequate Site Office and Storage Space.
(xix)	Regular Interface Meeting	-Civil Contractor to organize coordination meetings as per	All System wide contractors to attend coordination meetings as per project

S. No.	ITEM DESCRIPTION	DDC / CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
		project requirement to discuss interface issue, exchange information, drawings, documents etc. and inform Employer / Employer's representative (GC employee) for critical issues. Minutes of meeting for these meetings to be maintained and communicated by civil contractor.	requirement to discuss interface issue, exchange information, drawings, documents etc. and inform Employer / Employer's representative (GC Employee) for critical issues
(xx)	Cut-outs in Slab (Floor / Ceiling), Walls etc.	Civil contractor to provide the cut-outs and recesses in slab, walls etc. for passage of services as per SEM, WRD, CSD etc. drawings provided by Civil. Civil contractor to coordinate with System Wide Contractor for joint inspection of cut-outs prior to casting.	System Wide Contractor to coordinate with Civil for timely incorporation of their requirement in SEM, WRD, CSD etc. drawings. System Wide Contractor to jointly verify the compliance of all requirements prior to casting as per the approved drawings.
(xxi)	Lifting / Pulling Hooks	Civil contractor to provide the lifting hooks to the System Wide Contractors as per the location and hook design communicated by the System Wide Contractors.	System Wide Contractor to provide the equipment / plant weight, hook location and dimensional drawing of the hooks.
(xxii)	Foundations for Equipment	Civil contractor to provide foundations as per requirements of System Wide Contractor. Any structural detailing required for foundations has to be carried out by Civil Contractor based on design from System Wide Contractor. All foundations should be properly levelled and edge protection (Nosing) to be provided as per drawings.	System Wide Contractor to provide details of Foundations required by them in various station areas for various equipment.
(xxiii)	Water Tanks	Civil contractor to provide Water tanks of required capacity with partitions, waterproofing, interconnection etc. as per details provided in latest approved drawings, as per Employer's requirements with all necessary sleeves, cut-out, flanges, access manholes, manhole covers, monkey ladder, drainage arrangement etc. as per requirements given by System Wide Contractor in approved architectural drawings. Tiling to be provided in all the	System Wide Contractor to coordinate and interface with Civil Contractor for adequacy of E&M & BMS requirements.

S. No.	ITEM DESCRIPTION	DDC / CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
		tanks and drain with sump also to be provided in all the tanks. The Tank opening covers are to be provided with lock and key arrangements. Unused sleeves to be closed by civil contractor. Overflow of water tanks to be properly drained out to respective sump by civil contractor as per approved drawings.	
(xxiv)	Reflected Ceiling Plan (RCP)	Civil Contractor to provide the RCP and False Ceiling Installation Schedule to the System Wide Contractor whenever required by a system contractor. Furthermore, Civil Contractor to interface and coordinate with System Wide Contractor for provisions and installation arrangement of Services. -Civil Contractor to obtain clearance from System Wide Contractor before starting False Ceiling Works in any area. System Wide Contractor to provide the same without unnecessary delay. -Civil Contractor shall provide openings and any specific supporting arrangement if required by System Wide Contractor in false ceiling to install light fixtures, detectors or any other minor equipment etc. -Easily Openable and re-fixable access doors / Trap doors for piping valves, duct dampers etc. to be provided by Civil contractor in the false ceiling as per the requirement given by System Wide Contractors in approved drawings. -False ceiling supports should be installed after coordination with System Wide Contractor as per approved RCP.	-SWC to provide the coordinated RCP along with all services arrangement and location. -System Wide Contractor to further coordinate with SWC & Civil Contractor for finalization of E&M, Telecom, Escalator & BMS Services and installation arrangement along with False Ceiling Installation schedule. -System Wide Contractor to ensure that no fixtures/installations/cabling is done over the ceiling after issuing clearance for False Ceiling Works. Only those works which can only be done subsequently/after installation of false ceiling shall be allowed in coordination with civil contractor. -System Wide Contractor to provide location and opening size for any opening required to be left by the civil contractor to facilitate installation of fixtures such as lights, detectors, camera, speakers, PIDs, Signage, etc.
(xxv)	Flooring / Wall cladding works	-Civil contractor to provide the cutouts and recesses in flooring/cladding works as per latest architectural drawings provided by DDC. -Civil contractor to coordinate with	System Contractor to coordinate with Civil contractor for timely incorporation of his requirement in architectural drawings. They also need to jointly verify the compliance of all requirements prior to execution

S. No.	ITEM DESCRIPTION	DDC / CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
		System Wide Contractor for joint inspection of the same prior to carrying out flooring/cladding in that area.	of works.
(xxvi)	Dewatering	Civil Contractor to provide temporary pumping arrangements along with Discharge piping at all locations to avoid water logging in the Station.	System contractor shall coordinate with civil contractor for dewatering and civil contractor will do the same till ROD.
(xxvii)	Closing of Cut-outs/Openings/Gaps	-Civil Contractor to close / optimize all cut-outs as cleared by System Wide Contractor, wherever the gap for closing is more than 200 mm in stations. -Civil contractor will carry out fireproof sealing of all cut-outs / openings/ Gaps of more than 200 mm size at Stations with concrete / block work/ACP. (Should be specify in GFC civil drawings)	-System Wide Contractor to give clearance to civil for optimization / closing of cut-outs after installation of services. -In Stations, Fire sealing of openings of up to 200 mm, shall be done by the respective system contractors whose service is passing through the cut-outs. SWC to provide cutout details and drawings
(xxviii)	Temporary Doors	Civil Contractor to provide proper Temporary Doors with Locking arrangement at the time of giving access to work areas till the provision of permanent doors.	System Wide Contractor to take over the rooms for working only after provision of Temporary Doors with proper locking arrangement by Civil Contractor.
(xxix)	Epoxy Flooring	Civil contractor will provide Epoxy flooring / Painting in TER, SER and SCR rooms as per the procedure and specifications provided System Wide Contractor in the contract / as per the instructions of the Employer / Employer's representative and as per the provision in BOQ of Civil / Finishing works.	System Wide Contractor will coordinate with civil contractor for Epoxy flooring /Painting in ASS, LIFT PIT, TER, SER and SCR.

