



**Gemeente
Amsterdam**

Schedule of requirements

**Supply and maintenance of
traction power components for
tram and metro traction power
substations**

Part 2 Process requirements

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1	Introduction	6
1.1	Relation to other parts of the Schedule of requirements	6
1.2	Form of contract	6
1.3	Contract and supplier management	7
1.4	Advisor	7
1.5	Glossary and Abbreviations	7
2	Structure and design of process requirements	9
2.1	Requirements tables	9
3	Applicable documents	12
3.1	Binding documents	12
3.2	Information documents	14
4	Contract Management and Project Plan	15
4.1	Contract management	15
4.1.1	Contract management objective	15
4.1.2	Contract management activities	16
4.1.3	Requirements and products of contract management	16
4.2	Project plan	17
4.2.1	Objective of the project plan	17
4.2.2	Project management activities	18
4.2.3	Requirements and products project management	18
4.3	Interaction with the Client	19
4.3.1	Objective Interaction with the Client	19
4.3.2	Work Interaction with the Client	19
4.3.3	Requirements and products Interaction with the client	20
4.4	Planning	22
4.4.1	Objective Planning	22
4.4.2	Work Planning	23
4.4.3	Requirements and products Planning	23
4.5	Coordination	25
4.5.1	Objective Coordination	25
4.5.2	Activities Coordination	25
4.5.3	Requirements and products Coordination	25
5	Technical management	27
5.1	Interface management	27
5.1.1	Objective Interface management	27
5.1.2	Work on interface management	27
5.1.3	Requirements and products Interface management	27
5.2	Designs	29
5.2.1	Objective Design	29
5.2.2	Activities Design	29
5.2.3	Requirements and products Design	29
5.2.4	Objective Preliminary design	34
5.2.5	Work on preliminary design	34
5.2.6	Requirements and products Preliminary design	35

5.2.7 Objective Final Design	37
5.2.8 Work Final Design	37
5.2.9 Requirements and products Final Design	38
5.2.10 Objective Implementation Design	40
5.2.11 Activities Implementation Design	41
5.2.12 Requirements and products Implementation design	41
5.3 Implementation work and safety	43
5.3.1 Objective Implementation work	43
5.3.2 Work under sub-projects and work under management and maintenance	43
5.3.3 Requirements and products Implementation work	44
5.4 Testing	48
5.4.1 Objective Testing	48
5.4.2 Activities Testing	48
5.4.3 Requirements and products Testing	48
5.5 Verify and validate	56
5.5.1 Objective Verification and validation	56
5.5.2 Activities Verification and validation	57
5.5.3 Requirements and products Verification and validation	58
5.6 Delivery and completion	61
5.6.1 Objective Deliver and deliver	61
5.6.2 Activities Delivery and completion	62
5.6.3 Requirements and products Delivery	62
5.7 Education, Training and Exercise (RTD)	65
5.7.1 Education, Training and Exercise objective	65
5.7.2 Activities Training and Practice	66
5.7.3 Requirements and products Training, Education and Practice	66
6 Project control	69
6.1 Risk management	69
6.1.1 Objective Risk management	69
6.1.2 Risk management activities	69
6.1.3 Requirements and products Risk management	69
6.2 Purchasing management	71
6.2.1 Objective Procurement Management	71
6.2.2 Procurement management activities	71
6.2.3 Requirements and products Procurement management	72
6.3 Financial management	73
6.3.1 Objective Financial management	73
6.3.2 Activities Financial management	73
6.3.3 Requirements and products Financial management	73
6.4 Configuration management	74
6.4.1 Objective Configuration Management	74
6.4.2 Activities of configuration management	75
6.4.3 Requirements and products Configuration management	75
6.5 Management information systems	76
6.5.1 Objective management information systems	76
6.5.2 Information systems management activities	76
6.5.3 Requirements and products Information system management	76

6.6	Cybersecurity management	77
6.6.1	Objective Cyber Security Management (CS Management)	77
6.6.2	Work on cyber security management	77
6.6.3	Requirements and products Cybersecurity management	78
7	Quality assurance	79
7.1	Quality assurance objective	79
7.2	Quality assurance work	79
7.3	Requirements and products quality assurance	79
8	Aftercare and warranty	82
8.1	Aftercare	82
8.1.1	Objective Aftercare	82
8.1.2	Work aftercare	82
8.1.3	Requirements and products Aftercare	82
8.2	Warranty	83
8.2.1	Warranty objective	83
8.2.2	Warranty work	83
8.2.3	Requirements and products Warranty	84
9	Service, maintenance, special tools and spare parts supply	85
9.1	Service, maintenance and upkeep	85
9.1.1	Service, maintenance and upkeep objective	85
9.1.2	Service, maintenance and upkeep work	85
9.1.3	Requirements and products service, maintenance and upkeep	86
9.2	Special tools and spare parts supply	91
9.2.1	Objective special tools and spare parts supply	91
9.2.2	Service and maintenance work	91
9.2.3	Requirements and products service and, maintenance	91
10	List of requirements	94

1 Introduction

1.1 Relation to other parts of the Schedule of requirements

Part 1 of the Schedule of requirements contains all technical requirements. Part 2, this document, includes all process requirements for project management, design, delivery and commissioning. figure 1 the cohesion and hierarchy of the various documents. In addition to the process requirements, this document also describes the requirements for management and maintenance, user training and education, and the subsequent supply of components during the operational phase. For this purpose, this document refers to a number of underlying documents.

Requirement means the knock-out criteria that the Tender must meet. Options are additional to the Requirements and do not count as knock-out criteria; see the Tender Guidelines for additional information.

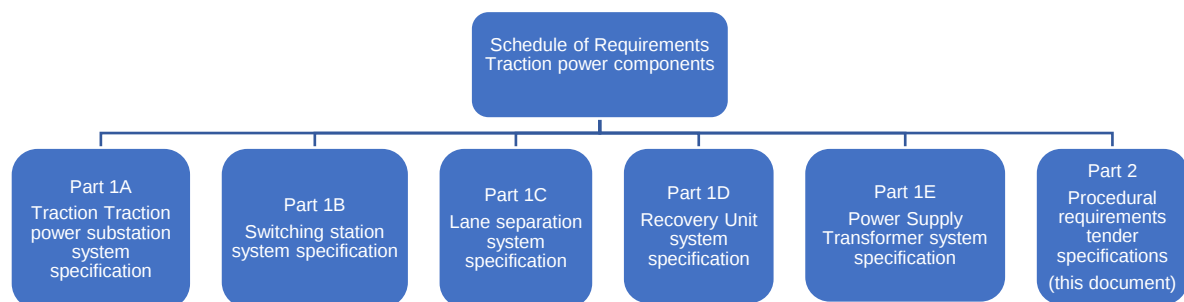


Figure 12 Hierarchy of specification documents

1.2 Form of contract

The Framework Agreement for the purchase, delivery and maintenance of traction power supply components for tram and metro traction power substations concerns an integrated customised contract. In addition to being the supplier of traction power supply components, the Contractor is also responsible for designing these traction power supply systems and is partly responsible for the integration of these systems within the existing infrastructure and the control and monitoring systems used within it by the Client.

The choice for this form of contract was prompted by GVB's analysis that benefits could be achieved by entrusting the supply of traction power systems and the associated design and testing activities to market parties for whom this is a core activity. The chosen method of system-oriented contract control (SCB) was prompted by GVB's need to get more grip on the Contractor, to guarantee the agreed quality and to place the responsibility for quality management with the party that has the most influence on it: the Contractor.

The second important objective of applying SCB is to reduce failure and repair costs. The last important goal of the application of SCB is to achieve intensive substantive cooperation between the Client and the Contractor in which innovation and improvement are continually worked on from the technical content as well as the process, from the design to the operational phase.

1.3 Contract and supplier management

GVB applies System-Based Contract Management (SCB) for this contract.

GVB understands this to mean that the responsibility for meeting the requirements in the contract lies with the contractor. The contractor manages his projects and is able to demonstrate, by means of the records included in his management plan and the resulting reports, that he meets the requirements of (sub)products. The most important element of the contractor's quality management is that he describes his processes, controls the risks, identifies deviations in time, takes appropriate - corrective and/or preventive - measures in time and evaluates this whole process on a regular basis. The Contractor must be able to demonstrate that the Deming circle (plan-do-check-act) works on the projects it carries out under this Framework Agreement.

1.4 Advisor

GVB Infra B.V. has been advised by Arcadis Nederland B.V. in drawing up the technical specifications in this schedule of requirements. For more information about the advisor see: www.arcadis.nl

1.5 Glossary and Abbreviations

Abbreviations and terms used in this Schedule of Requirements have the following meanings:

Term/abbreviation	Meaning
BLVC	Accessibility, Livability, Safety and Communication
CAB	Central remote control
CBI	Central control of installations
CO	Corrective Maintenance: to correct defects after, for example, the report of a complaint, an observation by an authorised person or an automatically generated report of a malfunction by an installation
DO	Final Design
Requirement (E)	Requirement, Contractor must indicate whether this wish will be fulfilled.
Claim with evidence (E-b)	Requirement with proof, Contractor must demonstrate by means of the requested evidence whether the requirement is fulfilled
AND	European Standard
FAT	Factory Acceptance Test
FIT	Factory Integration Test
FO	Functional Design
GAO	Use-dependent maintenance: preventive maintenance carried out on the basis of the use of an installation
GS	Traction power substation
HMI	Human Machine Interface
INS	Installer (The party contracted by the Customer who has final responsibility for the construction of a traction power substation and/or assembly and commissioning of traction power components and/or traction power installation)
MTTF	Mean Time To Fail
MTTR	Mean Time To Repair

Term/abbreviation	Meaning
Option (O)	Option, Client must indicate whether this option can be delivered and what the additional price of this is
OG	Client (GVB Infra B.V., Municipality of Amsterdam or Transport Region Amsterdam)
ON	Contractor (Supplier Engineering and Components)
PO	Systematic Maintenance: to prevent defects, carried out in a structured manner over time on the basis of a maintenance plan that has been established on the basis of the use of the installation and is adjusted periodically
SA	Station Automation System
SAT	Site Acceptance Test
SCADA	Supervisory Control And Data Acquisition
SIT	Site Integration Test
TAO	Condition Dependent Maintenance
TI	For Information. This information or document is provided for information purposes
TO	Technical Design
UO	Implementation design
VO	Preliminary design

Table 1 - Glossary of terms and abbreviations

2 Structure and design of process requirements

The process requirements in this specification are in line with the functional requirements, aspect requirements, interface requirements and realisation requirements in the system specifications from part 1A to 1E.

A colour code is indicated with each requirement. This colour code indicates for which Contractor this requirement is intended. See paragraph 2.2 for the definition of the colour codes.

We distinguish between the Contractor (Supplier Engineering and Components) and the Installer (the party contracted by the Client who is ultimately responsible for the construction of a traction power substation and/or assembly and commissioning of traction power components and/or traction power installation).

Both parties receive this complete System Specification. The requirements for the Contractor serve as a starting point for the Installer and vice-versa. The aim is to make the context of the requirements and their relationship clear. In a number of places in this document, there are interfaces and shared responsibilities whereby the final responsibility usually lies with the Installer, but where responsibility for subcomponents lies with the Contractor or whereby the Contractor must support the Installer. The Client aims for a long-term constructive cooperation with both the Contractor and the yet-to-be-contracted Installer, in which the parties work together intensively and continuously on innovation and improvement in terms of both technical content and process and from the design to the operational phase.

In this set of process requirements, extra attention has therefore been paid to those parts where parties must cooperate.

2.1 Requirements tables

The requirements in this Process Specification are presented in accordance with the format in table 1.

- Topic
- Objective: Which objective is to be achieved?
- Work: What work is to be done?
- Requirements and products: What requirements apply and what products must be delivered?

	:	Supplier of engineering and components (is also indicated by the letter L in the requirement number).
	:	Installer (is also indicated by the letter I in the requirement number).

I or L, ID Unique requirement number	Title of the requirement or product: Short description of the requirement with keywords
Elaboration of Requirement and/or Product	

Table 12- Requirement number, title and description

The unique Requirement Number is composed of 9 characters, W-XX-YY-ZZZ. Whereby the characters represent the following:

W L or I Coding requirement applies to the supplier (L) or to the installer (I)
 XX M, T or MT Code requirement applies to M=Metro, T=Tram or MT=Metro and Tram
 YYY 000-103 Coding for system group, see Table 3.
 ZZZ 001-999 Coding of requirement within system group

System group code YYY	Group name
000	General
001	Functionality
002	Test protocols
003	1-line diagram
004	Object Architecture
005	Contact list
006	Civilian Requirements/Designs
010	HVI
011	Metering
020	Traction Transformer
021	Own Company Trafo
022	Power supply transformer
030	Rectifier
031	Recovery Unit
040	GVI general
041	GVI quick switch
043	GVI-Plus-/mine separator
044	GVI Separator Recovery
045	Sectional switchgear (SSI)
046	Orbital separator
050	Low voltage general
051	Low-voltage switchgear
052	Low-voltage UPS
060	General security
061	Security-HVI
062	Security-Straction Transformer
063	Safety-EB transformer
064	Safety-Rectifier
065	Security-GVI
066	Interlocks-SSI
070	Cabling general
071	Cable paths
072	Cabling-internal
073	Cabling-external
074	Cabling - fibre optic network

System group code YYY	Group name
075	Wiring 61850
076	Connection CBI Metro
077	Connection CBI Tram
080	General controls
081	Control-CBI Metro
082	Control-CBI Tram
083	HMI operation
084	Emergency outlet circuit
090	Building-related installations
091	Project management
092	Interface management
093	Designs
094	Implementation
095	Testing
096	Verify/Validation
097	Completion/Delivery
098	Education/Training
099	Project Control and Project Support
100	Aftercare
101	Warranty
102	Parts supply
103	Service and maintenance

Table 34- Coding system group

3 Applicable documents

3.1 Binding documents

L-MT-000-901 Binding documents

The following table shows the Binding Documents prescribed in Schedule of Requirements Part 2.

