

ಬೆಂಗಳೂರು ಸಂಯೋಜಿತ ರೈಲು ಮೂಲಸೌಲಭ್ಯ
ಅಭಿವೃದ್ಧಿ ಉದ್ಯಮ ನಿಯಮಿತ (ಬಿ-ರೈಡ್)

**BENGALURU INTEGRATED RAIL INFRASTRUCTURE DEVELOPMENT
ENTERPRISE LIMITED (Bi-RIDE)**

Bi-RIDE

BID DOCUMENT

NAME OF WORK

C4/PACKAGE – 1

“NAME OF WORK: “Design & Construction of Formation In Embankments /Cuttings, Blanketing, MIB’s, RUB’s, MJB’s, ERS/Retaining Wall, Drains, Boundary Wall. Fencing Works In At-Grade Section of Length 6.259 Km, Elevated viaduct of length 3.681 km and Other Related Infrastructural Works From Benniganahalli To Jakkur Including Validation of Design And Stability Check Wherever Applicable For Works Executed By Previous Contractor (Excluding 5 Stations and Channasandra RCC Box) between Ch. 22.386 Km and Ch. 33.742 Km of Corridor - 4 of Bengaluru Suburban Transport Project (BSTP)”

BENGALURU INTEGRATED RAIL INFRASTRUCTURE DEVELOPMENT ENTERPRISE LIMITED (Bi-RIDE)

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INTERFACE METRIX

INTERFACE MANAGEMENT DOCUMENTS FOR CIVIL: STATIONS & VIADUCT, E&M, SOLAR, POWER SUPPLY, OHE, S&T, TELECOM, AFC, ESCALATORS, LIFTS A DTRACK CONTRACTS OF ELEVATED & AT GRADE STATIONS OF BANGALORE SUB-URBAN TRANSPORT PROJECT – CORRIDOR – 4.

This document describes the interface responsibilities and obligations of Civil Contractor (Stations & Viaduct) with other system contractors like C&M, Solar, Power Supply, OHE, S&T, Telecom, AFC, Escalators, Lifts and Track and vice versa. All the above “Contractors” have been addressed as “SYSTEM WIDE CONTRACOTR” for all interface purposes wherein any specific mention has not been done except Track Contract.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
1. GENERAL REQUIREMENT			
(i)	Work Areas	<p>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.</p> <p>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.</p>	<p>System Wide Contractors to advise requirements and date for handover to suit Civil Contractor's site program.</p> <p>System Wide Contractor to coordinate with Civil Contractor for proper Work Areas, Access to & from site loading / unloading areas.</p>
(ii)	Cranes	Civil to Permit use of cranes on site by other Contractors on a mutually agreed rental basis and subject to the availability of the same on site.	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 usages of scaffolding erected by the civil contractor shall be allowed only during the periods as agreed by the civil contractors under the supervision of 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”.
(v)	Drinking Water	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 light become functional in that area or issuance of Taking over certificate whichever is earlier.	Task lighting will be the responsibility of various agencies / system contractors.
(vii)	Power	<p>Civil to supply power distribution boards at each end of the concourse and platform.</p> <p>The energy charge rate per unit a consumption is to be mutually agreed with the system Contractors.</p>	System Wide Contractors may obtain power supply from civil contractor on mutually agreed basis.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>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.</p> <p>Thereafter Civil may take power supply at single point from ASS level on chargeable basis from the employer, as per the rates conveyed by the 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 each concourse / level and two nos. at each platform level)</p>	
(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), False Ceiling level marking at stations 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.	
(ix)	Cleaning	<p>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.</p> <p>In case any system contractor fails to remove his material, the Employer (BI-RIDE) / Employer's representative (GC employee) of Civil contract along with the Employer (BI-RIDE) / Employer's representative (GC employee) of respective system wide contractors shall Inspect the site jointly and prepare a joint note. After written notice of minimum three 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 Employer's representative (GC) of various system wide contractors and civil. Civil will hand over the room to respective system contractors in properly cleaned condition</p>	<p>Once technical room is handed over, the principal system contractor for that room will take over responsibility for cleaning the room.</p> <p>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.</p>

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		and after providing proper lockable door & keys in a secured condition.	
(x)	Security	<p>The verification or any person removing material from site or bringing any, material to site, shall be sole responsibility of the contractor to whom the material belongs.</p> <p>The system once approved by the Employer / Employer's representative (GC employee) of Civil contractor shall be binding on all system contractors.</p>	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 & Amenities	As per "Conditions of Contract on Safety & Health and Environment".	As per "Conditions of Contract on Safety & Health and Environment".
(xiii)	Drainage	Civil Contractor has to provide and maintain pump arrangements for all requirements related to station	E&M contractor 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, tunnel, 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	<p>DDC 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.</p> <p>In case common BIM interface is implemented, the drawings to be obtained from the same.</p>	<p>System Wide Contractor shall collect Station, Architectural / Structural drawings and sectional views in the concourse level, platform, interchange, ground level, etc. from DDC</p> <p>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.</p> <p>Any proposed Change in system drawings which may affect civils' drawings to be promptly communicated by System Wide Contractor to Civil contractor to his consent and subsequent updation of drawings Prior to execution of civil works.</p>
(xvi)	Services Requirements	Civil Contractor to carry out works as per requirements of latest approved drawings	System Wide Contractor to timely provide tile room size, door size and finish details for equipment rooms to DDC for incorporation in Drawings.
(xvii)	Niches	<p>Civil Contractor to provide the same as per latest approved drawings.</p> <p>FHC niches with proper drain arrangement to be provided by civil contractor.</p>	System Wide Contractor to timely provide details of Niches required by them in the station area along with necessary cut-outs.
(xviii)	Site Storage Space	Civil contractor to provide properly levelled and debris free site storage 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.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
(xix)	Regular Interface Meeting	Civil Contractor to organize coordination meetings as per project requirement to discuss interface issue, exchange information, drawings, documents etc. and inform the Employer / Employer's representative (GC employee) for critical issues. Minutes of Meeting for these meetings to be maintained and communicated by Civil Contractor.	All System Wide Contractors to attend coordination meetings as per project requirement to discuss interface issue, exchange information, drawings, documents etc. and inform the 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 DDC. Civil contractor to coordinate With System Wide Contractor for joint inspection of cut outs prior to casting.	System Wide Contractors to coordinate with DDC 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 DDC /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 with overhead tanks 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 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.	System Wide Contractor to coordinate and interface with Civil Contractor for adequacy of E&M & BMS requirements.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
(xxiv)	Reflected Ceiling Plan (RCP)	<p>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.</p> <p>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.</p> <p>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.</p>	<p>DDC to provide the coordinated RCP along with all services arrangement and location. System Wide Contractor to further coordinate with DDC & Civil Contractor for finalization of E&M, Telecom, Escalator & BMS Services and Installation arrangement along with False Ceiling Installation schedule.</p> <p>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 co-ordination with civil contractor.</p> <p>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.</p>
(xxv)	Flooring / Wall cladding works	Civil contractor to provide the cut-outs and recesses in flooring / cladding works as per latest architectural drawings provided by DDC. Civil contractor to coordinate with System Wide Contractor for joint inspection of the same prior to carrying out flooring / cladding in that area.	System Contractor to coordinate with DDC for timely incorporation of his requirement in architectural drawings. They also need to jointly verify the compliance of all requirements prior to execution 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 co-ordinate with civil contractor for dewatering and civil contractor will do the same till ROD.
(xxvii)	Closing of Cut-outs / Openings / Gaps	<p>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.</p> <p>Civil contractor will carry out fire proof sealing of all cut-outs / openings / Gaps of more than 200 mm size gap at Stations with concrete / block work / ACP.</p>	<p>System Wide Contractor to give clearance to civil for optimization closing of cut-outs after installation of services.</p> <p>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 out.</p>
(xxviii)	Temporary Doors	Civil Contractor to provide proper Temporary Doors with Locking arrangement at the time of giving access to	System Wide Contractor to take over the rooms for working only after provision of Temporary Doors with proper Locking arrangement by Civil Contractor.