1.2 GENERAL INTERFACE REQUIREMENT

S.NO.	ITEM DESCRIPTION	DDC/ CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
(i)	Openings/Cut-outs/Casting	-Civil to provide openings as per latest approved drawings. -Civil will get pour card signed by concerned System Wide Contractor prior to casting to ensure that work has been done as per approved drawings. -Any modification in cut-outs etc. for improvement / better functioning of the system shall be done by civil along with undertaking from Electrical systems contractors duly approved by respective Employer/Employers representative.	-Any changes if proposed are to be requested by system wide contractor in writing well in advance, through the Employer/Employers representative of his contract to architecture wing of Employer/Employers representative for incorporation in architectural drawings, prior to execution of civil works. -System Contractor to sign the pour card in coordination with civil contractor. Any changes (such as change in service opening, lifting / pulling hooks, foundation, ducts etc.) desired by the System Wide Contractor post execution of any civil work shall be on the account of the agency/ System Wide Contractor responsible for the change, if not as per approved drawings.
(ii)	Delivery of Material at Site	-Civil to assist System Wide Contractors in planning equipment delivery route for major materials and plant of the system contractors showing temporary and permanent provisions in slabs and walls to permit future replacement of plant and to allow initial transport from ground level to final room location in consultation with system contractors. -Civil to provide ingress / egress route including loading deck (in case of elevated stations), closing / opening arrangements in consultation with System Wide Contractor. -Civil contractor to provide the temporary opening of required size and access routes for delivery of equipment as proposed in equipment delivery route. No wall etc. to be altered /closed in the delivery route before clearance from respective system wide contractors.	-System Wide Contractor to plan and propose their own Equipment Delivery Route in consultation with civil contractor. -All System Wide Contractors to provide the equipment & plants weight, dimension etc. to Civil contractor to provide temporary opening and access route and the same to be agreed and reflected in Equipment Delivery Route Drawings. -System Wide Contractor to deliver the plants and equipment

S.NO.	ITEM DESCRIPTION	DDC/ CIVIL CONTRACTOR	SYSTEM WIDE CONTRACTOR
(iii)	Water for Pump Testing	Treated / Raw WATER (QUANTITY & TYPE OF WATER AS PER REQUIREMENT OF SYSTEM CONTRACTOR 8 Lacs liters approx. per station) shall be provided by civil for carrying out testing activities if a permanent water supply arrangement is not available.	System Wide contractor will provide the requirement to civil contractors.
(iv)	Interface Coordination Meeting	The civil contractor shall conduct regular meetings with other system contractors and vice versa as necessary to clarify particular aspect of the requirement of the works.	All system contractors shall ensure the presence of their qualified /experienced coordinating engineer during civil construction works to enable proper interface with civil contractor to ensure timely intervention (if necessary) and swift interfacing of works.
(v)	Resolution of Interface issues	Civil contractor as well as other system contractors shall, in carrying out their interface coordination responsibilities, raise their observations well in time and provide sufficient information for the employer to decide on any disagreement between contractors. If any contractor, despite having made reasonable efforts, cannot resolve any such disagreement, then the decision of the employer shall be final.	Civil contractor as well as other system contractors shall, in carrying out their interface coordination responsibilities, raise their observations well in time and provide sufficient information for the employer to decide on any disagreement between contractors. If any contractor, despite having made reasonable efforts, cannot resolve any such disagreement, then the decision of the employer shall be final.

1.3 SPECIFIC/ADDITIONAL INTERFACES WITH INDIVIDUAL CONTRACTORS**a) INTERFACE BETWEEN CIVIL AND POWER SUPPLY CONTRACTOR**

S. No.	ITEM DESCRIPTION	CIVIL CONTRACTOR	POWER SUPPLY CONTRACTOR
1	ASS Room / Building	(i) Shall design and construct ASS room / building to the requirement of the PS (Power Supply) Contractor. (ii) Shall provide loading deck / Platform (open to sky) for carrying heavy equipment and materials to substations. (iii) Room should be constructed as such that wall mount equipment & ceiling suspended cable trays to be fixed, room temperature to be maintained, water seepage/leakage to be avoided, etc. (iv) Shall construct ASS rooms keeping in view the specific requirements of PS Contractor regarding passages, ingress /egress routes, door size, knock out panels, floor openings etc. for access of heavy equipment's forming permanent works (v) Shall provide ASS room complete in all respects, including flooring, ventilation, access doors, rolling shutters, windows, ventilators and interior finish. (vi) Civil contractor to allow PS contractor for mounting of cable trays and erection of wall mounted panels on walls.	(i) Shall provide the layout drawings to Station Building Contractor. (ii) Shall provide dimensions and weights of various equipment. (iii) Power supply contractor to provide the details like size, load etc. of wall mounting panels and cable trays to civil contractor
2	Installation of 33 kV cables and control cables - Station Areas	a. Cut-outs/Openings on the parapet under the platform edge. b. Shall make provision for passage /crossing of various cables in the station along the walls, under the platform copings etc. for cable entry from viaduct cable duct to ASS room. c. Support ladder arrangement from Parapet opening to Intermediate level / 33 kV route on link bridge. d. Throughout the 33 KV route along with catwalk on link bridge shall have	(i) Shall provide weight & dimensions of the cables. (ii) Shall supply & install 33 kV and other cables. (iii) Shall design & provide and install cable path (duct, metallic brackets, cable trays etc.) as per requirement inside ASS. (iv) Shall co-ordinate and give requirements to the Station Contractor for the cable path, gallery

S. No.	ITEM DESCRIPTION	CIVIL CONTRACTOR	POWER SUPPLY CONTRACTOR
		supports to carry 33kV/HT cable as per requirements by PS contractor. e. From Intermediate level to till ASS room connectivity and catwalk to be provided as per requirements of PS contractor. f. Shall take into consideration the bending radius of cable and covering of cables in public places.	size, route alignment and mounting requirements for cables in the Station area.
3	Temporary Power for Installation, Testing & Commissioning	Shall provide sockets for temporary power, if available, inside ASS rooms as per requirement.	(ii) Shall co-ordinate with Station Contractor for provision of suitable sockets inside ASS rooms for temporary power. (ii) Shall pay to the Station Contractor for the power consumption. Note: If temporary power is not available from Station Contractor, then PS Contractor shall make his own arrangement.
4	Cable bracket arrangement for carrying power, earthing and control cables on viaduct/At grade	(i) DELETED (ii) Cables supports for all system wide contractors shall also be supplied and installed by Civil Contractor. (ii) Shall provide suitable opening & inserts for carrying cables as per requirement throughout the corridors	(i) Power supply contractor to provide the details of brackets requirement and cables loading to civil contractor. (ii) Shall supply and install cables on the viaduct/at-grade. (iii) Shall co-ordinate and give requirements to the Viaduct/at grade Contractor for the cable path, route alignment and mounting requirements for various cables on the viaduct.
5	Providing openings in viaduct structures for routing cables etc.	Viaduct Contractor shall provide openings to the requirement of PS Contractor.	PS Contractor shall advise the size and locations where the openings / cut-outs are required.

