Israel Railway Ltd.

Technical Specifications
FOR EXECUTION OF ELECTRIFICATION WORKS

00 Section 00 – Preliminaries

0.1 Scope of Section 00 – Preliminaries

This Preliminaries Section includes general and common provisions forming an integral and binding part of the conditions for execution of the Project Works.
The Contractor shall perform the Works in full coordination with ISR, ISR's Project Manager or any party acting on their behalf, and strictly in accordance with the instructions thereof.
All planning, permitting, execution, testing, commissioning and handover activities shall be carried out under the engineering management and supervision of ISR's Project Manager.

0.2 High-level, General Description of the Works

The Works under this Tender include full Design and Build (DB) of the ISR Overhead Contact System for railway electrification pursuant to the terms and conditions set forth herein and in the Tender Documents (hereinafter: the "**OCS System**").
The scope of the Works includes, without limitation, the following activities:

Design (Pre-Execution) Phase

The Contractor shall be fully responsible for all pre-execution activities (unless instructed otherwise by ISR), which constitute a condition precedent for commencement of any physical Works, including but not limited to:

- **Notice to Proceed (Design)** - This notice will include a start date to commence the Design phase as described in this volume.
- Preparation of updated topographical and control surveys, signed by a licensed surveyor in accordance with ISR standards. The surveyor will be pre-approved by ISR.
- Detection and mapping of existing underground utilities prior to design, including GPR (Ground Penetrating Radar), earth vacuuming, and manual digging as necessary and instructed by ISR.
- Full design of the OCS System in accordance with the Technical Specifications and in accordance with ISR standards.
- Obtaining all design approvals from any competent Authority as required under Law and ISR standards.
- Payments to third parties for supervision, as instructed by ISR.
- Design and approval of Temporary Traffic Arrangements (TTA)

Execution Phase

Commencement of the execution phase of the Works shall be strictly conditional upon completion and approval of all pre-execution requirements.
Execution Phase shall include the following, among others:

- **Notice to Proceed (Execution)** - This notice will include a start date to commence the Execution phase as described in this volume.
- Obtaining all excavation permits and work permits in accordance with the Planning and Building Law, utility owners' requirements, and ISR instructions.
- Local Infrastructures' detection prior to drilling. Infrastructures shall be marked clearly to avoid destruction.
- Execution of Temporary Traffic Arrangements (TTA)
- Foundations for OCS structures (unless instructed otherwise by ISR).
- Erection of OCS poles and structures.
- Installation and tensioning of OCS wiring.
- Completion and integration of the OCS System.

- SCADA cabling and connections works as instructed by the ISR – end to end.
- Connection to existing OCS or traction substations.
- Post Execution As-Made drawings signed by a licensed surveyor.

- Testing, commissioning and handover to ISR or to the maintenance entity in accordance with ISR requirements and as specified by ISR.

Due to the nature of the Works, activities may be performed adjacent to active and/or energized railway lines. Track possessions (TPs) shall be defined by ISR. The Contractor shall fully adapt its resources, manpower and equipment to the defined track possession windows.

0.3 Nature of the Works and Working Conditions

The Contractor is aware that it shall be required to carry out the Works in deferent Sites and that aboveground, belowground, geotechnical, geological, hydrological, climatic, environmental and seismic conditions could differ from Site to Site.

It is hereby clarified that for execution of certain parts of the Works, the Contractor may be required to work within areas that have been permanently or temporarily expropriated for the purpose of the Works, strictly in accordance with written instructions issued by ISR.

The Contractor shall carry out all actions required to locate existing utilities at the Site by means of electronic detection, trial excavations, vacuum excavation or any other approved method, and shall clearly and accurately mark such utilities to prevent damage. As part of obtaining excavation permits, the Contractor shall coordinate with representatives of the relevant utility owners and shall comply fully with their instructions.

The Contractor shall not block access roads, agricultural roads, entrances or exits to existing buildings or plots along the alignment. Where required, the Contractor shall plan and obtain all necessary approvals from relevant stakeholders.

Commencement of any Works at the Site shall be subject to the written approval of ISR by issuance of a notice to proceed ("Notice To Proceed (Execution)").

It is further clarified that failure to commence Works due to non-fulfilment of the conditions set forth in this Section 0.3 shall not constitute grounds for any claim by the Contractor of any kind. The provisions of this Section shall not derogate in any manner from the Contractor's contractual responsibilities and obligations throughout the execution phase.

0.4 Access Roads, Fencing and Site Organization Plan Road

The Contractor shall obtain all required approvals for temporary traffic arrangements and for regulation of all access roads to and adjacent to the Site.

The Contractor undertakes to comply with all safety instructions issued by the relevant Authorities and to implement all requirements thereof, whether provided directly to the Contractor or conveyed through ISR following prior coordination.

It is emphasized that some access roads intersect existing infrastructure such as fuel pipelines, wet utilities and similar facilities.

Without derogating from the provisions of the Agreement, the Contractor shall plan, approve and implement temporary traffic arrangements during the Design Phase as required, and shall obtain any required approval from the competent Authorities, including the authorized traffic authority and the police. The Contractor shall engage an approved traffic consultant for carrying out the foregoing.

Fencing

The Contractor shall fence all site organization and mobilization areas with white corrugated steel fencing with a minimum height of 2.0 meters (or other if instructed by ISR) and shall install suitable access gates in accordance with site constraints. Gates shall remain locked at all times during and off working hours and shall be opened solely for authorized site access, delivery of equipment and materials, and operational needs.

The Contractor shall maintain all fencing throughout the execution period in accordance with ISR requirements and shall relocate fencing as required.

Site Organization Areas

A site organization area is defined as an area located near the Site and required for temporary storage of materials, equipment, tools and temporary offices as necessary for execution of the Works.

ISR shall specify in the applicable Work Order any site organization area arranged thereby. Should the Contractor require an alternative site or additional site to that arranged by ISR, it shall be responsible for procuring, arranging and maintaining same, including entering into the required agreements with third parties with respect thereto.

Within 20 days from issuance of a Notice To Proceed (Execution) with respect to a specific Work Order, the Contractor shall submit to ISR site organization plans, including approved access arrangements, as approved by the relevant local authority and ISR.

The Contractor shall coordinate and obtain approvals from relevant utility owners regarding the location of the site organization areas.

The Contractor shall ensure continuous and proper maintenance of the site organization areas throughout the execution period and until dismantling.

The site organization plan shall be prepared with an up-to-date topography survey and the general work plan at a scale of 1:100, as required by ISR and any Authority. The plan shall clearly indicate all components required for site organization, including:

- Temporary structures, utility connections, drainage arrangements, equipment parking areas;
- Storage areas, site offices, access routes, entrances and exits, safety fencing;
- Temporary traffic arrangements for vehicles and pedestrians for all execution stages;
- Locations for equipment, cranes and all elements required for execution of the Works.

The Contractor shall be responsible for obtaining, maintaining and renewing any permits related to the site structures, including paying municipal taxes and levies, if applicable.

0.5 Installation of Signage within the Organization Site

The Contractor shall plan, approve and install, in accordance with the instructions of ISR, two project signs for the entire execution period. The signs shall comply with the size requirements instructed by ISR and shall include the project name, the name of the chief designer, ISR's Project Manager, the executing Contractor and the Site Manager, as well as the logos of ISR and the Ministry of Transport.

The content of each sign shall be approved by ISR prior to manufacture. A digital file of the sign shall be submitted for approval following ISR approval and prior to production.

The Contractor shall submit a draft of the sign wording, including an approved visualization, for the approval of ISR.

The exact location, size, background color and lettering shall be determined by ISR.

The signs shall be installed on appropriate steel poles with suitable supports and concrete foundations. Prior to fabrication, the Contractor shall submit detailed structural drawings of the sign, its foundations and installation method, approved by a licensed structural engineer.

The design, foundation and installation of the signage shall be executed by the Contractor, under its sole responsibility, and in accordance with applicable Laws.

The Contractor shall take into account that relocation of the signage may be required during the execution of the Works.

0.6 Protection Against Climate Damage, Groundwater and Temporary Drainage

The Contractor shall take all measures necessary to protect all executed Works, structures, materials, tools and equipment from damage caused by natural elements throughout the execution period and until the end of the Warranty Period.

In particular, the Contractor shall implement all measures required by ISR to protect the Site against flooding from rainfall or any other water source.

The Contractor shall also provide and maintain temporary drainage arrangements as required.

0.7 Contractor's Staff

The Contractor shall submit and obtain ISR's approval for the Core Management Team and Key Personnel as detailed in the table in Section 0.33 below.

The Core Management Team and Key Personnel constitute minimum requirements, and the Contractor will be required to engage, maintain and deploy professionals, experts, consultants, advisors and other service providers and subcontractors as necessary and required to ensure that the Works are carried out fully, appropriately and properly in accordance with the Agreement, each Work Order and applicable Law.

A licensed Surveyor shall be appointed for surveys, measurements, preparation of as-Made drawings, submission of payment quantities and site marking. The surveyor shall be available within 24 hours from receipt of ISR's request.

To the extent required, an environmental quality officer shall be appointed, holding an academic background in relevant fields such as environmental engineering, landscape architecture or ecology, and with at least three years' experience in supervision of railway or road infrastructure projects.

The environmental quality officer shall liaise with the environmental consultant appointed by the competent authority and shall ensure compliance with all environmental requirements. Approval of environmental conditions by the competent Authority shall constitute a condition precedent to commencement of any Works.

The environmental quality officer shall report to ISR's Project Manager any deviation from defined threshold values or mandatory work instructions. All deviations shall be recorded in an "Exceptional Events Log", including details of the nature of the deviation, date, responsible party, corrective instructions and completion date.

0.8 Safety at Work

The Contractor shall perform all Works in accordance with all Laws, ISR's procedures and all relevant occupational safety standards.
Execution of Works shall commence only after receipt of approval from ISR's safety manager and from the Contractor's safety officer.

0.9 Equipment Required for Execution of the Works

Importation and Availability of Equipment

In accordance with the distribution of the work sites and for the purpose of ensuring appropriate quality, all equipment, materials and tools required for execution of the Works shall be present in Israel at least thirty (30) calendar days prior to the planned work commencement date.
All materials and equipment shall be stored in accordance with the relevant Standards, manufacturer instructions and applicable PHST manufacturer guidelines, as relevant.

Transfer of Equipment to the Site Organization Area

Transportation of materials to the site organization area shall be carried out in accordance with the manufacturer's instructions and applicable Standards and shall be the sole responsibility of the Contractor.
The Contractor shall not commence any Works unless all equipment required for the execution of the specific activity is present on Site, in the quantity and quality required, to the satisfaction of ISR and in accordance with the drawings, relevant standards, nature of the Works and manufacturer instructions.
All required equipment shall be delivered to the site organization area in proximity to the commencement of the Works and shall be present on Site at least one (1) hour prior to receipt of track possession, for the purpose of inspection of all required equipment.

0.11 Verification and Design Review of ISR Drawings, Data and Interface Information (DB)

Review of Drawings and Data Received from ISR

Upon receipt of any drawings, data or information provided by ISR ("the Data") or by other parties acting on its behalf, including but not limited to reference drawings, surveys, existing infrastructure information, interface drawings, specifications, bills of quantities (if any) and dimensional data, the Contractor shall perform a professional, coordinated and timely review thereof.
The Contractor shall examine the Data in advance of execution and, within fourteen (14) working days from receipt, notify ISR in writing of any error, omission, contradiction or inconsistency identified within the Data, between the Data and actual site conditions, or between the Data and applicable Laws or Standards, which could reasonably be identified by a Design–Build contractor.This obligation shall include, inter alia, verification and measurement of existing elements to which the Works are connected, and notification of any on-site conditions inconsistent with the ISR Data.

Nature of the Data

The Contractor acknowledges that the Data is provided for information only and interface purposes only. Certain dimensions shown therein may be approximate and execution details may be indicative only, and subject to adjustment in accordance with actual site conditions. The Contractor shall be responsible for coordinating and executing the Works in accordance with accurate, verified and correct dimensions.

Scope of Review

The Contractor's review obligation under this clause shall be limited to identifying obvious and reasonably detectable discrepancies and inconsistencies in the Data and shall not constitute a detailed design verification, independent calculations, or a review of the Contractor's own design solutions.
Nothing in this clause shall be construed as relieving the Contractor of its full and exclusive responsibility for the design of the Works, nor as transferring any design liability to ISR.

Consequences of Failure to Notify

Failure by the Contractor to notify ISR within the timeframe stated above of discrepancies that could reasonably have been identified shall result in such discrepancies being deemed included within the Contractor's design responsibility. Any corrections, including demolition and reconstruction if required, shall be carried out by the Contractor without any obligations to ISR.

ISR Instructions

Upon notification, ISR shall issue written instructions or clarifications within a reasonable time. The Contractor shall not proceed with execution of the affected Works until such instructions are received, unless otherwise directed by ISR in writing.

Safety

Notwithstanding the above, the Contractor shall immediately notify ISR upon discovery of any issue affecting safety, regardless of when such issue is identified.

0.10 Quality Control Laboratory

The Contractor shall engage and maintain an approved and certified laboratory for purpose of performing the required tests, all in accordance with ISR's Quality Control Specification attached in **ISR Procedures** to the Technical Specification and forming an integral part thereof.
The laboratory testing shall include, *inter alia*:

- Preliminary tests for the assurance of material quality.
- Ongoing tests for execution quality.
- Tests for workmanship quality.
- Various on-site tests, as required by ISR.

Documentation and Test Records

The Contractor shall maintain full and detailed documentation of all tests performed at the work sites and/or at manufacturers or suppliers' facilities. Documentation shall also include products bearing a standards certification mark.

The Contractor shall prepare consolidated summaries of test documentation and submit them to ISR in accordance with its requirements and the provisions of the Agreement.
The laboratory shall operate in accordance with the Contractor's Quality Control Plan and under the supervision of its Project Manager and in compliance with the requirements of the quality assurance company maintained thereby.

0.11 Preliminary Tests for Civil Engineering Works

Preliminary tests to determine the quality and composition of materials, and their compliance with all applicable standards, specifications and Agreement requirements, shall be performed by the approved and certified laboratory as part of the Quality Control Plan implemented by the Contractor, all in accordance with ISR's Quality Control Specifications attached in any and all **ISR Procedures** hereto and forming an integral part of the Technical Specification. Payment for such tests, including sampling and transportation, shall be borne by the Contractor. Preliminary tests shall include, *inter alia*, determination of the quality of aggregates, base layers, imported fill materials, excavation material (where used as fill), materials intended for concrete, and, if required by ISR, additional preliminary tests for any item or material supplied by the Contractor.
The scope of preliminary testing shall be determined in accordance with applicable Standards and shall be approved by ISR, based on the Quality Control Plan, the type of Works, their scope and results. Test results shall be submitted for the approval of the quality control entity and ISR sufficiently in advance of material supply.

0.12 Materials, Equipment and Tools – OCS System

- Source of Materials
  The Contractor is obligated to procure materials in accordance with the requirements of the relevant Standards, the Technical Specifications, quality assurance instructions and the requirements of ISR.
  Materials and equipment shall be procured from approved factories that comply with ISR's standards and quality requirements, certified for railway use, and in accordance with the Technical Specifications. Factories shall be approved in advance in accordance with quality assurance instructions.
  Failure to comply with the applicable standards or with quality assurance requirements may result in rejection of materials.