Coding	Document title	Version number	Date	Author
Bind-VS2-TM05-1	- VB-IAM-010 Voorschrift betreffende het aanleveren asset data aan de beheerder, Metro en Tram, Eigendom en Beheer	2.0	29-8-2018	MET
Bind-VS2-TM05-2	- VB AMS 010 voor het aanleveren van assetmanagementdata 4953_13 (MS Excel)			
Bind-VS2-TM12	Specifieke eisen voor objecten t.a.v. RAMS informatie, gerubriceerd per object-type		28-8-2019	MET
Bind-VS2-TM13	CAD Handboek	1.4	24-1-2019	GVB, Gemeente Amsterdam
Bind-VS2-TM10	Eisen BIM Assetmanagement GRS OV A'dam	1.1	8-6- 2021	MET
Bind-VS2-TM16-1	Systeemnotities:			
Bind-VS2-TM16-2	- Baan Gelijkrichterstation	2.0	26-7-2019	MET
Bind-VS2-TM16-3	- Algemeen NMA			
Bind-VS2-TM16-4	- Algemeen CBI-Tram			
	- Algemeen CBI-Metro (volgt bij Nvl)			
Bind-VS2-TM17-1	Sleutelsysteem (EMMA sleutels):	1.0	3-7-2014	
Bind-VS2-TM17-2	-Memo toegangseisen EMMA	1.0	3-7-2014	
Bind-VS2-TM17-3	-Algemene voorwaarden EMMA	11.9	2-4-2019	GVB
Bind-VS2-TM17-4	-Emma aanvraagformulier	1.0	3-7-2014	
Bind-VS2-TM17-5	-Valideren sleutels	1.7	25-4-2018	
	-Locatie's validators EMMA v1.7 20180425			
Bind-VS2-TM24	NEN-EN 50126-1:2017 RAMS systematiek. European Standard EN 50126: Railway applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) *	NEN-EN 50126-1:2017 NEN-EN 50126-1:2017	2017	NEN
Bind-VS2-TM26-1	Voorschrift aanleveren asset management informatie:	3.0	20-5-2019	
Bind-VS2-TM26-2	-VB-AMS 053 Areaaldecompositie van locaties, installaties, objecten en kabels	3.0	16-11-2015	MET
Bind-VS2-TM26-3	-VB AMS 051.2 Routeopdeling Metro Puntgeografie	1.0	26-8-2010	
Bind-VS2-TM26-4	-VB AMS 052 kilometrering Metro -Routeopdeling Tram	1.0	17-12-2010	

Coding	Document title	Version number	Date	Author
Bind-VS2-TM28	Elektrotechnisch Bedrijfsvoering Handboek	3.2	10-7-2018	GVB
Bind-VS2-PO01	NEN-EN-ISO 9001:2015 "Kwaliteitsmanagementsystemen"	NEN-EN-ISO 9001:2015	2015	NEN
Bind-VS2-TM29				
Bind-VS2-TM30-1	Cybersecurity Voorschrift OT CEB-OVG-21876	1.5	14-6-2021	MET
Bind-VS2-TM30-2	Cybersecurity-eisenset MET OT systemen CEB-OVG-18908	1.2	21-12-2020	
Bind-VS2-TM30-3	Cybersecurity en Operationele KPI's CEB-OVG-21172	1	21-2-2020	
Bind-VS2-TM30-4	Cybersecurity en Vertrouwelijkheid OT CEB-OVG-20264	2	2-12-2019	
Bind-VS2-TM30-5	Cybersecurity-dossier-sjabloon CEB-OVG-20265	1.0	21-2-2020	
Bind-VS2-TM30-6	Cybersecurity-risicomanagement CEB-OVG-18786			
	1-3 OT Uitleg	1.1	19-12-2019	
	2-3 OT Bedrijfswaarden		18-9-2019	
	3-3 OT Sjabloon		24-7-2019	
Bind-VS2-TM30-7	Cybersecurity-hardeninginstructie OT MET CEB-OVG-21203	0.1	20-8-2019	
Bind-VS2-TM30-8	Cybersecurity-handreiking wachtwoordbeleid MET OT CEB-OVG-21794	2.11	1-9-2019	
Bind-VS2-TM30-9	Cybersecurity- Incidentmanagementprocedure OT MET MET CEB-OVG-18784	1.4	26-3-2019	
Bind-VS2-TM30-10	De volgende documenten worden na gunning vertrouwelijk gedeeld met de ON: Cyber dreigingsbeeld OT CEB-OVG-22124 (vertrouwelijk/versleuteld) Cyber risicoanalyse GRS (vertrouwelijk/versleuteld)			
Bind-VS2-TM30-11	Cybersecurity-dossier-sjabloon CEB-OVG-20265 (vertrouwelijk/versleuteld)			

The documents marked with * are not provided as part of the Schedule. Where a standard or guideline is stated in the Schedule as a Binding Document, this Binding Document shall apply in full to the Traction Power Supply Components or Traction Power Supply Installation, as this Binding Document reads 30 days prior to the final date for submission of the Tender, unless otherwise provided in this Agreement.

3.2 Information documents

L-MT-000-902 Informative documents

The following table shows the information documents prescribed in part 2 of the Schedule of Requirements.

Coding	Document title	Version number	Date	Author
Inf-VS2-TM01	Procedure Acceptatie Overdracht en Ingebruikname (2 documenten)	3.0	22-5-2018	MET
Inf-VS2-TM03	Handboek Wet Lokaal Spoor	2.0	7-12-2015	MET
Inf-VS2-TM20	Wet lokaal spoor in regio Amsterdam			Gemeente Amsterdam
Inf-VS2-OM08	Algemeen proces voor Indienststellingsvergunning, TBGN en artikel 12 vergunningen	2.0	15-3-2018	MET
Inf-OVG-666	Kader document VG dossier	3.0	20-1-2020	MET
Inf-OVG-684	Aanwijzing V&G coördinator	0.x	15-6-2021	MET
Inf-OVG-00692	Calamiteitenplan	0.x	15-6-2021	MET
Inf-OVG-00719	Veiligheidsrapportage systeem	0.x	30-3-2020	MET
Inf-OVG-00720	Incidentendeelplan	0.x	20-3-2020	MET
Inf-OVG-00665	Format V&G plan	0.x	15-6-2021	MET
Inf-OVG-VG CRS2	Agendapunt 7b Bijlage 1 VG CRS2 versie voor CCB v1	0.x	15-6-2021	MET

4 Contract Management and Project Plan

4.1 Contract management

4.1.1 Contract management objective

The Contractor must organise and adjust the deliveries and services in such a way that the deliveries and services (designs, performance of FAT/SAT tests, support for commissioning and (support for) maintenance activities) are realised within the scope of the Framework Agreement. To this end, the Contractor must draw up a Contract Management Plan and comply with it.

The following underlying components and plans are part of the Contract Management Plan:

- Interaction with the Client (section 4.3)
- Planning (section 4.4)
- Interface management (Section 5.1)
- Education, training and practice (section 5.7)
- Financial management (section 6.3)
- Cyber security management (Section 6.5)
- Quality assurance (paragraph 7)
- Aftercare (Section 8.1)
- Warranty (section 8.2)
- Service and maintenance (Section 9.1)
- Special tools and spare parts supply (section 9.2)

The Contract Management Plan lays down the collaboration between the Client and the Contractor. The manner of collaboration and the division of tasks between the Contractor and the Installer are also laid down.

The Contract Management Plan constitutes the overarching document in which the Contractor describes the way in which it will perform overall contract management for the Framework Agreement. The Contract Management Plan describes, specifically for this Framework Agreement, how the Contractor's organisation will be deployed, among other things using the Contractor's general quality management system, in order to achieve a process focused on continuous quality improvement, both in the execution of projects and in the cooperation with the Client in the performance of management, maintenance and asset management. The most important element in this process of quality improvement by the Contractor is that he takes responsibility himself. The Contractor does this by describing its processes, managing the risks, signalling deviations in good time, taking suitable - corrective and/or preventive - measures in good time and evaluating this entire process on a regular basis. The Contractor must be able to demonstrate that the Deming circle (plan-do-check-act) works for everything it performs within the scope of this Framework Agreement.

The Contractor has already drawn up the basis for the Contract Management Plan during the tendering procedure. As part of the tender, the Candidates have drawn up a plan of approach that will be further elaborated and supplemented to form the Contract Management Plan after the award of the contract.

4.1.2 Contract management activities

- Drafting Contract Management Plan (CMP).

4.1.3 Requirements and products of contract management

L-MT-091-001 Contract management plan scope, elaboration of requirements and products

The Contractor must elaborate the Contract Management Plan for the following topics from this document in relation to the working method, the products to be delivered and the implementation in time by drawing up a schedule:

- Interaction with the Client (section 4.3)
- Planning (section 4.4)
- Interface management (Section 5.1)
- Education, training and practice (section 5.7)
- Financial management (section 6.3)
- Cyber security management (Section 6.5)
- Quality assurance (paragraph 7)
- Aftercare (Section 8.1)
- Warranty (section 8.2)
- Service and maintenance (Section 9.1)
- Special tools and spare parts supply (section 9.2)

All actions, measures and products included in the Contract Management Plan must be so Specific, Measurable, Acceptable, Realistic and Time-bound (SMART) that the Activities and their results can be objectively verified on the basis of these criteria. The following preconditions apply:

- Products and documents to be delivered will always be delivered at least two weeks before the delivery date or physical appointment so that Client has time to assess them.
- Products to be approved by the Client are first offered for review in draft form. The Client needs 10 working days to provide review comments on a product. Contractor must take these deadlines into account in his contract management plan.

L-MT-091-002 Contract management plan human resources

In the Contract Management Plan, the Contractor describes the working method and the products to be delivered and indicates which employees will carry these out.

The Contract Management Plan must indicate how the tasks, responsibilities and authorities (including the designation of a key officer and replacement arrangement) within the organisation of the Contractor, including its independent auxiliary persons and subcontractors, are allocated and which officer(s) will perform the Contract Management for which requirements.

It is also worked out what deployment of which functions is required from the Client.

L-MT-091-003 Review and amendment of Contract Management Plan

Periodically (at least once a year), the Contractor must evaluate the effectiveness of the working methods included in the Contract Management Plan (including sub-plans or underlying plans) and, where necessary, update and improve them. The updated version must be resubmitted for acceptance.

The Contractor must include in the Contract Management Plan a procedure describing how any adjustments to the Contract Management Plan are to be made and by whom these adjustments will be released.

4.2 Project plan

4.2.1 Objective of the project plan

The Contractor draws up a generic Project Plan aimed at organising, executing and adjusting the work for each Subsequent Order in such a way that the design work proceeds in a controlled manner and the FAT, delivery, SAT and commissioning are realised within the scope of the Subsequent Agreement. The following underlying components and plans are part of the Project Plan:

- Interaction with the Client (section 4.3)
- Planning (section 4.4)
- Coordination (section 4.5)
- Interface management (Section 5.1)
- Design (section 5.2)
- Construction work and safety (Section 5.3)
- Testing (section 5.4)
- Verify and validate (section 5.5)
- Delivery and handover (Section 5.6)
- Education, training and practice (section 5.7)
- Risk management (section 6.1)
- Purchasing management (section 6.2)
- Financial management (section 6.3)
- Configuration management (Section 6.4)
- Cyber security management (Section 6.5)
- Quality assurance (paragraph 7)
- Aftercare (Section 8.1)
- Warranty (section 8.2)
- Service and maintenance (Section 9.1)
- Special tools and spare parts supply (section 9.2)
- Any additional or different requirements from the sub-project tender

The Project Plan also lays down the manner of collaboration and the division of tasks between the Client and the Contractor and between the Contractor and the Installer for those parts that are primarily the responsibility of the Installer.

The Contractor must make the generic Project Plan project-specific for each sub-project / Further Agreement and comply with it. The Project Plan forms the central project-specific document in which the Contractor describes the manner in which the design, delivery, acceptance tests and commissioning will be realised.

The Project Plan describes, specifically for this sub-task, how the Contractor's organisation will be deployed, among other things using the Contractor's general quality management system, to achieve a process aimed at continuous quality improvement both in the execution of projects and in the cooperation with the Client. The most important element in this process of quality improvement on the part of the Contractor is that it takes responsibility itself. The Contractor does this by describing its processes, managing the risks, signalling deviations in good time, taking suitable - corrective and/or preventive - measures in good time and evaluating this entire process on a regular basis. Project plans will therefore always incorporate the learning points and points for improvement from previous sub-projects, with the aim of preventing errors and realising improvements. The Contractor must be able to demonstrate that the Deming circle (plan-do-check-act) works for everything he carries out in this sub-project.