S. No.	ITEM DESCRIPTION	CIVIL CONTRACTOR	POWER SUPPLY CONTRACTOR
6	Mounting of structures for power sockets/ viaduct light fixtures on parapet & At-grade	Shall allow required drilling and provide opening in parapet & at-grade as per the requirement of PS Contractor.	PS Contractor shall provide necessary fixing details for viaduct & at-grade lighting to Viaduct & at-grade contractor and shall provide cable and support and design of opening for cable crossing.
7	Track Crossing of system cables at-grade level	Civil contractor shall provide sufficient no. of embedded HDPE/Hume pipes under the track formation to lay system cables. These pipes shall be connected to pull-pits on both side. Pull-pits shall be connected to system rooms through buried pipes/trenches.	System contractors shall provide the requirements

b) INTERFACE BETWEEN CIVIL AND OHE/OCS CONTRACTOR

S. No.	ITEM DESCRIPTION	CIVIL CONTRACTOR/STATION BUILDING CONTRACTOR	OHE /OCS CONTRACTOR
1	Support for OHE from platform shed roof trusses	Civil Contractor/ SBC will provide the necessary steelwork and bolt-holes etc. at designed height to enable the suspension members to be supported from the platform shed roof trusses.	(i) OCS Contractor will provide general arrangement showing suspension members from station ceiling, from which OCS can be supported. (ii) OCS Contractor will also indicate typical bending moment and direct load arising from OCS at suspension points. (iii) OCS Contractor will prepare detailed drawings for support of OCS from suspension members.
2	Warning and indicator boards	Shall provide suitable fixings arrangements for indicator boards in station areas as per requirements of OCS.	(i) Shall coordinate and inform locations of OCS warning and indicator boards. (ii) Shall furnish the relevant drawings. (iii) Shall review the fixing arrangement. (iii) Shall supply and install all (iv) warning and indicator boards.
3	Providing OCS Mast / Portal, anchors etc. on Viaduct	(i) Will arrange to strengthen concerned segments and provide holding down bolts (as per designs /drawings provided by OCS Contractor). (ii) OHE holding down bolts shall be greased and properly covered to protect the damages to bolt threads. (iii) As per site condition, if there are any changes in viaduct, Viaduct contractor will interface with OCS contractor to further modification.	(i) OCS Contractor/DDC will prepare list of segments requiring strengthening, to receive OCS masts, anchors etc. (ii) OCS contractor/DDC will provide OHE loads to be considered for viaduct and segments design. (v) OCS Contractor shall verify OHE the location.
4	Earthing and bonding arrangements at viaducts	(i) Shall supply and provide dedicated earth bars and earth terminals according to drawings ensuring continuity of reinforcement bars of viaduct segments piers and parapet segments. (ii) Shall provide earth terminals for connection. (iii) Shall coordinate with OCS Contractor for verification of earthing and bonding measures adopted in the structure as per the recommendations in approved design. Pier Earthing Terminal for Viaduct	(i) OCS Contractor/DDC shall provide designs / drawings showing arrangement of Earth terminals required to be provided on piers, pedestals, segments, parapet etc. and the extent of welding required to be done on Reinforcement bars. (ii) Shall design, supply and install BEC and earthing plate at ITL locations. (iii) Shall provide the necessary earthing connections between BEC & ITL earthing plates etc. and the earth terminals. This will include supply of cable to connect BEC and other

S. No.	ITEM DESCRIPTION	CIVIL CONTRACTOR/STATION BUILDING CONTRACTOR	OHE /OCS CONTRACTOR
1	Support for OHE from platform shed roof trusses	Civil Contractor/ SBC will provide the necessary steelwork and bolt-holes etc. at designed height to enable the suspension members to be supported from the platform shed roof trusses.	(i) OCS Contractor will provide general arrangement showing suspension members from station ceiling, from which OCS can be supported. (ii) OCS Contractor will also indicate typical bending moment and direct load arising from OCS at suspension points. (iii) OCS Contractor will prepare detailed drawings for support of OCS from suspension members.
2	Warning and indicator boards	Shall provide suitable fixings arrangements for indicator boards in station areas as per requirements of OCS.	(i) Shall coordinate and inform locations of OCS warning and indicator boards. (ii) Shall furnish the relevant drawings. (iii) Shall review the fixing arrangement. (iii) Shall supply and install all (iv) warning and indicator boards.
		piers Shall be provided in between two tracks on viaduct at deck level for laying of earthing connection cables from pier earth terminal to BEC.	connecting plates. (iv) Shall coordinate with Viaduct Contractors for verification of earthing and bonding measures adopted in the structure as per the recommendations in approved design.
5	Earthing connection for handrails	The viaduct contractor shall ensure that normally there should be discontinuity in handrails	OCS Contractor/DDC will provide the requirement of Earthing to handrails at locations
6	Provision of Manholes cover on viaduct	Viaduct contractor shall ensure that all the manholes and opening on viaduct are properly covered before handing over the access for work to OCS contractor.	OCS contractor shall coordinate with viaduct contractor
7	Trees trim near viaduct/at grade	Viaduct contractor/Civil contractor shall cut/trim the trees as advised by OCS contractor to have free access for OCS installation.	OCS contractor shall provide the list of locations where tree cutting/trimming is required for proper erection of OCS.