0.13 Design documentation under the Responsibility of the Contractor

Design documentation under the responsibility of the Contractor shall include, *inter alia*, and without derogating from any other provisions of the Tender Documents:

- Design of the site organization area, obtaining all approvals for its establishment, operation and maintenance.
- Design of temporary supports for structural elements or ground, including for excavations adjacent to railway tracks, structures, roads, pipelines and above- or below-ground systems.
- Design of formwork for all concrete works and auxiliary facilities.
- Preparation of reinforcement schedules for reinforced concrete elements;
- Design of temporary access roads and working platforms;
- Design of auxiliary and temporary drainage;
- Design, coordination and approval of all project work stages and temporary traffic arrangements;

- Preparation of shop drawings for various elements, including horizontal drilling under railway tracks or roads, as detailed in the various specifications, including all requirements for obtaining approval of ISR.
- Preparation of As made drawings.

All design works shall be carried out by the Contractor, who shall engage licensed and experienced designers subject to approval by ISR.

0.14 Site Meetings

During the execution phase, regular coordination meetings shall be held for the purpose of coordinating the Works, at a frequency of at least once per week, with the participation of the Contractor's Project Manager, design teams ISR's Project Manager and any other consultant or representative on behalf of ISR.

The Contractor shall invite to such meetings, as instructed by ISR, subcontractors and suppliers whose participation is required for coordination of production, supply and execution activities. The Contractor, its subcontractors and all authorized personnel performing technical and administrative management roles shall be obligated to attend coordination meetings at the times and for the duration required by ISR.

Quality Control meetings shall be held separately from execution coordination meetings, with the participation of ISR's Project Manager, Contractor's Quality Control Manager, discipline-specific quality managers as required, Quality Assurance manager, design teams as required, and representatives of the ISR and/or its consultants where necessary.

0.15 Approval of Subcontractors and Suppliers

Within fourteen (14) calendar days from issuance of a Notice to Proceed (Design), the Contractor shall submit for the approval of ISR a list of all subcontractors and suppliers employed or intended to be employed in execution of the Works under the applicable Work Order. For each proposed subcontractor and supplier, the Contractor shall submit a list of similar works in nature and scope performed within the past five (5) years, at least three (3) projects of which were executed in Israel.

Each subcontractor shall be a registered contractor holding the appropriate classification. Subcontractors in disciplines requiring completion of design and preparation of shop drawings by the Contractor shall be evaluated also on the basis of their design capabilities. Subcontractors intended to perform infrastructure works to be delivered to third parties (such as utilities, Israel Electric Company (IEC), telecommunications companies, etc.) shall be approved by the relevant utility owner.

ISR may reject the engagement of any subcontractor by the Contractor for performance of any Works if deemed unsuitable for any reason, including failure to meet the above conditions, without being required to provide justification.

0.16 Other Contractors

The Contractor is aware that other contractors may work concurrently at the Site, performing various works on behalf of ISR and/or that ISR may engage other contractors to perform works on the Project. The Contractor shall be obligated to coordinate the activities of such contractors with its own Works, including integration of their works into the Project schedule, and to interface with such contractors in accordance with Interface Management and Coordination Requirements in section 2 in this document.

0.17 Information and Document Management Systems

The Contractor shall implement and operate an approved Document and Information Management System (DMS/EDMS) for all Project-related correspondence, drawings, documents, RFIs, approvals, records and deliverables.
The system shall be subject to the prior written approval of ISR and may include, for reference only, systems such as **Siteam**, or any other approved equivalent platform.
No document, drawing, instruction or approval shall be deemed valid unless issued and recorded through the approved system.

0.18 Quality Control System

The Contractor shall establish and maintain a comprehensive Quality Control (QC) system in accordance with ISR Quality Assurance Specifications (attached in **ISR Procedures.**

The system shall be subject to the prior written approval of ISR and may include, for reference only, systems such as **Siteam**, or any other approved equivalent platform.
The QC system shall include, *inter alia*:

- Design Quality Control and independent checks
- Procurement and supplier Quality Control
- Construction Quality Control
- Inspections, audits and traceability
- NCR issuance, closure and corrective/preventive actions.
- Day – to – day correspondence between all parties (Contractor, Design Team, ISR, PMC etc.)

The Contractor shall engage an external quality control company, the identity of which shall be subject to the approval of ISR.
ISR or QA review, audits or acceptance shall not constitute a waiver of the Contractor's full responsibility for quality.

0.19 Request for Information (RFI) Procedure

All RFIs shall be submitted, tracked and closed exclusively through the approved DMS.

0.20 Schedule

Within fourteen (14) calendar days from the issuance of a Notice to Proceed (Design), the Contractor shall submit to ISR, for its approval, a detailed Project Schedule covering all design phases of the Works. The Schedule shall also include indicative milestone dates for the Execution phase, including procurement, construction, testing, commissioning, and handover. Within fourteen (14) calendar days from the issuance of a Notice to Proceed (Execution), the Contractor shall submit for ISR approval a fully detailed Project Schedule covering all Execution phases of the Works.
The Schedule shall be prepared using recognized scheduling software (e.g., MS Project or equivalent), shall clearly identify critical path activities, milestones, and interfaces with third parties, and shall be fully aligned with the approved phasing and access constraints.
The Contractor shall update and maintain the Schedule on a weekly basis to reflect actual progress, approved changes, and mitigation measures for delays.

0.21 Design Approval

All designs shall be submitted through the approved DMS and will be subject to review and revisions according to ISR standards and regulations.

0.22 Material Approval Workflow

The Contractor shall establish and implement a material approval workflow, including submission of technical datasheets, certificates, samples and approvals by ISR and the QA company. No materials shall be manufactured, shipped, delivered or installed without prior written approval from ISR and/or QA.

Approval of materials will not relieve the Contractor of responsibility for performance, compliance, durability or fitness for purpose.

0.23 Management Routines and Site Administration

During the execution phase, regular coordination meetings shall be held for the purpose of coordinating the Works, at a frequency of at least once per week, with the participation of the design teams, ISR's Project Manager and any representatives or consultants required by ISR. The Contractor shall invite to such meetings, as instructed by ISR, subcontractors and suppliers whose participation is required for coordination of production, supply and execution activities. The Contractor, its subcontractors and all relevant personnel performing technical and administrative management roles shall be obligated to attend coordination meetings at the times and for the duration required by ISR.

The Contractor will attend all meetings necessary for the progression of the Works. The following table lists the mandatory meetings, to which additional meetings may be added as required by ISR:

Meeting	Frequency	Contractor Participants	Agenda
PMC	weekly	Project Manager, OCS manager	Updates on Project status from each party, ISR's feedback and concerns, action items and responsibilities, future planning and next steps
Construction	weekly	OCS Construction Manager, Work Order Manager, PMO	Next week lookahead, review of previous meeting minutes, current construction progress updates, challenges and issues encountered, action items from previous meeting, next steps and responsibilities, schedule for next Meeting
Safety	weekly	Work Order Manager, Head Safety Manager	Review of previous meeting minutes, current safety performance metrics, safety training updates, safety protocols and compliance, hazards' identification and mitigation, safety concerns, action items and responsibilities, next steps and future safety initiatives

Meeting	Frequency	Contractor Participants	Agenda
Workplan	weekly	Work Order Manager, PMO	Monthly schedule forecast, identifying risks and issues, adjusting resources table for upcoming week, next steps and responsibilities
Design	weekly	Design Manager, Interface Manager	Overview of current design status, review of design documents, feedback and required adjustments, action items from previous meeting, future design milestones
QA-QC	Weekly	Quality Control Manager, Work Order Manager	Review of previous meeting minutes, QA-QC status reports, quality issues, compliance updates, action items and responsibilities, review of Non-Conformance Reports (NCRs), resolution follow-ups, action items from previous meeting, next steps for NCRs
Schedule	Every Other Week	PMO, Work Order Manager	Review of Gantt chart updates, performance review against schedule, identifying delays and mitigation plans
Billing	Monthly	PMO, Work Order Manager, Procurement Officer	Review of previous meeting minutes, current billing status, outstanding invoices, future billing projections, action items and responsibilities
Risk management	Monthly	PMO, Work Order Manager	Review of previous meeting minutes, current risk register updates, identification of new risks, assessment of existing risks, likelihood and impact analysis, mitigation strategies for high-risk items, action items and responsibilities, monitoring and reporting procedures, risk concerns

0.24 Design Schedule and Design Milestones

The Contractor shall submit a detailed design schedule, defining minimum and maximum durations for each design stage, including tolerances, within 20 working days from issuance of Notice to Proceed (Design).

Design milestones are contractual and binding and shall be fully integrated with execution milestones.

ISR reserves the right to change any or all the time periods specified in the table below at its sole discretion.

Works are executed under operational constraints and increased interface and safety requirements.
Minimum track possession window: not less than 6 **gross** hours per possession, from TP start ("נוהל תפיסת מסילה") to TP end ("נוהל תפיסת מסילה") as defined in **ISR Procedures**.

Design Milestone	**Accumulated days from NTP (Design) [days]**
Preparation of updated topographical and control surveys, signed by a licensed surveyor according to ISR standards. The surveyor will be pre-approved by ISR.	30
Detection and mapping of existing underground utilities prior to design, including GPR (Ground Penetrating Radar), earth vacuuming, and manual digging as necessary and demanded by ISR.	30
Full design of the OCS System in accordance with the Technical Specifications and according to ISR standards.	45
Obtaining all design approvals from the competent and relevant authorities and in compliance with all Laws and Standards and according to ISR standards.	60
Design, approval and execution of temporary traffic arrangements as required.	60

0.25 Regulatory Approvals and Authorities

Other than in respect of the ISR Obtained Permits as specified in the Agreement, the Contractor shall bear full and exclusive responsibility for obtaining, maintaining and complying with all statutory and regulatory approvals required for execution of the Project, including approvals from VATAL, RRA and any other competent Authority.
Delays or requirements imposed by Authorities shall not constitute grounds for claims or extensions of time, unless expressly stated otherwise in the Agreement.

0.26 OEM and Manufacturer Requirements

All materials, components and systems shall be supplied by **Original Equipment Manufacturers** (OEMs) approved by ISR.
Substitutions shall not be permitted without prior written approval.
The Contractor shall ensure full manufacturer traceability, approvals and compliance with installation requirements.

0.27 Defects Liability, Maintenance and Spare Parts

During the **Warranty Period**, the Contractor shall be fully responsible for the following (without derogating from the provisions of the Agreement pertaining to the Warranty Period):

- Corrective maintenance
- Preventive maintenance
- Breakdown repairs

In addition, the Contractor shall supply and maintain an approved inventory of minimum spare parts of at least 5% of all components installed in the Works.

0.28 Procurement and Inventory Management

With respect to each Work Order, the Contractor shall establish procedures for procurement planning, purchasing, inventory management and long-lead items.
The Contractor shall ensure quality control inspections prior to shipment from the manufacturing facility, including factory acceptance tests to the extent required.
If required, the Contractor will assist ISR with audits in any factories or manufacturing plant where Works are being executed.

0.29 Guaranteed Track Availability

For the purposes of this tender:

TP Start: The time of day (HH:MM) that was scheduled for the TP to start.
TP End: The time of day (HH:MM) that was scheduled for the TP to End.
The Contractor shall ensure that the Works, including all temporary works, testing activities, maintenance interventions, dismantling, integration, and any other operations performed under this Agreement, do not adversely affect the operational availability of the Track beyond the limits approved in advance by ISR. All activities shall be planned and executed in a manner that preserves the continuous and safe operation of the railway network, except during duly authorized Track Possessions (TP) in accordance with ISR Procedures.
The minimum Track Possession window for execution purposes shall be not less than twelve (12) gross hours per possession, calculated from TP start to TP end as defined in ISR Procedures. It is clarified that the actual available working time within the possession window may be shorter due to operational, safety, energization, clearance, or other procedural requirements. The Contractor may request longer TP windows where reasonably required, and ISR shall consider such requests at its sole discretion.

0.30 Saturdays, Jewish Holidays and Official Rest Days

For the purposes of this Agreement, "Saturday" shall mean the period commencing at the official time of Sabbath entrance and ending at the official time of Sabbath exit, in accordance with the customary religious times applicable in Israel and at the geographical location of the relevant Work Site. "Jewish Holidays and Official Rest Days" shall mean the period commencing at the official entrance time of the relevant holiday or rest day and ending at its official conclusion time, as observed in Israel.

The Contractor shall not perform any Works during Saturdays, Jewish Holidays, or Official Rest Days

Position	Minimum Requirements & Qualification	Responsibilities
OCS Team Leader (local)	5 years' experience as a team leader in construction or infrastructure projects in Israel. Trained, certified and authorized in accordance with **EN 50110-1,** including documented competence for work on 25 kV AC railway electrification systems. Fluent in Hebrew and English.	Overall on-site shift team management. Connection with ISR's Project Manager and ISR safety supervisors. Responsible for all equipment, tools and materials on site for completion of work per shift.
OCS linesman	5 years' experience as a linesman in OCS projects. Trained, certified and authorized in accordance with **EN 50110-1,** including documented competence for work on 25 kV AC railway electrification systems.	On site OCS System installation.
worker (local/foreign)	Trained, certified and authorized in accordance with EN 50110-1, including documented competence for work on 25 kV AC railway electrification systems.	On site OCS System installation.
RRV Driver (local)	Trained, certified and authorized in accordance with EN 50110-1, including documented competence for work on 25 kV AC railway electrification systems. ISR certified for RRV operation. Fluent in Hebrew and English.	On site RRV Driver.

as defined above, unless expressly authorized in writing by ISR. The Contractor shall plan and manage the execution of the Works so as to prevent any scheduled activity from extending into such periods.
Notwithstanding the foregoing, ISR may authorize the execution of Works during Saturdays, Jewish Holidays, or Official Rest Days in exceptional circumstances, including but not limited to safety requirements, operational necessity, or prevention of material damage, subject to compliance with applicable laws and required permits. The Contractor shall bear full responsibility for coordinating and ensuring compliance with the provisions of this clause.
The Contractor shall provide formal On-the-Job training as specified in paragraph 0.32 in this document for all local Israeli personnel in OCS works, including safety training, installation and maintenance procedures.
All personnel working on or in the vicinity of the OCS shall be trained, certified and authorized in accordance with **EN 50110-1**, including documented competence for work on 25 kV AC railway electrification systems where required.

All RRV Drivers are required to receive ISR certification according to ISR standards.
The following table specifies the minimum requirements and responsibilities of each team member:

Each OCS team will include <u>at least</u> one (1) team leader, one (1) OCS linesman, two (2) workers and one (1) driver.
Each Civil or Foundation installation team will include <u>at least</u> one (1) team leader, two (2) workers and one (1) driver.

0.31 Manufacturer Warranty and Installation Audits

The Contractor shall provide full manufacturer warranties for all systems and components.
All components will be installed as per manufacturers′ instructions and in a way that will ensure proper installation manufacturer′s warranty.
If instructed, all or some component manufacturers' representatives shall conduct on site installation audits in compliance with EN and ISR standards.

0.32 Handover Protocol

The Contractor shall comply with ISR' Handover and Acceptance Procedure attached in **ISR Procedures** to the Technical Specifications), including submission of all required documentation, records, certificates, approvals, As- Made documents and training materials. No Works shall be deemed complete, and no final payment shall be made until full compliance with ISR's Handover and Acceptance Procedure.

0.33 Core Management and Key Personnel Qualifications and Responsibilities

The following table specifies the minimum requirements for the Core Management Team and Key Personnel to be engaged by the Contractor. The engagement of the Core Management Team and Key Personnel is subject to the prior written approval of ISR.
The members of the Core Management Team shall be engaged by the Contractor on a full time basis, and, unless with the prior approval of ISR, shall not render any work or services which are not connected to the Project.
The Core Management Team and Key Personnel shall attend all relevant meetings and be responsible for the due progress, execution and delivery of the Project.
The following table sets forth the minimum requirements for the engagement of personnel by the Contractor and does not constitute the overall human resources required to execute the Works under the Agreement. The Contractor shall be responsible for engagement of all personnel and manpower required to execute the Works in accordance and compliance with the Agreement.
ISR may require the Contractor to remove or replace any person engaged in performance of the Works, including members of the Core Management Team and Key personnel, as well as any designers, workers, drivers, OCS linesmen, surveyors and all other personnel of the Contactor, if ISR considers that such person is not performing his/her duties in accordance with the Agreement or in the best interests of the Project, or if ISR considers the conduct of such person to be unsatisfactory under the circumstances.
The replacement of any personnel of the Contractor shall not limit or derogate from the Contractor's responsibilities and obligations under and pursuant to the Agreement.