The basis for the Project Plan (and the underlying plans) was already drawn up by the Contractor during the tendering procedure. As part of the tender, the Candidates prepared a plan of approach that, after the award of the contract, will be further elaborated and supplemented to form the generic Project Plan.

4.2.2 *Project management activities*

- Draw up Project Plan (PP).

4.2.3 *Requirements and products project management*

L-MT-091-004 Project plan scope, elaboration of requirements and products

In the Project Plan, the Contractor describes the working method, the products to be delivered and the implementation in time by drawing up a schedule for this specific sub-project. With this working method and the products to be delivered, the Client meets the following requirements as set for this specific subproject:

- Interaction with the Client (section 4.3)
- Planning (section 4.4)
- Coordination (section 4.5)
- Interface management (Section 5.1)
- Design (section 5.2)
- Construction work and safety (Section 5.3)
- Testing (section 5.4)
- Verify and validate (section 5.5)
- Delivery and handover (Section 5.6)
- Education, training and practice (section 5.7)
- Risk management (section 6.1)
- Purchasing management (section 6.2)
- Financial management (section 6.3)
- Configuration management (Section 6.4)
- Cyber security management (Section 6.5)
- Quality assurance (paragraph 7)
- Aftercare (Section 8.1)
- Warranty (section 8.2)
- Service and maintenance (Section 9.1)
- Special tools and spare parts supply (section 9.2)

L-MT-091-004 Project plan scope, elaboration of requirements and products

- Any additional or different requirements from the sub-project tender

All actions, measures and products included in the Project Plan must be so Specific, Measurable, Acceptable, Realistic and Time-bound (SMART) that the Activities and their results can be objectively verified on the basis of these criteria. The following preconditions apply:

- Products and documents to be delivered will always be delivered at least two weeks before the delivery date or physical appointment so that Client has time to assess them.
- Products to be approved by Client are first offered for review in draft version. Client needs 10 working days for review comments on a product. Contractor must take these deadlines into account in his project plan.
- Learning and improvement points from previous subprojects are actively incorporated in subsequent versions of the project plan

L-MT-091-005 Project plan human resources

In the Project Plan, the Contractor describes the working method and the products to be delivered and indicates which employees will carry these out.

The Project Plan must state how the tasks, responsibilities and authorities (including the designation of a key officer and replacement arrangement) within the project organisation of the Contractor, including its independent auxiliary persons and subcontractors, are allocated/allocated and which officer(s) will carry out which requirements from the Project Plan.

It is also worked out what deployment of which functions is required from the Client.

L-MT-091-006 Evaluation and Amendment Project Plan

After completion of each sub-project, Contractor, together with Client, organises a project evaluation to list the learning and improvement points. Contractor will make a written report of this evaluation.

The points for improvement are periodically (at least after each sub-project) incorporated into the generic Project Plan and into subsequent specific Project Plans.

The updated version must again be submitted to the Client for acceptance.

The Contractor must include a procedure in the Project Plan that describes how any adjustments to the Project Plan will be made and by whom these adjustments will be released.

4.3 Interaction with the Client

4.3.1 Objective Interaction with the Client

Timely exchange of information about the progress and planned Work and Deliverables in order to be able to take timely management measures in the event of any risks. The interaction concerns both Contract Management (of the Framework Contract) and Project Management (Detailed Agreement for a sub-project).

4.3.2 Work Interaction with the Client

- Drafting of progress reports
- Consultation with Client

4.3.3 Requirements and products Interaction with the client

L-MT-091-007 Interaction with the Client

All Documents arising from the Agreement must be drawn up by the Contractor in Dutch. All consultations and interaction between the Contractor and the Client must take place in the Netherlands, in principle at the Client's location. The language of communication and interaction between the Contractor and the Client is Dutch.

L-MT-091-008 Preparation of progress reports

The Contractor must draw up a progress report every three months with regard to the Framework Agreement (including the total of the current Side Agreements).

The Contractor must draw up a monthly progress report on Further Agreements.

The Contractor must submit its progress report to the Client no later than on the fourth day after the end of the relevant period.

L-MT-091-009 Project start-up

Immediately after the award of the contract, the Client and the Contractor will together organise a Project Start-up Meeting (PSU) lasting two half-days. The main objective of the PSU is to promote cooperation between the Client and the Contractor. The participants in the PSU must at least consist of all the members of each party's management team, the intended contract managers and the project leaders who will carry out sub-projects.

The costs for the location and catering of this meeting shall be borne by Client.

Any costs for external supervision shall be borne by the Contractor.

L-MT-091-010 Project follow up

After the PSU, a Project Follow-Up (PFU) will be organised periodically, at least once every two years, by the Client together with the Contractor. The participants of the PFU must consist of at least all members of each management team.

The costs for the location and catering of this meeting shall be borne by Client.

Any costs for external supervision shall be borne by the Contractor.

L-MT-091-011 Project progress meetings

In the context of current requests for offers and current Further Agreements, the Client will organise a project meeting at least once every two weeks, or as much less often or more often as considered necessary. The following, among other things, will be discussed at these meetings:

1. the topics from the progress report for the respective project;
2. contractual aspects arising from amendments proposed by one of the parties.

L-MT-091-012 Contract Management Consultation Framework Agreement

As part of the progress of the Framework Agreement, the Client will organise a contract management meeting at least twice a year, or as much less often or more often as considered necessary. The following matters, among others, will be discussed at these consultations

1. the subjects of the progress report for the Framework Agreements and all current calls for tender and ongoing Further Agreements;
2. contractual aspects arising from amendments proposed by one of the parties

L-MT-091-013 Invitation, representation and reporting

Contractor shall:

- to participate in consultations that are deemed necessary by the Client and to which the Contractor is invited;
- be represented in consultations by (an) officer(s) with appropriate authority according to the subject matter of the consultation;
- within 28 days of the award of the contract on the basis of the risk register and after updating the risk register, invite the Client to a consultation meeting about the identified and current risks and control measures;
- to take care of the reporting of all consultations.

L-MT-091-014 Product requirements of progress reports

The progress report shall consist of factual information regarding the progress and shall contain at least the following information:

A Regarding project management (per current subproject):

- decisions to be taken and/or actions to be carried out by the Client;
- opportunities, threats and progress towards achieving the project's objectives;
- the state of coordination with the Installer and the Assistant Contractors

B Regarding technical process:

- Updated interface register including mitigation measures.

C Regarding project control:

- the progress (status line) on the Integral Planning, detailed planning and coordination planning (*NB Coordination lies with the Installer, the Contractor provides input for the progress of sub-projects to the Installer*).
- progress (incl. standstill) of the Integral Planning and detailed planning, including an outlook on the critical path;
- main changes in the planning in the last period, including explanations;
- risk top 5, including control measures and their status, for all consequence aspects: time, money, quality, environment, safety and image;
- risk top 5 with the most urgent risks for the coming period;
- an up-to-date risk register;
- an overview of all (proposed) Amendments to the Agreement;
- Overview and status of documents;
- Current configuration status overview (see 6.4).

D Regarding project support:

- status follow-up of any shortcomings found by the Client;
- deviation register;
- reporting residual points;
- reporting guarantee points;
- Overview of learning and improvement points based on evaluations and plan for processing these points;
- a safety report.

4.4 Planning

4.4.1 Objective Planning

Controlling the planning per sub-project, so that deliveries and work progress according to this planning and milestones are met and the Client, the Installer and stakeholders can be kept informed continuously about the current status of the deliveries and the work. Maintaining the Integral Planning for a sub-project is not the responsibility of the Contractor but of the Installer. This Integral Planning also serves to coordinate the various side contractors.

4.4.2 Work Planning

- Draw up an Integral Subproject Schedule for each subproject.
- Draw up an integral planning for all sub-projects together.
- Observing and updating the input for the integral planning.
- Delivering updated schedules, detailed schedules and reporting.

4.4.3 Requirements and products Planning

L-MT-091-015 Preparation of Planning and provision of input for Integrated Subproject Planning

The Installer will draw up a subproject plan for each subproject. For this project planning, the Contractor supplies all the necessary information regarding the design, delivery and testing of traction power components. After acceptance of the Overall Project Plan, this serves as a basis for the following sub-projects

I-MT-091-016 Product requirements for integral planning

The integral subproject schedule to be delivered by the Installer must include at least the following information:

1. The phases of the project;
2. Design and engineering documents for client review;
3. Document planning;
4. Planning permits
5. Production planning of all plant parts;
6. Factory acceptance tests;
7. Construction and conversion work;
8. Site acceptance test and Integral tests;
9. Completion;

I-MT-091-017 Adjustment of Planning and provision of adjusted input for the purpose of Integrated Subproject Planning

The Planning must be adapted by the Installer by means of a new planning baseline if one or more of the following situations occurs:

1. proactive management is required to adjust the design, production, testing and/or commissioning activities in order to continue to meet project objectives;
2. the actual progress of design, production, testing and/or commissioning activities on the critical path differs from the planned progress;
3. management measures of deviations and Changes have been identified, which have an impact on the Planning.

This planning must be accepted by the Client. Upon acceptance, the version of the planning is increased by 1 and this new version is given the status of baseline in relation to which future progress reports will be measured.

L-MT-091-018 Preparation of Subproject Planning

For each sub-project, the Contractor will draw up a separate Schedule for the delivery, testing and commissioning of the traction power supply components. The Contractor has already prepared the basis for the Schedule during the tendering procedure, namely as part of the Plan of Action submitted in which a subproject is detailed. After the contract has been awarded, this must be worked out in more detail and then submitted for acceptance. After acceptance of the Planning, this will serve as the basis for the planning of all sub-projects.

L-MT-091-019 Preparation of Total Supply Planning

The Contractor shall draw up a total schedule for deliveries and tests of traction power components for all current sub-projects. After two or more sub-projects have been awarded, this must be worked out in more detail and then submitted for acceptance. After acceptance of the overall schedule, this will serve as the basis for planning all sub-projects together.

L-MT-091-020 Product requirements for delivery planning

The integrated planning per subproject and the overall planning to be delivered should include at least the following information:

1. The phases of the project;
2. Design and engineering documents for client review;
3. Document planning (including submission of test plans);
4. Production planning of all plant parts;
5. Factory acceptance tests;
6. Conversion work;
7. Site acceptance test and Integral tests;
8. Completion.

L-MT-091-021 Adjusting Subproject Planning and Total Supply Planning

The Planning must be adjusted by the Contractor by means of a new planning baseline if one or more of the following situations occurs:

1. proactive management is required to adjust the design, production, testing and/or commissioning activities in order to continue to meet project objectives;
2. the actual progress of design, production, testing and/or commissioning activities on the critical path differs from the planned progress;
3. management measures of deviations and Changes have been identified, which have an impact on the Planning.

This planning must be approved in writing by Client. Upon acceptance, the version of the planning is increased by 1 and this new version is given the status of baseline in relation to which future progress reports will be measured.

4.5 Coordination

4.5.1 Objective Coordination

The Installer bears ultimate responsibility for the coordination of the entire design process. The Contractor is responsible for the design of the entire Traction Supply Installation throughout the design process. The Contractor shall coordinate with the suppliers of CBI tram, CBI metro, the grid operator Liander, the suppliers of the construction and installation of the traction power substations up to and including the Preliminary Design.

The Installer is ultimately responsible for coordinating the entire implementation process.

The coordination includes the following topics, subdivided into the categories design coordination, implementation coordination and test coordination.

4.5.2 Activities Coordination

- Coordination of the design process for the traction power plant per subproject.
- Coordinating the implementation process for the Traction Supply Plant per sub-project.

4.5.3 Requirements and products Coordination

001 Design coordination

The design coordination lies primarily with the Installer and includes the following tasks and products:

- Identifying and updating the interfaces between the design work of the different parties;
- Prepare and manage the coordination planning for all phases of the design process;
- The Contractor is responsible for coordinating the design of the Traction Power Plant and the associated control installation and provides input to the installer who is responsible for the overall coordination of the project;
- The targeted exchange of other relevant information.

L-MT-091-023 Implementation coordination

Implementation coordination lies primarily with the Installer. The Contractor performs the following tasks and supplies the following products to support the coordination task of the Installer:

- Identifying and updating the interfaces between the work of the different parties (especially on CBI).
- Providing input for the coordination planning for the implementation phase;
- Providing input for construction site management;
- Providing input for the implementation phases;
- The targeted exchange of other relevant information.
- Providing input for the V&G plan implementation.

L-MT-091-024 Test coordination Factory Acceptance Test (FAT) Site Acceptance Test (SAT), Commissioning, Site Integration Test (SIT) and Short Circuit Tests.

The test coordination lies with the Contractor up to and including the FAT test and with the Installer after the FAT test. The Contractor performs the following tasks and supplies the following products:

- Drafting and managing the coordination planning for the test phase up to FAT;
- Providing input for the coordination planning from FAT to commissioning;
- Providing input for construction site management;
- Coordinating the test phases up to FAT;
- Providing input for the test phases from FAT to commissioning;
- The targeted exchange of other relevant information.

5 Technical management

5.1 Interface management

5.1.1 Objective Interface management

By means of interface management, the Installer must ensure that the interfaces of the sub-project with its environment are adequately controlled. The Contractor supports the Installer in this regard with regard to aspects concerning the design, delivery and testing of the traction power supply components. There are internal interfaces between the traction components and subsystems to be delivered within this delivery. The following internal interfaces are relevant to this Framework Agreement:

- CBI tram;
- CBI metro;
- Link to regional grid connection;
- Link to traction network;
- Integration into the building and connection with building services

The Contractor is responsible for the internal interfaces described above. Through interface management, care must be taken to ensure that the internal interfaces of the delivery are controlled for the purpose of realising a functioning transport system. With regard to these and other interfaces, the Contractor provides input and support to the Installer. The Installer bears ultimate responsibility for the total internal and external interface management and for the coordination of the various interfaces.