c) INTERFACE BETWEEN RSS & TRACTION (NOT REQUIRED)**d) INTERFACE BETWEEN TRACTION AND ROLLING STOCK (RS) CONTRACTOR**

S.No.	ITEM DESCRIPTION	TRACTION CONTRACTOR	ROLLING STOCK CONTRACTOR (RS)
1	Supply of Basic data and information regarding following: -Speed/current characteristics. - Speed /Tractive Effort curves. - Current Collection equipment details. - Regeneration - Acceleration and braking - Motor KW and specifications - Speed/Braking Effort curves -Auxiliary power requirement and its Power factor. Acceleration & Braking - Harmonics - Power Factor correction - Pantograph details - General Arrangement Diagram & Power Supply Schematic of Rolling Stock.	Traction and regenerative curves are required for Traction Simulation. Harmonic types and range are required for the EMI Simulation. These shall be required prior to the key date of design submission (at least 1 month before KD).	Shall supply information to Traction Contractor
2	Neutral Sections	Traction contractor shall supply information about location, arrangement etc. to Rolling Stock contractor.	a) Rolling Stock Contractor will check and confirm suitability and locations. Supply and install track side equipment if required as per Rolling Stock design.
3	Location of warning boards and visual indications at Neutral sections	-Traction contractor will supply and install the Boards and indications. -Details of warning boards shall be shared with Rolling Stock by Traction Contractor.	Rolling Stock will confirm the suitability of the location of VCM open and VCB closed boards at Neutral section.
4	Deleted		

S.No.	ITEM DESCRIPTION	TRACTION CONTRACTOR	ROLLING STOCK CONTRACTOR (RS)
5	Details drawings of Pantograph and Pantograph head	Traction contractor to take into consideration for the design of the OHE SYSTEM.	-Rolling Stock Contractor shall provide information to DDC/Traction Contractor. -Drawing of Pantograph head and Dimensional drawing of Pantograph shall be provided by Rolling Stock Contractor.
6	Detailed massed, springing and damping of pantograph.	-Traction contractor to take into consideration for the design of the OHE system. -Details required for Panto dynamic simulation and OHE Design.	-Drawing of Pantograph head and Dimensional drawing. -Panto pressure and carbon strip material of Pantograph shall be provided by Rolling Stock Contractor.
7	Pantograph sway calculation and validation of dynamic interaction with OHE.	Traction Contractor to take into consideration for the design of the OHE System and provide relevant data to Rolling Stock Contractor for Simulation and validation as per EN 50317 and EN 50318.	-Maximum sway value due to curves shall be provided by Rolling Stock Contractor to Traction contractor. -Rolling Stock Contractor shall assess the dynamic interaction as per EN50317 and validate as per EN50318.
8	Maximum traction return current	Traction Contractor to take into consideration for the design of the OHE system and bonding plan.	Rolling Stock Contractor shall provide required information to Traction contractor.
9	Camera installation in trains directed towards pantograph for real time monitoring at OCC	Traction contractor will interface with Rolling Stock Contractor for the live view storage as well as transmission of the camera footage to train equipment/OCC.	-Rolling Stock Contractor shall provide High quality camera with night vision facility at the roof of the train directed towards each pantograph with real time video storage and transmitting facility and connect the same to train NVR/switch similar to other cameras of Rolling Stock. -Rolling Stock Contractor will facilitate Signaling contractor for relay of real time video footage of Pantograph monitoring cameras at OCC and arrangement of downloading of CCTV footage on demand basis and event pre-1 min and post 5 min of fault at OCC from the train borne NVR/Switch.

S.No.	ITEM DESCRIPTION	TRACTION CONTRACTOR	ROLLING STOCK CONTRACTOR (RS)
10	Camera installation in trains on front and rear cabs focused towards OHE for real time monitoring at OCC	Traction contractor will interface with Rolling Stock Contractor for the live view Transmission of the train camera to OCC.	-Rolling Stock Contractor shall provide high quality camera with HD night vision facility on front and rear cabs focused towards OHE with video storage as well as transmitting facility and connect the same to train NVR/ Switch similar to other cameras of Rolling Stock. -Rolling Stock Contractor will facilitate Signaling contractor for arrangement of Playback of stored video in train for selectable time period at OCC from the train borne NVR/Switch.
11	Pantograph Automatic Drop Device (ADD) SYSTEM with event generation at OCC.	Traction contractor will interface with Rolling Stock Contractor for the provision of Pantograph Automatic Drop Device (ADD) System with event generation at OCC.	Rolling Stock Contractor shall provide Pantograph Automatic Drop Device (ADD) System with event generation at OCC.

e) INTERFACE BETWEEN DDC/TRACTION and VIADUCT CONTRACTOR

S.No.	ITEM DESCRIPTION	VIADUCT CONTRACTOR (VDC)	DDC / TRACTION CONTRACTOR
1	Providing OHE Poles, anchors etc. on viaduct the bending moment shall be taken into account.	-Will provide segment list and alignment drawing for preparation of OHE layout Plan (LOP). -Will arrange to strengthen the concerned segments and provide holding down bolts along with nuts (as per approved drawing provided by the DDC/Traction Contractor for Viaduct). -Viaduct contractor shall ensure that the bolts provided shall be greased and covered and undamaged for easy movement of nuts.	-DDC/Traction contractor will prepare list of segments / U-Girder mast location requiring strengthening, to receive OHE masts, anchors etc. based on available track plans. -TRACTION Contractor will verify at site. If there are any changes in the track layout plans, TRACTION Contractor will interface with viaduct contractor to further add segments to the list (wherever segments are not cast) or modify OHE design etc. to suit available strengthened segments/ U-Girder.
2	Cable bracket arrangement for carrying power and control cables on viaduct/at grade	Will provide brackets as per design given by DDC/Traction contractor.	DDC/Traction contractor will give drawing of brackets for power and control cables on viaduct/at grade.

3	Providing openings in Viaduct/at grade structures for passing cables etc.	Will provide openings as per requirements shown in the design.	DDC/TRACTION contractor will advise the size and locations where the cut-outs are required.
4	Providing arrangement for marshalling box and viaduct lighting	Viaduct contractor to provide the bolts for Marshalling box installation arrangement at switching post location as per the design shared by traction contractor. Viaduct contractor to provide the bolts for viaduct lighting as per the design shared by traction contractor.	Traction contractor to provide the design for installation of marshalling box and viaduct lighting to viaduct contractor.
4	Earthing connections	Will supply and provide welding of Reinforcement bars and earth terminals according to drawings ensuring continuity of reinforcement bars of viaduct segments piers and parapet segments. Provide earth terminals for connection.	DDC/TRACTION contractor will provide drawings showing arrangement of Earth terminals required to be provided on piers, pedestals, segments, parapet, railing etc. and the extent of welding required to be done on Reinforcement bars. -TRACTION Contractor will provide the necessary earthing connections between BEC/OPC/ITL/any other steel structure earthing plates etc. and the earth terminals. This will include supply of cable to connect BEC and other connecting plates.
5	Earthing connection for handrail	The viaduct contractor shall ensure proper welding of Vertical and horizontal bars of the railings and will provide the necessary earth connection.	DDC/TRACTION Contractor will provide drawings showing arrangement of earth terminals required to be provided for earthing the handrail.
6	Electrical and physical clearances as specified in the drawing	Respect the given clearances throughout the viaduct.	DDC/TRACTION contractor will co-ordinate with Viaduct Contractor.