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		work areas till the provision of permanent doors.	
(xxix)	Epoxy Flooring / Painting	Civil contractor will provide Epoxy flooring /painting in SER, TER 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, SER, TER and SCR.
2. GENERAL INTERFACE REQUIREMENT			
(i)	Openings / Cut-outs / Casting	<p>Civil to provide openings as per latest approved drawings.</p> <p>Civil will get pour card signed by concerned System Wide Contractor prior to casting ensure that work has been done as per approved drawings.</p> <p>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 the Employer / Employer's representative (GC employee).</p>	<p>Any changes if proposed are to be requested by system Wide contractor in writing well in advance through the Employer / Employer's representative (GC employee) of his contract to architecture wing of the Employer / Employer's representative (GC employee) for in cooperation in architectural drawings, prior to execution of civil works. System Contractor to sign the pour card in coordination with civil contractor.</p> <p>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.</p>
(ii)	Delivery of Material at Site	<p>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.</p> <p>Civil contractor to provide the temporary opening of required size and access routes for delivery of equipment as proposed in equipment delivery route.</p> <p>No wall etc. to be altered/ closed in the delivery route before clearance from respective System Wide Contractors.</p>	<p>System Wide Contractor to plan and propose their Own Equipment Delivery Route in consultation with civil contractor.</p> <p>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.</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
(iii)	Water for Pump Testing	Treated / Raw water (quantity and type as per requirement of system contractor) shall be provided by civil for carrying out testing activities if a permanent water supply arrangement is not available.	System Contractor will provide the requirements 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 so as 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.
3 SPECIFIC/ADDITIONAL INTERFACES WITH INDIVIDUAL CONTRACTORS			
BETWEEN CIVIL AND E&M CONTRACTORS			
1.	Utility Map	Shall share the updated Utility Map in case of any changes / shifting of utility services made by Civil contractor.	Shall co-ordinate with Civil contractors.
2.	Earth Mat & Earth Pits	Design: Shall receive the area requirement and location from E&M DDC / Contractor and shall incorporate the same in Combined Service Drawing. Construction: Shall provide clear levelled area in designated location.	Design: Shall provide the detailed design, area and location. Construction: Shall install the earth mat, backfill the excavated soil and level.
3.	Pump Room, Foundation inside pump room, Fire pipe & Cable routing	Design: Shall receive the area requirement, pump foundation details, fire pipe sizing and cable tray sizing from E&M DDC / Contractor and shall incorporate the same in Combined Service Drawing. Routing for Fire pipe and cable trays shall be prepared in coordination with DDC/ E&M contractor. Construction: Shall construct the pump room and pump foundations as per	Design: Shall provide the details of pump foundation, sizing of fire pipe and cable trays Shall co-ordinate with DDC / Station Building Contractor for finalization of cable trays and fire pipe routing. Construction: Shall install the fire pumps, fire pipes and cable trays with cables.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>approved CSD or as provided by the E&M contractor.</p> <p>Shall provide the puddle flanges during construction of fire tank and pump room, as per approved drawing.</p> <p>Shall make temporary provision for dewatering of Pump Room till the system gets commissioned.</p>	
4.	DG Set	<p>Design: Shall co-ordinate with DDC / E&M Contractor for the location, foundation details, chain link fencing, exhaust routing and cable tray routings and incorporate the same in Combined Service Drawing.</p> <p>Construction: Shall construct the foundation, chain link fencing etc. as per approved CSD or as provided by the E&M contractor. Shed shall be provided, if required.</p>	<p>Design: Shall, provide the DG foundation details, chain link fencing, exhaust routing and cable tray routings.</p> <p>Construction: Shall install the DG set, exhaust system and cable tray etc.</p>
5.	Entry/Exit Structure	<p>Design: Shall co-ordinate with DDC / E&M Contractor for the supporting arrangement of light fixtures and conduit routing at entry/exit structure, and incorporate the same in Combined Service Drawing.</p> <p>Construction: Shall provide the supporting arrangement for light fixtures and conduit/trays support etc. as per approved CSD or as provided by the E&M contractor.</p>	<p>Design: Shall provide the details for the supporting arrangement of light fixtures and conduit routing at entry/exit structure is provided.</p> <p>Construction: Shall install the light fixtures, conduits and cable trays etc.</p>
6.	Shaft (Ground to Concourse), (Concourse to Platform) etc.	<p>Design: Shall co-ordinate with the DDC / E&M contractor for shaft sizing and location and shall incorporate the same in Combined Service Drawing.</p> <p>Construction: Shall construct the shaft and provide the required cut-outs as per approved CSD in co-ordination with E&M contractor.</p>	<p>Design: Shall provide the details of required shafts. Shall co-ordinate with DDC / Station Building Contractor for finalization of the shaft's location.</p> <p>Construction: Shall co-ordinate with the Station Building contractor and install the cable trays, fire pipes, HVAC pipes etc. inside the shafts.</p>
7.	Technical Rooms such as SER, TER, SCR, TOM, ASS etc.	Shall provide clearance for conduiting work before wall plastering and co-ordinate with E&M contractor for wall plastering. For all rooms cable tray entry cutouts for cable routing shall be done.	Shall co-ordinate with Station Building Contractor for conduiting, all room cable tray entry cutouts, work before wall plastering and hand over for plastering work after the conduiting work.
8.	Closing of openings / cut-outs / gaps inside the air conditioned rooms.	Shall cover/seal the open space, cut-outs, gap between girder & wall, etc. above false ceiling or in ceiling/roof, on side wall, etc. inside the air-conditioned rooms to prevent the cooling loss.	Shall share the list of air-conditioned rooms and coordinate at site.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
9.	Cut-outs/pipes & Cut-out closing (PVC pipes of different sizes can be used as cut-outs)	Shall co-ordinate with the DDC / E&M contractor for wall /ceiling cut-outs / pipes for cable tray, HVAC piping etc., incorporate the same in Combined Service Drawings (CSD). Shall provide different sizes of PVC pipes as cut-outs. Seal all the gaps / openings / cut-outs with fire resistant materials or with detachable ACP sheet before CMRS inspection of that areas/Viaduct/Stations.	Shall co-ordinate with the DDC / Station Building contractor and provide details for wall/ceiling cut-outs / pipes for cable tray, HVAC piping etc. Shall install the cable trays, HVAC pipes etc. and shall close the cut outs with fire rated materials.
10.	ASS Room – Exhaust Fans and Earth Strips works	Shall co-ordinate with DDC / E&M contractor for the size of exhaust fan openings, cutouts for cable trays etc. and incorporate the same in the CSD. Provide the cutouts on wall for exhaust fans. Shall co-ordinate with E&M contractor for laying of earth strips on the floor before screed concreting.	Shall co-ordinate with DDC and provide details to Station Building contractor for the size of exhaust fan openings, cutouts for cable trays etc. Shall install the exhaust fans. Shall install the earth strips etc. and provide clearance to station building contractor for screed concreting
11.	Fire Hose Cabinet (FHC) & Power Distribution Board (PDB) niche	Design: Shall co-ordinate with DDC / E&M contractor for the location and size of FHC, DB niches etc. and incorporate the same in the CSD. Construction: Shall construct the niches and provide the required cut-outs as per CSD.	Design: Shall co-ordinate with DDC and provide details to Station Building Contractor for the location and size of FHC, DB niches etc. Construction: Shall install the FHCs & PDBs.
12.	PEB Structure for Systems	Design: Shall co-ordinate with DDC / E&M contractor for the details of cable trays, fire pipes, HVAC pipes, connectivity, supports for cable trays, light fixtures etc. and incorporate the same in the CSD. Construction: Shall provide the PEB structure as per drawings. PEB structure includes support for cable trays, Fire pipes, lighting, etc.	Design: Shall provide the load details of the cable trays, fire pipes, HVAC pipes etc. along with required supporting arrangement and connectivity. Construction: Shall install the cable trays, fire pipes, HVAC pipes, light fixtures etc.
13.	HVAC ODUs	Design: Shall co-ordinate with DDC / E&M contractor for the location and foundation details for HVAC ODUs and incorporate the same in the CSD. Construction: Shall construct the foundation for HVAC ODUs and shall provide access to reach the HVAC ODUs. Shall provide Covered space / canopy for isolator of ODUs.	Design: Shall co-ordinate with DDC and provide details to Station Building Contractor for the location and foundation details of HVAC ODUs. and also load details of the ODUs. Construction: Shall coordinate and install the ODUs and Isolators.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
14.	Lightning Arrestor (Access to Roof)	<p>Shall provide access (ladder with safety cage) to roofs and supporting arrangements on the roof sheets for installation of Lightning arrestors and strips.</p> <p>Till the permanent ladder is erected/installed for accessing roof, temporary safe ladder to be provided for LA works.</p>	Shall co-ordinate with Station Building contractor and install the lightning arrestor and strips on roof sheet.
15.	Routing for Cable tray, fire pipe, HVAC pipe etc. and Supporting Arrangements etc.	<p>Design: Shall design the routing for cable tray, fire pipe, HVAC pipe, HVAC drain water pipe, LA etc. and supporting arrangement in co-ordination with DDC for all the areas, link bridges, platforms, terrace etc. and incorporate in CSD and other related drawings.</p> <p>Construction: Shall construct and provide required supporting arrangements for cable tray, fire pipe, HVAC pipe, Lighting Arrestor (LA), etc. in PEB, FoB, Link Bridges.</p>	<p>Design: Shall provide the load details for cable tray, fire pipe, HVAC pipe, LA etc. and provide details of supporting arrangement in co-ordination with DDC for all the areas, link bridges, platforms, terrace etc.</p> <p>Construction: Shall install all the cable tray, fire pipe, HVAC pipe, LA etc.</p>
16.	Staircases	Shall provide arrangement for cable tray, conduit, light fixture etc., in case of steel staircases.	Shall install the cable trays, conduits, light fixture etc.
17.	High Mast Foundation	Shall construct foundation for high Mast as per design provided by E&M DDC / E&M contractors.	Shall share the design of Mast foundation. Shall erect high mast.
18.	Work Plan	Civil Contractor shall incorporate the work plan received from system wide contractors.	A detailed micro level plan to be submitted to Civil contractors for the dependent activities mentioning about the lead time of completion of such activities.
19.	Priority	Priority wise all the system rooms, connectivity, shafts, supporting arrangements etc. shall be provided early, so as to complete the system works in line with Civil works.	
20	Equipment rooms, sumps, conduit and ducts	<p>Design:</p> <ul style="list-style-type: none"> Shall incorporate input from the E&M Contractor in the production of Structural E&M drawings (SEM) that will show all the necessary openings, cut-outs, hatch, core cutting, plinths, foundations etc. Shall provide input for seepage, sewage and domestic water pipeline etc. for route drawing in stations. Shall review the CSD and SEM as and when required. 	<p>Design:</p> <ul style="list-style-type: none"> Shall prepare the CSD. Shall provide design of all E&M equipment, sizing, weight, layouts etc. Shall provide input for deciding room sizes at station to civil Contractor. Shall prepare equipment, cable, raceways, trunking, seepage, sewage, hydrant, and domestic water pipeline etc., route drawing in stations. Shall provide input for SEM drawings and the inputs on requirement of cable shaft, shaft opening details, floor cut-outs, pull pits etc.,