5.1.2 Work on interface management

- Managing the internal and external technical interfaces.
- Set up, implement and maintain an interface register linked to the risk register.
- Drafting of an interface note.
- Carry out research if problems arise at an interface.

5.1.3 Requirements and products Interface management

L-MT-092-001 Managing the internal technical interfaces.

The Installer must proactively coordinate the interfaces with the Contractor and the Additional Contractors in such a way that the general requirement(s) above are met. The Contractor will make a proactive contribution to controlling the interfaces related to its work and deliveries.

L-MT-092-002 Setting up, implementing and maintaining an interface register linked to the risk register

The Installer must set up an interface register, implement it within his processes, and keep it up to date, which meets at least the following requirements:

1. The Installer must list, register, control and coordinate both internal and external (technical) interfaces during all phases of the Agreement;
2. The interfaces that should at least be included in the register are those that have a consequential risk, that are not easy to control, and/or where it is unclear who is responsible for the interface.
3. The Contractor shall contribute to the interfaces between the objects and subsystems to be realised that are coordinated by controlling the environment, in such a way that the objects connect physically and functionally to the environment and to each other.

The Client can provide support in identifying the interfaces for the Work to be realised. Some of the interfaces identified by the Client have already been included in the system notes (Bind-VS2-TM16). The Installer remains responsible for the interface inventory and must draw up at least one interface memorandum with the Contractor and each Assistant Contractor and for each system memorandum. If new interfaces arise during the Work, they must be added to the interfaces register.

I-MT-092-003 Setting up, implementing and maintaining an interface register linked to the risk register

The Interface Register should at least identify and record the following:

1. The information included in the interface register such as:
 - a. the unique identification number of the interface;
 - b. the brief description of the interface;
 - c. the name of the party with whom the interface has been coordinated (including the signature of both parties).
2. Reference to the specifications where interfaces are worked out in requirements, or in other Documents where the interface is controlled.
3. The agreements that have been made between the parties to the interface in order to realise the interface. The measures to be taken, the action holder and the status of the interface
4. The (derived) requirements as a result of the interface (coordinated with the Client/contractor/associate contractors) and other parties;
5. If the Client has made System Notes available (see Bind-VS2-TM16), the relevant information must be included in the interface note;
6. Reference to the relevant design document in which the interface design is/will be made.

5.2 Designs

5.2.1 Objective Design

Making an integral design, including a description of derived requirements, that meets the requirements from part 1 and 2 of the Schedule of Requirements, up to the level where execution by the Installer is possible.

Ensuring that the design of the objects is carried out in a controlled, explicit, transparent and traceable manner, and that the most optimal solution is arrived at.

The Installer bears final responsibility for the Preliminary Design, Final Design and Execution Design.

The Contractor supports the Installer in realising the SoL, SoL and SoL. The Contractor is always ultimately responsible at all stages of the project for designing the traction power plant (complete system design including control installation).

5.2.2 Activities Design

- Decompose and identify objects from the application and record them in the object tree.
- Carry out a technical installation baseline measurement (optional).
- Draw up specifications for all objects in the object tree in which the derived requirements are specified.
- Drafting a design note per design phase for the system design of the traction power plant in a subcontract for which the Contractor is responsible (VO).
- Providing input for a design note per design phase for each specified object in a subcontract for which Installer is responsible (DO and UO).

5.2.3 Requirements and products Design

L-MT-093-001 Provides information initial situation

An invitation to tender with specifications for a subproject to be realised is accompanied by (possibly) available revision drawings and other documents. It may not automatically be assumed that these represent the existing as-built or correct situation.

L-MT-093-002 Installation technical baseline measurement (optional)

Before the start of the design process, the Client may decide to have a baseline measurement carried out on all relevant parts of the existing traction power substation. The baseline measurement will be carried out by the most diligent party. Normally this will be the installer but in exceptional cases this can also be the Contractor. The method of the zero measurement must be determined in consultation with the Client. The zero measurement must consist of a visual inspection of, among other things, the following components:

- Dimensions, technical and spatial compatibility
- Floor load
- Accessibility and accessibility of the site
- Condition of existing traction power supply components (for possible reuse)
- Available ventilation and cooling
- Possibilities of phased conversion

The baseline measurement must be recorded in a report (including photographs) and by means of drawings.

001Objectspecificatie

The level of detail in the specification should depend on the stage in the design process.

For each requirement in the specification, the following information should be indicated:

1. unique identification number;
2. description;
3. reference to relevant requirement;
4. If underlying specifications are present, reference to the underlying requirement;
5. Each requirement must be verifiable and, where relevant, must have margins for deviation.

L-MT-093-004 Prepare design notes for requested objects

The Installer must draw up a design note for each object or logical cluster of objects, in which at least the phases Preliminary Design (PD), Final Design (DO) and Implementation Design (UO) are distinguished.

The Contractor shall specifically prepare the part of the design note concerning the traction power installations (complete system design including control installation) for all phases (VO, DO and UO) of the project.

The Contractor provides input and support to the Installer in drawing up design notes for the Preliminary Design, Final Design and Execution Design.

The Contractor must design all objects of the Delivery in mutual cohesion to form a working system (complete system design including control installation) based on the requirements set in the Agreement.

The Contractor shall deploy, as a key official, an electrical engineering lead engineer who demonstrably releases all integral designs.

The Contractor reports on the progress of the design process to the project manager of the Client, who will assess the designs (or have them assessed) and provide feedback (approval or rejection) to the Contractor. During the design process, project meetings are held every two weeks. During these meetings, the Contractor will present its designs to the Client.

During the design presentations, it must be made clear to the Client how the Contractor interprets the requirements, indicates the traceability of requirements, approaches the design and sufficiently controls the design risks and the risks derived from these. Attention must also be paid to the document structure.

When generating solutions, the Contractor must explicitly lay down the considerations involved. When the various solutions have been worked out in more detail, the effects of the solutions must be considered in relation to the assessment criteria. The choice should be made, on the basis of a trade-off matrix, with the accompanying argumentation for each assessment criterion. The solution that scores best (i.e. represents the highest "value") is ultimately chosen. This choice must be made explicit and must be recorded.

At least the following assessment criteria should be considered in the trade-off matrix:

1. time
2. money
3. Public transport nuisance
4. interfaces
5. degree to which the solution can be maintained (maintainability)
6. maintenance costs

A solution that is not sufficiently safe should not be part of the trade-off matrix.

L-MT-093-005 Preparation of design notes by means of design workshops (optional)

In the start-up phase of this contract, in the event of major or more complex sub-projects, the Client may decide to have the design process partly conducted through design workshops. In that case, during the development of the Design Memoranda, the Contractor must organise several design presentations (Workshops) for the Client and, where necessary, the future management and operating organisations, in which the (interim) results of the Design note and the design choices with a fixing character are shared and discussed with the aforementioned parties. The planning and content of these workshops should be determined in consultation with the Client.

The design presentation has an informal character. The design presentation is a presentation to be organized by the Contractor that must provide the Client with an insight into the design, the underlying (design) choices of the Contractor and the anticipated bottlenecks. The relevant key officials of the Contractor must be present at the design presentation.

L-MT-093-006 Product requirements content Design notes for identified objects (1)

The Design Notes should describe how the requirements set out in the Schedule of requirements part 1 will be met.

A Design Note should further identify and set out:

1. the object(s) to which the Design Note applies;
2. All parts/objects of the Installation are designed together on the basis of the requirements set out in the Agreement.
3. a design (VO, DO or UO) up to and including the final situation described in drawings, calculations, phasing, construction method, working methods, safety measures, environmental measures, processes, risks and control measures;
4. the description of how the object is to be assembled (assembly concept): with phases and drawing, construction method, work method and work processes;
5. the description of how an object is to be inspected (inspection plan), if the object is or includes an object to be inspected;
6. The description of how an object is to be tested (test concept), if the object is or includes an object to be tested;
7. the description of how the object is to be operated (operating concept);
8. the description of how the property is to be maintained (maintenance concept);
9. the description of the operating instructions & maintenance instructions to be drawn up,
10. A description of how the object can be replaced after its end of life;
11. The implementation concept, test concept, operation concept and maintenance concept must be of such a level that the feasibility, testability, operability and maintainability can be demonstrated;
12. the implementation principles that have been taken into account in the design;
13. a description of the internal and external interfaces, including associated management measures;
14. the operating principles that have been taken into account in the design;
15. the design choices made, including substantiation;
16. the control measures from the risk inventory and evaluation (RI&E) for H&S management and from safety management
17. the management & maintenance analysis which meets the requirements as stated in chapter 9

L-MT-093-007 Product requirements content Design notes for identified objects (2)

The Design Notes should meet the following requirements:

1. The Contractor must carry out his design work in such a way that the result meets the requirements of the Specification and is feasible.
2. The Contractor shall carry out its design work iteratively and in mutual cohesion.
3. The entire traction supply system must be worked out to the level of project-specific implementation design prior to production of the system.
4. All technical design documents shall be drafted in Dutch.
5. The design documentation must be supplied in both analogue and digital form (in PDF format or another common file format (to be discussed with the Client) and as source document in DOCX, XLSX and DWG format) and must comply with the Client's regulations.

The drawings and calculations in the Design Notes must comply with the following requirements:

1. Generally used and recognised calculation methods and state-of-the-art calculation models must be used in the design of, among other things, the permanent structures and the temporary structures for the purpose of execution;
2. The calculations and the results of the calculations shall be presented in a logical manner, in an orderly fashion, easily accessible, clearly legible and complete. If an output (sketches, figures, drawings, EEM output) in colour is necessary in order to assess a calculation properly, this output should be provided in colour;
3. If proprietary software is used in a calculation, the quality of the program must be demonstrated separately from the other quality checks by means of a verification report. The verification report shall contain calculation examples other than the actual calculation.
4. The drawings must be supplied in both analogue and digital format (in PDF and DWG) and must comply with the Binding Documents.
5. The drawings shall comply with the document "Regulations CAD drawings" [Bind-VS2-TM13].
6. If the Contractor chooses to submit drawings in 3-D format, the related provisions of [Inf-VS2-TM10] must be met.

5.2.4 Objective Preliminary design

The drawing up of an Integral Preliminary Design that meets the requirements set in the Schedule of requirements part 1 and the process requirements in this part 2. In this phase, the Installer has final responsibility for the Preliminary Design (VO). The Contractor is responsible for the design of the traction power installations (complete system design including control installation).

5.2.5 Work on preliminary design

1. Developing the schedule of requirements into a preliminary design.
2. Developing the schedule of requirements into sketchy design drawings.
3. Performing global calculations to estimate dimensions and determine global capacities.
4. Drafting a technical explanation of the preliminary design.

5.2.6 Requirements and products Preliminary design

L-MT-093-008 Product requirements Integrated Preliminary Design (VO)

All parts of the Installation must be worked out into a Preliminary Design by the Installer. The Contractor shall develop a Preliminary Design (VO) for a traction power supply system (complete system design including control system).

Preliminary design General

The Preliminary Design includes a design note in which, as a minimum, the following is recorded:

1. The object(s) to which the Design Note applies;
2. A design up to and including the final situation consisting of:
 - Project-specific drawings of main components at sketch level;
 - Drawing package with project layout drawings, single-line drawings primary/secondary & auxiliary voltage, cable types (incl. cable calculation), selectivity study, protection settings + set-up sheets, block diagrams; control architecture at sketch level;
 - Data network configuration + software configuration IEDs IEC61850;
 - Colour and finish installation parts;
 - Dimensioning;
 - Spatial integration of system cabinets and additional work;
 - Specify exact I/O for remote control;
 - Functional design;
 - Technical design;
 - Specifications all installation parts;
 - EMC and Earthing Plan (EAP);
 - FAT and SAT protocols;
 - Phasing;
 - Installation Method and Installation Plan (IP);
 - Working methods;
 - Safety measures;
 - Environmental measures;
 - Processes;
 - Work processes;
 - Risks and control measures.
3. Description of how an object is to be tested (test concept) based on the instructions of the Contractor and subcontractors (e.g. CBI), if the object is or includes an object to be tested;
4. Description of how the object is to be operated (operating concept);
5. Description of how the object should be maintained (maintenance concept);
6. Description of how the object can be replaced at the end of its life;
7. The implementation concept, test concept, operation concept and maintenance concept must be of such a level that the feasibility, testability, operability and maintainability can be demonstrated;
8. Description of the internal and external interfaces including related control measures.