7	At viaduct suitable monkey ladder/platform may be provided for easy accessibility of BM & Isolator for manual operation.	The viaduct contractor shall provide the monkey ladder / platform access as per requirement of DDC/Traction contractor at designated locations within SOD.	TRACTION contractor will interface with Viaduct Contractor and give the locations for the provision of monkey ladder / platform for accessibility.
8	Shielding sheet provision at BMRCL/Indian Railways and BSTP alignment interface	Viaduct contractor to provide required bolting arrangement for shielding sheets as applicable locations as directed by Employer/Engineer. Viaduct contractor shall collect the drawings for bolting and mounting provisions.	Traction contractor to provide Shielding sheet with relevant mounting structures at applicable locations as directed by Employer/Engineer. Required drawings shall be prepared by traction contractor.

f) **INTERFACE BETWEEN DDC/TRACTION & TRACK CONTRACTOR**

S.No.	ITEM DESCRIPTION	TRACK CONTRACTOR	DDC / TRACTION CONTRACTOR
1	Information regarding track alignment, curves, levels etc.	Will provide information to DDC/Traction contractor.	
2	Viaduct and bridges, earthing through tracks plinth and plates welded to plinth reinforcement steel.	Supply and install GI plates on every deck end. Ensure the electric plinth continuity on every span by providing earth terminals at each end of the plinth duly connected with cable. The material details and specifications of connecting cables shall be interfaced with TRACTION contractor. Plinth to plinth connection shall be done by Track contractor.	Traction contractor will supply and connect the connection cable to the BEC and plinth connecting plates at the end of consecutive spans. Specification of plinth-to-plinth cable connection shall be provided by Traction contractor.
3	Providing pipes for track crossing, for cables.	-Track contractor shall interface with Traction Contractor for finalizing location of pipe crossings. -Will provide pipes buried in concrete as per design provided by DDC/Traction Contractor for Viaduct and seal them temporarily.	-DDC/ TRACTION will provide drawings showing requirement of pipes at specific locations. -TRACTION contractor shall supply and provide the pipes over viaduct and pipes over parapet walls and interface with TRACK for correct location of pipes and verify before plinth casting.
4	Providing continuity bonds in tracks.	Will check the details and confirm acceptability.	DDC will provide bonding details. TRACTION contractor will provide the continuity bonds.
5	Electrical and Physical clearance	Respect the given clearance.	Shall provide necessary drawings.
6	Track Centre Line	Track Contractor shall provide the track -center line.	

g) **INTERFACE BETWEEN DDC/TRACTION AND STATION BUILDING CONTRACTOR (SBC)**

S.NO.	ITEM DESCRIPTION	STATION BUILDING CONTRACTOR	DDC/TRACTION CONTRACTOR
1	Support of OHE from Platform shed roof trusses	Station Building Contractor will provide the necessary / suitable (as per required loading) steelwork and bolt-holes etc. to enable the suspension members to be supported from the platform shed roof trusses.	-DDC/Traction Contractor will provide general arrangement showing suspension members from station ceiling from which OHE can be supported. DDC will also indicate typical bending moment and direct load arising from OHE, at suspension points. -TRACTION contractor will prepare detailed drawings for support of OHE from suspension members.
2	Providing OHE masts / anchors on external parapets at stations.	Will provide holding down bolts as per approved drawings (used on viaduct to take the baseplate).	-DDC/Traction Contractor will indicate the locations where masts/anchors are required to be provided (in the pegging plans). -TRACTION contractor will provide bolted base OHE masts / anchors etc.
3	Providing electrical and mechanical clearances for OHE	Will ensure that the clearance diagrams are respected and there are no infringements.	DDC/TRACTION contractor will provide the necessary clearance diagrams showing minimum clearances required from OHE.
4	Providing earthing connections	Will provide necessary earth terminals, earth mesh etc. and risers and respect the schematic earthing drawing, will ensure provision of continuity of earthing platform shelter/canopy, as per approved drawings.	-DDC/TRACTION contractor will provide Earthing connection drawings, showing locations of earth terminals, separate MET for RTU, earth mesh etc required at stations. -TRACTION contractor will provide necessary interconnections between earth terminals/riser terminals and earth conductors (OPC, BEC) as shown in the Earthing connection drawings.

h) INTERFACE BETWEEN TRACTION AND DEPOT CIVIL CONTRACTOR

S.No,	Item Description	DEPOT CIVIL CONTRACTOR	TRACTION CONTRACTOR
1	Feeding Post	Prepare a space as per the drawing.	Install equipment's in the Feeding Post
2	Installation of OHE in Workshop (Inspection Bay), Stabling shed, Interior cleaning Plant and Emergency Equipment Building.	Realize supporting structure preparation for OHE suspension / bracket assemblies on the columns and drop arms fixed on trusses as per specific detailed drawings.	-Supply of Interface drawings including requirements of mounting plates on columns and drop arms fixed to the trusses, supports for termination arrangements on beams/ slabs etc., for various buildings. -Supply and install bracket assemblies with fastening devices on the columns and drop arms.
3	ASS room preparation according to drawing and the following criteria: ASS room layout principle- i) Preparation of ASS Room as per drawings and specification. ii) Possibility of concrete refilling 0.3m depth. iii) Floor and walls prepared with anti-dust paint. iv) 2 doors 2x3 m with anti-panic system (bar across the door facilitating its opening). v) Low voltage	Prepare the ASS room as per the drawing and criteria.	Supply Interfacing drawings

	installations (Lighting, Socket, fans, ventilation, fire protection). vi) Transformers access from the nearest suitable road.		
4	Foundations for OHE Masts	Depot civil Contractor shall provide proper levelled & compacted soil is to Traction Contractor before proceeding for OHE foundation works.	Traction Contractor shall interface time to time for handovers. Traction contractor to cast foundation for OHE in depot.