Position	Minimum Requirements & Qualification	Responsibilities	ISR Approval and Arrival to Israel
Project Director/Manager (Core Management Team)	B.Sc. in civil/ rail/ electrical or Mechanical engineering. 10 years' experience or more in management of at least 2 heavy rail electrification projects with an accumulated value of not less than 50 million Euros. At least one of the above heavy rail electrification projects include: 80km single track OCS and SCADA interface.	Responsible for the full technical, commercial, and operational delivery of the OCS from NTP (Design) or NTP (Execution) to Final Acceptance. Leading the project team, design management and resource allocation, ensuring design compliance with EN and/or ISR standards and overseeing all construction, safety, and quality activities. Main interface with ISR and its consultants, resolving issues and ensuring coordinated progress across civil, track, signaling, and power systems. Overall management of budgets, contractual obligations, procurement, testing and commissioning activities, and ensuring all documentation, As Made drawings, and handover deliverables are completed to the required standard. Accountable for safely delivering the OCS scope on time, within budget, and in accordance with all required technical specifications.	ISR Approval: the Effective Date Arrival to the Project: issuance of the first Work Order
Design Manager (Core Management Team)	BEng/MEng Electrical. 8 years' experience or more in leading OCS design and engineering teams.	Responsible for leading and coordinating all engineering design activities to ensure the overhead contact system is developed in full compliance with EN standards, ISR	ISR Approval: the Effective Date

Position	Minimum Requirements & Qualification	Responsibilities	ISR Approval and Arrival to Israel
	Involved in design process in at least 2 major rail electrification projects (UK, EU, or equivalent). Profound knowledge of OCS design and EN standards.	requirements, and technical specifications. Management of the design team, overseeing production of alignment plans, cantilever layouts, wiring diagrams, tensioning calculations, and earthing/bonding schemes, while ensuring interfaces with civil, track, signaling, and power supply disciplines. Controls design quality, reviews and approves drawings, manages change requests, supports construction with technical solutions, and ensures timely delivery of AFC, red-line, and As-Made drawings and documentation.	Arrival to the Project: issuance of the first Work Order
OCS Construction Manager (Core Management Team)	Minimum 10 years' experience in OCS construction in 25 kV AC rail systems. Proven delivery of at least 2 major electrification projects (UK, EU, or equivalent). International experience is an advantage.	Responsible for leading and coordinating all site construction activities to ensure the works are delivered safely, on time, and in accordance with design and quality requirements. Management of supervisors, teams, and daily work fronts. Responsible for planning shift activities, resolving on-site issues, coordinating with other disciplines, and ensure compliance with safety, RAMS, and project standards. Monitoring progress and control productivity. Reporting status to project leadership. Overall responsibility for the efficient and safe execution of all construction tasks to meet Project milestones.	ISR Approval: the Effective Date Arrival to the Project: issuance of the first Work Order
Head Safety Manager (Core Management Team)	Certified by Law as Safety Officer.	Supervision of civil and construction activities on site, ensuring safety compliance,	ISR Approval: the Effective Date

Position	Minimum Requirements & Qualification	Responsibilities	ISR Approval and Arrival to Israel
	At least 7 years' experience as head safety officer in large scale new roads or rail infrastructure projects in Israel, at least one of which has a contract value exceeding NIS 200 million.	coordinating safety resources, support of OCS installation sequencing, and acting as the primary local authority for safe, high-quality execution of works under Law. Interfacing with ISR inspectors, safety officers, and project engineers. Acting as the primary local liaison for Hebrew-speaking crews and 3rd Parties.	Arrival to the Project: issuance of the first Work Order
Work Order Manager (Key Personal)	At least 5 years' experience in OCS construction in 25 kV AC rail systems. Proven delivery of at least 2 major electrification projects (UK, EU, or equivalent). International experience required.	Primary point of contact for assigned work order activities. Coordination and follow-up of specific tasks, method statements and execution instructions. Interface coordination between the Contractor's execution teams and ISR representatives for the relevant work orders. Tracking progress, reporting status, and escalating issues related to the Project Manager. Ensuring timely submission of required documentation related to the relevant work orders, including execution records and as-built information, as applicable.	Issuance of Work Order +7 days

Position	Minimum Requirements & Qualification	Responsibilities	ISR Approval and Arrival to Israel
PMO (Key Personal)	At least 5 years' experience in large scale infrastructure projects (such as roads and/or rails), at least one of which has a contract value exceeding 200 million NIS. Proficient in MS-project or eq.	Administrative and procedural support for the management of work orders for OCS construction activities. Tracking, monitoring and updating the status of approved work orders, including schedules, milestones and deliverables. Preparation and maintenance of work order logs, reports and dashboards for review by the Project Manager and ISR. Coordination of documentation flow, including submissions, approvals and close-out records. Identification and flagging of deviations, delays or missing information, and escalation to the Project Manager. Ensuring consistency, traceability and orderly documentation throughout the work order lifecycle.	Issuance of Work Order +7 days
Quality Control Manager (Key Personal)	At least 5 years' experience in OCS projects, Quality Control management qualification, railway QA or QC experience, EN standards proficient.	Overall quality control responsibilities. Design QA and on-site work methods, Parts Tools, Equipment and Machinery approval, NCR's, EN standards approved materials and factories responsibility.	Issuance of Work Order +7 days
Interface Manager (Key Personal)	B.Sc. or B. Arc or eq. At least 5 years' experience in large scale projects in the State of Israel. Fluent in Hebrew and English.	Overall 3rd party and internal design approval, excavation permits and deliverables, including Israel utility system coordination and all relevant authorities.	Issuance of Work Order +7 days

01 STATEMENT OF WORK

This Statement of Work establishes the technical requirements and specification for design and build of the Overhead Contact System (OCS) electrification project for railway lines.
The Contractor shall deliver a fully functional OCS system that meets all operational, safety, and performance requirements while ensuring full certified compliance with applicable

standards including among others TSI ENE, EN 50126, EN 50119, EN 50110-1 EN 50122-1 (SI 61228-1), EN 50163 and EN 50317.

0.1 Scope and Objectives

0.1.1 Primary Objectives

- Design and construct a complete OCS system for designated execution package including OCS with Motorized disconnectors and Section Insulators based on Sectioning diagram, Earthing and Bonding, integration with SCADA system.
- Ensure compliance with all applicable international and local standards
- Achieve operational readiness with full system certification including the Certificate of Final Acceptance
- Deliver comprehensive documentation including safety case and training materials

0.1.2 Scope Inclusions (among others but not limited to):

- Preliminary Design and Detailed Design
- Construction and installation including OCS, Earthing and Bonding including protection elements in order to comply with EN 50122-1 and Israeli electrical law/SI 62128-1
- System integration and testing
- Regulatory approvals and permits
- Static and dynamic commissioning
- Safety systems implementation
- Documentation and training
- Warranty and support services

0.2 System definition

0.2.1 1×25 kV ≤160 km/h;

0.2.2 TSI/ENE- by the official Notified Body. The certificate shall have validity as minimum as for the next 5 years.

- The proposed OCS system shall be a proven system that has been implemented and is in operational use on other railway networks under comparable conditions.
- OCS shall consist of standardized components as similar as possible to ISR existing OCS components for conventional lines (e.g. types of poles, portals, cantilevers, clamps etc.).
- OCS shall be compatible with existing conventional OCS in ISR network, meaning that conventional electric trains shall be able to run on the electrified tracks and vice versa.

0.2.3 Compatible with ISR already-electrified lines.

0.2.4 Pole offsets, portals, foundations; no head spans on main lines.

0.2.5 CW ≥120 mm²; CW/MW tensions ≥12 kN, <18 kN;

0.2.6 Single-track lines have to be equipped with one return wire.

0.2.7 Lines with two tracks or more in parallel have to be equipped with two return wires (1 return wire for each side of the railway line).

0.2.8 The OCS-zone and pantograph zone have to comply with EN 50122-1 (X=4 meters).

0.2.9 Insulators (>60 cm) for prevention of bird electric shock, in accordance with the applicable requirements of NIP (TATAL) 22 or any other.

0.2.10 Touch voltage and step voltage protection in all surrounding areas such as but not limited to overcrossing, buildings, staircases and passenger's railway stations and stops shall be designed and installed in compliance with EN 50122-1/SI 62128-1 standard and local regulations.

0.2.11 The OCS has to be divided into feeding sections. Each Feeder line shall have individual circuit breaker.

0.2.12 The contact wire shall comply with EN 50149. The contact strips shall be made from hard carbon; the contact wire must be made of appropriate matching material, according to EN 50367, item 6.3.

0.2.13 The lateral offset of the contact wire shall use the entire width of the contact strips. The relative lateral offset (between two supports) may not be zero.

0.2.14 The OCS shall be divided into electrical sections in accordance with existing & future tracks, geometry and signaling configuration in stations and for open lines, by isolated overlaps. In case of an incident in one operational section, electrification system shall be capable of isolating from unaffected adjacent sections.

0.2.15 To allow selective switching off and using crossovers of tracks for electrical operation, longitudinal separations of the OCS within railway passenger or operational stations (as defined by ISR) are required.

0.2.16 Isolated overlaps between open line and railway station and Neutral Sections (NS) of parallel tracks shall be arranged at the same Kilometer Point (KP).

0.2.17 Isolated overlaps in the entrance to railway stations shall be arranged under protection of their home signals.

0.2.18 Such an overlap will be equipped with load breakers and earthing device for each track in order to de-energize safely the station in case of emergency.

0.2.19 All OCS poles and foundations shall be suitable for installation of future reinforcing feeder wire and additional return wire.

0.2.20 Installation of OCS structures, the maximum possible clearance shall be maintained between track centre and face of the structure. In case of the site constraints the clearance provided shall not be less than minimum values as specified in the SoD

0.2.21 All steel structures and small part steel carrying Overhead equipment shall be fully galvanized (as per standard).

0.2.22 Signages shall be provided on steel structures/ standalone boards, warning boards and critical locations.

0.2.23 The reinforcing wires shall be installed pole mounted on both sides of the railway line.

0.2.24 For each main track OCS catenary (individual main switching groups) one reinforcing wire with a cross section of at least 240 mm² AL shall be installed.

0.2.25 The reinforcement wires shall be rigidly coupled to the appropriate catenary. It means that the appendant reinforcing wire will be switched off in case of switching off a catenary section as well.

0.2.26 All OCS poles of the 1x25 kV electrification system including foundations shall be calculated as including 25 kV reinforcing wires, double return-wires and ADSS cable.

0.2.27 Therefore, the 25 kV reinforcing wires, dimensioning and preparation for a future installation of reinforcing wires as described above shall be part of the mandatory requirements for OCS.

0.2.28 Neutral sections (where necessary) shall be arranged as long version according to EN 50367, A.1.2 in open lines. Also, short neutral sections shall be allowed in main tracks up to 160 km/h; the short solution shall show appropriate installation quality and, in any case, needs ISR approval.

0.2.29 Section insulators shall not be installed in main tracks.

0.2.30 Section insulators on sidings shall be avoided if the conditions allow installing regular insulated overlaps.

0.2.31 It is strictly forbidden to use the same pole between or at the side of two main tracks to carry the OCS's of both of those tracks.

0.2.32 Structural analysis for the OCS poles shall consider at least two return wires, reinforcing wires (or wires of 2x25 kV system), communication cables and ADSS cables and provisions for future and parallel projects.

0.2.33 The profile of the poles shall be HEB, unless otherwise approved by ISR.

0.2.34 The OCS shall not disrupt the visibility of signals according to ISR signaling regulation. Visibility must be demonstrated by the Contractor by appertaining simulation and approved by the signaling department of ISR.

0.2.35 Neutral sections, loading tracks and the transitions to tracks, which are not electrified, need to be indicated by electrification signals (EL-signals). The types of the EL-signals need an approval from both the Signaling Division and Operational Department but shall be installed and maintained by the electrification Contractor.

0.2.36 OCS disconnectors and load breakers shall be designed as motorized switches and shall be remotely controllable by the main SCADA control centers.

0.2.37 OCS disconnectors and load breakers: Local control and manual handling must be possible.

0.2.38 In Depots and workshops Local SCADA and interlocking system shall be applied

0.2.39 According to EN 50388, chapter 7, table 2, the OCS has to comply with the maximum train current (target): 1000 A.

0.2.40 Earthing, bonding, traction return control and touch protection requirements shall comply to the requirements of EN 50122-1 and consider mixed operation/parallel operation of 1x25kV and 2x25kV electrical systems, incl. identifying any additional measures required for earthing, bonding, traction return circuit control.

0.2.41 Maximum short circuit current shall be considered as 15 kA for 1 sec.

0.3 Characteristics of the electrification system – 160 km/h – 1x25 kV

	PARAMETERS FOR THE OCS	VALUE
0.3.1	Max speed on main line	160 km / h (testing speed +10% = 176 km/h)
0.3.2	Max speed on side tracks	80 km / h
0.3.3	Pantograph	Figure B2, type 1 EN-50367: 2012 (1950 mm width without insulated horns)
0.3.4	Gauge	GC
0.3.5	Track Gauge	UIC (1435 mm)
0.3.6	Contact wire for main tracks	≥120 mm² (CuAg)
0.3.7	Allowable wear of contact wire cross-section	<20%
0.3.8	The quality of the contact wire, including its dynamic behaviour and stagger, shall ensure operation over the required distance without the need for replacement of the pantograph contact strips.	120,000 km
0.3.9	Ambient temperature minimum / maximum	-05 °C / +50 °C
0.3.10	Contact wire wind speed reference	36 m/s at 10 m above ground level
0.3.11	Pollution in industrial areas	Yes
0.3.12	Minimum contact wire height (level crossing)	6.1 m
0.3.13	Maximum contact wire height	6.4 m
0.3.14	Tolerances in height and side of the contact wire:	±3 cm
0.3.15	Minimum contact wire height	5.15 m
0.3.16	Maximum lateral deviation of contact wire from axis track	+/- 550 mm
0.3.17	Nominal stagger	≥+/- 200 mm (shall be supported by calculation)
0.3.18	System height	≥1.4 m
0.3.19	Minimum spans in overlaps	3
0.3.20	Pole type	The poles types shall be HEB profile.
0.3.21	Foundation type	Pile drilled foundation or cast concrete including galvanized steel bolts. Bolts shall be protected against mechanical damages and corrosion.
0.3.22	Maximum number of poles types	10
0.3.23	Cantilever type	Aluminium alloy tubes and parts. Triangular / diamond shape
0.3.24		3.3 m (straight line)
0.3.25		3.3 m (inside curve)

	PARAMETERS FOR THE OCS	VALUE
0.3.26	General distance for direct tracks between face of poles and Track Centre Line (TCL), tolerance 5 cm:	3.3 – 3.7 m (outside curve)
0.3.27		3.8 m (with cable ducts)
0.3.28	Minimum distance signal – OCS pole	10 m, for maintenance purposes
0.3.29	Lifetime	50 years for all components except dynamically stressed parts (contact wire, section insulators, disconnectors, etc.)