Preliminary Design Maintenance and Operating Instructions

1. The contractor shall draw up and deliver a Maintenance Plan (OP) for the systems used.
2. The Contractor shall draw up and deliver a Maintenance Regulation (OV) for the systems used. The maintenance regulations shall meet the following requirements:
 - A maintenance regulation should describe all necessary maintenance.
 - A maintenance instruction should consist of the following for every part of the Work that requires maintenance:
 - Periodic maintenance sheet.
 - Condition-dependent maintenance sheet.
 - Corrective maintenance sheet.
 - Maintenance instructions should be drawn up in the Dutch language and their structure and language should be accessible to technical staff with an intermediate vocational education level.
 - A maintenance instruction must at least contain all the drawings, diagrams, original supplier information and the like required for the maintenance.
3. Maintenance instructions for realised software applications must include:
 - "As-Built" version of the functional design.
 - "As-Built" version of the technical design.
 - Documentation of the hardware used.
 - Documentation of the applied software
 - I/O lists.
 - Cross-reference list of the I/O signals and markings referring to the programme paragraphs.
4. The Contractor shall prepare and deliver the necessary operating instructions (BV) for the systems applied.
5. The Contractor shall draw up and deliver an EMC plan for the systems used.
6. The Contractor shall prepare and deliver an Earthing Plan (AP) for the systems used.
7. The Contractor shall prepare and deliver a Test Plan (TP) for the systems applied.
8. The Contractor shall supply a Test Instruction (TI) and a Test Report (TR) for the benefit of the H&S.

Preliminary design Functional design

The functional design (FO) describes at a functional level the operation of the system parts and the system as an integrated whole. The FA contains, among other things, the following topics: operation, signalling, safety, locking, etc. The FA does not contain any technically complex descriptions. Extensive flow charts, detailed drawings and complex logical diagrams do not belong in a FA. The FA must be understandable for the end user.

Preliminary design Functional design HMI

Within the design process, the Contractor is responsible for realising the HMI component in accordance with the Traction power substation System Specification.

- Based on the HMI table, a preliminary design document is made for each HMI containing a description of the screens and how to navigate between them. This document is discussed by the contractor with representatives of the GVB operators and adjusted if necessary.
- After approval of the preliminary design document, a prototype of the HMI is made. This prototype is also discussed by the contractor with representatives of the operators.

L-MT-093-008 Product requirements Integrated Preliminary Design (VO)
Preliminary design Technical design

The technical design (TO) describes the technical implementation to make the functions described in the FA possible. Part of the technical design are the installation drawings, but also flow charts and programming codes with which the functions of PLCs are worked out.

5.2.7 Objective Final Design

All parts of the installation must be worked out by the Installer from a Preliminary Design to a Final Design that meets the requirements laid down in the Schedule of Requirements part 1 and the process requirements in this part 2. In the integral Final Design, the traction power supply system is part of the total Implementation Design in which the architectural and civil engineering aspects of the sub-project are also worked out by the Installer. The Contractor supports the Installer in the traction power section, where necessary, in drawing up the Final Design. The Installer must draw up the Final Design, including the associated design note, and notify the Client thereof.

The Final Design note should identify and lay down the following:

- The object(s) from the object tree to which the design note applies.
- A design of the final situation, among others described in:
 - Phasing;
 - Construction method;
 - Safety measures;
 - Environmental measures;
 - Work processes;
 - Risks and control measures.

5.2.8 Work Final Design

1. Processing changes to the Preliminary Design.
2. Developing the Preliminary Design into a Final Design.
3. Developing the sketchy design drawings into final drawings; these drawings provide sufficient information to apply for the necessary official permits/authorisations and for public participation procedures.
4. Performing calculations to determine the main dimensions and material choices and to determine final capacities.

5.2.9 Requirements and products Final Design

I-MT-093-009 Product requirements integral final design

All parts of the Installation must be worked out into a Final Design by the Installer. The Contractor shall provide the Installer with the necessary input for the traction power plant part (complete system design including control installation).

Final Design General

The Final Design includes a design note in which, as a minimum, the following is recorded:

1. The object(s) to which the Design Note applies;
2. A design up to and including the final situation consisting of:
 - Project-specific drawings of main components;
 - Drawing package with project drawings, single-line drawings primary/secondary & auxiliary voltage, cable types (incl. cable calculation), selectivity study, protection settings + set-up sheets, block diagrams; control architecture;
 - Data network configuration + software configuration IEDs IEC61850;
 - Colour and finish installation parts;
 - Dimensioning;
 - Spatial integration of system cabinets and additional work;
 - Specify exact I/O for remote control;
 - Functional design;
 - Technical design;
 - Specifications all installation parts;
 - EMC and Earthing Plan (EAP);
 - FAT and SAT protocols;
 - Phasing;
 - Installation Method and Installation Plan (IP);
 - Working methods;
 - Safety measures;
 - Environmental measures;
 - Processes;
 - Work processes;
 - Risks and control measures.
3. Description of how an object is to be tested (test concept) based on input from the suppliers of the framework contracts, if the object is or includes an object to be tested;
4. Description of how the object is to be operated (operating concept);
5. Description of how the object should be maintained (maintenance concept);
6. Description of how the object can be replaced at the end of its life;
7. The implementation concept, test concept, operation concept and maintenance concept must be of such a level that the feasibility, testability, operability and maintainability can be demonstrated;
8. Description of the internal and external interfaces including related control measures.

Final Design Maintenance and Operating Instructions

The Installer must draw up and deliver a Maintenance Plan (OP) for the systems used.

2. The Installer must draw up and deliver a Maintenance Instruction (OV) for the systems used. The Maintenance Regulations must meet the following requirements:
 - A maintenance regulation should describe all necessary maintenance.
 - A maintenance instruction should consist of the following for every part of the Work that requires maintenance:
 - Periodic maintenance sheet.
 - Condition-dependent maintenance sheet.
 - Corrective maintenance sheet.
 - The detailed specification of the maintenance sheets should be requested from Client.
 - Maintenance instructions should be drawn up in the Dutch language and their structure and language should be accessible to technical staff with an intermediate vocational education level.
 - A maintenance instruction must at least contain all the drawings, diagrams, original supplier information and the like required for the maintenance.
3. Maintenance instructions for realised software applications must include:
 - "As-Built" version of the functional design.
 - "As-Built" version of the technical design.
 - Documentation of the hardware used.
 - Documentation of the applied software
 - I/O lists.
 - Cross-reference list of the I/O signals and markings referring to the programme paragraphs.
4. The Installer, with the support of the Contractor, must draw up and deliver the necessary operating instructions (BV) for the systems applied.
5. The Installer must draw up and deliver an EMC plan (EMCP) with the support of the Contractor.
6. The Installer, supported by the Contractor, must draw up and deliver an Earthing Plan (AP) for the systems applied.
7. The Installer, supported by the Contractor, must draw up and deliver a Test Plan (TP) for the systems applied.
8. The Installer, supported by the Contractor, must supply a Test Instruction (TI) and a Test Report (TR) for the benefit of the H&S.

Final design Functional design

The functional design (FO) describes at a functional level the operation of the system parts and the system as an integrated whole. The FA contains, among other things, the following topics: operation, signalling, safety, locking, etc. The FA does not contain any technically complex descriptions. Extensive flow charts, detailed drawings and complex logical diagrams do not belong in a FA. The FA must be understandable for the end user.

I-MT-093-009 Product requirements integral final design
Final design Functional design HMI

Within the design process, the Contractor is responsible for realising the HMI component in accordance with the Traction power substation System Specification.

- Based on the comments on the Preliminary Functional Design and the prototype, a final HMI table is created with a final design document. This document gives a description of the screens and how to navigate between them.
- After approval of the final design document, a modified prototype of the HMI is made. This prototype is also discussed by the contractor with representatives of the operators.

Final design Technical design

The technical design (TO) describes the technical implementation to make the functions described in the FA possible. Part of the technical design are the installation drawings, but also flow charts and programming codes with which the functions of PLCs are worked out.

5.2.10 Objective Implementation Design

The Implementation Design is the responsibility of the Installer. All parts of the traction feed installation must be worked out by the Installer from a Final Design to a Implementation Design that meets the requirements set out in the Schedule of Requirements, part 1, and the process requirements in this part 2. In the integral Performance Design, the Traction Supply Installation is part of the total Performance Design in which the architectural and civil engineering aspects of the sub-project are also worked out by the Installer. The Contractor supports the Installer primarily in the traction power plant component, where necessary in realising the implementation design. The Installer must draw up the complete Implementation Design, including the associated design note, and bring it to the attention of the Client.

The Contractor provides the Installer with input for the Design Outline Memorandum. This must identify and lay down the following

- The object(s) from the object tree to which the design note applies.
- A design of the final situation, among others described in:
 - Phasing;
 - Construction method;
 - Safety measures;
 - Environmental measures;
 - Work processes;
 - Risks and control measures.

5.2.11 Activities Implementation Design

Contractor provides Installer with input for:

1. Processing changes to the Final Design.
2. Preparation of coordination drawings and arrangement drawings for work to be carried out by other disciplines.
3. Elaborating the final design and producing detailed calculations and detailed drawings.
4. The Construction Design must contain all the information necessary to realise the Work without incurring critical risks during the realisation and operation of the Work.
5. The Performance Design must contain an overview of all materials to be applied, including specifications of parts.
6. Any adjusted interface notes with the Assistant Contractors.

5.2.12 Requirements and products Implementation design

L-MT-093-010 Product requirements integral implementation design

All parts of the Installation must be worked out into a Performance Design by the Installer. The Contractor provides the Installer here with the necessary input for the Traction Power Plant component (complete system design including control installation).

Implementation Design General

The Implementation Design includes a design note in which, as a minimum, the following is recorded:

1. The object(s) to which the Design Note applies;
2. A design up to and including the final situation consisting of:
 - Project-specific drawings of main components;
 - Drawing package with project drawings, single-line drawings primary/secondary & auxiliary voltage, cable types (incl. cable calculation), selectivity study, protection settings + set-up sheets, block diagrams; control architecture;
 - Data network configuration + software configuration IEDs IEC61850;
 - Colour and finish installation parts;
 - Dimensioning;
 - Spatial integration of system cabinets and additional work;
 - Specify exact I/O for remote control;
 - Functional design;
 - Technical design;
 - Specifications all installation parts;
 - EMC and Earthing Plan (EAP);
 - FAT and SAT protocols;
 - Phasing;
 - Installation Method and Installation Plan (IP);
 - Working methods;
 - Safety measures;
 - Environmental measures;
 - Processes;
 - Work processes;
 - Risks and control measures.

L-MT-093-010 Product requirements integral implementation design

3. Description of how an object is to be tested (test concept) based on input from the suppliers of the framework contracts, if the object is or includes an object to be tested;
4. Description of how the object is to be operated (operating concept);
5. Description of how the object should be maintained (maintenance concept);
6. Description of how the object can be replaced at the end of its life;
7. The implementation concept, test concept, operation concept and maintenance concept must be of such a level that the feasibility, testability, operability and maintainability can be demonstrated;
8. Description of the internal and external interfaces including related control measures.

Design, maintenance and operating instructions

1. The Installer shall draw up and deliver a Maintenance Plan (OP) for the Traction Feed Systems used, drawn up by the Supplier.
2. The Installer must draw up and deliver a Maintenance Instruction (OV) for the Traction Feed systems used, drawn up by the Contractor. The Maintenance Regulations must meet the following requirements:
 - A maintenance regulation should describe all necessary maintenance.
 - A maintenance instruction should consist of the following for each component of the installation that requires maintenance:
 - Periodic maintenance sheet.
 - Condition-dependent maintenance sheet.
 - Corrective maintenance sheet.
 - The detailed specification of the maintenance sheets should be requested from Client.
 - Maintenance instructions should be drawn up in the Dutch language and their structure and language should be accessible to technical staff with an intermediate vocational education level.
 - A maintenance instruction must at least contain all the drawings, diagrams, original supplier information and the like required for the maintenance.
3. Maintenance instructions for realised software applications must include:
 - "As-Built" version of the functional design.
 - "As-Built" version of the technical design.
 - Documentation of the hardware used.
 - Documentation of the applied software
 - I/O lists.
 - Cross-reference list of the I/O signals and markings referring to the programme paragraphs.
4. The Installer must draw up and deliver the necessary operating instructions (BV) for the systems applied, which have been drawn up together with the Contractor .
5. The Installer must draw up and deliver an EMC plan (EMCP) for the systems used, drawn up together with the Contractor.
6. The Installer must draw up and deliver an Earthing Plan (AP) for the systems used, drawn up together with the Contractor.
7. The Installer must draw up and deliver a Test Plan (TP) for the systems applied, drawn up together with the Contractor.
8. The Installer must supply a Test Instruction (TI) and a Test Report (TR) drawn up together with the Contractor for the purposes of the H&S.

L-MT-093-010 Product requirements integral implementation design
Implementation Design Functional Design

The functional design (FO) describes at a functional level the operation of the system parts and the system as an integrated whole. The FA contains, among other things, the following topics: operation, signalling, safety, locking, etc. The FA does not contain any technically complex descriptions. Extensive flow charts, detailed drawings and complex logical diagrams do not belong in a FA. The FA must be understandable for the end user.

Implementation Design Functional Design HMI

Within the design process, the Contractor is responsible for realising the HMI component in accordance with the Traction power substation System Specification.

- Based on the comments on the Final Functional Design and after approval of the implementation design document, a modified prototype of the HMI is made. This prototype is also discussed by the contractor with representatives of the operators.
- After approval of the prototype, an implementation design is established and recorded in a document.
- After approval of the execution design, the HMI is realised.

Implementation Design Technical Design

The technical design (TO) describes the technical implementation to make the functions described in the FA possible. Part of the technical design are the installation drawings, but also flow charts and programming codes with which the functions of PLCs are worked out.

5.3 Implementation work and safety

5.3.1 Objective Implementation work

The Contractor must carry out its Performance Activities in such a way that the Traction Supply Components to be delivered and the Activities comply with the requirements ensuing from the Agreement.