i) **INTERFACE BETWEEN TRACTION BOX SECTION / RAMP CONTRACTOR**

S.NO.	ITEM DESCRIPTION	RAMP CONTRACTOR	TRACTION CONTRACTOR
1	Earthing arrangements in the Ramp portion	The earthing bars embedded in concrete and earth plates will be provided by RAMP Contractor as per approved design and specifications provided by DDC / TRACTION CONTRACTOR.	Connections to Earth plates as per design and specifications provided by DDC/Traction will be made by TRACTION CONTRACTOR.
2	Erection of Masts / Cantilevers / OHE terminations for OHE support, Lightning arresters etc in the Ramp portion	RAMP contractor will provide the necessary holding down bolts, for masts, as per design and specifications	-DDC/Traction will provide necessary designs, showing locations and holding down bolt's arrangements. -TRACTION CONTRACTOR will supply and erect OHE Masts with Base Plates at the locations as per design.
3	At transition of RAMP towards rail corridor where viaduct height is low, side railing with concertina wires to be provided	At transition of RAMP towards rail corridor where viaduct height is low, RAMP Contractor will provide side railing with concertina wires.	TRACTION CONTRACTOR will interface with RAMP Contractor for provision of side railing with concertina wires at transition of RAMP towards rail corridor where viaduct height is low.

j) **INTERFACE BETWEEN TRACTION AND SIGNALING (SIG), PG/PSD CONTRACTOR**

S.NO.	ITEM DESCRIPTION	TRACTION CONTRACTOR	SIGNALING (SIG), PG/PSD CONTRACTOR
1	Signal's locations around insulated overlaps / SI, Booster Transformer locations	a) Traction Contractor will provide locations of insulated overlaps / SI etc. to Signaling Contractor. b) c) Traction Contractor shall take Signaling plan / Signal location(s) from Signaling Contractor / Signaling department before finalizing the Sectioning plan. Sectioning plan shall be shared by Traction Contractor with Signaling contractor for jointly deciding the IOL/SI/ locations etc. d) For any dispute, Employer/ Engineer shall decide the location.	a) Will avoid Signal ahead of /Insulated overlap location as mutually agreed with the Traction contractor. i b) Signaling plan / Signal location(s) shall be provided by Signaling contractor/Signaling department to Traction contractor for finalization of OHE sectioning arrangements. i) Signalling and Train Control Contract is finalized on Design , Build Mode. The Exact location of Signals will be given by the Signalling Contractor. iii) If there are any issues cropping up before the Signalling Contractor is on board, such issues be referred to the GC Signalling Team. c) For any dispute, Employer/ Engineer will decide the location.
2	Design of Signal locations near Neutral Section.	Traction Contractor shall take Signaling plan / Signal location(s) from Signaling Contractor / Signaling department before finalizing the Sectioning plan. Sectioning plan shall be shared by Traction Contractor with Signaling contractor for jointly deciding the location. -For any dispute, Employer/ Engineer shall decide the location.	-Will design the signal location in such a way that a train starting from rest position is able to achieve necessary speed to negotiate the neutral section, with power off, under its own momentum. -Respective signaling Contractor(s) shall design Signal Locations such that no train or a part of a train stops within the neutral section(s) during normal operations. b) Signaling plan / Signal location(s) shall be provided by Signaling contractor/Signaling department to Traction contractor for finalization of OHE sectioning arrangements. -For any dispute, Employer/ Engineer shall decide the location.

S.NO.	ITEM DESCRIPTION	TRACTION CONTRACTOR	SIGNALING (SIG), PG/PSD CONTRACTOR
3	No power Zone	Traction contractor will provide information of no power section to signaling.	On receipt of no power zone, signaling shall prevent entry of train in no power section. Signaling system shall be designed suitably.
4	Track circuiting details& axle counters (only if applicable/ provided))	a) Traction contractor will design Bonding and earthing plan to suit the track circuiting and axle counters details furnished by Signaling Contractor. Traction Contractor will provide earthing and bonding accordingly.	Will furnish details of track circuits and axle counters along the track to Traction Contractor. There will not be any Track Circuits in the Signalling Scheme
5	Connection of Return Conductor to rail, through ITL or direct to rail or through MET.	a) TRACTION contractor will prepare typical connection drawings showing connection between RC and Rail through ITL (wherever provided). b) Traction return current cables may be connected to the ITL by providing MET at the desired location/station. c) Traction Contractor will supply and install cables and connect them to RC side accordingly. d) In case direct connection to rail is required Traction Contractor shall provide the connection to rail with exothermic welding.	a) Will supply and install impedance bonds and make connection of ITL if provided, to the Rails using thermos welding/ pin brazing / exothermic welding technology. No Impedance Bonds are required in the Signalling Scheme envisaged for the BSTP Signaling Contractor will facilitate Traction Contractor in preparing Earthing & Bonding (Return Circuit) drawing.
6	Signaling cable details	Traction contractor will 'model' the Signaling cables suitably for EMI/EMC study.	Will furnish to Traction contractor specifications of unscreened Signaling cables and their locations. No screened signalling cables will be used in the BSTP
7	Normal and short circuit currents levels in the OHE	Traction contractor will provide required details to the SIG Contractor.	Signaling contractor will consider the short circuit current level for the signaling equipment and incorporate in the design for safety concern.
8	Location of Track Circuits (if provided / applicable)	Traction Contractor will Design Bonding and Earthing Plan to suit track- circuiting details furnished by Signaling Contractor.	Signaling Contractor will give details to TRACTION contractor. There will not be any Track Circuits in the signalling scheme for BSTP.
9	Bonding and Earthing Plan	Traction will Design Bonding and Earthing Plan to suit track-circuiting details furnished by Signaling Contractor.	Signaling Contractor will provide Track Circuiting (TC) Axle Counter location details to Traction contractor. (if provided/applicable).