0.3.30	Wire temperature range minimum / maximum	-15 °C / +80 °C (100 °C contact wire)
0.3.31	Static contact pressure minimum / maximum	60 – 90 N (nominal 70 N) EN-50367
0.3.32	Dynamic contact pressure minimum / maximum	0 – 200 N (recommended 40 – 240 N)
0.3.33	Earthing and Bonding	EN 50122 EN 50152-2 Israeli Electrical Law and regulations SI 62128

0.4 General Requirements

0.4.1 Contractor Responsibilities

The Contractor shall perform all Project tasks required to develop, design and execute the OCS in accordance with the Project requirements that include, but are not limited to:

- Analysis and simulations including consideration of Earthing & Bonding, Touch protection requirements also related to mixed operation/parallel operation of 1x25kV and 2x25kV electrical systems, incl. identifying any additional measures required for earthing, bonding, traction return circuit control, and network protection/power supply protection
- Preliminary and Detailed Design
- Mock-up construction and testing
- Facility and system elements construction
- Interface coordination with internal/external parties
- RAMS consideration (the system shall not only be safe and easy to build but also safe and easy to operate & maintain)
- Integration with existing infrastructure
- Coordination with parallel projects
- Testing and Commissioning including documentation for PTO
- Handover of Works including but not limited to As - Made drawings and documentation

0.4.2 Design Review and Approval Process

The Contractor shall review all Project requirements, concepts and ISR future planning documents and shall perform designs for the Project in compliance with applicable documents. Construction work shall conform to approved design documents and be performed in compliance with mandatory requirements, applicable laws, codes, and standards.

0.5 Design Requirements

0.5.1 Design Stages and Submissions

The Contractor shall submit for each design stage, specifications, reports, calculations and other documents as per the project needs for ISR review and approval. The design shall be divided into design packages for each execution package, according to each work order.

Design Stages:

- Preliminary Design: Concept development and feasibility analysis
- Detailed Design: Complete engineering specifications and drawings according to ISR standards
- Construction Design: As- Made drawings and documentation and final specifications

0.5.2 Required Approvals

External Approvals (among others):

- Municipal authorities
- VATAL (Environmental)
- Regional committees
- CAAI (Civil Aviation) for special areas
- 3rd party infrastructure companies

Internal ISR Approvals (among others):

- Electrification Directorate
- Signaling Department
- Operational Department
- Infrastructure Division
- Safety Department

0.6 Survey and Infrastructure Analysis

0.6.1 Comprehensive Survey Requirements

The Contractor shall be responsible for coordinating and synchronize all its tasks with all other tasks performed by ISR's parallel projects including direct coordination with ISR's sub-contractors. The Contractor shall resurvey current and future elements and conditions of ISR infrastructure.

Infrastructure Element	Survey Requirements	Deliverable
Overcrossing Bridges	Structural condition, clearances, future plans	Detailed survey report
Track Alignment	Current geometry, obstacles, future modifications	Alignment analysis report
Existing Utilities	Type, condition, location, third-party utilities	Utility coordination report
Level Crossings	Current configuration, safety requirements	Level crossing analysis
Passenger Stations	Platform layouts, grounding systems, accessibility	Station survey report

0.6.2 Environmental and Regulatory Constraints

The Contractor shall study current and future documentation and constraints for each line to reach all design requirements including:

- Subsoil conditions information (basis for selecting pole foundation type and dimensions)
- Information about future structures (planned, under design, or under construction)
- National Infrastructure Plans requirements ("TATAL")
- Environmental regulations and requirements
- Municipal, Regional and Governmental normative requirements
- Standards Institution of Israel compliance

0.7 Electrical Sectioning Design

0.7.1 Electrical Sectioning and Feeding Diagrams

Before executing the OCS layout, the Contractor shall develop electrical sectioning and feeding diagrams for each station and execution package. The design shall consider:

System Considerations:

- Track alignment and operational requirements
- Power Study of Israel network
- ISR electrical sectioning plans
- Traction power supply lines
- Parallel feeders and bypass lines
- Signaling

Design Elements:

- Neutral section locations
- Section insulators and Motorized disconnectors
- Voltage detectors
- Protection and switching schemes
- Emergency operation procedures

0.7.2 Approval Requirements

All electrical sectioning and feeding diagrams must be approved by ISR Operational Department before proceeding with OCS layout design. The Contractor shall obtain written confirmation of approval for each electrical package.

0.8 OCS Layout Design

0.8.1 Layout Development Process

The Contractor shall prepare OCS layout for each execution package and design stage after ensuring all electrical sectioning and feeding diagrams are approved by ISR Operational Department.

0.8.2 Design Considerations

Interfaces

Infrastructure Elements:

- On-site existing track alignment
- Infrastructure coordination with third parties
- Signaling poles locations
- Obstacles along track alignments
- Bridges and tunnels
- High Voltage and Medium Voltage power lines
- Underground pipelines
- Additional constraints such as Military or Civil Aviation authority requirements

Safety and Systems:

- Signaling cables trench coordination
- Drainage and under structure constraints
- Adjacent building and bridges considerations
- EN 50122-1 safety compliance

0.8.3 Authorization Requirements

Critical Authorization Points:

- Design solutions for poles locations and anchors on bridges/viaducts must be authorized by competent authorities (3rd parties – excavation permits) and by ISR
- Solutions for fixing supports at overpasses, overcrossings and station buildings must be authorized by competent authorities or owners
- All safety measures shall comply with EN 50122-1 and Israeli local regulations and standards

0.9 Special Works

0.9.1 Signaling System Coordination

The Contractor must consider the location of train signals to avoid any interference between both systems and ensure visibility of signals by the train driver. The OCS design and signaling system must be coordinated so that electrical package limits in stations are within signal stop boundaries.

0.9.2 Level Crossing Requirements

Contact Wire height at level crossings and other OCS parameters shall comply with:

- Israeli electrical regulations
- MOT guideline regulation for height limitation
- Road Traffic Regulations of Israel
- EN 50122-1
- Israeli Electrical Law and regulations
- SI 62128-1 local standard

0.10 Passenger Stations and Platforms

Contractor shall install all protective measures including:

- Grounding of equipment and installations
- Equi-potential meshes in platforms
- Bridge connections between equi-potential meshes and tracks
- Compliance with international and local standards

0.11 Testing and Commissioning

0.11.1 Comprehensive Testing Program

For each test run, visual inspection shall be carried out by competent, highly experienced technicians in OCS systems. The testing program includes multiple phases to ensure system reliability and safety.

Test Phase	Voltage Level	Key Requirements
Disconnection Elements Verification	Without Voltage	Manual, local post, remote control operations
Electrical Insulation and Impedance	Low Voltage	Complete system verification
High Voltage Insulation	High Voltage	Insulators, overpasses, canopies
Electrical Packages Check	High Voltage	All sections powered, breaker operations
Short Circuit Tests	High Voltage	Protection coordination verification

0.11.2 Static and Dynamic Tests

Static Test Parameters (per EN 50119):

- Contact wire height measurement
- Stagger verification
- Gradient of contact wires
- Pre-sag measurement
- Wire condition and cross section
- Wear assessment

Dynamic Test Requirements (per EN 50317):

Tests carried out with calibrated pantograph (1950 mm) applying mean contact force (Fm) at running speed:

- Contact wire uplift measurement
- Mean contact forces Fm and standard deviation σmax
- Calibrated contact wire uplift detectors on supports
- Comparison with static measurements

These and additional tests shall be carried out before commissioning the whole line and comply with TSI requirements.

0.11.3 Safety Verification

Touch and step voltage testing shall be performed to verify protection of the OCS installation according to official regulations of Israel and Europe. Additional testing in accordance with good engineering practice and European standards and regulations.

0.12 Quality Assurance and Safety

0.12.1 Quality Management System

The Contractor shall implement a comprehensive independent quality management system according to ISO 9001:2015 covering all project phases from design through commissioning via 3rd party company. Quality assurance activities shall be documented and auditable.

0.12.2 Safety Requirements

Safety Standards Compliance:

- EN 50126
- EN 50122-1 (Railway Safety)
- Israeli electrical law and regulations
- Local safety codes and standards
- Occupational health and safety requirements (NIPs and Ministry of Environmental protection requirements)

Safety Implementation:

- Risk assessment and mitigation
- Safety training programs
- Emergency response procedures
- Incident reporting and investigation

0.13 Deliverables and Documentation

0.13.1 Design (Pre - Execution) Phase Deliverables

Deliverable Category	Documents Required	Format
Design Drawings	Layout plans, cross-sections for each pole or pole duo, details, structural designs, General Arrangement drawings Cantilever shop drawings Feeding and Sectioning diagrams	AutoCAD, PDF
Technical Specifications	Equipment specs, performance criteria	Word, PDF
Calculations	Structural, electrical, Droppers calculations thermal analysis **Maximum span calculation**	Excel, PDF
Simulation Results	Performance modelling, validation	Software native, PDF

0.14 Construction (Execution) Phase Deliverables

- Construction method statements and procedures
- Factory standards compliance documentation
- Material certificates and test reports
- Progress reports and photographic records
- Quality control and inspection records
- As- Made drawings and documentation

0.15 Commissioning Phase Deliverables

- Test procedures and protocols
- Test results and measurement data
- System performance verification reports
- Commissioning certificates and approvals
- Operations and maintenance manuals
- Training materials and records

0.16 Standards and Compliance

0.16.1 International Standards

European Standards (EN/IEC):

- EN 50119
- EN50126
- EN 50367
- EN 50318
- EN 50317
- EN 50122-1
- EN 50163
- EN 50121
- EN 15273-3;
- TSI SRT/ENE/OPE
- EN 50388-1/-2
- IEC 61850;
- IEC/ISA 62443

0.16.2 Local and National Standards

Israeli Standards and Regulations:

- Israeli electrical safety regulations
- Standards Institution of Israel (SII) requirements
- Ministry of Transport (MOT) guidelines for height limitations
- Road Traffic Regulations of Israel
- Any approved TATAL or other regulatory plan
- Environmental protection regulations

0.16.3 Compliance Verification

The Contractor shall demonstrate compliance with all applicable standards through:

- Design review and verification documentation
- Third-party testing and certification where required
- Regulatory authority inspections and approvals
- Comprehensive testing and commissioning programs
- Ongoing monitoring and maintenance procedures

01 INTERFACE MANAGEMENT AND COORDINATION EQUIREMENTS

1.1 Introduction

1.1.1 Purpose and Scope

This document defines the interface management and coordination requirements.

It establishes the responsibilities, coordination procedures, and integration protocols between the Contractor and Supervisory Control and Data Acquisition (SCADA) and Traction Substation (TS) systems.

The scope encompasses the complete design, construction, testing, and commissioning phases of the new stages of electrification project. This document serves as the governing specification for all interface activities from project commencement through to the issuance of a Certificate of Final Acceptance, Permit to Operate and final transfer of responsibility to the Infrastructure Division of ISR by the Contractor.

1.1.2 Definitions and Abbreviations

CDE (Contact Line Disconnection Element)

Portal structure with disconnectors and motors that divides the responsibility area between TS and OCS systems

LOP (Local Operating Post)

Local control facility for SCADA system operations

OCS (Overhead Contact System)

Complete overhead electrification system including contact wire, catenary, supports, and sectioning equipment

SCADA (Supervisory Control and Data Acquisition)

Computer-based control system for monitoring and controlling the electrification infrastructure

TS (Traction Substation)

Electrical substation that converts and supplies power from the 161kV national grid to the 25kV railway traction system

Interface Point

Physical or logical boundary where responsibilities transfer between contractors

Sectioning Diagram

Technical drawing showing the electrical division and disconnector locations of the OCS system

1.1.3 General Interface Management Principles

The following principles shall govern all interface management activities:

1. **Clear Responsibility Definition:** Each contractor shall have clearly defined areas of responsibility with unambiguous interface points.
2. **Coordinated Design Development:** All design activities shall be coordinated through formal interface control procedures.
3. **Integrated Testing Approach:** Testing and commissioning shall progress from individual systems through interface testing to full system integration.

4. **Change Control:** All changes affecting interfaces shall be subject to formal change control procedures involving all affected parties.
5. **Quality Assurance:** Interface deliverables shall be subject to joint quality assurance and acceptance procedures.
6. **Documentation Control:** All interface documentation shall be controlled and distributed through the established document management system.

1.2 Project Overview

1.2.1 System Description

The ISR electrification system is a 25kV, 50Hz AC traction system compliant with TSI ENE / EN 50163 standards. The system comprises three major subsystems requiring close coordination:

Traction Substation System

Traction substations converting 161kV IECo grid supply to 25kV traction voltage, including high voltage switchgear, transformers, protection systems, and auxiliary services.

Overhead Contact System

Complete overhead electrification infrastructure including contact wire, catenary system, support structures, sectioning equipment, disconnectors, and associated civil works.

SCADA System

Centralized monitoring and control systems including control centers, Local Operating Posts (LOP), communication networks, and integration with existing railway control systems. It is clarified that SCADA system would be in the contractor's responsibility from end to end, unless specified otherwise.

It is also clarified that other SCADA documentation can be forwarded to the contractor and shall not constitute as additional scope.

1.3 Contractor Responsibilities Overview

The project operates under a Design & Build contracting strategy with the following primary responsibilities:

1.3.1 Contractor - (Primary Design & Build Contractor)

- Design, supply, install, test and commission the complete OCS system
- Construction of disconnectors and motors according to approved sectioning diagram
- Installation of CDE portals at locations specified by TS Contractor
- Connection of power cables to disconnectors on the CDE
- Deployment of all SCADA cables (power and communication) based on SCADA schematic design
- Overall project coordination and integration responsibility
- Obtaining a the Certificate of Final Acceptance for the complete system and supporting ISR in issuance of Permit to Operate

1.3.1 Contractor – SCADA (Primary Design & Build Contractor)

- Design, supply, install, test and commission the complete SCADA system
- Update existing control centers to include new tracks and disconnectors
- Construction of Local Operating Posts (LOP)
- Provide schematic designs for SCADA cable installation
- SCADA system integration and testing

1.3.2 Traction Substation Contractors

- Design, supply, install, test and commission traction substations
- Installation of feeding cables from TS buildings to tracks
- Specification of CDE portal locations
- Deployment of power cables including cables ends to connection points
- Installation of control cables between TS and disconnector motors control boxes
- TS system testing and commissioning

1.4 Interface Management Framework

Interface management shall be implemented through a structured framework comprising:

Framework Element	Description	Responsible Party
Interface Control Documents (ICD)	Formal documents defining each interface in detail	OCS Contractor (Lead)
Interface Management Plan	Overall plan for managing all project interfaces	OCS Contractor
Interface Control Board	Joint committee for interface decision making	All Contractors + ISR
Interface Registers	Living documents tracking interface status	OCS Contractor
Joint Testing Protocols	Procedures for interface and integration testing	All Contractors

1.4.1 Coordination Requirements

All contractors shall participate in mandatory coordination activities including:

- Interface coordination meetings during design phase
- Joint design reviews at major milestones
- Coordinated construction scheduling and sequencing
- Joint factory acceptance testing where applicable
- Integrated site testing and commissioning
- Coordinated documentation delivery and handover

1.5 OCS Contractor - SCADA Contractor Interface

1.5.1 Interface Description

The OCS-SCADA interface encompasses the integration of overhead line sectioning equipment with the centralized monitoring and control system. This interface is critical for operational control, protection coordination, and maintenance management of the electrification system.