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		Construction: <ul style="list-style-type: none"> Complete equipment rooms such as ancillary building, sumps and other spaces for the installation of the E&M equipment such as pumps, DGs, control panels etc., Provide structural openings, construction of plinths/foundations, embedded conduits, sleeves for use of E&M Contractor as per SEM. Shall provide suitable road access for loading/unloading of the equipment.	<ul style="list-style-type: none"> Shall review CSD and SEM as and when required. Construction <ul style="list-style-type: none"> Shall install E&M equipment as required in the E&M scope of works at location provided by the station contractor. Shall provide raceways, trunking for the E&M works and other system Contractor for all routes defined in the CSDs. Shall close all floor and wall openings provided by Civil Contractor with fire rated material after installation of all E&M services related to their work. Installation of seepage, sewage pumps along with embedded discharge pipe up to discharge level outlet.
	B. BETWEEN CIVIL AND SOLAR CONTRACTOR		
1.	Roof inspection Platform	Design, fabrication, supply and erection of structural steel for roof inspection platforms and catwalks on the roof shall be done by Civil contractor as per approved drawings and details.	Solar contractor shall provide detailed drawings / arrangement details etc. well in advance so that the same can be incorporated in the architectural GFC of the Civil works.
2.	Roof structure and roof sheet	Roof structure and roof sheet shall be planned as per solar module installation arrangements.	Shall share solar module installation arrangement drawings.
3.	Lifeline	Provide lifeline (safety rope on the roof) for maintenance / cleaning purpose as per approved drawing shall be in scope of station building contractor.	
4.	Access Ladder	Shall provide ladder to access roof and water connection on the roof for cleaning of Solar modules.	
	C. BETWEEN CIVIL AND POWER SUPPLY CONTRACTOR		
1.	ASS Room / Building	Shall design and construct ASS room / building to the requirement of the PS (Power Supply) Contractor. Shall provide loading deck / Platform (open to sky) for carrying heavy equipment and materials to substations. 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.	Shall provide the layout drawings to Station Building Contractor. Shall provide dimensions and weights of various equipment.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>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.</p> <p>Shall provide ASS room complete in all respects, including flooring, ventilation, access doors, rolling shutters, windows, ventilators and interior finish.</p>	
2.	Installation of 33 kV cables and control cables - Station Areas	<p>a. Cut-outs/Openings on the parapet under the platform edge.</p> <p>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.</p> <p>c. Support ladder arrangement from Parapet opening to Intermediate level / 33 kV route on link bridge.</p> <p>d. Throughout the 33 KV route along with catwalk on link bridge shall have supports to carry 33kV/HT cable as per requirements by PS contractor.</p> <p>e. From Intermediate level to till ASS room connectivity and catwalk to be provided as per requirements of PS contractor.</p> <p>f. Shall take into consideration the bending radius of cable and covering of cables in public places.</p>	<p>Shall provide weight & dimensions of the cables.</p> <p>Shall supply & install 33 kV and other cables</p> <p>Shall design & provide and install cable path (duct, metallic brackets, cable trays etc.) as per requirement inside ASS.</p> <p>Shall co-ordinate and give requirements to the Station Contractor for the cable path, gallery size, route alignment and mounting requirements for cables in the Station area.</p>
3.	Temporary Power for Installation, Testing & Commissioning	Shall provide sockets for temporary power, if available, inside ASS rooms as per requirement.	<p>Shall co-ordinate with Station Contractor for provision of suitable sockets inside ASS rooms for temporary power.</p> <p>Shall pay to the Station Contractor for the power consumption</p> <p>Note: If temporary power is not available from Station Contractor, then PS Contractor shall make his own arrangement.</p>
4.	Cable bracket arrangement for carrying power, earthing and control cables on viaduct	<p>Shall coordinate and allow PS (Power Supply) Contractor to install suitable cable support infrastructure (metallic brackets, cable trays etc.) on Parapet for laying of cables.</p> <p>Shall provide suitable opening for carrying cables as per requirement</p>	<p>Shall supply & install cables on the viaduct including cable support infrastructure (trays, brackets etc.). Cables supports for all system wide contractors shall also be supplied and installed by PS (Power Supply).</p> <p>Shall co-ordinate and give requirements to the Viaduct Contractor for the cable path, route alignment and mounting requirements requirement for various cables on the viaduct.</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
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.
6.	Mounting of structures for power sockets/ viaduct light fixtures on parapet	Shall allow required drilling and provide opening in parapet as per the requirement of PS Contractor.	PS Contractor shall provide necessary fixing details for viaduct lighting to Viaduct 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.
D. BETWEEN CIVIL AND OHE/OCS CONTRACTOR			
1.	Support for OHE from platform shed roof trusses	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.	OCS Contractor will provide general arrangement showing suspension members from station ceiling, from which OCS can be supported. OCS Contractor will also indicate typical bending moment and direct load arising from OCS at suspension points. 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.	Shall coordinate and inform locations of OCS warning and indicator boards. Shall furnish the relevant drawings. Shall review the fixing arrangement. Shall supply and install all warning and indicator boards.
3.	Providing OCS Mast / Portal, anchors etc. on Viaduct	Will arrange to strengthen concerned segments and provide holding down bolts (as per designs / drawings provided by OCS Contractor). OHE holding down bolts shall be greased and properly covered to protect the damages to bolt threads. As per site condition, if there are any changes in viaduct, Viaduct contractor will interface with OCS contractor to further modification.	OCS Contractor/DDC will prepare list of segments requiring strengthening, to receive OCS masts, anchors etc. OCS contractor/DDC will provide OHE loads to be considered for viaduct and segments design. OCS Contractor shall verify OHE the location.
4.	Earthing and bonding	Shall supply and provide dedicated earth bars and earth terminals according to	OCS Contractor/DDC shall provide designs / drawings showing arrangement