The Installer is ultimately responsible for the H&G coordination of sub-projects. The Contractor provides input to the Installer where necessary and follows the instructions of the Installer. The Contractor must carry out implementation work within the set safety frameworks and in a safe environment.

The Execution Activities shall be performed by competent personnel of the Contractor.

5.3.2 Work under sub-projects and work under management and maintenance

- The Contractor will ensure that he works on the basis of an approved design and that he has written permission from the Client and the Installer to carry out the work.
- Work that the Contractor performs independently on the Client's premises is carried out within the stipulated requirements and laws and regulations relating to safety and working conditions.
- Work that the Contractor carries out within sub-projects under the coordination of the Installer is carried out within the frameworks set by the Installer with regard to safety and working conditions.

- Contractor provides support to Installer for H&G coordination
- Management and maintenance work which the Contractor performs on the instructions of the Client is carried out within the frameworks set by the Client with regard to safety and working conditions.

5.3.3 Requirements and products Implementation work

L-MT-094-001 Drawing up V&G and setting up V&G organisation for sub-project by Installer

In the design phase, the Installer draws up a V&G plan and sets up a V&G organisation for the execution phase. The V&G plan and organisation to be set up are delivered in accordance with the templates and regulations from the following documents:

- Inf-OVG-666 Framework document VG dossier
- Inf-OVG-684 Designation V&G Coordinator
- Inf-OVG-00692 Calamity plan
- Inf-OVG-00719 Safety Reporting System
- Inf-OVG-00720 Incident sharing plan
- Inf-OVG-666 Format V&G plan
- Inf-OVG-VG CRS2 Agenda Item 7b Annex 1 VG CRS2 version for CCB v1

If necessary, the Contractor will support the Installer in drawing up the H&S plan.

L-MT-094-002 Start of work

The Contractor may not start the deliveries and execution activities before the Client has approved in writing the design activities relating thereto.

L-MT-094-003 Health, Safety and Environment (ARBO) and H&S coordination of activities under the Contractor's own management

For work in the context of the Agreement that the Contractor performs independently, the Contractor is responsible for health, safety and environment coordination. This includes the following obligations:

- The Contractor must appoint a coordinator for the execution phase as a key official in accordance with article 2.29 of the Working Conditions Decree.
- The Contractor must fulfil at least the additional obligations in accordance with article 2.33 of the Working Conditions Decree.
- The Contractor shall provide and coordinate the provision of information with regard to overall safety to (independent) auxiliary persons and third parties on the Work Site.
- The Contractor shall take care of the obligations relating to the notification in accordance with article 2.27 of the Working Conditions Decree.

L-MT-094-004 Health & Safety and H&S coordination activities under the coordination of Installer

For work within the framework of the Contract that the Contractor carries out under the coordination of the Installer, the Installer is responsible for Health & Safety and H&S coordination. This includes the following obligations for the Contractor:

- The Contractor will comply with the applicable V&G plan for the execution phase and follow the instructions of the Installer who is responsible for V&G coordination.
- The Contractor shall provide a point of contact.
- The Contractor must fulfil at least the additional obligations in accordance with article 2.33 of the Working Conditions Decree.
- The Contractor shall provide and coordinate the provision of information with regard to overall safety to (independent) auxiliary persons and third parties on the Work site that it engages.

L-MT-094-005 Safety system requirements at organisation level

For the duration of the Agreement, the Contractor will at least have a certified safety system at its disposal that complies with NEN-EN-ISO 45000, OHSAS 18001 or VCA**.

L-MT-094-006 Security system requirements at person level

Personnel to be deployed on site by the Contractor or independent auxiliary persons must have the following professional qualifications:

- A valid Digital Safety Passport for the Metro and to have successfully completed at least the VTOM (Safety and Access on the Metro Line) course and the Metro Safety Awareness Training course.
- a valid certificate of Basic Safety SCC
- A valid certificate of Safety for Operational Managers VCA (only for managerial staff)

L-MT-094-007 Requirements for professional qualifications of staff Contractor

Personnel to be deployed by Contractor in the performance of this contract (including personnel of third parties to be deployed by Contractor) must have the following professional qualifications:

1. Testing (including FAT, SAT and commissioning) and service work must be carried out by a competent person (VP). A VP is someone with relevant training and experience, who is capable of estimating and preventing dangers that can arise when working on or in the vicinity of electrical installations and who handles this responsibly. A VP must meet the following requirements:
 - a. have successfully completed vocational training in electrical energy technology at WEB level 3 and have gained sufficient demonstrable relevant experience
 - b. have undergone additional training for the relevant electrical installations.
 - c. Have at least one year's demonstrable relevant experience.
2. The testing (e.g. FAT, SAT and commissioning) and service activities must be supervised by a works foreman (TSO). A TSO is someone who has been designated as directly responsible for the management of work activities. If desired, parts of this responsibility may be transferred to one or more competent persons. The work leader is responsible for preparing the work in terms of risk assessment and determining the safety measures to be taken. An ER should meet the following requirements:
 - a. have completed, or have successfully completed, vocational training in electrotechnical energy technology at WEB level 4 and
 - b. having successfully completed a supplementary training course for the electrotechnical installation concerned and
 - c. have at least three years of demonstrable relevant experience.
3. The project management for sub-projects must be carried out by an experienced project manager. Client understands experienced to mean that the person or persons in question have at least five years' experience in managing project-based work on medium-voltage and/or direct-current traction installations. A project leader must meet the following requirements:
 - a. have successfully completed a vocational training course in electrotechnical energy technology on WEB level 4 or a higher professional education course in the field of electrotechnical energy technology and
 - b. successfully completed additional training for project management at least at PRINCE 2 practitioner level and
 - c. have at least 5 years of demonstrable relevant experience.
4. The design work for this project must be carried out by experienced engineer(s). By experienced, Client means that the person or persons in question have at least five years' experience in designing and directing work on medium-voltage and/or direct-current traction installations. An engineer must meet the following requirements:
 - a. have successfully completed at least a higher professional education (HBO) or university course in electrical engineering and
 - b. having successfully completed a supplementary training course for the electrotechnical installation concerned and
 - c. have at least 5 years of demonstrable relevant experience.

L-MT-094-008 Laws and regulations internal procedures Customer

Work on tram and metro systems is subject to the Local Railways Act. For work performed by the Contractor within the scope of this contract, rules from the Local Railways Act may apply. Further information is included in the appendices:

- Inf-VS2-TM20 Local track act in A'dam
- Inf-VS2-TM03 handbook_local_rail_organisation_and_permit_procedures

Where appropriate, it may be necessary to carry out work on the Customer's Tram and Metro Area:

1. Apply for an Article 12 permit including an approved work plan by the GVB administrators;
2. Ensure that a mention is made in the Technical Weekly Bulletin of Client

Procedure for applying for an Article 12 permit:

An application has to be made at least 13 weeks before the execution. The application should be submitted to the Municipality of Amsterdam MET E&B/GVB see also link below:

https://www.amsterdam.nl/bestuur/organisation/space_economy/metro_tram/permit_metro/

A work plan must be submitted to Client no later than 8 weeks before execution, as a supplement to the permit application. The work plan is forwarded to the Client's asset managers for assessment. After a positive assessment, Client provides advice for writing the permit. Work plans should be submitted to the e-mail address below:

Vergunning@gvb.nl

Procedure for planning the implementation:

No later than 4 weeks before the planned date of execution, a work notification must be submitted to Client at the following e-mail address:

Technischweekbericht@gvb.nl

L-MT-094-009 Requirements for clearing work site

The Contractor must ensure on a daily basis, with a view to combating vandalism, that after completion of the Execution Work, there are no loose objects that can be handled on site and/or in the vicinity of the public area.

5.4 Testing

5.4.1 Objective Testing

Inspection and testing of objects and systems so that it can be demonstrated that the objects or systems meet the requirements, partly in connection with and as a derivative of Chapter 10 Verification and Validation.

5.4.2 Activities Testing

- Draw up Test Master Plan.
- Drawing up and complying with inspection and test plans.
- Carrying out inspections and tests.
- Preparation of inspection and test reports.
- Preparation of verification notes.

5.4.3 Requirements and products Testing

L-MT-095-001 Drawing up the Test Master Plan

The installer must draw up a Test Master Plan.

The Installer must draw up inspection and test plans for each object. If several objects form a coherent system, an inspection and test plan must also be drawn up for the whole system. When drawing up this master test plan, the following starting points are taken into account:

1. The installer shall subject the entire set of traction power supply components to a series of tests that demonstrate their compliance with the requirements.
2. The tests must be carried out integrally, including the components Security and SCADA.
3. The Contractor supports the Installer in drawing up the test protocols.
4. The Contractor supports the Installer in commissioning and testing.
5. The Installer should send the draft test protocols to the Client for acceptance well before the tests (6 weeks). The Client assesses these and gives its approval or comments within 2 weeks.

The test protocol should be finalised at least 2 weeks before the actual testing.

L-MT-095-002 Performance of inspections and tests by the Contractor

During the realisation of a subcontract, the Contractor must perform the following inspections and/or tests and record the results in writing in order to demonstrate that the objects and systems realised meet the requirements:

- FAT (Factory Acceptance Test)
- FIT (Factory Integration Test)

The actual tests to be performed are determined per subcontract by the Client on the basis of the nature and scope of the subcontract concerned. The tests described in this chapter should be regarded as a form of inspection (in accordance with the UAV-GC 2005).

The Contractor shall perform tests (FAT, FIT) sequentially, which means that a subsequent test cannot be started until the previous test has been successfully completed.

- The FAT must be carried out per object (for example, transformer, rectifier, recovery unit to be built into existing installation, etc.) in a test environment of the Contractor.
- The FIT serves as a Proof of concept for software changes and new types of ICT objects and shall be performed in an Acceptance Test environment of Client or Contractor to be agreed upon.

L-MT-095-003 Perform inspections and tests by installer

During the realisation of a subcontract, the Installer must carry out the following inspections and/or tests and record the results in writing in order to demonstrate that the objects and systems realised meet the requirements:

- SAT (Site Acceptance Test)
- SIT (System Integration Test)
- IVT (Integral Release Testing)
- Performing Short Circuit Tests

The actual tests to be carried out will be determined per subcommission by the Client on the basis of the nature and scope of the subcommission concerned. Where necessary, the Contractor will provide support in carrying out the tests. The tests described in this chapter should be regarded as a form of inspection (in accordance with the UAV-GC 2005).

The Installer must perform tests (SAT, SIT, IVT, short-circuit tests) sequentially, which means that a subsequent test cannot be started until the previous test has been successfully completed.

- The SAT should be performed per object at the final location of the object.
- The SIT should be carried out at the final location of the object in connection with the central systems and supplies of the auxiliary contractors.
- The short-circuit tests are to be carried out at the final location of the object in connection with the central systems and supplies of the Subcontractor.

L-MT-095-004 Preparation of inspection and test reports

The Contractor or the Installer must draw up an inspection and/or test report after inspections and tests. The responsibility for drawing up a test report per test is as follows:

- FAT (Factory Acceptance Test): Report is provided by Contractor
- FIT (Factory Integration Test): Report is provided by Contractor
- SAT (Site Acceptance Test): Report is provided by Installer
- SIT (System Integration Test): Report is provided by Installer
- IVT (Integral Release Testing): Report is provided by Installer
- Performing Short Circuit Tests: Report is provided by Installer

L-MT-095-005 Preparation of verification note

The Contractor shall include the reference to the registrations that demonstrate compliance with the requirements in the verification note. The responsibility for preparing the verification note per test is as follows:

- FAT (Factory Acceptance Test): verification note provided by Contractor
- FIT (Factory Integration Test): verification note provided by Contractor
- SAT (Site Acceptance Test): verification note is provided by Installer
- SIT (System Integration Test): verification note is provided by Installer
- IVT (Integral Release Tests): verification note is provided by Installer
- Performing Short Circuit Tests: verification note is provided by Installer

L-MT-095-006 Product requirements Test Master Plan

In the Test Master Plan to be submitted, the Installer must state the structure, the method, the techniques to be used and the reporting method on the basis of which the correct functioning of the object is demonstrated. The Contractor supports the Installer in drawing up the Test Master Plan.

The Test Master Plan must at least contain the following sections:

- Description of the testing process;
- Test organisation with job profiles including the test manager;
- Risk analysis;
- Description of the testing strategy based on the risk analysis;
- Description of all milestone products to be delivered;
- The relationship between the test system and the quality system;
- Identification of all underlying test plans;
- Number of tests to be carried out in design and implementation phase;
- Test types and purpose of the test type;
- Test environment;
- Interrelationship between the tests;
- Phasing and planning of the tests;
- The coverage of the tests;
- Expected resources of the Client and/or manager for the test(s).

L-MT-095-007 Requirements Inspection and test plan

In an inspection and test plan, at least the following must be identified and recorded for an object per requirement and for all applicable requirements:

1. requirement (with requirement number);
2. what values should be observed;
3. applicable binding, informative and other documents;
4. Description of the inspection or test method, inspection or test route, inspection or test equipment, applicable accuracy requirements and calibration methods, frequency and record-keeping;
5. the test and measurement equipment must also be calibrated. All this in accordance with the regulations of the supplier(s) of this equipment.
6. when it has been demonstrated that the requirement has been fulfilled;
7. application/touching down of inspected or tested item;
8. those involved in inspection or testing (including powers and responsibilities);
9. demonstrate suitability of the inspection and testing method (and if applicable: compliance with applicable standards);
10. the acceptance criteria for the inspection or test;
11. the forms used during the inspection or test.