Primary Interface Points

- Disconnector control and indication systems
- Motor drive units for disconnector operation
- SCADA communication cables and infrastructure
- Local Operating Posts (LOP) integration
- Control center updates and modifications
- Power supply systems for SCADA equipment

1.5.2 Design Coordination

1.5.2.1 Sectioning Diagram Coordination

The Contractor shall develop the sectioning diagram in coordination with the SCADA Design to ensure:

- Optimal placement of disconnectors for operational flexibility including disconnectors installed on the CDEs (feeding point)

- SCADA system monitoring and control capabilities
- Coordination with existing network sectioning
- Future expansion capability
- Maintenance accessibility requirements

1.5.2.2 Control System Integration

The Contractor shall design control system interfaces compatible with OCS disconnector systems including:

- Control signal specifications
- Status indication requirements
- Alarm and fault reporting systems
- Emergency operation procedures
- Manual/automatic operation modes

1.5.2.3 Communication Network Design

Design activities shall include:

- Communication network topology
- Cable routing and protection requirements
- Redundancy and backup systems
- Network security and access control
- Integration with existing ISR communication systems

1.5.3 Construction and Installation

1.5.3.1 Sequencing Requirements

Construction activities shall be sequenced as follows:

1. OCS: Procures and Install support structures and prepare cable routes
2. OCS: Procures and Install SCADA power and communication cables
3. OCS: Procures and Install disconnectors and motor drive units
4. SCADA: Install/expand LOP buildings and equipment
5. SCADA: Expand control center equipment and software
6. Joint: Cable terminations and initial connectivity testing
7. Joint: System integration and functional testing

1.5.3.2 Quality Control Coordination

Quality control activities shall include:

- Cable installation inspection (routing, protection, identification)
- Equipment installation verification
- Interconnection testing
- System configuration verification
- Documentation compliance checking

1.5.4 Testing and Commissioning

1.5.4.1 Individual System Testing

Contractor Responsibilities:

- Disconnector mechanical operation testing
- Motor drive unit functionality testing
- Cable continuity and insulation testing
- Power supply system testing
- Control center equipment functionality testing
- LOP equipment and software testing
- Communication network testing
- Database and human-machine interface testing

1.5.4.2 Interface Testing

Interface testing shall verify:

- Disconnector remote control functionality
- Status indication accuracy and timing
- Alarm and fault reporting systems
- Communication system performance
- Emergency operation procedures
- Data logging and historical data systems

1.5.4.3 Integration Testing

Comprehensive integration testing shall include:

- End-to-end system functionality
- Multiple disconnector coordination
- Failure mode and backup system testing
- Operator training and validation
- System performance verification

1.5.5 Documentation Requirements

Documentation deliverables shall include:

- Interface Control Document (ICD) - OCS/SCADA
- Integrated system drawings and schematics
- Joint testing and commissioning procedures
- Operation and maintenance manuals
- As- Made drawings and documentation package
- Training materials and procedures
- Warranty and service documentation

1.6 OCS Contractor - Traction Substation Contractor Interface

1.6.1 Interface Description

The OCS-TS interface represents the critical power delivery boundary between the traction substation system and the overhead contact system. This interface encompasses power transfer, protection coordination, and control integration between the 25kV distribution system and the contact line infrastructure.

Primary Interface Points

- Contact Line Disconnect Equipment (CDE) portals
- Power cable connections from TS to OCS
- Control cable systems between TS and CDE
- Protection system coordination
- Return conductor connections
- Earthing and bonding systems

1.6.2 Responsibility Matrix

Item	OCS Contractor	TS Contractor	Joint Responsibility
Traction Substation Design	○	●	Load Requirements
CDE Location Specification	○	●	Site Coordination
CDE Portal Construction	●	○	Foundation Requirements
Trackside CDE Disconnectors & Motors	●	○	Specification Coordination
Feeding Cables (TS to Track)	○	●	Route Coordination
Power Cable Ends	○	●	Connection Interface
Cable Connection to Disconnectors	●	○	Joint Testing
Control Cables (TS to CDE)	○	●	Signal Requirements
Return Conductor System	●	○	Connection Points
Protection System Coordination	○	○	●
Short-Circuit Testing	○	○	●
System Commissioning	○	○	●

Legend: ● = Primary Responsibility, ○ = Support/Input Required

1.6.3 Design Coordination

1.6.3.1 CDE Location and Configuration

The TS Contractor shall specify CDE locations considering:

- Traction substation layout and cable routing
- Electrical clearance requirements
- Access requirements for maintenance
- Protection system coordination
- Future expansion capabilities

The OCS Contractor shall design CDE portals to accommodate:

- Required disconnector configurations based on the approved sectioning diagram
- Motor drive unit installations
- Cable termination facilities
- Lightning protection systems
- Access platforms and safety systems

1.6.3.2 Power System Design Coordination

Joint design activities shall ensure:

- Proper cable sizing for maximum load conditions
- Coordination of protection settings
- Short-circuit rating compatibility
- Return conductor system design
- Earthing and bonding system integration
- EMF mitigation measures coordination

1.6.3.3 Control System Integration

Control system coordination shall address:

- CDE disconnectors control from the main/secondary control center

- Status indication and alarm systems
- Interlocking systems between TS and OCS
- Emergency shutdown procedures
- Remote/local operation modes

1.6.4 Construction and Installation

1.6.4.1 Construction Sequencing

Construction activities shall be coordinated as follows:

1. TS Contractor: Complete substation building and equipment installation
2. TS Contractor: Install and terminate feeding cables from TS to designated connection points (disconnectors at the top of the CDE)
3. OCS Contractor: Construct CDE portal structures
4. OCS Contractor: Install disconnectors and motor drive units
5. TS Contractor: Install and terminate control cables
6. OCS Contractor: Connect power cables to disconnectors
7. Joint: Complete return conductor connections
8. Joint: Execute earthing and bonding connections (earthing and bonding cables are under OCS contractor scope)

1.6.4.2 Interface Point Management

Critical interface points requiring joint oversight:

- Cable termination and connection procedures
- Insulation coordination verification
- Mechanical connection integrity
- Protection system settings coordination
- Control circuit functionality

1.6.5 Testing and Commissioning

1.6.5.1 Individual System Testing

TS Contractor Responsibilities:

- Substation equipment functionality testing
- Power cable insulation and continuity testing
- Control cable testing and verification
- Protection system functionality testing
- Auxiliary systems testing

OCS Contractor Responsibilities:

- CDE portal mechanical and electrical testing
- Disconnector operation testing
- Motor drive unit functionality testing
- Return conductor system testing
- Contact line installation verification

1.6.5.2 Interface Testing

Joint interface testing shall verify:

- Power cable connection integrity
- Control system functionality end-to-end
- Protection system coordination
- Disconnector remote operation
- Return path continuity and resistance
- Earthing system effectiveness

1.6.5.3 Short-Circuit Testing

Critical short-circuit testing requirements:

- Joint planning and execution of short-circuit tests
- Protection system response verification
- Equipment withstand capability confirmation
- Arc-fault interruption testing
- System recovery and restoration procedures
- EMF measurement and verification
- Testing equipment to be arranged by TS contractor

1.6.6 Documentation Requirements

Joint documentation deliverables shall include:

- Interface Control Document (ICD) - OCS/TS
- Power system single-line diagrams
- Protection system coordination study
- Short-circuit analysis and test results
- Cable installation and termination records
- Commissioning test procedures and results
- Operation and maintenance instructions
- Emergency response procedures

1.7 Mutual Coordination

1.7.1 Joint Coordination Meetings

1.7.1.1 Interface Control Board

A formal Interface Control Board shall be established comprising senior representatives from all three contractors plus ISR/PMC representatives. The board shall meet monthly during design phase and bi-weekly during construction and commissioning phases.

Board Responsibilities:

- Review and approve all Interface Control Documents
- Resolve interface disputes and technical issues
- Coordinate major design decisions affecting multiple systems
- Approve interface change requests
- Monitor interface milestone achievements
- Coordinate integrated testing and commissioning activities

1.7.1.2 Technical Coordination Meetings

Weekly technical coordination meetings shall be conducted during active design and construction phases covering:

- Design progress and milestone status
- Interface issue identification and resolution
- Construction sequencing coordination
- Quality assurance and testing coordination
- Risk identification and mitigation
- Document review and approval status

1.7.1.3 Site Coordination Meetings

Daily site coordination meetings shall be held during overlapping construction activities addressing:

- Daily work planning and resource coordination

- Safety coordination and hazard management
- Access and logistics coordination
- Quality control and inspection scheduling
- Interface work completion verification

1.7.2 Integrated Testing Procedures

1.7.2.1 Testing Phase Structure

Phase	Description	Participants
Phase 1: Individual System Testing	Each contractor tests their own systems independently	Individual Contractors
Phase 2: Interface Testing	Testing of interfaces between pairs of systems	Relevant Contractor Pairs
Phase 3: Three-System Integration	Complete system integration testing	All Contractors + ISR
Phase 4: Operational Validation	Full system validation with simulated operations	All Contractors + ISR Operations

1.7.2.2 Critical Integration Tests

The following integration tests require all contractors' participation:

Power System Integration Test

- TS energization through to OCS contact line
- SCADA monitoring and control verification
- Protection system coordination verification

Control System Integration Test

- End-to-end disconnector control from SCADA system
- Status indication and alarm propagation
- Emergency shutdown procedures
- Manual override capabilities

Fault Response Integration Test

- Simulated fault conditions and system response
- Protection system coordination
- SCADA alarm and indication systems
- System restoration procedures

1.7.3 System Integration Requirements

1.7.3.1 Operational Integration

Operational integration shall ensure:

- Seamless integration with existing ISR control systems
- Operator training on integrated system functionality
- Maintenance procedure coordination
- Emergency response procedure integration
- Spare parts and logistics coordination

1.7.4 Handover and Transfer to Operations

1.7.4.1 Pre-Handover Requirements

Prior to system handover, the following shall be completed:

- All individual system commissioning complete
- All interface testing successfully completed
- Integrated system testing and validation complete
- All documentation delivered and approved
- Operator training completed and certified
- Environmental permits obtained (including "Permit to Operate")
- All defects and punch list items resolved

1.7.4.2 Handover Process

The handover process shall include:

1. **Technical Handover:** Transfer of all technical documentation, drawings, and manuals
2. **Operational Handover:** Transfer of operational control to ISR Infrastructure Division
3. **Maintenance Handover:** Transfer of maintenance responsibility to ISR Infrastructure Division
4. **Warranty Handover:** Definition of warranty periods and responsibilities
5. **Training Completion:** Certification of all operator and maintenance training

1.7.4.3 Post-Handover Support

Post-handover support shall include:

- Technical support during initial operational period
- Warranty support and defect rectification in accordance with the Agreement requirements
- Performance monitoring and optimization
- Additional training as required
- System modification support as needed

1.8 Interface Management Procedures

1.8.1 Interface Control Documents

1.8.1.1 Interface Control Document Structure

Each Interface Control Document (ICD) shall be developed by the OCS contractor and contain at least the following sections:

1. **Interface Overview:** Description, scope, and key stakeholders
2. **Technical Requirements:** Detailed technical specifications and standards
3. **Responsibility Matrix:** Clear definition of each party's responsibilities
4. **Design Requirements:** Design coordination and approval procedures
5. **Construction Requirements:** Installation and construction coordination
6. **Testing Requirements:** Individual and joint testing procedures
7. **Documentation Requirements:** Required deliverables and formats
8. **Acceptance Criteria:** Criteria for interface acceptance
9. **Schedule Requirements:** Key milestones and dependencies
10. **Risk Management:** Interface-specific risks and mitigation measures

1.8.1.2 ICD Development and Approval Process

Step	Activity	Responsible Party
1	Initial ICD Draft Preparation	OCS Contractor (Lead)
2	Technical Review by Interface Partners	Relevant Contractors
3	Incorporation of Comments	OCS Contractor
4	Interface Control Board Review	Interface Control Board
5	ISR Review and Approval	ISR Technical Team
6	Final ICD Issuance	OCS Contractor

1.8.2 Change Order Management

1.8.2.1 Interface Change Control Process

All changes affecting interfaces shall be managed through a formal change control process:

1. **Change Identification:** Any party may identify the need for an interface change
2. **Change Request Preparation:** Formal change request document preparation
3. **Impact Assessment:** Assessment of technical, schedule, and cost impacts
4. **Stakeholder Review:** Review by all affected contractors
5. **Interface Control Board Evaluation:** Formal evaluation and recommendation
6. **ISR Approval:** Final approval by ISR /PMC
7. **Implementation:** Coordinated implementation of approved changes
8. **Documentation Update:** Update of all relevant interface documents

1.8.2.2 Change Order Categories and Authority

Change Category	Description	Approval Authority
Minor Administrative	Documentation updates, clarifications	Technical Coordinators
Technical Modifications	Equipment specifications, procedures	Interface Control Board
Major Changes	Scope modifications, new interfaces	ISR Project Management
Emergency Changes	Safety or critical operational issues	Expedited Process

1.8.3 Quality Assurance and Control

1.8.3.1 Interface Quality Management

Quality assurance for interface management shall include:

- Regular audits of interface documentation
- Verification of interface deliverable quality
- Review of interface testing procedures and results
- Assessment of coordination effectiveness
- Continuous improvement of interface processes

1.9 Testing and Commissioning Protocol

1.9.1 Individual System Testing

1.9.1.1 OCS System Testing Requirements

The Contractor shall complete the following individual system tests:

Mechanical Systems Testing

- Support structure installation verification
- Contact wire and catenary installation testing

- Disconnector mechanical operation testing
- Tension system verification
- Clearance and gauge verification
- All required tests as per TSI/ENE requirements

Electrical Systems Testing

- Insulation resistance testing
- Continuity and bonding verification
- Return conductor system testing
- Motor drive unit functionality testing
- Power cable installation verification
- All required tests as per TSI/ENE requirements
- Electrical inspector approval to energize the system

1.9.1.2 SCADA System Testing Requirements

The Contractor shall complete the following individual system tests:

Control Center Systems

- Hardware platform functionality testing
- Software application testing
- Database integrity verification
- Human-machine interface testing
- Alarm and event management testing

Communication Systems

- Network connectivity testing
- Communication protocol verification
- Data transmission integrity testing
- Network security testing
- Redundancy and backup system testing

1.9.1.3 Traction Substation Testing Requirements

The TS Contractor shall complete the following individual system tests:

Primary Equipment Testing

- High voltage equipment testing
- Transformer functionality and performance testing
- Switchgear operation testing
- Protection system testing
- Auxiliary systems testing
- Electrical inspector approval to energize the system

Power Delivery Systems

- Feeding cable installation and testing
- Control cable verification
- Grounding system testing
- Power quality measurement
- Load capability verification
- Electrical inspector approval to energize the system

1.9.2 Interface Testing

1.9.2.1 OCS-SCADA Interface Testing

Joint testing between OCS and SCADA systems shall verify:

Test Category	Test Description	Success Criteria
Control Interface	Disconnector remote control from SCADA	100% successful operations within 30 seconds
Status Indication	Real-time status updates from field to control center	Status updates within 2 seconds, 99.9% accuracy
Alarm Systems	Fault detection and alarm propagation	All alarms transmitted within 1 second
Communication	End-to-end communication network testing	< 1% packet loss, < 100ms latency
Emergency Systems	Emergency shutdown and isolation procedures	Emergency commands executed within 5 seconds

1.9.2.2 OCS-TS Interface Testing

Joint testing between OCS and TS systems shall verify:

Test Category	Test Description	Success Criteria
Power Transfer	25kV power delivery from TS to contact line	Voltage within ±5% of nominal, stable delivery
Protection Coordination	Protective device coordination testing	Selective operation, proper coordination margins
Control Integration	CDE control from TS control room	100% successful remote operations
Return Path	Return conductor system verification	Return path resistance within specifications
Short Circuit	Short circuit testing and protection verification	Proper fault clearing within specified time

1.9.2.3 Integrated System Testing

1.9.2.3.1 Full System Integration Tests

Comprehensive system integration testing shall include:

Operational Scenarios Testing

- Normal operation mode testing
- Maintenance mode operations
- Emergency response procedures
- System restoration after faults
- Multiple train operation simulation

Performance Verification Testing

- System capacity and load testing
- Power quality measurement and verification
- EMF measurement and compliance verification
- System efficiency measurement
- Environmental compliance testing

Reliability and Availability Testing

- System availability measurement
- Mean time between failures (MTBF) assessment
- Mean time to repair (MTTR) verification
- Redundancy and backup system testing
- Long-term reliability demonstration

1.9.2.4 Integration Test Schedule

Week	Testing Activity	Participants	Key Deliverables
1-2	System Integration Preparation	All Contractors	Test procedures, safety plans
3-4	Basic System Integration	All Contractors	Basic functionality verification
5-6	Operational Scenario Testing	All Contractors + ISR Ops	Operational procedure validation
7-8	Performance and Compliance Testing	All Contractors + ISR	Performance test results
9-10	Final Validation and Documentation	All Contractors + ISR	Final test reports and certificates

1.9.3 Acceptance Criteria

1.9.3.1 Operational Acceptance Criteria

Operational acceptance shall require:

- Successful completion of all test procedures
- Demonstration of all operational modes
- Verification of all safety systems
- Completion of operator training and certification
- Delivery of all required documentation
- Resolution of all defects and punch list items
- Obtaining all required permits and certifications

1.9.3.2 Final Acceptance Process

1. **Pre-Acceptance Review:** Verification of all acceptance criteria
2. **Acceptance Testing:** Formal acceptance test execution
3. **Documentation Review:** Final review of all deliverable documentation
4. **ISR Acceptance:** Formal acceptance by ISR
5. **Certificate of Completion:** Issuance of completion certificate
6. **Operational Handover:** Transfer to ISR Infrastructure division
7. **Warranty Period Commencement:** Start of warranty obligations

1.10 OCS Foundation Works by others

1.10.1 Purpose and Scope

This document defines the interface management and coordination requirements between the OCS Contractor and Foundation Design and Execution activities. It establishes the responsibilities, coordination procedures, and integration protocols for pole foundation works supporting the Overhead Contact System (OCS) infrastructure.