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
	arrangements at viaducts	<p>drawings ensuring continuity of reinforcement bars of viaduct segments piers and parapet segments. Shall provide earth terminals for connection.</p> <p>Shall coordinate with OCS Contractor for verification of earthing and bonding measures adopted in the structure, as per the recommendations in approved design.</p> <p>Pier Earthing Terminal for Viaduct 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.</p>	<p>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.</p> <p>Shall design, supply and install BEC and earthing plate at ITL locations.</p> <p>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 connecting plates. Shall coordinate with Viaduct Contractors for verification of earthing and bonding measures adopted in the structure, as per the recommendations in approved design.</p>
5.	Earthing connection for handrails	The viaduct contractor shall ensure that normally there should be discontinuity in hand rails after 20 metres. If in case the length exceeds 20 metres viaduct contractor shall provide necessary earthing connection.	OCS Contractor/DDC will provide the requirement of Earthing to handrails at locations where the parallel length of Handrail exceeds 20 metres.
6.	Provision of Man holes cover on viaduct	Viaduct contractor shall ensure that all the man holes 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	Viaduct 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.
	E. BETWEEN CIVIL AND SIGNALING (S&TC) CONTRACTOR		
1.	Layout of rooms at the station: Signalling and PSD Equipment Room (SPER), Telecom Equipment Room(TER) , UPS Room, Signalling Maintenance Room(SMR), Telecom Maintenance Room(TMR) and Station Control Room (SCR).	<p>Design: Prepare and furnish station drawings. Incorporate room requirements and routing of Cable ducts/ cable trays. Provision of space for Emergency Stop Plunger, Ducts in S&T UPS Room.</p> <p>Construction: Rooms complete with structures, false flooring, false ceiling if necessary, finishes, fire retardant doors, cable cut-out & shaft finishes, cable trenches for S&T UPS Room, checkered plates for cable trench cover, provide fire protection, lighting, fixtures, Air-conditioning & Ventilation , Power Sockets,etc.</p> <p>General lighting shall be provided by Civil Contractor for Testing,</p>	<p>Design: Mark cable trays on the station drawings in close coordination with the DDCs. Review design with the DDCs. Co-ordinate closely with Station Building Contractors to ensure the requirements at site are met. Suitable interface for marking cable Entry/Exit points in Technical Rooms and cable trenches in UPS Room on the station drawings in close co-ordination with the E&M/DDC/Construction/Finishing contractor</p> <p>Construction: Provide equipment foundations / base frames/Pedestals. Furnish weight, dimension and mounting details of S&T Equipment. Install all S&TC equipment, cables etc.</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		Seal all the gaps / openings / cut-outs with fire resistant materials or with detachable ACP sheet before CRS/CMRS inspection of that areas/Viaduct/Stations.	Seal the gaps up to 200 mm in size in all technical rooms after cable installation work with fire resistant material or detachable ACP Sheet.
2.	Station Control Room: Space for workstations / ESP and other Signalling equipments.	<p>Design: Incorporate design requirement of S&TC Contractor in the SCR room.</p> <p>Construction: Construct the SCR room as per approved design. Space for workstations, Emergency Stop Plunger(ESP), Reset Cubicles, and other STC Equipment. Maintain room distance of SCR and SPER shall be less than 30 m.</p> <p>Shall provide cable Tray/Hanger/Conduits/Etc. Connectivity from equipment rooms to SCR as per requirement of S&T contractor. Install Precast slab at suitable height with core cutting and power sockets provision to be provided for system workstations as per design of S&T contractor.</p>	<p>Design: Furnish layout of Signalling equipment within Station Control Room for S&TC equipment in close coordination with the DDCs and/ or Station Building Contractor.</p> <p>Construction: Install Signalling equipment within Station Control Room with cable manager or duct etc., and UPS supply and power socket for STC Equipment.</p>
3.	Provision of Primary Structure and Holes in PEB Short Pole for ESP & ECP at Platform	<p>Design: Shall co-ordinate with DDC / Signalling contractor for the details of Fixing / hanging arrangement of ESP, Signage, etc. to incorporate the same in the drawings.</p> <p>Construction: Shall provide the PEB structure/Short Pole as per drawings. PEB structure includes primary support for Signaling equipment's, holes in PEB structure, routes for cable, cutouts, core cuts, etc.</p> <p>Note: Ensure sharing of PEB detailed drawings with system wide contractors (E&M, Telecom, Signalling, OCS, etc.) in early stage of execution to receive inputs from system wide contractors on time.</p> <p>Early inputs to PEB drawings will ensure incorporation holes, supports, etc. and those requirements will be catered during PEB manufacturing itself.</p>	<p>Design: Shall provide the load details of the Signaling equipment's, location and size of holes, etc. along with required supporting arrangement and connectivity.</p> <p>Construction: Shall install the Signalling equipment (ESP).</p> <p>Note: Ensure PEB hole requirement to be shared with DDC / Civil contractors well in advance. So that, requirements are incorporated at the time of PEB manufacturing itself.</p>
4.	Signalling Post Base on Metal Platform on Viaduct or pre-casted base on segments with 3 options	Design and construct to accommodate Signalling Post, ladder and its associated equipment's. Primarily pre-casted or metal platform to be provided by civil contractors.	Provide design data of Signalling Post, ladder, etc. to DDCs / Civil Contractor. Install the Signalling Post, Ladder, etc.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
5.	Trackside equipment & Cabling infrastructure for Signalling at viaduct	<p>Design: Design cable ducts, cross track cast in cable ducts for main Signalling cables throughout the guideways.</p> <p>Signaling & Fibre optic cables throughout the guideways shall have route diversity.</p> <p>Provision of space for line side equipment's Viz antenna pole along with termination boxes, point machine along with termination boxes, signal pole along with termination boxes, Axle counter termination boxes, etc.</p> <p>Design details to be worked out in interface with Signalling design requirements.</p> <p>Provision of drainage in viaduct</p> <p>Construction: Supply and install cable hangers, cable trough on the viaduct</p>	<p>Design: Furnish and confirm sizes and bending radius of trays, hangers, main cable duct and cross track cable ducts for main cables in close coordination with the civil design and/ or construction contractor.</p> <p>Furnish locations of line side equipment's.</p> <p>Furnish and review requirements of EMC separation for cabling.</p> <p>Review the design from Detailed Design Contractors.</p> <p>Construction: Install cables for all Signalling systems. Install all line side equipment's. Construct all secondary ducts including track crossings and partitioning/ providing cable trays channels in main cable ducts as required. Install cables for all STC systems including provision of all cable supports.</p> <p>Install all line side equipment including equipment foundations etc.</p>
6.	Openings in Viaduct Structures(station area) for routing cables	<p>Viaduct Contractor shall provide openings to the requirement of Signalling Contractor.</p> <p>Closing of all cut-outs</p>	<p>Signalling Contractor shall advise the size and locations where the openings / cut-outs are required.</p> <p>All s&t cutouts will be closed by S&T contractor.</p>
7.	Buried pipes for cables crossing tracks (at grade)	<p>Shall install pipes buried in concrete as per design provided by Signalling Contractor and seal them temporarily.</p> <p>Once the Signalling Work is finish, Sealing shall be done permanently.</p>	<p>Signalling Contractor will prepare a list of locations where buried pipes are to be provided.</p> <p>Signalling Contractor will remove seals at appropriate time and use the buried pies for cable crossing.</p>
8	Cabling infrastructure for S&T at stations	<p>Civil: Incorporate routing of Cable ducts/ hangers/ trays for STC main cables throughout the station. Fibre optic cables throughout the station will have route diversity. Design details to be worked out in interface with STC design requirements.</p>	<p>Design: Shall mark & Review cable duct/ tray path / size / separation and provide the requirement of cable troughs/Supports on the GAD/ CSD for main cables in close coordination with the Civil / Architectural design and Civil construction cum E&M contractor to ensure that all requirements at site are met. Furnish and review requirements of EMC for cabling. Review and confirm design with the design contractor and closely co-ordinate with</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
			<p>construction contractor to ensure that the requirements at site are met.</p> <p>Construction: Install cables for all STC systems. Install cable trays/hangers for routing STC cables inside Signal Equipment Room/SCR</p>
9	Interconnection between corridors in for cable laying.	<p>Design:</p> <p>Develop routing of Cable ducts / conduits / hangers / trays between corridors at the intersection / junction Stations.</p> <p>Design details to be worked out in interface with STC design requirements;</p> <p>Construction: Supply and Installation of Cable ducts / conduits / hangers / trays within and between corridors.</p> <p>Cast in cable ducts on walls / floor penetrations, for routing of all types of cables</p> <p>seal the relevant gaps / Cut Outs after cable installation work.</p>	<p>Design:</p> <p>Furnish cabling requirements including destinations, sizes, quantities and cable loadings of Cable ducts / conduits / hangers / trays between corridors at intersection / Junction stations.</p> <p>Furnish requirements of cable Cut Outs / bores on walls / floor penetrations, complete with pipe, sleeves for routing of all types of cables. Furnish requirements of EMC/EMI and fire separation for cabling.</p> <p>Construction: Install STC cables,</p>
10	Room Acceptance	<p>DDC / Civil / Building Construction Contractor to interface with concerned contractors and ensure compliance</p> <p>To ensure that all requirements as per the Design are incorporated and agreed and signed by STC contractor</p>	<p>Coordinate with Civil/E&M team and clean Debris / Dust after Carrying out work STC Works on a daily/regular basis</p>
11	Reference Points	<p>Civil: DDC Civil / Building Construction Contractor to interface with concerned Contractors and ensure compliance</p> <p>Shall provide all reference points marking regarding level station, platform centre line to STC contractor at site and preserve these marking points for future verification and reference at site</p>	<p>STC Contractor shall coordinate with Building / Civil contractor to get all inputs regarding reference points, marking of levels, station/platform centre line etc.</p>
12	Lighting/power arrangement	<p>Civil: DDC Civil / Building / E & M Contractor to interface with concerned Contractors and ensure compliance</p>	<p>Shall coordinate with Civil / Building Construction/E&M Contractor for general lighting/power arrangements for installation works and pay for the consumption.</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		E&M: Shall provide power to S&T contractor for S&T UPS system. General lighting and power sockets, meters, etc. for installation work to be provided by civil contractor on chargeable basis.	
13	Preparation of As-built survey/drawings	Civil: Bldg./ Civil (Including E & M) contractor shall coordinate with STC contractor for Preparation of as-built drawings	Shall assist and provide inputs in as-built survey and coordinate with Participating Contractors for preparation of as built drawings.
14	Inter Room cable way	Incorporate Cableway from the Signalling perspective. Furnish and coordinate requirements, if any.	Coordinate with Civil / Building Contractor for cable installation.
15	Interface documentation	Architectural / Civil / Building Contractor to interface with concerned contractors and ensure compliance Civil/ Building / E&M Contractor shall coordinate with STC contractor for interface document preparation and Prepare Detailed Interface document etc.	STC contractor shall , coordinate and cooperate with Building / Civil/E&M contractor for the interface documents
16	Installation of trackside S&T Equipments.	Shall coordinate with STCcontractor to ensure the compliance of schedule of dimensions while installing the Track side S&T Equipments / Gears	Shall furnish the finalised/dimensions of trackside signalling equipments / gears and co-ordinate with Civil/E&M Contractor(s) to ensure the compliance of schedule of dimensions.
17	Power for Installation Works	Temporary power supply shall be extended to the STC contractor on chargeable basis on mutually agreed terms and conditions	In absence of temporary Power availability from Civil / Building / E&M Contractor, then Signalling Contractor shall make its own/suitable arrangement for Power requirement for installation and testing. Energy meter and cable required for extension of temporary power from participating contractors shall be provided.
18	Common Interface Points	All technical rooms shall be design for waterproofing Furnish and coordinate with DDC/Design contractor. At Viaduct/Platform level, Details of cable trough(type, specs, design , etc with respect to water logging, lifting of cover, strength, etc..)to be decided after designated system contractor are on board.	S&T contractor shall coordinate with civil contractor for same.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>Water supply pipe, drain pipe, toilet wall, shall not share common wall with SER, SMR, UPS (S&T), SCR etc</p> <p>Path of rain water pipe, sewerage pipe, track drainage pipe etc. shall not fall on top of STC rooms (SER, UPS S&T, SMR, SCR) and expansion joint over the equipments rooms shall be preferably avoided</p>	
	F. BETWEEN CIVIL AND TELECOMMUNICATION (TEL) CONTRACTOR		
1.	Layout of relevant equipment rooms (TER, SCR) at the station	<p>Design: Prepare and furnish station drawings. Incorporate room requirements and routing of Cable ducts / cable trays.</p> <p>Construction: Rooms complete with structures, false flooring, false ceiling if necessary, finishes, fire rated doors, etc.</p> <p>Seal all the gaps / openings / cut-outs with fire resistant materials or with detachable ACP sheet before CMRS inspection of that areas/Viaduct/Stations.</p>	<p>Design: Mark requirements in close coordination with the DDCs / Station Building Contractor. Review design with the DDCs. Coordinate closely with civil contractor to ensure the requirements at site are met.</p> <p>Construction: Provide equipment foundations/ base frame. Install all telecom equipment, cables etc.</p> <p>Seal the gaps up to 200 mm in size in TER after cable installation work with fire resistant material or detachable ACP Sheet.</p>
2.	Station Control Room	<p>Design: Incorporate design requirement of Telecom Contractor in the SCR room viz. Space for workstations / and other telecom equipment's etc. and routing of cable trays/duct.</p> <p>Construction: Construct the SCR room as per approved design.</p>	<p>Design: Furnish layout of telecom equipment within Station Control Room for telecom equipment in close coordination with the DDCs / Civil Contractor.</p> <p>Construction: Install telecom equipment within Station Control Room.</p>
3.	TETRA Radio Tower	<p>Design: Incorporate the requirement of radio tower at selected stations at roof or ground level.</p> <p>Construction: construct the suitable structure / foundation to enable installation of radio tower.</p>	<p>Design: Provide design requirements for radio tower and shall coordinate appropriately.</p> <p>Construction: Shall supply & install the radio towers.</p>
4.	PEB - Provision of Primary Structure and Holes in PEB	<p>Design: Shall co-ordinate with DDC / Telecom contractor for the details of Fixing / hanging arrangement of Display Panels, cameras, speaker, Analog Clock, ECP, ESP, Signage, etc. to incorporate the same in the drawings.</p>	<p>Design: Shall provide the load details of the Telecom equipment's, location and size of holes, etc. along with required supporting arrangement and connectivity.</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>Construction: Shall provide the PEB structure as per drawings. PEB structure includes primary support for Telecom equipment's, holes in PEB structure, etc.</p> <p>Note: Ensure sharing of PEB detailed drawings with system wide contractors (E&M, Telecom, Signalling, OCS, etc.) in early stage of execution to receive inputs from system wide contractors on time.</p> <p>Early inputs to PEB drawings will ensure incorporation holes, supports, etc. and those requirements will be catered during PEB manufacturing itself.</p> <p>Creating holes in PEB structure is always a very difficult task & a lot of perfection needed to be taken care during execution.</p>	<p>Construction: Shall install the Telecom equipment's.</p> <p>Note: Ensure PEB hole requirement to be shared with DDC / Civil contractors well in advance. So that, requirements are incorporated at the time of PEB manufacturing itself.</p> <p>Creating holes in PEB structure is always a very difficult task & a lot of perfection needed to be taken care during execution.</p>
5.	Wicket Gate at Platform	<p>Design: Shall co-ordinate with DDC / Telecom contractor for the details of Fixing arrangement of Access Control on the Wicket Gate to incorporate the same in the drawings.</p> <p>Construction: Shall provide the Wicket Gate as per drawings.</p> <p>Note: Coordinate & ensure that the granite near Wicket gate to be fixed after Telecom conduiting work confirmation.</p>	<p>Design: Shall provide the Fixing details of the Telecom equipment (Access Control System), location and size of holes, etc. along with required supporting arrangement and connectivity.</p> <p>Construction: Shall install the Telecom equipment's.</p> <p>Note: Coordinate & Ensure that conduit connectivity till wicket gate has been made before granite work.</p>
6.	Trackside equipment & Cabling infrastructure for Telecom	<p>Design: Design cable ducts, cross track cast in cable ducts for main Telecommunication cables throughout the guideways.</p> <p>Fibre optic cables throughout the guideways shall have route diversity.</p> <p>Provision of space for line side equipment's Viz CCTV poles with ladder, TETRA Tower, etc..</p> <p>Design details to be worked out in interface with Telecom design requirements.</p> <p>Provision of drainage in viaduct.</p>	<p>Design: Furnish and confirm sizes and bending radius of trays, hangers, main cable duct and cross track cable ducts for main cables in close coordination with the civil design and/ or construction contractor.</p> <p>Furnish locations of line side equipment's.</p> <p>Furnish and review requirements of EMC separation for cabling.</p> <p>Review the design from Detailed Design Contractors.</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		Construction: Supply and Install Cable Trays, Cable Trough and Cable Hangers as per S&T requirement	Construction: Install cables for all Telecom systems. Install all line side equipment's.
7.	Openings in Viaduct structures for routing cables	Viaduct Contractor shall provide openings to the requirement of Telecom Contractor.	Telecom Contractor shall advise the size and locations where the openings / cut-outs are required.
8.	Buried pipes for cables crossing tracks (at grade)	Shall install pipes buried in concrete as per design provided by Telecom Contractor and seal them temporarily. Once the Telecom Work is finish, Sealing shall be done permanently.	Telecom Contractor will prepare a list of locations where buried pipes are to be provided. Telecom Contractor will remove seals at appropriate time and use the buried pipes for cable crossing.
G. BETWEEN CIVIL AND AUTOMATIC FIRE COLLECTION (AFC) CONTRACTOR			
1.	Ticket Booth (TOM) /Excess Fare Office /Ticket Reader related works	Design: <ul style="list-style-type: none"> Design of booth/counters – number of windows and its location. Civil has to coordinate with E&M for AFC power & data cable trays/raceways. Design details to be worked out in interface with AFC design requirements. Construction: <ul style="list-style-type: none"> Construction of ticket booth with false ceiling and windows with glass panes, Construction of trenches/ trough/ raceway/ tray for laying of Power and data cable, Fare and Route display Counter as per AFC equipment design including holes in TOM / EFO counters and window glasses. Coordinate with AFC contractors for all critical locations where AFC requirements are needed are as follows: <ul style="list-style-type: none"> i. Height and size of TOM/EFO counters for normal & handicapped. ii. Location of opening required on TOM /EFO window glasses. 	Design: <ul style="list-style-type: none"> Confirm basic booth sizes and layout. Furnish equipment sizes and weights. Furnish equipment mounting details. Confirm room finishes. Furnish requirements of cable trenches/raceways, cable routing and cable support provisions on walls and floor, holes in TOM/EFO counters and windows glass (for ticket reader). Confirm fire safety provisions. Review the design from designated contractor. Construction: <ul style="list-style-type: none"> Installation of Ticketing operation Machines, Power & Data cable for ticketing machines.
2.	Passenger Operated Machines / Ticket Vending Machine (TVM)	Design: <ul style="list-style-type: none"> Design details to be worked out in interface with design requirements of AFC Contractor. Construction: <ul style="list-style-type: none"> Construction of trench / trough to lay the raceway / tray for laying of power and 	Design: <ul style="list-style-type: none"> Furnish requirement of cable trenches /raceways /trays, cable routing and cable support provisions. Construction: <ul style="list-style-type: none"> Installation of TVM: Power & Data cable for TVM