S.NO.	ITEM DESCRIPTION	TRACTION CONTRACTOR	SIGNALING (SIG), PG/PSD CONTRACTOR
10	Rail Continuity Bonds (if provided)	Traction contractor will provide Rail continuity bonds, according to finalized bonding plan and in co-ordination with Signaling Contractor.	
11	ITL & TCPMM (if provided)	Traction Contractor will provide TCPMM for earth continuity, if required.	Signaling Contractor will supply and install ITL at finalized locations (if provided). Signalling Contractor will supply and install Impedance bonds at finalized locations (if provided). There will not be any impedance bonds in the signalling scheme for BSTP.
12	Cross Bonds (if provided)	EPC / Traction Contractor will provide cross bonds, according to finalized bonding plan and in co-ordination with SIG Contractor.	
13	Insulated Rail Joints (if required)	Traction Contractor shall design the traction return system duly considering location of insulated joints.	Signaling Contractor will provide details regarding locations of insulated rail joints on the main line and in the Depot/yard. (if provided). No insulated Rail joints, will in general, be needed for the signalling scheme envisaged for BSTP.
14	Signal Locations	Traction contractor will take this input from signaling contractor/ Signaling department before finalization of SLD. For any dispute, BI-RIDE/GC Engineers shall decide the location.	a) Signaling Contractor/ will provide chainages of signal posts to Traction Contractor. b) Signal locations shall be provided by signaling contractor/ before finalization of SLD by Traction contractor. c) For any dispute, Employer/ Engineer shall decide the location.
15	OHE mast / structure locations/Sectioning Post along trackside as applicable	a) Traction Contractor will provide Layout Plans of OHE showing mast locations, wire staggers, anchoring wires etc. to Signaling Contractor. b) Sectioning Plan / Layout Plan (LOP) shall be shared by Traction Contractor with Signaling contractor for jointly deciding the location. c) For any dispute, BI-RIDE/GC Engineer will decide the location.	a) Signaling Contractor will coordinate with Traction contractor. b) Signaling plan shall be shared by Signaling Contractor with Traction contractor for jointly deciding the location. For any dispute, Employer/ Engineer will decide the location.
16	Electrical Clearances	Traction Contractor will provide details of FOCS system electrical clearance required to signaling contractor.	Signaling Contractor shall coordinate with Traction Contractor to ensure minimum safe clearances between any signaling field installation and the live OHE

S.NO.	ITEM DESCRIPTION	TRACTION CONTRACTOR	SIGNALING (SIG), PG/PSD CONTRACTOR
			component.
17	Power Supply Protection System and trip settings and protection characteristics	-Traction contractor will advise to Signaling contractor the protection relay settings. -Traction Contractor shall provide the signaling Contractor with overhead line feeder circuit rating, the protection tripping setting, the overhead line conductor current carrying capacity, Transient & surge protection and the protection relay setting.	a) Signaling Contractor will ensure Train Control and Signaling systems are designed suitably. b) The Signaling Contractor shall ensure that the Train Control and Signaling System provides allowance for suitable settings viz. sequential start up, when planning for simultaneous start-up of several trains. This will be possible to implement , only when all the Trains are under the Control of ATP. c) The signalling Contractors shall ensure that there is no degradation with respect to performance requirement as specified in the respective Specifications.
18	EMI/EMC Study	a) Both Contractors shall jointly perform a study and develop the Electromagnetic Compatibility Management Plans using such data as emission characteristics, susceptibility levels, filter characteristics, physical layout and construction of their equipment, taking into consideration variation in component characteristics with frequencies. b) The study shall demonstrate compatibility or highlight areas of potential problems with a view to implement remedial measures in time to achieve compatibility. c) Traction Contractor and SIGNALING Contractors shall co-ordinate for any information concerning EMI / EMC in the overhead line & other structures. d) The Contractors shall jointly develop a test plan detailing how the electromagnetic compatibility of the OHE traction System and the Signaling & Train control System will be verified, taking into consideration the study conducted. The signaling contractor has to submit the "No Objection" regarding the EMI/EMC values coming from the traction simulation, check and verified as per the jointly developed testing plan with traction contractor.	

S.NO.	ITEM DESCRIPTION	TRACTION CONTRACTOR	SIGNALING (SIG), PG/PSD CONTRACTOR
19	Charged/Discharged status of OHE for UTO enabled lines (if applicable).	Traction Contractor shall provide the Charged/Discharged status of each elementary sections of OHE in form of 1/0 status respectively on IEC 60870-5-104 protocol on redundant ports at gateway provided by Traction contractor.	a) Signaling contractor will interface regarding requirement of UTO for provision of Charged / Discharged status of each elementary section of OHE by Traction contractor. There will not be any UTO feature in BSTP Trains / Signalling and Operation Signaling contractor will take the data on IEC 60870- 5-104 protocol from the gateway ports provided by Traction Contractor. (mutually agreed).
20	Signal location and SI at Depot Entry/Exit line, SI at FP, BT overlap should coincide with each other (As applicable).	a) TRACTION contractor to interface with Signaling before finalizing location of Depot Entry/Exit line, SI at FP, BT overlap. Will shift the location of sectioning, if possible, to coincide with the location of signal.	a) Signaling Contractor to interface with TRACTION contractor before finalizing the location of Depot Entry/Exit line, SI at FP, BT overlap. b) Will shift the location, if possible, to coincide with the sectioning location of OHE.
21	UPS Feeder Provision for SCADA in S&T UPS in OCC (As applicable).	TRACTION contractor to interface with Signaling for redundant Feeders in S&T UPS and shall inform the load requirement of SCADA.	Signaling contractor to make provision of redundant feeders in S&T UPS for SCADA as per the load requirement submitted by Traction contractor. Maximum load requirements for SCADA server / equipments to be advised with back up calculation for facilitating extension of UPS Supply to SCADA.
22	Earthing of Outdoor Signaling and PSG/PSD equipment.	a) TRACTION contractor shall provide Buried Earth conductor, along the line and below each PF edge for earthing of outdoor signaling & PG/PSD equipment. b) Traction contractor shall provide the sizing of BEC wire. Fault level to be provided to S&T/PSG contractor as per simulation study.	a) The signaling & PG/PSD contractors shall interface regarding use of Buried Earth conductor, along the line, and below each PF edge for earthing of outdoor signaling & PG/PSD equipment. b) The signaling contractor shall interface for use of /Buried Earth Conductor, along the line, for earthing of outdoor signaling equipment.
23	Operating modes and principle Document (OMPD)	TRACTION contractor shall provide the inputs required by the signaling contractor for preparation of the document.	a) The signaling contractor as a lead contractor shall prepare a comprehensive OMPD. The document shall establish the principles pertaining to system and interface design under normal,