The scope encompasses two distinct interface models for foundations delivery:

- **Option 1:** ISR Pre-Constructed Foundations Model - where ISR designs and constructs foundations prior to OCS Contractor engagement
- **Option 2:** OCS Contractor Design / ISR Execution Model - where the OCS Contractor provides detailed foundation designs and ISR executes construction under the supervision of the OCS Contractors'

This document serves as the governing specification for all foundation interface activities from project commencement through to the issuance of the Certificate of Final Acceptance, issuance of Permit to Operate and final transfer of responsibility to the Infrastructure Division of ISR.

1.10.2 Definitions and Abbreviations

1. **Pole Foundation**
   Structural element that transfers loads from OCS support structures to the ground, including but not limited to drilled piles, spread footings, and mass concrete foundations.
2. **Due Diligence Process**
   Comprehensive inspection, testing, and verification procedure undertaken by the OCS Contractor to assess the condition, quality, and suitability of pre-constructed foundations.
3. **Handover Point**
   Physical and contractual boundary where responsibility for foundation performance transfers from ISR/Foundation Contractor to OCS Contractor.
4. **CDE Portal Foundation**
   Specialized foundation system designed to support Contact Line Disconnection Equipment (CDE) portal structures including all associated loads and operational requirements.
5. **OCS Pole**
   Vertical support structure for overhead contact system including masts, cantilevers, portals, and sectioning posts requiring foundation support.
6. **Foundation Design Load**
   Complete load specification, including vertical, horizontal, torsional, and dynamic loads that the foundation must safely support throughout its design life.
7. **Tunnel section**
   Section with possibility to install cantilevers and OCS equipment without installation of masts

1.10.3 Project Overview

1.10.3.1 System Description

The OCS foundation system provides structural support for the complete overhead electrification infrastructure of the ISR 25kV/2x25 kV, 50Hz AC traction system. Foundation requirements encompass support for various OCS elements including:

- OCS support structures and anchoring points
- Portal structures for track crossings and special locations
- Sectioning posts and disconnector support structures
- CDE (Contact Line Disconnection Equipment) portals
- Tensioning and anchoring structures
- Auxiliary equipment supports and cable routes

Foundation design must accommodate the unique loading conditions of railway electrification systems including:

- Static loads from OCS equipment and structures
- Dynamic loads from train-induced oscillations
- Wind loads on overhead structures and equipment
- Ice loads in applicable climatic conditions
- Seismic loads per Israeli seismic design requirements
- Thermal expansion and contraction effects
- Construction and maintenance loading scenarios

1.10.4 Contractor Responsibilities regarding foundations

This project offers two additional distinct interface models for foundation delivery, based on project timing, technical requirements, and procurement strategies:

1.10.4.1 Option 1: ISR Constructed Foundations Model

Under this model:

- **ISR Responsibilities:** Complete foundation design, approved design documents, execution of foundation works, and performance of quality control and testing in accordance with applicable standards and ISR requirements. **OCS Contractor Responsibilities:** Performance of a comprehensive due diligence review of both the foundation design (where available and feasible) and the constructed foundations, including verification of design assumptions, and compliance with applicable standards. Verification of the constructed foundations against the approved design and site conditions; formal acceptance of the foundations. Identification, reporting, and coordination of rectification of defects or non-conformities and assumption of full responsibility for foundation performance following acceptance. Any required corrective or remedial works arising from the due diligence review or foundation acceptance process shall be executed by the OCS Contractor in accordance with the instructions of the Project Manager,

and shall be deemed included in the applicable unit prices, with no entitlement to additional payment.

- Application: Suitable for projects where foundation construction precedes OCS contractor engagement or where ISR wishes to maintain direct control over foundation construction

1.10.4.2 Option 2: OCS Contractor Design and ISR foundation Execution Model

Under this model:

- **Contractor Responsibilities**: Preparation of the complete foundation design, including design basis, calculations, drawings, and technical specifications; provision of construction supreme supervision and technical guidance during execution; performance of design verification and quality assurance activities; and formal acceptance and handover of the completed foundations. The OCS Contractor shall retain full design authority and responsibility for the adequacy and performance of the foundations. ISR Responsibilities: Execution of the foundation works in accordance with the OCS Contractor's approved designs, specifications, and instructions; procurement of materials; and implementation of construction quality control, testing, and documentation in coordination with the OCS Contractor.
- Application: Suitable for integrated project delivery where OCS contractor maintains design control and construction oversight

1.10.5 Option 1: ISR Pre-Constructed Foundations Interface

1.10.5.1 Interface Description

The ISR Pre-Constructed Foundations interface model applies to situations where ISR has completed foundation design and construction prior to OCS Contractor engagement. Under this model, the OCS Contractor must conduct comprehensive due diligence to assess foundation suitability and condition before accepting responsibility for foundation performance.

Key characteristics of this interface include:

- ISR delivers completed foundations to agreed specifications
- OCS Contractor conducts detailed technical and physical assessment
- Clear accept/reject decision process with defined criteria
- OCS Contractor responsibility for defect rectification or replacement
- Comprehensive documentation and warranty transfer

1.10.5.2 Responsibility Matrix

Activity	OCS Contractor	ISR	Joint Responsibility
Foundation Design Development	○	●	Load specification coordination
Foundation location marking/ survey	○	●	Inspection protocols
Geotechnical/ Soil investigation report	○	●	Inspection protocols
Foundation Construction	○	●	Progress monitoring
Construction Quality Control	○	●	Inspection protocols
Due Diligence Assessment	●	○	Documentation provision
Foundation Testing and Verification	●	○	Test procedure approval
Defect Identification	●	○	Classification criteria
Defect Rectification	●	○	Technical coordination
Foundation Replacement (if required)	●	○	Access and coordination
Long-term Performance Responsibility	●	○	Warranty transition
Documentation Handover	○	●	Completeness verification

Legend: ● = Primary Responsibility, ○ = Support/Input Required

1.10.5.3 Pre-Construction Coordination

1.10.5.3.1 Design Information Exchange

Prior to foundation handover, ISR shall provide:

- Complete foundation design calculations and drawings
- Geotechnical investigation reports and analysis
- Material specifications and test certificates
- Quality control records and inspection reports
- As- Made drawings and dimensional surveys

1.10.5.3.2 Construction Monitoring Interface

Although not responsible for construction, OCS Contractor may request:

- Access to construction sites for progress monitoring
- Notification of key construction milestones
- Participation in critical quality control inspections
- Review of construction quality control records

1.10.5.4 Foundation Handover Process

1.10.5.4.1 Due Diligence Requirements

The OCS Contractor shall conduct comprehensive due diligence assessment of all foundations prior to acceptance. This assessment shall include:

1.10.5.4.1.1 Documentation Review

- Verification of design compliance with OCS load requirements
- Review of geotechnical investigation adequacy

- Assessment of construction quality control records
- Verification of material test certificates and specifications
- Review of dimensional survey accuracy and compliance
- Assessment of foundation load testing results

1.10.5.4.1.1.1 Physical Inspection Protocol

Physical inspection shall encompass:

- Visual Inspection: Surface condition, crack assessment, construction defects
- Dimensional Verification: Confirm as- Made drawings dimensions against design requirements

1.10.5.4.1.1.2 Defect Identification and Classification

1.10.5.4.1.1.2.1 Defect Classification System

Category	Description	Action Required	Responsibility
Category A - Critical	Defects affecting structural integrity or safety	Foundation rejection or major reconstruction	OCS Contractor rectification
Category B - Major	Defects affecting performance but not safety	Repair or reinforcement required	OCS Contractor rectification
Category C - Minor	Cosmetic or minor non-conformance	Repair or acceptance with monitoring	OCS Contractor discretion
Category D - Administrative	Documentation or procedural deficiencies	Documentation correction	ISR correction

1.10.5.4.1.1.2.2 Specific Defect Examples

- Category A (Critical):
  - Structural cracks wider than 0.5mm
  - Foundation settlement or displacement
  - Inadequate concrete strength (<90% of design)
  - Missing or inadequate reinforcement
  - Dimensional errors exceeding 50mm
- Category B (Major):
  - Surface cracks 0.3-0.5mm width
  - Dimensional errors 20-50mm
  - Concrete strength 90-95% of design
  - Minor reinforcement deficiencies
  - Incomplete waterproofing systems

1.10.5.4.2 Acceptance Criteria

Foundation acceptance requires satisfaction of all following criteria:

- Structural Adequacy: Demonstrated capacity to support all OCS design loads
- Dimensional Compliance: All dimensions within specified tolerances

- Material Compliance: All materials meeting specification requirements
- Construction Quality: No Category A defects and limited Category B defects
- Documentation Completeness: All required documentation provided and verified

1.10.5.4.3 Defect Rectification Responsibilities

1.10.5.4.3.1 OCS Contractor Rectification Obligations

Upon foundation acceptance, the OCS Contractor becomes responsible for:

- All defect rectification regardless of original cause
- Foundation replacement if rectification is not feasible
- Additional testing and verification after rectification
- All costs associated with defect rectification
- Schedule impacts resulting from defect rectification

1.10.5.4.3.2 Rectification Standards

All defect rectification shall:

- Restore foundation to original design performance standards
- Use materials and methods equivalent to or better than original construction
- Include comprehensive testing and verification
- Provide equivalent or extended design life
- Maintain warranty coverage for rectified elements

1.10.5.5 Construction Phase Coordination

During OCS construction phase, coordination requirements include:

1.10.5.5.1 Foundation Protection

- Protection of completed foundations during OCS construction
- Coordination of construction access and equipment movement
- Prevention of construction damage to completed foundations
- Immediate reporting and assessment of any foundation damage

1.10.5.5.2 Installation Interface

- Verification of foundation condition prior to OCS installation
- Coordination of anchor bolt preparation and installation
- Integration of OCS earthing connections with foundation earth electrodes
- Final dimensional verification during OCS installation

1.10.5.6 Quality Assurance and Control

1.10.5.7 Quality Control Framework

Quality control for Option 1 interfaces shall include:

- Handover Quality Assurance: Verification of ISR quality control adequacy
- Due Diligence Quality Control: OCS Contractor inspection and testing quality
- Rectification Quality Assurance: Quality control of any rectification work
- Long-term Monitoring: Ongoing foundation performance monitoring

1.10.5.8 Documentation Requirements

Complete documentation package for Option 1 handover shall include:

1.10.5.8.1 Design Documentation

- Foundation design calculations and analysis
- Structural drawings and specifications
- Geotechnical investigation reports
- Load analysis and capacity calculations
- Material specifications and approvals

1.10.5.8.2 Construction Documentation

- Quality control inspection records
- Material test certificates
- Concrete placement and curing records
- As- Made drawings and surveys

1.10.5.8.3 Testing and Acceptance Documentation

- Material testing certificates
- Due diligence assessment reports
- Defect identification and rectification records
- Final acceptance certificates

1.10.6 Option 2: OCS Contractor Design / ISR Execution Model

1.10.6.1 Interface Description

The OCS Contractor Design / ISR Execution model provides the OCS Contractor with complete design control while utilizing ISR's execution capabilities. Under this model, the OCS Contractor maintains full design responsibility and provides comprehensive construction supervision, while ISR acts as the executing contractor following OCS specifications and supervision.

Key characteristics of this interface include:

- OCS Contractor complete design responsibility and control
- Detailed construction specifications and supervision by OCS Contractor
- ISR execution under OCS Contractor oversight
- Integrated quality assurance throughout construction
- Direct handover from construction to OCS Contractor responsibility

1.10.6.2 Responsibility Matrix

Activity	OCS Contractor	ISR/Execution Contractor	Joint Responsibility
Foundation Design Development	●	○	Design review process
Geotechnical Investigation	●	○	Site access coordination
Construction Specifications	●	○	Specification review
Material Procurement	○	●	Material approval process
Construction Execution	○	●	Supervision and inspection
Construction Quality Control	●	○	Inspection procedures
Construction Supervision	●	○	Progress coordination
Testing and Verification	●	○	Test execution
Defect Rectification	●	●	Rectification coordination
Foundation Acceptance	●	○	Handover procedures

Legend: ● = Primary Responsibility, ○ = Support/Input Required

1.10.6.3 Design Development Process

1.10.6.3.1 Foundation Design Specifications

The OCS Contractor shall develop complete foundation designs including:

1.10.6.3.1.1 Structural Design Requirements

- Load Analysis: Complete analysis of all OCS loads including static, dynamic, wind, seismic, and construction loads
- Foundation Type Selection: Selection of appropriate foundation type based on geotechnical conditions and load requirements
- Structural Calculations: Complete structural analysis and design calculations per applicable codes
- Reinforcement Design: Detailed reinforcement layout and specifications
- Connection Design: Anchor bolt and connection system design

1.10.6.3.1.2 Geotechnical Design Integration

- Site-specific geotechnical investigation requirements
- Foundation bearing capacity analysis
- Settlement analysis and acceptance criteria
- Lateral load capacity evaluation
- Groundwater and drainage considerations
- Soil-structure interaction analysis

1.10.6.4 ISR Review and Approval Process

1.10.6.4.1 Design Review Stages

Review Stage	Deliverables
Preliminary Design	Foundation concepts and layouts
Detailed Design	Complete structural calculations and drawings
Construction Documents	Final drawings and specifications
Material Specifications	Material and testing specifications

1.10.6.4.2 Review Criteria

ISR design review shall be based on:

- Compliance with Israeli structural design codes
- Conformance with railway infrastructure standards
- Integration with existing infrastructure
- Environmental and safety compliance
- Constructability and access considerations
- Long-term maintenance requirements

1.10.6.4.3 Design Deliverables

Complete design package shall include:

1.10.6.4.3.1 Design Calculations

- Load analysis and load combinations
- Structural analysis and design calculations
- Geotechnical analysis and foundation design
- Connection design and anchor bolt calculations
- Construction load analysis