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>communication cables for TVM's to be installed at present and in future.</p> <ul style="list-style-type: none"> Marking of cut-outs for tap-off boxes, junction boxes on granite as per AFC raceway work and cut-outs for the same as and when required. 	<ul style="list-style-type: none"> Ensure security compliance for cards usages on the machine.
3.	Passenger Operated Machines / Recharge Card Terminal Machines	Construction of trench / trough/ raceway/ tray for laying of power and communication cables for ticket reader / Recharge Card Terminal Machines / Smart Card Vending Machine to be installed presently and in future Stone cutting work shall be done by the civil / furnishing contractor.	Design: Furnish requirement of cable trenches / trough/ raceway/ tray cable routing and cable support provisions to Civil Contractor All Earthing works for Recharge machines.
4.	Automatic Gates related works.	Design: <ul style="list-style-type: none"> Design details to be worked out in interface with design requirements of AFC Contractor. Location and number of gates to be decided in consultation with AFC contractor. Ensure compatibility for fixing of AFC gate. Construction: <ul style="list-style-type: none"> Construction of trenches / trough/ raceway/ tray for laying of Power and data / communication cables. Marking of cut-outs for tap-off boxes, junction boxes on granite as per AFC raceway work and cut-outs for the same as and when required. 	Design: <ul style="list-style-type: none"> Confirm basic gate sizes and booth / cabinet layout Furnish equipment sizes and weights Furnish equipment mounting details Confirm finishes Furnish requirement of cable trenches /trough /raceways /trays, cable routing and cable support provisions. Review the design from designated contractor Construction: <ul style="list-style-type: none"> Contractor shall be responsible for fencing area uncovered by gates and shall also provide all furniture. Installation of gates. Power & Data cables for Gate.
5.	Station Control Room (SCR)	Design: Incorporate design requirement of AFC Contractor in the SCR room viz. Space for workstations / and other AFC equipment's etc. and routing of cable trays/duct. Construction: Construct the SCR room as per approved design.	Design: <ul style="list-style-type: none"> Furnish layout of AFC equipment's (MMI, DB, Racks, Switches, etc.) within SCR in close coordination with the DDCs / Civil Contractor. Furnish requirement of cable trenches / trough/ raceway/ tray cable routing and cable support provisions to Civil Contractor. Construction: Install AFC equipment in SCR.
6.	XBIS (Baggage Scanner)	Design: <ul style="list-style-type: none"> Design details to be worked out in interface with XBIS (baggage scanner) design requirements. Construction:	Design: XBIS (Baggage Scanner) contractor- <ul style="list-style-type: none"> Furnish equipment sizes, weights and layouts. Furnish equipment mounting details.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<ul style="list-style-type: none"> Construction of trenches/ trough/ raceway/ tray for laying of Power and data cable. 	<ul style="list-style-type: none"> Furnish requirements of cable trenches/raceways, cable routing and cable support provisions on walls/floor. Review the design from designated contractor. <p>Construction:</p> <ul style="list-style-type: none"> Installation and commissioning of XBIS machines (Baggage scanner).
	H. BETWEEN CIVIL AND ROLLING STOCK (RS) CONTRACTOR		
1.	Car Details	Requires details of Rolling stock including length of train cars, height and location of doors for station design.	Shall provide required details of Rolling stock including Length of train cars, height and location of doors for station design.
2.	Kinematic and structural gauges	Requires details of kinematic and structural gauges.	Shall provide the details of kinematic and structural gauges.
3.	Clearances checking	Shall jointly check and confirm the curves, dimensional clearances, gradients, chainages, levels and emergency escape provision.	Shall co-ordinate and confirm with station contractor.
4.	Testing and commissioning	Shall jointly check and confirm the maximum noise / echo level with respect to various operating speeds of rolling stock.	Shall co-ordinate and confirm with Station contractor.
5.	Integrated testing	Shall coordinate with RS Contractor to complete testing and commissioning work.	Require to conduct integrated test with all systems.
	I. BETWEEN CIVIL AND PLATFORM, SCREEN DOOR / GATE (PSD/PSG) CONTRACTOR		
	PSD/PSG Installation	Shall construct the platform including any groove in the platform edge for installation of the PSG / PSD system. Coordinate and cooperate for joint survey / inspection with PSG / PSD Contractor.	<p>The Contractor shall coordinate with the Civil Works Contractors of each station to confirm the physical arrangements and any modifications thereto prior to the finalization of PSG / PSD System design. Provide all the required civil works details/inputs including foundations, inserts, openings and other structural works required for the erection of equipment, system and sub-systems, in time for casting, to the Station Civil Contractor.</p> <p>It is the Contractor's responsibility to coordinate with Civil Works Contractor of each station to have joint inspection / survey on Site to ensure that all parts of the Works are provided to the acceptable construction tolerances.</p>
2.	Layout of PSD / PSG rooms at the station	<p>Design: Furnish location, room layout with dimensions of PSG Equipment Room in relation to the entire station and facilities</p>	<p>Design: Confirm floor load bearing capacity and room finishes.</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>layout; Furnish details of architectural finishes of the rooms. Incorporate routing of Cable Ducts Cable Trays (within false ceiling).</p> <p>Incorporate routing of Cable Trays .</p> <p>Construction: Rooms Complete with structures, false ceiling, finishes, false flooring, etc.</p>	<p>Furnish weight, dimensions and mounting details of PSG equipment, control panels, UPS unit and other PSG equipments. Furnish layout of PSG equipment Room.</p> <p>Confirm fire safety provisions. Review design with the design contractor. Co-ordinate closely with construction contractor to ensure the requirements at site are met.</p> <p>Construction: Provide equipment foundations/ pedestals. Install all PSG / PSD equipment.</p>
3.	PSL Location	Shall provide any cut-out, if required, for PSL.	Shall coordinate for PSL location at platform end walls.
	J. BETWEEN CIVIL AND ESCALATORS CONTRACTOR		
1.	Action Before Erection	<p>Before Erection:</p> <ul style="list-style-type: none"> Identify escalator locations and sizes of escalators. Define mounting and structural provisions for escalator assemblies, Coordinate access and delivery space provisions Civil contractor to build Escalator Shaft with Top, Middle & Bottom supports along with notch at Top and Bottom, finishes meeting the escalator requirements at top/bottom of escalator, Lifting hooks, Pit drainage, Escalator Shaft side wall plaster, anti-dust paint, finish of shaft and provision for raceway and sprinkler pipe routing, and SCR layout, cable entry holes as per approved drawing. To construct Escalator shaft as per dimensions in the approved drawing with plumbness. In case of any subsequent correction/ alteration, Civil contractor to provide certificate that Shaft is suitable for installation and safe operation of Escalator. To provide Lifting Beam/ embedded Hooks/ Core-cut as per requirement of Escalator Contractor. In case of drilled hooks, load test also to be conducted and test reports to be provided. To Provide properly levelled, clean, clear and debris free work area& storage space, shaft access (including cable entry holes / cut outs), loading / unloading area and clear access from road to shaft for 	<p>Before Erection:</p> <ul style="list-style-type: none"> Define requirements and provide design details/ details to Civil Contractor for various requirements such as mounting provision, shaft & Pit dimensional data, Notch details , load details at Top , Middle & Bottom structural support, Equipment load, Lifting Hook location & details, earthing requirement, water proofing requirement and protection from rain, structural provision, cutout and recess details, services routes, delivery rout and method of erection, SCR equipment layout etc. well in advance so that the same can be incorporated in the architectural GFCs drawings prior to casting of the Escalator Shaft. Co-ordinate for mounting provisions, Furnish sizes for pit, support details and well way dimensions. Coordinate with Civil Contractor for location and provision of suitable hoisting hooks and stray water drainage arrangements. Plan escalator section / sizes considering local site conditions to facilitate easy transportation to installation location. Provide details about the size of access necessary likely along the passage for unloading, moving/shifting the Escalator materials for erection. To satisfy himself with load bearing capacity of civil structure at the Top,