S.NO.	ITEM DESCRIPTION	TRACTION CONTRACTOR	SIGNALING (SIG), PG/PSD CONTRACTOR
			degraded and emergency mode.
24	Realtime streaming of all Pantographs Camera	a) TRACTION contractor will interface with Signaling for live view transmission of the camera as well as incident footage recording. OHE/Pantograph camera will be provided by RS.	Signaling contractor shall be responsible for: Transmitting real time video footage of Pantograph monitoring cameras to OCC and arrangement of downloading of CCTV footage (on demand basis & event pre-1 min and post 5 min of fault) at OCC from train borne NVR / Switch, provided by RS Contractor. Along with the images transmitted from the CCTV Cameras provided on board by RS Contractor, the images captured by the Pantograph monitoring camera also will be streamed to OCC and downloaded to a server meant exclusively for this. Thereafter necessary extraction and processing shall be done by the Traction Contractor.
25	Realtime streaming of Camera installed on front and rear cabs focused towards OHE for monitor health of OHE	a) TRACTION contractor will interface with Signaling for the live view transmission of the camera as well as incident footage recording. b) OHE camera will be provided by RS.	Signaling contractor shall be responsible for: Transmitting real time video footage of OHE monitoring cameras at OCC and arrangement of downloading of CCTV footage (on demand basis & event pre-1 min and post 5 min of fault) at OCC from train borne NVR / Switch, provided by RS Contractor.
26	Equipment's and Human safety	The Traction Contractor will incorporate safe minimum distance in FOCS design.	The contractors shall co- ordinate for ensuring min. safe distance between any signaling field installation and live Flexible OHE contact point for purpose of human safety apart from EMI/EMC considerations.

k) INTERFACE BETWEEN TRACTION CONTRACTOR AND TELECOM CONTRACTOR

S.No	ITEM DESCRIPTION	TRACTION CONTRACTOR	TELECOM CONTRACTOR
1	Telecom Cables and exchange locations.	Traction Contractor will perform the EMC simulation study.	Telecom contractor will furnish Traction Contractor details of locations of telecom cables and Telephone exchanges of Rail corridor in sufficient details for enabling 'modelling' of cables and for performing simulation study on Electro- magnetic compatibility.
2	Control & Monitoring (C&M) data exchange (if applicable).	Traction contractor: a) Will supply and install suitable redundant OFC cables, LIUs, Patch cords for connection from RTU/Gateway (from ASS, Traction Switching Stations and RSS) to optical ports at- each station telecom equipment room. b) Will interface with Telecom contractor for provision of space for mounting LIU in TER.	Telecom contractor: a) Will supply and install optic fiber cables and provide suitable pairs of dedicated fibers, as required by the SCADA Contractor for the SCADA works. For these, ports will be provided at ODF of each station TER, Depots TER and OCC/BCC TER required for C&M data exchange and for interlinking the OCC. b) Will also provide space for mounting LIUs at Station and Depot TERs. c) Will also provide space for mounting the wall mounted cubicle box for OCC LIUs.
3	Telephone connections to the Rail and /or Metro corridor internal telecom network (as applicable).		Telecom contractor shall provide a telephone with proper stand at: i) Each ASS Room. ii) RSS / TSS Control Rooms. iii) Switching/Sectioning room (If there is any) iv) ECC desks at OCC/BCC OHE depot
4	Laying of C&M cables (if applicable)	Traction contractor Supply and install C&M cables in the S&T cable path (trays) between each traction switching station and the nearest Station Control Room/TER.	Telecom contractor will provide space in the S&T cable tray provided by E&M Contractor.
5	Electromagnetic Compatibility	TRACTION Contractor will give details of the EMC study report.	Telecom contractor shall coordinate jointly with Traction Contractor to ensure compatibility.

6	Telephone, FOTS & CCTV cables from RSS to nearby station.	Traction Contractor shall supply & lay 2 nos. HDPE/Hume pipes of suitable size as informed by Telecom contractor.	a) Shall supply and lay Telephone, FOTS and CCTV Cables in HDPE pipe laid by Traction Contractor. b) Telecom contractor to supervise laying of HDPE pipe by Traction Contractor.
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I) INETRFACE BETWEEN RSS AND SIGNALING & TELECOM CONTRACTOR

S.No.	ITEM DESCRIPTION	SIGNALING & TELECOM CONTRACTOR	RSS CONTRACTOR
1	Facilities to be provided at RSS	Telecom Contractor shall provide following facilities in each RSS: a) Direct Telephone connection from each RSSs to OCC (Intercom). b) Cable provision for P&T connection. c) Cable provision for SAP & Intranet connectivity. d) CCTV for security of switch- yard & technical rooms shall consist of: CCTV Cameras - 08 no's CCTV workstation with 2 Monitors -01 no's with Quad live view for Monitoring of RSS cameras. e) RSS cameras shall also be monitored in OCC at TPC workstation. f) LAN connectivity from OCC for SCADA.	a) RSS Contractor shall interface with Telecom contractor for necessary provisions pertaining to Trenches, cable path etc. required for laying of FOTS / CCTV / Telephone/ intranet / Radio BDA cables as also finalization of CCTV location etc. b) Internal route for connectivity and arrangement for placement of CCTV Monitor and Telephone handsets shall be provided. c) Space for 42 U rack in RSS /TSS building (floor mount (1000*1000*1850mm) size inside room). d) Provision of minimum load, as required by Telecom contractor, from UPS in RSS for CCTV and BDA and its connection from trench/pulpit for telecom service

m) INETRFACE BETWEEN CIVIL AT GRADE AND TRACTION CONTRACTOR

S.No.	ITEM DESCRIPTION	CIVIL AT GRADE CONTRACTOR	TRACTION CONTRACTOR
1	Feeding Post/switching stations	At Grade civil Contractor shall provide proper levelled & compacted site to Traction Contractor.	Install equipment's in the Feeding Post/switching stations
2	Foundations for OHE Masts	At grade civil Contractor shall provide proper levelled & compacted site to Traction Contractor	Traction Contractor shall interface with at grade civil contractor time to time for handovers. Traction contractor to cast foundation for OHE as per approved drawings.
3	Cable bracket arrangement for carrying power and control cables on at grade	Will provide brackets/Trench as per design given by DDC/Traction contractor.	DDC/Traction contractor will give drawing of brackets/Trench for power and control cables on at grade.
4	Providing openings in at grade structures for passing cables etc.	Will provide openings as per requirements shown in the design.	DDC/TRACTION contractor will advise the size and locations where the cut-outs are required.
5	Soil Test	Soil investing reports shall be shared by civil contractor to traction contractor	Traction contractor to interface with civil contractor and also to conduct soil investigation wherever applicable.

NOTE: For any Dispute in between all the system working contractors working in Bangaluru Suburban Transport Project (BSTP) in corridor 2 and 4, the employers (BI-RIDE)/Employers representative (GC) decision will be final and binding.