1.10.6.4.3.2 Technical Drawings

- Foundation layout plans
- Foundation details and sections
- Reinforcement plans and details
- Anchor bolt layouts and details

1.10.6.5 Detailed Instructions Preparation

1.10.6.5.1 Technical Specifications

The OCS Contractor shall provide comprehensive technical specifications covering:

1.10.6.5.1.1 Construction Drawings

Detailed construction drawings shall include:

- Excavation plans and sections
- Formwork layout and details
- Reinforcement placement drawings
- Anchor bolt installation details
- Construction tolerances

1.10.6.5.1.2 Construction Supervision Interface

1.10.6.5.1.2.1 OCS Contractor Supervision Role

The OCS Contractor shall provide comprehensive construction supervision including:

1.10.6.5.1.2.1.1 Supervision Organization

- **Site Supervision Team:** Qualified engineers and inspectors with foundation construction experience
- **Quality Control Manager:** Senior engineer responsible for overall quality assurance
- **Specialist Inspectors:** Concrete, reinforcement, and geotechnical specialists as required
- **Documentation Coordinator:** Responsible for inspection records and documentation

1.10.6.5.1.2.1.2 Daily Supervision Activities

- Inspection of materials prior to incorporation
- Supervision of construction activities and compliance
- Quality control testing coordination
- Issue identification and resolution coordination

1.10.6.6 Construction Execution

1.10.6.6.1 ISR Contractor Responsibilities

ISR, acting as the executing contractor, shall be responsible for:

1.10.6.6.1.1 Construction Management

- Site establishment and safety management
- Construction equipment provision and operation
- Construction crew management and coordination
- Construction progress scheduling and control
- Interface coordination with other ISR activities

1.10.6.6.1.2 Construction Execution

- Execution of all construction activities per OCS specifications
- Implementation of approved construction methods
- Compliance with all quality control requirements
- Coordination with OCS supervision team
- Immediate response to supervision instructions

1.10.6.6.2 Material Procurement and Approval

1.10.6.6.2.1 Procurement Process

Step	Activity	ISR Responsibility	OCS Responsibility
1	Supplier Selection	Supplier identification and qualification	Supplier approval and certification
2	Material Ordering	Purchase order placement and management	Order specification review and approval
3	Quality Assurance	Delivery coordination and logistics	Material inspection and acceptance
4	Documentation	Purchase documentation maintenance	Quality documentation review and filing

1.10.6.7 Direct Handover Process

Under Option 2, foundations are handed over directly from construction completion to OCS Contractor responsibility:

1.10.6.7.1 Handover Requirements

- Completion of all construction activities
- Successful completion of all testing and verification
- Resolution of all construction defects
- Completion of all required documentation
- Final inspection and approval by OCS Contractor

1.10.6.7.2 Handover Documentation

- As-Made drawings and dimensional surveys
- Construction records and quality control documentation
- Material certificates and testing results
- Final inspection reports and approvals

1.10.6.7.3 Documentation Requirements

Comprehensive documentation for Option 2 shall include:

1.10.6.7.4 Design Phase Documentation

- Complete design calculations and analysis
- Geotechnical investigation reports and analysis
- Technical specifications and construction documents
- Material specifications and approval records
- Design review records and approvals

1.10.6.7.5 Construction Phase Documentation

- Daily inspection reports and quality control records
- Material delivery and acceptance records
- Construction progress records and photographs
- Non-conformance reports and corrective actions
- Testing and verification results

1.10.6.7.6 Handover Documentation

- Final as- Made drawings and documentation package
- Testing certificates and compliance reports
- Warranty documentation and service records
- Operation and maintenance instructions
- Final acceptance certificates

1.10.7 Mutual Coordination (Applies to Both Options)

1.10.7.1 Joint Coordination Meetings

1.10.7.1.1 Interface Control Board

A formal Foundation Interface Control Board shall be established comprising representatives from the OCS Contractor, ISR, and Foundation Contractors (where applicable). The board shall meet according to the following schedule:

- Pre-Construction Phase: Monthly meetings during design and planning
- Construction Phase: Bi-weekly meetings during active construction
- Handover Phase: As required for handover completion

1.10.7.1.2 Board Responsibilities

- Review and approve foundation interface control documents
- Resolve foundation-related interface disputes
- Coordinate major design and construction decisions
- Approve foundation-related change requests
- Monitor foundation milestone achievements
- Coordinate foundation testing and acceptance activities

1.10.7.1.3 Technical Coordination Meetings

Regular technical coordination meetings shall address:

- Design Coordination: Foundation design progress and technical issues
- Construction Coordination: Construction progress, quality issues, and schedule coordination
- Quality Coordination: Quality assurance activities, testing schedules, and results
- Risk Management: Foundation-related risk identification and mitigation
- Interface Management: Coordination with other project interfaces

1.10.7.2 Site Coordination Procedures

1.10.7.2.1 Access Coordination

Site access coordination shall ensure:

- Coordinated access for foundation construction activities
- Integration with other ISR construction activities
- Safety coordination for overlapping activities
- Equipment and material delivery coordination
- Temporary facilities and utilities coordination

1.10.7.2.2 Safety Coordination

Foundation construction safety coordination includes:

- Integrated safety planning and risk assessment
- Coordinated safety training and procedures
- Joint safety inspections and monitoring
- Emergency response coordination
- Incident reporting and investigation coordination

1.10.8 Interface Management Procedures

1.10.8.1 Interface Control Documents

1.10.8.1.1 Foundation Interface Control Document Structure

The Foundation Interface Control Document (ICD) shall contain:

- Interface Overview: Description, scope, and stakeholder identification
- Technical Requirements: Foundation specifications and OCS integration requirements
- Responsibility Matrix: Clear definition of each party's responsibilities
- Design Requirements: Design coordination and approval procedures
- Construction Requirements: Construction coordination and supervision procedures
- Testing Requirements: Testing, verification, and acceptance procedures
- Quality Requirements: Quality assurance and control procedures
- Documentation Requirements: Required deliverables and documentation standards
- Acceptance Criteria: Criteria for foundation acceptance and handover
- Risk Management: Foundation-specific risks and mitigation measures

1.10.8.2 Change order Management

1.10.8.2.1 Foundation Change Categories

Change Category	Description	Approval Authority	Impact Assessment
Minor Modifications	Small dimensional or specification changes	OCS Technical Manager	Technical impact only
Design Changes	Foundation type or design modifications	Interface Control Board	Technical, schedule, cost
Scope Changes	Addition/deletion of foundations	ISR Project Management	Full impact assessment
Emergency Changes	Safety or critical issue resolution	Expedited Process	Post-change assessment

1.10.8.2.1.1 Change Control Process

- Change Identification: Identification of need for foundation change
- Change Request Preparation: Formal change request documentation
- Technical Impact Assessment: Assessment of technical implications
- Schedule Impact Assessment: Assessment of schedule implications
- Cost Impact Assessment: Assessment of cost implications
- Stakeholder Review: Review by all affected parties
- Approval Decision: Formal approval or rejection decision
- Implementation: Coordinated implementation of approved changes
- Documentation Update: Update of all relevant documentation

02 DELIVERABLES DURING DIFFERENT PROJECT STAGES

2.1 Abbreviations and Definitions

- NOBO: Notified Body - Independent organization designated to assess conformity with TSI requirements
- IC: Interoperability Constituent - Component or assembly covered by TSI
- OCS: Overhead Contact System
- RAMS: Reliability, Availability, Maintainability, Safety
- TSI ENE: Technical Specification for Interoperability relating to Energy subsystem
- CDM: Construction (Design and Management) Regulations
- RISQS: Railway Industry Supplier Qualification Scheme
- QMS: Quality Management System
- SMS: Safety Management System
- EMS: Environmental Management System

Regulatory Framework: All submissions must demonstrate compliance with:

- Commission Regulation (EU) No 1301/2014 - TSI ENE (Technical Specification for Interoperability - Energy)
- Directive (EU) 2016/797 - Interoperability of the rail system within the European Union
- EN 50126-1:2017+A1:2024 - Railway RAMS (Reliability, Availability, Maintainability, Safety)
- EN 50119:2020 - Railway applications - Fixed installations - Electric traction overhead contact lines
- EN 50122-1:2022+A1:2025 - Railway applications - Electrical safety, earthing and return circuit
- EN 50163:2004+A3:2022 - Railway applications - Supply voltages of traction systems
- EN 50317:2012+A1:2022 - Railway applications - Current collection systems - Dynamic interaction
- EN 50388-1:2022/2025: Railway Applications - Fixed installations and rolling stock - Technical criteria for the coordination between electric traction power supply systems and rolling stock to achieve interoperability
- Local standards and regulations

Submission Requirements: All documents must be submitted in digital format (PDF, DWG as specified) with appropriate quality assurance, version control, and certification. Documents must be prepared by qualified personnel and bear appropriate approvals. Translation to English required for all non-English documents.

2.2 Submission for Demonstration of Capabilities

All documents specified in this Section 2.2 shall be submitted by the Contractor and approved by ISR by the Effective Date.

2.2.1 CONSTRUCTION METHODOLOGY

Construction Aspect	Documentation Required
Construction Program	Master program template, phasing methodology
OCS Installation Procedures	Method statements, installation sequences
Specialized Equipment	OCS installation vehicle specifications, availability
Safety During Construction	Construction safety procedures, risk assessments
Quality Control	Construction QC procedures, inspection checklists
Environmental Management	Environmental procedures, mitigation measures
Traffic Management	Possession planning procedures, railway interface
Temporary Works Design	Temporary works procedures

2.2.2 TESTING & COMMISSIONING PLAN

Testing Phase	Procedures & Equipment Required
Pre-commissioning Tests	Pre-commissioning test schedule and procedures
Static Testing Procedures	Static test methodology, measurement equipment
Dynamic Testing (EN 50317)	Dynamic measurement capability, certified equipment
Pantograph-OCS Interaction	Contact force measurement systems, analysis software
Protection Coordination Tests	Protection testing procedures, coordination studies
System Integration Testing	Integration test procedures, interface verification
Performance Verification	Performance test procedures, acceptance criteria
Test Equipment Calibration	Calibration certificates, measurement uncertainty
Test Reporting	Test report templates, data analysis procedures

2.2.3 TRANSFER TO COMMERCIAL OPERATION

Handover Element	Documentation & Procedures Required
Handover Documentation	Handover procedure, document register
As- Made drawings and Documentation	As- Made drawing procedures, survey requirements
O&M Manuals	Operation manual template, maintenance procedures
Training Programs	Training curriculum, competency assessment
Warranty Provisions	Warranty terms, defects liability procedures
Spare Parts Strategy	Spare parts list, provisioning strategy
Emergency Support	24/7 support arrangements, response procedures
Performance Monitoring	Performance monitoring system, KPI reporting

2.2.4 QUALITY ASSURANCE & COMPLIANCE

QA Element	System/Procedures Required
Quality Management System	ISO 9001 QMS manual, process documentation
Quality Control Plan	Project-specific QC plan, hold points
Inspection & Test Plans	ITP templates, inspection checklists
Non-conformance Management	NCR procedures, corrective action system
Document Control	Document control procedures, version control
Traceability Systems	Material traceability, certification records
Internal Audit Procedures	Audit program, auditor qualifications

2.2.5 HEALTH, SAFETY & ENVIRONMENT

HSE Element	Management System/Procedures
Safety Management System	SMS manual, safety policies and procedures
Risk Assessment Methodology	Risk assessment procedures, hazard identification
RAMS Documentation	RAMS plan template, assessment procedures
Environmental Management	EMS procedures, environmental impact assessment
CDM Compliance	CDM procedures, principal contractor capability
Safety Training Matrix	Training requirements, competency records
Emergency Response	Emergency procedures, incident management
Safety Performance	Safety KPIs, performance monitoring system

2.3 Technical Submission for OCS Technical Compliance

2.3.1 CERTIFICATION & APPROVAL DOCUMENTS

Document Type	Description	Standard Reference	Format	Due Date
EC Certificate of Conformity (IC - OCL)	NOBO-issued certificate for overhead contact line as interoperability constituent	TSI ENE 6.1	PDF	NTP (Execution) + 60 days
EC Declaration of Conformity	Manufacturer's declaration of conformity for all OCS components	Directive 2016/797	PDF	NTP (Execution) + 60 days
EC Certificate of Verification (Energy Subsystem)	NOBO certificate for complete energy subsystem verification	TSI ENE 6.2	PDF	NTP (Execution) + 60 days
NOBO Assessment Reports	Detailed technical assessment reports from notified body	TSI ENE	PDF	NTP (Execution) + 60 days
Type Approval Certificates	Type approval for all OCS component types (insulators, clamps, etc.)	EN 50119	PDF	NTP (Execution) + 60 days
Factory Acceptance Test Certificates	FAT certificates for manufactured components	Quality standards	PDF	Pre Procurement
Contact Wire Material Certificate	Material certificate and test reports for contact wire	EN 50149	PDF	Pre Procurement

Document Type	Description	Standard Reference	Format	Due Date
Messenger Wire Material Certificate	Material certificate and test reports for messenger wire	EN 50182	PDF	Pre Procurement
Dropper Certificates	Material and performance certificates for droppers	EN 50119	PDF	Pre Procurement
ISO 9001 Certificate (Manufacturing)	Valid QMS certificate for all manufacturing facilities	ISO 9001	PDF	Effective Date + 60 days
ISO 14001 Certificate	Environmental management system certification	ISO 14001	PDF	Effective Date + 60 days

2.3.2 TECHNICAL DESIGN DOCUMENTATION

Document Type	Description	Standard Reference	Format	Due Date
OCS General Arrangement Drawings	Complete system layout drawings showing all OCS components	EN 50119	DWG + PDF	According to Design milestone
Standard Support Assembly Drawings	Detailed drawings of all standard support structures	EN 50119	DWG + PDF	According to Design milestone
Cantilever Design Drawings	Cantilever arm assemblies with all components and connections	EN 50119	DWG + PDF	According to Design milestone
Registration Arm Assembly Drawings	Registration arm details with steady arm connections	EN 50119	DWG + PDF	According to Design milestone
Tensioning Device Drawings	Balance weight and pulley assemblies with installation details	EN 50119	DWG + PDF	According to Design milestone
Overlap Arrangement Drawings	Insulated and uninsulated overlap details with clearances	TSI ENE	DWG + PDF	According to Design milestone
Phase Break/Section Separator Drawings	Phase break arrangements and neutral section details	TSI ENE	DWG + PDF	According to Design milestone
Special Location Drawings	Tunnel, bridge, and station-specific arrangements	EN 50119	DWG + PDF	According to Design milestone
Foundation Design Drawings	Foundation details for all support structures	EN 50119	DWG + PDF	According to Design milestone
Electrical Single Line Diagrams	OCS electrical schematics and protection arrangements	EN 50122-1	DWG + PDF	According to Design milestone
Earthing and Bonding Drawings	Complete earthing system with impedance bond locations	EN 50122-1	DWG + PDF	According to Design milestone

Document Type	Description	Standard Reference	Format	Due Date
Lightning Protection Drawings	Lightning protection system design and earth mat	EN 62305	DWG + PDF	According to Design milestone
Design Calculations – Civil	Static and Dynamic forces, foundations	Local standards	PDF	According to Design milestone
Design Calculations – Mechanical	Mechanical load calculations, stress analysis, fatigue assessment	EN 50119	PDF	According to Design milestone
Design Calculations - Electrical	Current carrying capacity, voltage drop, fault level calculations	EN 50163	PDF	According to Design milestone
Dynamic Analysis Calculations	Pantograph-OCS interaction analysis per EN 50317	EN 50317	PDF	According to Design milestone
Load Calculations	Wind, ice, temperature loading with safety factors	EN 50119	PDF	According to Design milestone
Clearance Calculations	Electrical and mechanical clearance verification	EN 50119, EN 50122-1	PDF	According to Design milestone