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>erection of Escalator as per requirement of Escalator Contractor.</p> <ul style="list-style-type: none"> • Adequate extension of roof sheet above the entrances of escalator on both sides of escalator for protection from rain showers • To provide marking for finished floor level at top support and bottom support of escalator. • To provide slope in pit towards drainage hole and pits shall have gravitational drainage system. • To provide proper connectivity of drainage hole to nearest sump by suitable pipes / arrangement and its depth must be more than Escalator Pit depth for effective drainage and to avoid backflow of water into Escalator Pit. Drainage sump pit of Escalator should be away from the Escalator pit to avoid any inconvenience to users and for ease of cleaning. • To provide water proofing of Escalator Pit / Shaft (wherever required) as per requirement of Escalator Contractor. • Ensure Slope of finished floor at the landing of Escalator should be away from Escalator / shaft to prevent entry of mopping water to Escalator's pit. • To provide proper slope and drainage arrangement for accumulated water above roof of Escalator Shaft. • Cutout/ Hole in Slab/ Wall/ Floor for cable entry/ junction box as per requirement of Escalator Contractor. • Finishing of roof ceiling, painting, etc. above escalator. • To protect and cover future escalator shafts suitably. 	<p>Middle & Bottom support location and load bearing hooks /beams before starting installation</p> <ul style="list-style-type: none"> • Plan escalator section/ sizes considering local site locations to facilitate easy transportation to installation location • Provide proper size wooden block for routing of raceways from Isolator Panel to Top Machine Room.
2.	Action during Erection		<p>During Erection:</p> <ul style="list-style-type: none"> • Provide and install escalator units complete along with claddings, decking, decking extension, finishes and operating mechanisms. • Interface with Civil contractor for suitable water drainage arrangements. • Provide and install Fire detectors in the Escalators Pits and Escalator Control Room / Escalator Controller Cabinet.

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
			<ul style="list-style-type: none"> To cover the gap between Top/Bottom Floor Plate & Granite Flooring with flexible sealant. Minor civil works like cutting of Iron bar/ Granite Stone/ Concrete for mounting Escalator fixtures.
3.	Action After Erection	<p>After Erection:</p> <ul style="list-style-type: none"> To provide floor stone and to match stone finished floor level with the level of Escalator Floor Plate (at top & bottom landings). If required Civil contractor will create suitable slope as per approved architectural drawings. Escalator floor plate landing sill stone flaming for making it rough surface as per provision in scope of work. Filling of gap at both side on Top & Bottom of Escalator Landing Floor. SS Handrail on both sides of Escalator Floor Plate Area as per requirement of Escalator <p>Testing:</p> <ul style="list-style-type: none"> Drainage hole connectivity to sump checking. 	<p>After Erection:</p> <ul style="list-style-type: none"> To cover the gap between escalator and the adjoining walls/ parapet walls /Stairs shall by providing with decking extensions up to 300 mm. The Contractor shall allow a gap of approximately 15mm between the decking and the adjacent walls/ parapet walls. The gap shall be filled up by the Escalator Contractor with flexible sealant. Co-ordinate with Civil Contractor for proper fixing of Granite /stone flooring at top and bottom landings Co-ordinate with Civil Contractor for proper fixing of SS Hand railing at top and bottom landings Escalator Floor Plate Area.
	K. BETWEEN CIVIL AND LIFTS CONTRACTOR		
1.	Action Before Erection	<p>Before Erection:</p> <ul style="list-style-type: none"> Define installation provisions for elevator assemblies, co-ordinate access and delivery space provisions. To design and build Lift Shaft along with, Provision for Lifting beam/hook/holes, drainage, rain shelter, and internal plaster including front wall brick/ block and anti-dust paint, finish of shaft, cutouts, recesses, cable entry holes as per approved drawing To construct Lift shaft as per dimensions in the approved drawing with plumbness. In case of any subsequent correction/ alteration, Civil contractor to provide certificate that Shaft is suitable for installation and safe operation of Lift. To provide Lifting Beam/ embedded Hooks as per requirement of Lift Contractor. In case of drilled hooks, load test also to be conducted and test reports to be provided. To Provide properly levelled, clean, clear and debris free adequate storage area at 	<p>Before Erection:</p> <ul style="list-style-type: none"> Provide detailed requirements of shaft size, ventilation opening/cut out size, detailed load calculation, design and drawings of Load beams/ hooks, water proofing requirement and protection from rain, structural provision, surface mounted fixtures, etc. well in advance so that the same can be incorporated in the architectural GFCs drawings prior to casting of the Lift Shaft to Civil Contractor Provide details about the size of access necessary likely along the passage for unloading, moving/shifting the elevator materials for installation. satisfy himself with load bearing capacity of civil structure at the location of Guide way support and of the load bearing hooks /beams before starting installation Plan elevator section/ sizes considering local site locations to facilitate easy transportation to installation location

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<p>the station/ depot/ storage yard including proper access to storage area from the nearby road for carrying elevator materials by hydra cranes/ trailers as per requirement of Lift Contractor.</p> <ul style="list-style-type: none"> • To provide marking for finished floor level at all landings of elevator. • To provide cutouts/holes for fixing indicators and for laying of cables at all landings. • To provide proper connectivity of drainage hole to nearest sump by suitable pipes/arrangement and its depth must be more than Lift Pit to avoid backflow of water into Lift Pit. Drainage sump pit of elevator (Lift) should be away from the elevator pit to avoid any inconvenience to users and for ease of cleaning. • To provide water proofing of Lift Pit/Shaft (wherever required) as per requirement of Lift Contractor. • Ensure Slope of finished floor at the landing of elevator should be away from elevator/ shaft to prevent entry of mopping water to elevator's shaft pit. • To provide proper slop and drainage arrangement for accumulated water on roof of Lift Shaft. • To provide canopy and shower protection of Lift Shaft/ Lift Lobby area which is exposed to open sky. • Water proofing in pit floor. • Provision of ventilation cutout in shaft as per requirement of Lift Contractor and approved drawing. Louvers for Ventilation cutout also to be provided. • Pit cleaning, PCC work and construction of slope in pit towards drainage hole. • Cutout/ Hole in Slab/ Wall for fixing of LIP / LOP (Lift Indicating / Operating Panel) mounting Box and cable routing at all landings as per requirement of Lift Contractor. • Finishing of roof ceiling-painting on load block etc. above elevator. • Future elevator shafts to be protected suitably by suitable block/ brick work. 	<ul style="list-style-type: none"> • Provide proper size wooden block for cutout to civil contractor.
2.	Action During Erection	<p>During Erection:</p> <ul style="list-style-type: none"> • PCC filling at entrance sill & provide sill stone/ Granite at all landings. 	<p>During Erection:</p>