In the inspection and test plan, in many cases a FAT, FIT, SAT and Short Circuit Tests must be distinguished. Depending on the nature and scope of a subproject, the Client will determine which tests must be performed for that particular subproject.

L-MT-095-008 Factory Acceptance Test (FAT) Requirements

After production of the installation parts, they must be tested and receive a FAT. Performing the FAT is the responsibility of the Contractor.

- The Contractor shall involve the Installer in the tests to be carried out.
- The Contractor shall involve the Installer in drawing up the test protocols.
- At least four weeks before the execution of the FAT, the Contractor must determine, in consultation with the Installer and the Client, a date for the execution of the FAT and invite the Installer and the Client to attend the FAT.
- The FAT must prove in the presence of the Installer (and possibly in the presence of the Client) that a component to be delivered meets the requirements;
- All hardware and software must be tested;
- During the FAT, the results of each tested item must be recorded in verifiable test protocols, provided with initials and date of the tester, the Installer and the Client;
- The component must be tested in functional operation in the Contractor's test room with all components;
- The FAT should include at least the following:
 - Check for correct indication of module, model, type, serial, revision numbers and software versions;
 - Control of name and number plates;
 - Checking compliance with the drawings;
 - Hard- and software tests;
 - Control of system messages;
 - Control of screen, report and printer layouts;
 - Test for processor, memory and communication bus usage under different loads;
 - Tests on response times;
 - Control of behaviour in case of power failure and return of power;
 - Tests for redundancy (power supply, modules, communications, etc.);
 - A test for correct behaviour when going through (leap) years, calendar dates and transitions between summer and winter time;
- In the situation that system parts are not available, the Contractor shall demonstrate the communication and performance of the system by means of identical (temporary) equipment and software;
- Components which have not passed the test must be repaired as soon as possible, possibly using a separate system, in order not to disrupt the further course of the FAT. The repaired parts must undergo FAT tests again;

Only after a successful FAT and receipt of a corresponding statement by the Client and the Installer will the Contractor be permitted to proceed with shipment to the site.

L-MT-095-009 Factory Integration Test (FIT) Requirements

The purpose of the FIT is to demonstrate the integral operation of the new type of objects of both the Contractor and the Additional Commissioners in conjunction with the existing central systems in a test environment of the Contractor or the Client to be determined. The FIT will take place under the Contractor's responsibility. The required Acceptance Test Environment for the FIT is a composition of existing systems of the Client supplemented with new components of the Contractor and the Ancillary Service Contractors.

- The Installer delivers, places and configures an extra copy of each new type of ICT object in the Acceptance Test Environment (FIT) of the Client or Contractor to be determined. The

L-MT-095-009 Factory Integration Test (FIT) Requirements

Installer, in close cooperation with the Contractor, the Secondary Commissioners and the Client, takes care of the necessary configuration adjustments of the Acceptance Test Environment.

- The FIT will take place at a location to be determined, where the Client or Contractor has created a suitable Acceptance Test Environment. The owner of the Acceptance Test Environment (Client or Contractor) makes this available for the performance of the FIT. The Installer coordinates the use of the Acceptance Test Environment and supervises the execution of the FIT.
- The FIT consists of testing new and existing components/subsystems in such a way that the correct integral functioning of the components/subsystems and the functional requirements set for them can be demonstrated.
- The end result of the FIT is a functionally working integral system, which is representative of the operational system, has been put together in accordance with the design, regulations and standards, and meets the functional requirements set for it.
- During the FIT, the results of each tested subject must be recorded in verifiable test reports.
- The FIT is successful if it has been carried out successfully in accordance with the previously drawn up pass/fail criteria (included in the relevant test plan). If the Test Report shows that the pass criteria have not been met, the failed tests must be carried out again.
- The Installer supports the Contractor with regard to the tests to be carried out.
- The Installer supports the Contractor in drawing up the test protocols.
- Prior to the integral tests on site, the total system must be functionally tested by the Installer as one functioning whole in a test environment. The test must be based on a procedure accepted by the Client (test plan). The result must be recorded with verifiable protocols (H&S file).
- The Contractor and the Installer shall provide capable personnel to carry out integration tests.
- The management and coordination of the integration test team shall be the responsibility of the Contractor.
- Identified deficiencies must be remedied and retested.
- As part of the FIT, the Contractor must carry out a user acceptance test in consultation with the Client.
- The Contractor and the Installer must take account of the fact that the Client wishes to be involved in the preparation and execution of tests. For this purpose, the Contractor will provide the Client with the necessary documents and information in good time. The Client will have the power to have third parties or experts accompany the Contractor for this purpose.
- After successful performance of the above tests, it has been demonstrated that the system will function as specified.

L-MT-095-010 Commissioning requirements

All installations and installation parts to be delivered must be put into operation under the responsibility of the Installer. The Installer is supported in this by the Contractor. In addition, these installations must be tested by the Installer itself with the support of the Contractor before inviting the Client for a SAT test.

The installations have to be tested in conjunction with the remote control (CBI) and cross-station protection functionality. Part of a successful commissioning is the short-circuit tests for both N and N-1 operation.

L-MT-095-011 Site Acceptance Test (SAT)

After the installation of the installation parts, the Site Acceptance Test (SAT) is carried out under the responsibility of the Installer:

- The Contractor supports the Installer with regard to the tests to be carried out.
- The Contractor supports the Installer in drawing up the test protocols.
- At least two weeks before the execution of the tests, the Installer, in consultation with the Customer, must set a date for the execution of the tests and invite the Customer to attend;
- After installation at the site, the Installer will install the component:
 - Inspect for any transport damage and proper installation;
 - Switch on and start up;
 - Test for correct operation. This test is a repetition of the FAT, in which addition those system parts that were not fully tested during the FAT must now undergo a complete test. The results must be recorded verifiably in protocols.
- The following work must at least be carried out:
 - Recording of module, model, type, series, revision numbers and software versions;
 - Compare with data from the FAT;
 - Record the agreement or differences;
 - In case of differences, the SATs have to be redone for the relevant parts after making the necessary changes;
 - Control of transmission of screen and printer presentations.
 - Defective, incorrect or missing parts or functionality must be repaired;

The test and inspection results must be accurately recorded. This report with protocols must be handed over to the Client immediately after the (partial) tests.

L-MT-095-012 Site Integration Test (SIT)

After successful completion of the SAT, a Site Integration Test (SIT) must be carried out.

The Client strives for the SAT and SIT to be carried out simultaneously or consecutively. In exceptional cases, SIT may be carried out at a later date.

During the integration test, the Contractor's component/sub-system will be connected to deliveries from Subcontractors and to the (changed) central systems, the external equipment and the control system. The total system must be tested under the responsibility of the Installer (where necessary with test vehicles) as a single functioning whole on the basis of a procedure accepted by the Client and the result must be recorded by means of verifiable protocols. :

- The Contractor supports the Installer in the tests to be carried out.
- The Contractor supports the Installer in drawing up the test protocols.
- Every time a traction power substation or switching station is put into operation, the entire system must be tested by the Installer as a functioning whole. The test must be based on a procedure accepted by the Client (test plan). The result must be recorded with verifiable protocols (H&S file).
- The Installer shall provide capable personnel for carrying out integration tests.
- The leadership and coordination of the integration test team is the responsibility of the Installer.
- The Installer must draw up test procedures and test protocols for each SIT. In the event of one or more subsystems not forming part of the integral contract but being supplied by the Contractor and/or Additional Contractors, the test planning, test procedures and test protocols must be drawn up in consultation with the Contractor and/or these Additional Contractors.
- Identified deficiencies must be remedied and retested.
- As part of the SIT, the Installer must carry out a user acceptance test in consultation with the Customer.
- The Installer should take into account that the Client wants to be involved in the preparation and execution of tests. The Installer will supply the necessary documents and information to the Customer for this in good time. The Customer is authorised to have third parties or experts accompany him for this purpose.
- If required, the Client will make equipment (metros or trams) available for SIT. The Installer must indicate the need for this in good time.

L-MT-095-013 Short-circuit tests

The Installer must carry out short-circuit tests on the track to demonstrate that the safety devices are working correctly. To do this, short-circuits should be made in the power rail (metro) or overhead wires (tram) at the furthest points from the power supply points. This will cause the lowest short-circuit current, which has to be detected and eliminated by the protection system. The short-circuit current must be measured and recorded.

If necessary, the Contractor must make a selectivity study / short-circuit calculation of the course of this short-circuit current for each situation in advance with input from the Installer. If the calculated value differs from the measured value by more than 10%, the Installer must provide a plausible, substantiated explanation. If necessary, calculations and settings must be revised. These must be submitted again to the Client for approval.

Short-circuit tests on the track should be carried out across stations on third rail (metro) or overhead line (tram):

- Testing on $I >$;
- Testing on di/dt .

The short-circuit tests are to be carried out in N operation and in N-1 operation.

L-MT-095-014 Full release

Only after successful execution and completion of the aforementioned tests has it been demonstrated that the system integrally functions as specified. Subsequently, the system is put into operation by the integration test team of the Client. The Installer and the Contractor provide support for this on demand. Prior to the Integral Release, the Installer confirms that:

- the Work and tests on the (integrated) systems have been completed, without any residual points;
- the required documentation has been provided;
- The necessary safety requirements are demonstrably met;
- all remedial work on items identified during tests has been completed.

5.5 Verify and validate

5.5.1 Objective Verification and validation

Demonstrating that the requirements in the Agreement are met. The Authority requires all Documents to be verified for compliance with the requirements and derived requirements on the basis of which they have been drawn up. Verification must (also) lead to the realisation of Traction Power Plants in accordance with the implementation design leading to an end product that meets all relevant requirements arising from the Agreement.

The terms verification and validation shall be interpreted as follows in the context of the Agreement:

- Verification: demonstrating that the solution meets predefined requirements. Requirements that contain geometrical criteria, and requirements that refer to standard products or standard specifications, are directly verifiable during design, for example by checking design documents, and after realisation by inspection and measurement.

- Validation: Demonstrating that the solution is suitable for its intended use. This can be divided into two parts: for the user, it is important that this is demonstrated before he has become dependent on the solution, and for the Contractor, it is important that this is demonstrated in order to obtain discharge. The Contractor must demonstrate that the chosen solution meets the specified performance and functional requirements.

The following also applies to the verification and validation of requirements:

1. For the verification and validation of requirements that can only be met by multiple parties, Supplier will be solely responsible for the verification and validation of the requirements insofar as the demonstrability falls within his scope. This does not affect the coordination obligation of the Contractor in respect of the fulfilment of the requirement concerned.
2. The Contractor may not assume that the above requirement will be delivered fully decomposed. The Contractor is/remains responsible for the complete decomposition of all requirements.

5.5.2 *Activities Verification and validation*

- Drawing up verification plans.
- Verify and record in verification reports whether the designs of the objects meet all the requirements set for them.
- Draw up verification memo.
- The interrelationship between these activities can be broadly considered as follows:
 - A verification plan describes how the requirements will be verified.
 - A verification report contains the results of the verifications carried out (incl. inspections and tests).
 - A verification note is the overall document that establishes the relationship between the objects and the requirements applicable to them (including derived requirements), the associated (inspection, testing and verification) plans and the final verification results (including inspections and tests).

5.5.3 Requirements and products Verification and validation

L-MT-096-001 General requirements Verification and validation

The Installer must draw up verification plans, verification reports and a verification memo. The Installer is supported by the Contractor for everything concerning verification and validation of traction power components. The responsibility for all aspects relating to verification and validation within the framework of the FAT lies with the Contractor. The following process requirements apply in this regard:

1. The Contractor must demonstrate that the preliminary design of the traction power plant will lead to a final result that meets all the requirements arising from the Agreement.
2. The Installer must demonstrate that the preliminary design, final design and implementation design of the Work will lead to a final result that meets all the requirements arising from the Contract.
3. The Customer must have access to the Installer's and Contractor's requirements database at all times.
4. The Installer and Contractor (in case of VO and FAT) must carry out verification prior to submitting the Documents for Testing or for Acceptance.
5. The Contractor must enclose a verification note when submitting the Design note for Assessment or Acceptance.
6. Compliance with the requirements must be demonstrated by verifying the Documents against the requirements on the basis of which they have been drawn up, in accordance with verification plans to be drawn up.
7. If the prescribed standards and guidelines are insufficiently clear, the Installer should explicitly present this to the Client, so that the Client can consider presenting this to the person who drew up the standard.
8. The realisation of objects should not take place before a verification with positive results on the corresponding design documents has taken place.
9. All design documents resulting from the design process must be verified for compliance with all requirements arising from the Agreement (on the basis of which they were drawn up).
10. In addition to verifying compliance with internal and external interface requirements, the connection of the Work to internal and external interfaces must be verified.
11. Verification must also take place in accordance with the quality system of the Installer and the Contractor and the specific quality plan(s) derived from it.
12. The working method and set-up of verification should be laid down in a verification plan.
13. The results of verifications made shall be recorded.
14. All Documents submitted for Acceptance or Review must be accompanied by a verification report.

L-MT-096-002 Verification plan

The Installer is responsible for drawing up a verification plan. The responsibility for drawing up the verification plan for the traction power components, the FAT and the HMI lies with the Contractor who supports the Installer in drawing up the verification plan.