2.3.3 EQUIPMENT TECHNICAL DATA & CATALOGUES

Document Type	Description	Standard Reference	Format	Due Date
Contact Wire Technical Data	Complete specification including material properties, dimensions, performance	EN 50149	PDF	Signature Date + 60 days
Messenger Wire Technical Data	Material specification, tensile strength, conductivity data	EN 50182	PDF	Signature Date + 60 days
Dropper/Hanger Technical Data	Specification including load capacity, material, connection details	EN 50119	PDF	Signature Date + 60 days
Insulator Technical Data	Electrical and mechanical properties, type test certificates	EN 50124-1	PDF	Signature Date + 60 days
Tensioning Device Manual	Complete technical manual with installation and maintenance instructions	EN 50119	PDF	Signature Date + 60 days
Registration Arm Technical Data	Load capacity, deflection characteristics, material specification	EN 50119	PDF	Signature Date + 60 days

Document Type	Description	Standard Reference	Format	Due Date
Section Insulator Technical Data	Electrical clearance, mechanical strength, operating procedures	EN 50119	PDF	Signature Date + 60 days
Balance Weight Assembly Data	Weight specifications, pulley details, installation procedures	EN 50119	PDF	Signature Date + 60 days
Termination Clamps Data	Conductor termination clamps with slip test results	EN 50119	PDF	Signature Date + 60 days
Electrical Connectors Data	Current rating, contact resistance, corrosion resistance data	EN 50124-1	PDF	Signature Date + 60 days
Earthing Components Data	Earth electrodes, bonds, connections with resistance values	EN 50122-1	PDF	Signature Date + 60 days
Support Structure Catalogue	Complete catalogue of masts, brackets, foundations	EN 50119	PDF	Signature Date + 60 days
Anti-vibration Devices Data	Vibration dampers specification and installation details (if applicable)	EN 50119	PDF	Signature Date + 60 days
Anti-climbing device data	Anti climbing devices specification and installation details	EN 50122-1	PDF	Signature Date + 60 days
Bird Protection Devices Data	Bird guard specifications and installation procedures (if applicable)	Environmental req.	PDF	Signature Date + 60 days

2.3.4 COMPLIANCE DEMONSTRATION DOCUMENTS

Document Type	Description	Standard Reference	Format	Due Date
TSI ENE Compliance Matrix	Clause-by-clause compliance demonstration with evidence references	TSI ENE	PDF + Excel	According to Design milestone
EN 50119:2020 Compliance Statement	Detailed compliance statement with design evidence	EN 50119	PDF	According to Design milestone
EN 50122-1:2022 / SI 61228-1 Compliance Report	Electrical safety compliance with earthing system verification	EN 50122-1 SI 61228-1	PDF	According to Design milestone
EN 50163:2004 Compliance Verification	Supply voltage compatibility verification and analysis	EN 50163	PDF	According to Design milestone
EN 50317:2012 Dynamic Test Results	Pantograph-OCS interaction test results and analysis	EN 50317	PDF	Handover

Document Type	Description	Standard Reference	Format	Due Date
EN 50126-1 RAMS Documentation	Reliability, Availability, Maintainability, Safety analysis and plan	EN 50126-1	PDF	According to Design milestone
Interoperability Directive Compliance	Legal compliance report with authorization procedures	Directive 2016/797	PDF	According to Design milestone
Technical File for IC Assessment	Complete technical file for interoperability constituent assessment	TSI ENE 6.1	PDF	NOBO submission
Technical File for Subsystem Verification	Subsystem technical file including integration evidence	TSI ENE 6.2	PDF	Pre-commissioning
Risk Assessment Documentation	Comprehensive risk assessment with mitigation measures	EN 50126-1	PDF	According to Design milestone
Hazard Log	System hazard log with risk controls and monitoring	EN 50126-1	PDF + Excel	Throughout the Project
Safety Case	System safety case demonstrating acceptable risk	EN 50126-1	PDF	According to Design milestone

2.3.5 SIMULATION & ANALYSIS REPORTS

Document Type	Description	Standard Reference	Format	Due Date
Pantograph-OCS Simulation Report	Dynamic interaction simulation per EN 50317 requirements	EN 50317	PDF	Design verification
Contact Force Analysis Report	Statistical analysis of contact forces (Fm, σ, Fmax, Fmin)	EN 50317	PDF	Design verification
Contact Wire Uplift Analysis	Uplift behavior analysis under pantograph forces	EN 50317	PDF	Design verification
Wave Propagation Speed Analysis	Wave speed calculation and operating speed verification	TSI ENE	PDF	Design verification
Mean Contact Force Calculation	Fm calculation report with speed-dependent analysis	EN 50317	PDF	Design verification
Statistical Analysis Report	Statistical evaluation of dynamic performance parameters	EN 50317	PDF	Design verification
Multi-Pantograph Operation Analysis	Analysis of multiple pantograph interaction effects	TSI ENE	PDF	Design verification
Aerodynamic Effects Study	High-speed aerodynamic effects on pantograph performance	EN 50317	PDF	Design verification
Temperature Effects Analysis	Temperature variation effects on OCS performance	EN 50119	PDF	Design verification
Worst-Case Scenario Analysis	Analysis of most demanding operating conditions	EN 50317	PDF	Design verification
Software Validation Report	Validation report for simulation software used	EN 50318	PDF	Before simulation
Simulation Tool Certification	Certification/validation of simulation tools and models	EN 50318	PDF	Before use

2.3.6 TYPE TESTING REPORTS

Document Type	Description	Standard Reference	Format	Due Date
Contact Wire Type Test Report	Mechanical and electrical properties testing per standard	EN 50149	PDF	Pre Procurement
Messenger Wire Type Test Report	Tensile strength, conductivity, and durability testing	EN 50182	PDF	Pre Procurement
Insulator Type Test Reports	Mechanical load and electrical withstand testing	EN 50124-1	PDF	Pre Procurement
Clamp Type Test Reports	Slip test, mechanical strength, and thermal cycling	EN 50119	PDF	Pre Procurement
Dropper Type Test Reports	Load testing and fatigue performance verification	EN 50119	PDF	Pre Procurement
Section Insulator Type Test	Electrical and mechanical performance testing	EN 50119	PDF	Pre Procurement
Registration Arm Load Test	Load testing and deflection characteristic verification	EN 50119	PDF	Pre Procurement
Tensioning Device Performance Test	Load testing and operational performance verification	EN 50119	PDF	Pre Procurement
Corrosion Resistance Reports	Salt spray and environmental corrosion testing	EN ISO 9227	PDF	Pre Procurement
Environmental Test Reports	Temperature, UV, and humidity exposure testing	IEC 60068	PDF	Pre Procurement
Short Circuit Withstand Test	Fault current withstand capability demonstration	EN 50119	PDF	Pre Procurement
Lightning Impulse Test Reports	Lightning impulse withstand testing for insulators	IEC 60060-1	PDF	Pre Procurement

2.3.7 MANUFACTURING & QUALITY DOCUMENTATION

Document Type	Description	Standard Reference	Format	Due Date
Manufacturing Process Descriptions	Detailed process documentation for all manufactured components	ISO 9001	PDF	Pre Procurement
Quality Control Plan	Comprehensive QC plan with inspection points and criteria	ISO 9001	PDF	Pre Procurement
Inspection and Test Plan (ITP)	Detailed ITP for all components and assemblies	ISO 9001	PDF + Excel	Pre Procurement
Factory QA Procedures	Factory quality assurance procedures and work instructions	ISO 9001	PDF	Pre Procurement
Material Traceability Procedures	Material identification and traceability system	ISO 9001	PDF	Pre Procurement
Welding Procedures	Qualified welding procedures for structural connections	EN ISO 15614	PDF	Pre welding
NDT Procedures	Non-destructive testing procedures and certifications	EN ISO 9712	PDF	Pre Testing
Coating Specifications	Paint and protective coating specifications and procedures	EN ISO 12944	PDF	Pre Coating
Material Certificates (EN 10204)	Material certificates of conformity type 3.1 or 3.2	EN 10204	PDF	Upon delivery
Chemical Composition Reports	Material chemical analysis reports	EN 10204	PDF	Upon delivery
Mechanical Properties Reports	Tensile, yield, and elongation test results	EN 10204	PDF	Upon delivery
Dimensional Inspection Reports	Final dimensional inspection results for manufactured items	ISO 9001	PDF	Pre delivery

2.3.8 INSTALLATION & CONSTRUCTION DOCUMENTATION

Document Type	Description	Standard Reference	Due Date
Installation Manual	Complete installation manual for all OCS components	EN 50119	Pre-execution
Installation Method Statements	Detailed method statements for all installation activities	ISO 9001	Pre-execution
Installation Sequence Drawings	Step-by-step installation sequence illustrations	Project req.	Pre-execution
Tensioning Procedures	Wire tensioning procedures with safety requirements	EN 50119	Pre-execution
Registration Procedures	Contact wire registration and stagger adjustment procedures	EN 50119	Pre-execution
Tolerance Specifications	Installation tolerances for all OCS components	EN 50119	Pre-execution
Special Installation Procedures	Procedures for tunnels, bridges, and constrained locations	EN 50119	Pre-execution
Health & Safety Procedures	Construction safety procedures and risk assessments	CDM Regulations	Pre-execution
Quality Control During Installation	Installation QC procedures and inspection checklists	ISO 9001	Pre-execution
Pre-commissioning Checklists	Pre-energization checklists and verification procedures	Project req.	Pre-execution
Installation Equipment Specs	Specifications for specialized OCS installation equipment	Project req.	Pre-execution
Temporary Works Drawings	Temporary support structures during construction (if required)	BS 5975	Before use

2.3.9 TESTING & COMMISSIONING DOCUMENTATION

Document Type	Description	Standard Reference	Format	Due Date
Commissioning Plan	Comprehensive commissioning plan with milestones and responsibilities	Project req.	PDF	Pre-commissioning
Testing Schedule	Detailed testing schedule coordinated with project milestones	Project req.	PDF + Excel	Pre-commissioning
Pre-energization Test Procedures	Safety testing procedures before first energization	EN 50122-1	PDF	Pre-commissioning
Insulation Resistance Test Procedures	Insulation testing procedures for all electrical components	EN 50122-1	PDF	Pre-commissioning
High Voltage Test Procedures	HV testing procedures for insulators and clearances	EN 50124-1	PDF	Pre-commissioning
Static Geometry Measurement Procedures	Contact wire height, stagger, and clearance measurement procedures	EN 50119	PDF	Post-construction
Dynamic Performance Test Procedures	EN 50317 dynamic testing procedures and equipment setup	EN 50317	PDF	Post-construction
Contact Force Measurement Report	Measured contact force results (Fm, σ) with statistical analysis	EN 50317	PDF	Post-testing
Uplift Measurement Report	Contact wire uplift measurement results and analysis	EN 50317	PDF	Post-testing
Protection System Test Reports	Electrical protection coordination test results	EN 50122-1	PDF	Post-testing
Earthing System Test Reports	Earth resistance and impedance bond test results	EN 50122-1	PDF	Post-testing
Test Equipment Calibration	Calibration certificates for all test equipment used	ISO 17025	PDF	Before testing
Commissioning Test Results	Complete commissioning test results and acceptance report	Project req.	PDF	Post-commissioning

2.3.10 MAINTENANCE DOCUMENTATION

Document Type	Description	Standard Reference	Format	Approved Due Date
Maintenance Manual	Comprehensive Maintenance Manual for Complete OCS system	Project req.	PDF + Hard copy	Before handover
Maintenance Schedule	Preventive maintenance schedule with frequencies and procedures	EN 50126-1	PDF + Excel	Before handover
Inspection Procedures	Routine inspection procedures for all OCS components	EN 50119	PDF	Before handover
Preventive Maintenance Procedures	Detailed preventive maintenance procedures	EN 50126-1	PDF	Before handover
Corrective Maintenance Procedures	Fault diagnosis and repair procedures	EN 50126-1	PDF	Before handover
Troubleshooting Guide	Fault finding and resolution guide with decision trees	Project req.	PDF	Before handover
Spare Parts List	Comprehensive spare parts list with part numbers and suppliers	EN 50126-1	PDF + Excel	Before handover
Spare Parts Catalogue	Illustrated spare parts catalogue with exploded views	Project req.	PDF	Before handover
Wear Limits Specification	Component wear limits and replacement criteria	EN 50119	PDF	Before handover
Safety Instructions	Safety procedures for maintenance personnel	EN 50122-1	PDF	Before handover
Emergency Procedures	Emergency response procedures for system failures	Project req.	PDF	Before handover
Performance Monitoring Guidelines	System performance monitoring and KPI tracking procedures	EN 50126-1	PDF	Before handover

2.3.11 TRAINING MATERIALS

Document Type	Description	Standard Reference	Format	Due Date
Maintenance Training Manual	Training manual for maintenance staff covering all maintenance activities	Project req.	PDF + Hard copy	Before handover
Training Course Curriculum	Structured training curriculum with learning objectives	Project req.	PDF	Before handover
Training Presentation Materials	PowerPoint presentations and visual aids for training delivery	Project req.	PPT + PDF	Before handover
Video Training Materials	Video demonstrations of key procedures (if available)	Project req.	MP4	Before handover
Competency Assessment Criteria	Assessment criteria and testing procedures for competency verification	Project req.	PDF	Before handover
Personnel Certification Requirements	Certification requirements and qualification matrix for personnel	Project req.	PDF	Before handover

2.3.12 WARRANTY & SUPPORT DOCUMENTATION

Document Type	Description	Standard Reference	Format	Due Date
Warranty Certificate	Comprehensive warranty certificate for complete OCS system	Contract terms	PDF + Original	At handover
Warranty Terms & Conditions	Detailed warranty terms, exclusions, and claim procedures	Contract terms	PDF	At handover
Defects Liability Documentation	Defects liability period terms and rectification procedures	Contract terms	PDF	At handover
Technical Support Contact Info	24/7 technical support contact details and escalation procedures	Contract terms	PDF	At handover
Emergency Support Procedures	Emergency callout procedures and response time commitments	Contract terms	PDF	At handover
Manufacturer Guarantee Letters	Component manufacturer guarantee letters for major equipment	Contract terms	PDF + Original	At handover
After-sales Service Agreements	Long-term service and maintenance agreements (if applicable)	Contract terms	PDF + Original	At handover

2.3.13 AS- MADE DRAWINGS AND DOCUMENTATION

(Post-Construction Submission)

Document Type	Description	Standard Reference	Format	Due Date
As - Made drawings - All Disciplines	Complete as- Made drawings reflecting actual installation	Project req.	DWG + PDF	Within 20 days of Final Acceptance
As - Made adapted Design Calculations	Updated calculations reflecting as- Made drawings conditions	EN 50119	PDF	Within 60 days of Final Acceptance
Survey Reports (As-Made drawings)	Final survey reports with actual installed positions	Project req.	PDF + DWG	Within 60 days of Final Acceptance
Photographic Record	Comprehensive photographic (drone video) record of completed installation	Project req.	Digital images + PDF	Within 60 days of Final Acceptance
Site Test Reports (All Tests)	Complete set of all site test reports and results	EN 50317, EN 50122-1	PDF	Within 60 days of Final Acceptance
Deviation Reports	Reports documenting all deviations from original design	Project req.	PDF	Within 60 days of Final Acceptance
Modification Records	Complete record of all design modifications and approvals	Project req.	PDF	Within 60 days of Final Acceptance
Final Commissioning Reports	Complete commissioning report with all test results	Project req.	PDF	At Final Acceptance
Handover Certificates	Formal handover certificates for all sections of work	Contract terms	PDF + Original	At handover
Snag List & Rectification Record	Final snag list with rectification evidence	Project req.	PDF	At handover