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
		<ul style="list-style-type: none"> Sealing of rain shelter for entrance elevator/ Ground elevator. Signage at all Landings (except in Architrave). 	<ul style="list-style-type: none"> Interface with Civil contractor and Architect for location of suitable water drainage arrangements. Provide and install elevator complete with claddings, finishes and operating mechanism. The gap between ELCB/RCCB Panel & MAP panel and the Architrave sheet to be filled up by the elevator contractor with flexible sealant. Provide Architrave sheet all around the landing Frame at all landings as per the Employer / Employer's representative approval. Elevator number, Job number & Station Name (in both Kannada, Hindi & English language). Elevator capacity plate (in both Kannada, Hindi English language), Emergency Safety Instruction (in both Kannada ,Hindi & English language) License display. Co-ordinate with Civil Contractor for Architrave/ Stonework. Roof leakage checking/ coping stone/ slope of roof for Entrance/ Ground elevator. Minor civil works like cutting of Iron bar/ Granite Stone/ Concrete for mounting elevator fixtures.
3.	Action After Erection	<p>After Erection:</p> <ul style="list-style-type: none"> Stone flaming for making it rough surface. Covering of Gap (Stone and Architrave) by stone cladding in all landings. Filling of gap on elevator shaft on all side & sealing of holes with fire rated material. SS Handrail along with Ramp on both side of elevator as per requirement of elevator contractor for Ground to Concourse elevator. Finishing of patch work with final whitewash/ Paint in elevator shaft. <p>Testing:</p> <ul style="list-style-type: none"> Drainage hole connectivity to sump pit. 	<p>After Erection:</p> <ul style="list-style-type: none"> Co-ordinate with Civil Contractor for provision of Louver over Ventilation cutout. Provide all exterior finishes and door components for landing doors.
	L. BETWEEN CIVIL AND TRACK WORKS CONTRACTOR		
1.	Clearance of track construction envelope	Clear and hand over the track construction envelope as per the approved construction program	Ensure availability of track construction envelope

S. No.	Item Description	Role of DDC / Civil Contractor	Role of System Wide Contractor
2.	Storage facilities and utilization of access period for transportation of material to site.	Shall Provide storage space and advise access period for transport of the track material at site.	Transportation of track material to site in specified space and period so that the construction activities systems / infrastructure are not hampered after access period.
3.	Temporary water supplies for construction of track.	Shall coordinate	Shall make his own arrangements without affecting the other contractors' works
4.	Details of horizontal and vertical clearances (Platform levels) of platform coping with respect to track centre line	Shall ensure that the Platform coping edge has the required horizontal and vertical clearances with respect to the as constructed track centre line and rail level.	Shall take into account these values for track installation
5.	Construction of track plinth	Provisions of vertical stirrups / shear connectors / dowels on viaduct deck in station area.	Construction of Track Plinth utilizing the provisions of vertical stirrups/ shear connector / dowels.
6.	Details of track drainage.	Design and construction of drainage system except the drains required within track. Furnish details of levels of drainage systems.	Design and construction of drains required within track based on details of levels of drainage system provided by Station Contractor
7.	Construction of precast elements	Construction: Construction of precast elements for elevated structures (viaduct) in final position. Provision of vertical stirrups / connection (shear connector).	Construction of concrete plinth using the provisions of vertical stirrups/connection (shear connector) between precast elements and concrete plinth.
13.	Design of Buffer stop	Shall ensure that Design of Viaduct caters to the Impact Loads on the Buffer stop if train overshoots and hits the Buffer stop.	Shall give details for locations of the Buffer stops at the ends of Track at Terminal Stations, Depots & Shunting Neck and design impact loads of the buffer stop.
14.	Expansion joints	Shall ensure that the Design of Deck and Substructure including bearings and location of expansion joints of the deck caters to the Turnouts / Cross overs	Shall provide locations and details of the Turnouts/Crossovers with respect to the centre line of the Station, criteria for deck such as location of expansion joints.
15.	Joint Surveys	Joint survey of viaduct from station to station for the patch offered for the track laying will be carried out by Civil & Track contractor. Track contractor will ensure that the viaduct for track laying will be taken over only if as built Viaduct level are within $\pm 20\text{mm}$ of designed level as per GAD.	Joint survey of viaduct from station to station for the patch offered for the track laying will be carried out by Civil & Track contractor. Track contractor will ensure that the viaduct for track laying will be taken over only if as built Viaduct level are within $\pm 20\text{mm}$ of designed level as per GAD.

M. BETWEEN AFC AND E&M CONTRACTOR			
S.No	Item Description	Role of AFC Contractor	Role of E&M Contractor
1.	Ticket Office, Customer Care (EFO) related works	<p>Design:</p> <ul style="list-style-type: none"> Furnish requirements of raceways, cable routing and cable support provisions on walls and floor. Furnish requirements of lighting, Air-conditioning, Power sockets etc. Confirm fire safety provisions Review the design from designated contractor. <p>Construction:</p> <ul style="list-style-type: none"> Shall ensure the execution of required works like, raceways, cable routing and cable support provisions on walls and floor, lighting, Air-conditioning, Power sockets etc. <p>Shall provide UPS power distribution/ LAN cabling from UPS room/ TER/ SCR, Installation of Ticketing Machines, network elements, power distribution, RVCT etc.</p>	<p>Design:</p> <ul style="list-style-type: none"> Incorporate room lighting, Fan/HVAC, FDA etc., requirements and routing of Cable ducts / cable trays up to operational rooms and station common areas. Shall incorporate the requirements of connectivity and services required for communication systems in station common areas. Review design with the AFC Contractor. <p>Construction:</p> <ul style="list-style-type: none"> Laying Raceways, Cable trays, for laying of power and data/ phone lines. <p>Supply and installation of Indoor and outdoor lighting, Fan/Air-conditioning system, Power points (Normal power) at counters as approved.</p>
2.	Passenger Operated Add Value Machine (AVM)/ Ticket Vending Machines (TVM)	<p>Design:</p> <ul style="list-style-type: none"> Design details to be worked out in interface with E&M contractor for requirement and path of raceways. <p>Construction:</p> <p>Shall ensure the execution of required works like Raceways and their Path.</p>	<p>Design:</p> <ul style="list-style-type: none"> Design details to be worked out in interface with AFC and station finishing contractors. <p>Construction:</p> <p>Laying of Raceways for power and data lines in the path approved in coordination with finishing contractor.</p>
3.	Automatic Gates related works	<p>Design:</p> <ul style="list-style-type: none"> Design details to be worked out in interface with station finishing contractor for Construction of trenches for laying of Power and Data lines. Design details to be worked out in interface with E&M contractor for Lighting Arrangements, Power and Data lines and Earthing. Review design with the E&M Contractor. <p>Construction:</p>	<p>Design:</p> <ul style="list-style-type: none"> Design details to be worked out in interface with AFC and station finishing contractors. Review design with the AFC and station finishing Contractor. <p>Construction:</p> <ul style="list-style-type: none"> Laying of Raceways for power and data lines in the path approved in coordination with finishing contractor. <p>Lighting arrangement in station common area near gates as approved.</p>

		Shall ensure the execution of required works like Lighting Arrangements, Power and Data lines and Earthing.	
N. BETWEEN S&T (TELECOM) AND E&M CONTRACTOR			
		S&T	Civil/E&M
1.	Services for Telecom Equipment Room (TER), and Station Control Rooms.	Design: <ul style="list-style-type: none"> Suitably interface for marking cable trays by furnishing the size, bending radius, voltage level etc., on the station drawings in close coordination with the DDC/E&M Contractor. Shall furnish the equipment/furniture layout. Review design with the DDC/E&M Contractor. Furnish AC load requirements to DDC and coordinate with E&M to ensure AC provision accordingly. Coordinate closely with DDC/E&M Contractor to ensure the requirements at site are met. Construction: <ul style="list-style-type: none"> Construct all cable trays within the TER, SCR & UPS rooms required for Communication systems. 	Design: <ul style="list-style-type: none"> Incorporate room lighting, HVAC, FDA etc., requirements and routing of Cable ducts / cable trays up to operational rooms and station common areas. Shall incorporate the requirements of connectivity and services required for communication systems in station common areas. Construction: <ul style="list-style-type: none"> Shall supply and install all general lighting, FDA, HVAC, ventilation and power sockets in accordance with equipment/furniture layout and CSD. <p>Lighting fixtures positioning inside room should be with proper illumination for the equipment inside the rack.</p>
2.	Cabling infrastructure for Communication systems at stations	Design: <ul style="list-style-type: none"> Suitably interface for marking cable trays by furnishing the size, bending radius, voltage level etc., on the station drawings in close coordination with the DDC/E&M Contractor. Shall interface and review design/CSD with the DDC/E&M Contractor. Furnish and review requirements of EMC for cabling. Review and confirm design with the DDC/E&M Contractor and closely coordinate with E&M Contractor to ensure that the requirements at site are met. 	Design: <ul style="list-style-type: none"> Shall prepare CSD drawings incorporating routing of Cable ducts / trays for communication systems cables throughout the station without clash. Fiber optic cables, Power cables, data cables throughout the station shall have route diversity Design details to be worked out in interface with communication design requirements. Construction: <p>Shall supply and install cable trays/risers/pipe/and the support infrastructure up to the entry of TER, SCR Rooms, Telecom Operator Room and other rooms.</p>
3.	Clocks, Public Address System,	Design: <ul style="list-style-type: none"> Furnish quantities, position and 	Design: <ul style="list-style-type: none"> Incorporate locations of CCTV

	CCTV cameras & monitors (at selected locations), Passenger Information Display Boards, telephones and Radio access units and other associated HMLs at stations	<p>sizes of space cut-outs to the ceiling/ wall finishes for mounting clocks, telephones, Public address loudspeakers, ambient noise sensors, Passenger Information Display Boards, CCTV cameras / monitors.</p> <ul style="list-style-type: none"> Confirm standard of acoustic treatment of areas of coverage by PAS throughout the station Review design with the design contractor and co-ordinate with construction contractor. <p>Construction:</p> <ul style="list-style-type: none"> Install clocks, telephones, Public address loud speakers, ambient noise sensors, all types of CCTV cameras / monitors (as required) and Passenger Information Display Boards throughout the station, including all types of primary and secondary mounting fixtures; Install integrated control panel/ work station for Public Address system and PIDS in SCR and control panel for Public Address system in Platform Supervisor's Booths; Install control panel/ work station and monitors for CCTV (at selected locations) in SCR; <p>Install Radio Access Unit in SCR.</p>	<p>cameras (at specified locations) clocks, telephones, Public address loudspeakers, Passenger Information Display Boards.</p> <ul style="list-style-type: none"> Design details to be worked out in interface with 5 S&T(Tele)-DM design requirements; <p>Construction:</p> <ul style="list-style-type: none"> Shall supply and install cable trays/risers/pipe/ in station area, Ancillary building etc. Shall install conduit upto the Telecom Passenger interface functions(Loudspeaker, CCTV Cameras, Passenger Information Display Board).
4.	Train Radio Antenna system	<p>Design:</p> <ul style="list-style-type: none"> Furnish details of Antenna mounting Tower Structure for Train Radio Base Station (s). Furnish tray requirement with necessary bending radius. <p>Construction:</p> <ul style="list-style-type: none"> Install Tower and Radio antennae and feeder cables. <p>Earthing connection to TETRA Tower(s) and lightning arrester.</p>	<p>Design:</p> <ul style="list-style-type: none"> Design details of Cable trays/Pipe connectivity from TER to foundation of antenna mounting Tower to be worked out in interface with S&T(Tele)-DM design requirements. Design detail to provide earthing arrangement to TETRA Tower and lightning arrester. <p>Construction:</p> <p>Shall supply and install cable trays/risers/pipe/ from TER to Base foundation of TETRA Tower(s) with required bending radius as specified by S&T (Tele)-DM.</p>

5.	Provision of Earthing at station in Communication equipment rooms, Station Control room, Ticket office, Telecom Equipment Room, Telecom Maintenance room, TETRA tower	Design: <ul style="list-style-type: none"> Furnish requirements for clean earth and main earth Review design with the design contractor and co-ordinate with construction contractor. Construction: <ul style="list-style-type: none"> Connect from MET (termination Strip) to clean earth inside Communication equipment rooms, Station control room Ticket office, Telecom operator room and TETRA tower as per requirement etc. as per requirement. 	Design: <ul style="list-style-type: none"> Design details to be worked out in interface with S&T (Tele)-DM contractor. Construction: <ul style="list-style-type: none"> Provide Earth Pits for MET and clean earth. Provide MET (termination Strip) separate for clean earth and main earth in Communication equipment room, Station Control room Ticket office, Telecom operator room as per requirement. <p>Design, Installation and T&C of Earth Grid and Extension of Earth bus bar to all the equipment rooms, Earth Value of < 1 ohm for Main Earth and < 0.5 ohm for clean Earth</p> <p>Provision of Earthing Strip with minimum 3 strips inside equipment rooms.</p>
6.	Provision of Building Management System (BMS)	Construction: Providing necessary Ethernet ports and dedicated bandwidth and QOS on the FOTS/GE backbone to transport all the BMS information between stations and OCC/BCC.	Design: <ul style="list-style-type: none"> Design details to be worked out in accordance with Telecom equipment location and interface requirements. Construction: <ul style="list-style-type: none"> Supply, installation, testing and commissioning of BMS, including PLCs and RTUs with Ethernet interface Mod bus TCP protocol at the station level. Overall integration of BMS at OCC/BCC with a central server including supply, installation and commissioning of associated hardware. Ethernet, Power cable laying till GE rack at TER for BMS systems.
7	Earthing of S&T Equipment on viaduct	To provide design details regarding termination of earthing cable with Bare earth conductor (BEC) cable	Civil contractor shall supply and install and make BEC cable available for earthing termination.
8	Power Supply Requirement	Conduct the power load calculation, indicate the requirements(considering Telecom, PSD, AFC & SCADA load) for signalling Equipments/System to the E&M contractor	Shall provide atleast 4 sources of power terminated at the switch gear namely Feeder -1, Feeder-2, AT-1, AT-2 to S&T contractor for S&T UPS system As per the power supply arrangement
O. BETWEEN S&T (SIGNAL) AND E&M CONTRACTOR			
		Signalling	E&M

1.	Services for signaling Equipment Room, UPS, Signaling Maintenance Room and Station Control Rooms.	<p>Design:</p> <ul style="list-style-type: none"> • Suitably interface for marking cable trays by furnishing the size, bending radius, voltage level etc., on the station drawings in close coordination with the DDC/E&M Contractor upto operational rooms and station common area. • Shall furnish the equipment/furniture layout. • Review design with the DDC/E&M Contractor. • Furnish AC load requirements to DDC and coordinate with E&M to ensure AC provision accordingly. • Coordinate closely with DDC/E&M Contractor to ensure the requirements at site are met. <p>Construction: Construct all cable trays within the SER, SCR & SMR rooms required for signaling and Train Control System.</p>	<p>Design:</p> <ul style="list-style-type: none"> • Incorporate room lighting, HVAC, FDA etc., requirements and routing of Cable ducts / cable trays. Shall incorporate the requirements of connectivity and services required for Emergency stop plunger up to operational room and station common areas. • Review design with the S&T-DM Contractor. <p>Construction:</p> <ul style="list-style-type: none"> • Shall supply and install all general lighting, FDA, HVAC, ventilation and power sockets in accordance with equipment/ furniture layout. <p>Shall supply and install isolators and cables up to isolator at UPS Room and extend permanent power supply from ESR MDB.</p>
2.	Cabling infrastructure for signaling at stations	<p>Design:</p> <ul style="list-style-type: none"> • Suitably interface for marking cable trays by furnishing the size, bending radius, voltage level etc., on the station drawings in close Coordination with the DDC/E&M Contractor. • Shall interface and review Design/CSD with the DDC(E&M)/E&M Contractor. • Furnish and review requirements of EMC for cabling. Review and confirm design with the DDC/E&M Contractor and closely coordinate with E&M Contractor to ensure that the requirements at site are met. • Construction: Shall supply and install all cables. <p>Construction: Shall supply and install all cables.</p>	<p>Design:</p> <ul style="list-style-type: none"> • Shall prepare CSD drawings incorporating routing of Cable ducts / trays for signaling cables throughout the station without clash. • Fiber optic cables throughout the station shall have route diversity Design details to be worked out in interface with signaling design requirements. <p>Construction: Contractors shall provide Cable ducts/ cable trays / risers/ conduit etc. for routing STC cables from PF/viaduct/Stations to technical rooms, ESP connectivity as per requirement etc.. this shall include route diversity of cable containment for cables as per the design finalised by the STC Contractor. Shall seal the gaps/openings at cutouts in the viaduct, in the foundations for cable entry into the rooms. Finishing works for Emergency Stop Plunger/Blue Light stations on the platforms including</p>

			<p>embedded pipes, trays, housing for ESP's etc.</p> <p>Shall design, supply and Install Lightning Arrestors of Suitable class as per S&T Requirement.</p>
3.	Station Control Room	<p>Design:</p> <ul style="list-style-type: none"> Shall provide layout of Signaling equipment to E&M DDC for appropriate design of lighting, AC, ventilations etc. <p>Construction:</p> <p>provide UPS supply for workstations for all systems including suitable protection arrangement in UPS room and install signaling equipment within Station Control Room. Cable tray provision of Signaling equipment.</p>	<p>Design:</p> <ul style="list-style-type: none"> Shall design the services like lighting, HVAC, FACP, keeping in view of the Signaling requirement. <p>Construction:</p> <p>Provide details of UPS supply requirement to the Signaling contractor for BMS, Lift and Escalator work stations provided in Station Control Room. Provision of power sockets. Civil shall Provide furniture for work stations of all Systems (Signaling, Telecom, AFC, BMS, Lifts, Escalators & FACP)</p>
4.	Provision of Earthing at stations in equipment rooms (Signalling Equipment Room, Signalling Maintenance Room, Station Control Room, UPS Room).	<p>Design:</p> <ul style="list-style-type: none"> Design review of earthing requirements for value <1 ohm for Signaling and Train control application and <0.5 ohms for telecom applications. <p>Construction:</p> <p>Shall witness the joint testing.</p>	<p>Design:</p> <ul style="list-style-type: none"> Shall supply and construct earth pits, draw connection from pit to MET Inside UPS (S&T) room, Signalling Equipment Room (SER), SMR, SCR and TER. <p>Construction:</p> <ul style="list-style-type: none"> Shall supply and install tray support for routing of earthing cable / flats from earth pit to UPS S&T Room. Design, Installation and T&C of Earth Grid and Extension of Earth bus bar to all the equipment rooms, Earth Value of < 1 ohm for Main Earth and < 0.5 ohm for clean Earth Provision of Earthing Strip with minimum 3 strips inside equipment rooms. <p>Joint testing to be carried out at earth pits terminals and loop test to be carried out up to MET.</p>
5	Earthing of S&T Equipment on viaduct	To provide design details regarding termination of earthing cable with BEC cable	E&M contractor shall supply and install and make BEC cable available for earthing termination.
6	Power Supply Requirement	Conduct the power load calculation, indicate the requirements (considering Telecom, PSD, AFC & SCADA load) for	Shall provide atleast 4 sources of power terminated at the switch gear namely Feeder -1, Feeder-2, AT-1, AT-

		signalling Equipments/System to the E&M contractor.	2 to S&T contractor for S&T UPS system
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