The verification plan shall include at least the following for each requirement for an object:

1. Description of requirement (with requirement number);
2. Reference to derived underlying requirements;
3. applicable principles from binding, informative and other documents;
4. description of the verification method to be applied;
5. description in which phase of the project the requirement is verified.

The validity of each verification method should be established, unless:

- 1.a standardised verification method is applied which is accepted by the Installer/Client; or
2. A document declared applicable within the Agreement is applied; or
3. a verification method has proven itself in practice and the reference is accepted by Client.

For each requirement of the specification, it is indicated, if relevant:

1. When (VO, DO, UO, FAT, FIT, SAT, Short Circuit Tests) compliance with the requirement is demonstrated;
2. who will carry out the verification;
3. who will assess and authorise the verification carried out;
4. demonstrating the validity of the verification method.

001 Verificatierapport

The Installer is responsible for drawing up a verification report. The responsibility for drawing up the verification report for the traction power supply components and the FAT lies with the Contractor who supports the Installer in drawing up the verification report.

The verification report shall include at least the following:

1. requirement (with requirement number);
2. applicable binding, informative and other documents;
3. evidence document or reference to evidence document, in which compliance with the requirement set is demonstrated;
4. how the requirements have been verified and what the assessment criteria are;
5. that it has been demonstrated that the requirements have been met;
6. how relevant risks have been dealt with;
7. which official has carried out verifications;
8. which official reviewed and authorised the verification;
9. possible corrective measures;
10. Revised verification (including timing, assessment and authorisation).

The validity of the verification method should be elaborated in the verification report. In the report, at least the following should be identified and recorded for a verification method:

1. The verification method;
2. Document of proof or reference to a document of proof, demonstrating the validity of the verification method.

L-MT-096-004 Verification note

The Installer is responsible for drawing up a verification note. The responsibility for drawing up the verification memo for the traction power supply components and the FAT lies with the Contractor who supports the Installer in drawing up the verification memo.

A verification note should, for each design phase, make it possible to trace compliance with all requirements arising from the Agreement.

The verification note is a document in which the relationship is established between the derived requirements, the objects and the verifications and tests (incl. tests). The verification note must be in line with the verification plan.

The verification note refers to the relevant upper requirements and registrations (verification, inspection and test reports) showing how it has been demonstrated and is traceable that these requirements are met (combination of specification, verification plan, inspection plan, test plan, verification report, inspection report and test report).

The verification note shall contain the following information:

1. Identification of the objects to which the verification note applies;
2. overview of the (derived requirements of the) requirements from the Agreement (number and description of the requirement) that apply to the objects concerned;
3. per derived requirement traceability to the requirements of the Agreement;
4. per requirement, a reference to the corresponding verification, inspection or test reports;
5. overview of the deviations that have occurred with the corrective and preventive measures taken insofar as these deviations relate to the objects to which the verification note applies.

5.6 Delivery and completion

5.6.1 Objective Deliver and deliver

Ensuring that the information (documents, drawings, schedules, asset data and software) of the delivered objects is recorded in a controlled, explicit and transparent manner in delivery and completion files and in the Client's asset management information systems. The exchange of draft files during the execution of sub-projects by the Installer, the Contractor (where applicable) and the Client takes place via a Sharepoint environment of the Client. After approval and endorsement of the draft information file by the Client, the Installer and the Contractor place the final information files in the Client's asset management information systems.

In accordance with Bind-VS2-TM10 Requirements BIM AM GRS OV A'dam, the Installer and the Contractor must draw up a BIM Protocol for this contract in consultation with the Client.

During the Work, the Installer and, where applicable, the Contractor, must keep a storage and delivery file and an information file, in which installation data required during the realisation phase, the FAT and SAT Tests and the operational phase are recorded and delivered in phases.

The Contractor is responsible for the completion and delivery dossier of the Traction Power Plant and associated control installation.

5.6.2 Activities Delivery and completion

- Drawing up a BIM protocol
- Drawing up delivery files
- Drawing up the opleverdossier
- Preparation of information file
- Preparation of early commissioning file

5.6.3 Requirements and products Delivery

L-MT-097-001 Drafting BIM protocol

The installer is ultimately responsible for document management of sub-projects. The Contractor is ultimately responsible for document management of the traction power plant and associated control system. Before the start of a sub-project, the installer and the contractor must draw up a BIM protocol in accordance with the requirements as included in Bind-VS2-TM10 Requirements BIM AM GRS OV A'dam.

I-MT-097-002 Moment of delivery

The final delivery of a traction power substation from the Installer to the Client may take place when:

- The SIT has been successfully completed;
- All remaining issues have been resolved;
- The installations have been cleaned electrically after all work;
- The traction power substation (rooms) have been cleaned;
- All documentation and spare parts have been delivered;
- All training courses have been given;
- The delivery document has been prepared and signed by the responsible parties.

The final delivery of a switching station from the Installer to the Client may take place when:

- The SIT has been successfully completed;
- All remaining issues have been resolved;
- The installations have been cleaned electrically after all work;
- The switching station (room) has been cleaned;
- All documentation and spare parts have been delivered;
- All training courses have been given;
- The delivery document has been prepared and signed by the responsible parties.

I-MT-097-003 Preparation of delivery file

The Installer and, where applicable, the Contractor must provide a delivery file upon completion of a sub-project.

If the delivery file relates to a part of the Work/Traction power plant that is to be put into use (prematurely), the delivery file must be ready and accepted prior to putting it into use and provided to Client.

A delivery file consists at least of an overview of deviations relating to the relevant work package.

If, within a work package, there is Design Work, the delivery file must consist of at least the following Documents:

1. specifications;
 2. draft note;
 3. verification reports;
 4. verification note (including all information referred to from the verification note such as verification, inspection and test reports, etc.);
 5. interface register;
 6. calculation list;
- List of drawings.

If, within the work package, there is Execution work, the delivery file must consist of at least the following Documents:

1. as-built data in the form of drawings;
2. verification note (including all information referred to from the verification note such as verification, inspection and test reports, etc.);
3. B&O documents;
4. zero (deformation) measurements of the Work, including reporting.

The delivery dossier shall be drawn up in accordance with the requirements set out in:

- Bind-VS2-TM10 Requirements BIM AM GRS OV A'dam
- Bind-VS2-TM26 Regulations for the supply of asset management information
- Bind-VS2-TM05 Regulations on the supply of asset data to the manager, Metro and Tram, Ownership and Management

L-MT-097-004 Drawing up the opleverdossier

The Installer and the Contractor (for the traction feed installation and HMI) must comply with the following deadlines when supplying information:

- Three weeks before the start of production: offer (Final) and/or Implementation design for review. The final version in which the Client's comments have been incorporated within five working days after the comments are submitted;
- Three weeks before start of FAT, SAT, SIT, commissioning and short-circuit tests: offer Test Plans and Selectivity Study for review. The final version in which the Client's comments have been incorporated within five working days after the comments are submitted;
- Three weeks before commissioning: transfer of (temporary) commissioning file for the purpose of fault repair. The final version in which the Client's comments have been incorporated within five working days after the comments are submitted;
- Three weeks for (partial) deliveries: offering the as-built file for acceptance within the agreed ICT systems. The final version in which the Client's comments have been processed within five working days after the comments are submitted;

L-MT-097-004 Drawing up the opleverdossier

The Installer and the Contractor (for the traction power plant and HMI) must comply with the following deadlines when supplying asset information:

- The draft asset list(s) and table of contents of the delivery file, 6 weeks before the commissioning date(s) GRS/SS in connection with timely acceptance by GVB AM. The definitive version in which the Client's comments have been incorporated no later than five working days after the comments are submitted;
- The draft asset data, no later than 2 weeks before the commissioning date(s) GS/SS. The final version in which the Client's comments have been incorporated, no later than five working days after the comments are submitted;
- The as-built documentation, no later than 4 weeks after the commissioning date(s) GS/SS. The final version in which the Client's comments have been incorporated no later than five working days after the comments are submitted;
- The red revision of the installation drawings shall be placed in the GS/SS by the Contractor when commissioning GS/SS, whereby the old drawings shall be replaced by the current red revision.

The Installer must enter into consultation with the Client and parties to be appointed by the Client at an early stage regarding the set-up of the completion file.

In anticipation of the delivery and the required completion file, the Installer and the Contractor must organise and facilitate a 'pilot delivery', including a completion file for a sub-project to be defined in consultation with the Customer, which will also include the process of transfer to the manager.

The delivery file shall be set up according to the chosen object structure. Data which are not object-specific shall be included in a general part of the delivery file.

The delivery file consists at least of the requirements for the delivery file in the document "Prescription for the delivery of asset management information" [Bind-VS2-TM26] and "Prescription concerning the delivery of asset data to the manager, Metro and Tram, Ownership and Management" [Bind-VS2-TM05], supplemented by a list of all delivered delivery files.

I-MT-097-005 Preparation of information file

Before delivery, the Installer must have provided the information file with which the Client can apply for the commissioning permit. The Contractor will supply information for this purpose where necessary.

The information file consists at least of the requirements for the information file in the document:

- NEN EN 50129
- Bind-VS2-TM26 Regulations on the supply of asset management information".

Further information on this procedure can be found in:

- Inf-VS2-TM20 Local track act in A'dam

I-MT-097-006 Preparation of commissioning file

An early commissioning file consists at least of the requirements set out in the document "Requirements for the supply of asset management information" [Bind-VS2-TM26]. The Contractor provides information for this purpose where necessary.

5.7 Education, Training and Exercise (RTD)

5.7.1 Education, Training and Exercise objective

In order to ensure safe and efficient operations and to be able to manage and maintain the infrastructure, it is necessary to train the Client's personnel in this respect. The Contractor must therefore provide training and instructions for maintenance technicians, operating personnel, the installation manager and engineers.

Training: the provision of training and related user documentation that successfully meets the following learning objectives:

1. Knowledge of and ability to work with business management systems for both operations and maintenance.
2. Having knowledge and understanding of the structure and functioning of the overall system.
3. Being able to apply the maintenance concept.
4. Enabling the Client or the operator and manager in the broadest sense to carry out their duties with regard to operation and management.

Training: after acquiring knowledge and learning skills (Training), these skills must be "owned" by means of targeted training sessions that are repeated regularly if necessary.

Practising: practising focuses on maintaining skills by means of practising objectives.

5.7.2 *Activities Training and Practice*

The complete, safe and unhindered availability of the relevant infrastructure for the required period of three months.

To contribute actively to the RTD programme.

5.7.3 *Requirements and products Training, Education and Practice*

L-MT-098-001 General Training Requirements
The training documents and instructions must be in the Dutch language and must be approved by Client in advance. The course material must be didactically suitable for the relevant target group and correspond to the indicated level. The content, organisation, dates and location must be determined in good time in consultation with the Client. The training courses must be included in the planning.

L-MT-098-002 General requirements Training plan

The Contractor must draw up and deliver a training plan for the Operator (PPO).

The Training Plan shall in any case include:

- An analysis of the different user groups.
- Formulating learning goals for the different groups.
- Drawing up a curriculum for the different groups with which the learning goals can be achieved (theory and practice).
- The way in which the achievement of the learning objectives is assessed.
- Prerequisites regarding education and experience.
- A practical proposal for location, duration and planning of the various training courses.

The Contractor shall provide User Documentation (GD) for the use of operating personnel.

The Contractor shall prepare training plans for management and maintenance organisations (OPBO) and any other stakeholders.

In terms of content, the training plans (OPBO) contain at least:

- An analysis of the various management and maintenance groups.
- Formulating learning goals for the different groups.
- Drawing up a curriculum for the different groups with which the learning goals can be achieved (theory and practice).
- The way in which the achievement of the learning objectives is assessed.
- Prerequisites regarding education and experience.
- A practical proposal for location, duration and planning of the various training courses.

The Contractor must provide training resources such as mock-ups, simulators etc. for the training of the strategic, tactical and operational manager and maintenance personnel. Available virtual training devices developed for the training of operations personnel can, in consultation and if possible, be used or expanded for the training of operations and maintenance personnel.

The Training Plan shall in any case cover the following subjects:

The Client expects an elaboration of the Contractor's contribution to the training of the Client's personnel. The training must provide instruction to the operating, management and maintenance organisation of the Client regarding the use of the systems realised by the Contractor.

The Client expects an elaboration of the Contractor's contribution to the training of the Client's personnel. The training(s) must provide support to and practice with the management and maintenance organisation in solving malfunctions in the systems realised by Contractor.

These courses and training sessions will cover at least the following subjects:

structure and operation of the overall system;
 -explanation of the operation;
 function and use of management tools;
 working method in the event of system changes;
 manual to make minor adjustments to subsystems.

L-MT-098-003 Maintenance Technician Training Requirements (MBO-level)

The Contractor must ensure that the maintenance engineers are trained and instructed in such a way that after the training they are able to operate, shut down and start up all the equipment supplied and carry out preventive and corrective maintenance in accordance with the regulations drawn up by the Contractor. Account must be taken of 12 employees to be trained (in 2 groups).

L-MT-098-004 Requirements for training of control engineers (MBO-level)

The Contractor shall provide training and instruction for the operating experts such that after the training employees have sufficient insight into the construction and function of the installations to be able to operate them safely and monitor their status. Account must be taken of 12 employees to be trained (in 2 groups).

L-MT-098-005 Requirements Training Installation Manager and (Maintenance) Engineers (HBO-level)

The Contractor must provide training and instruction for the installation manager and engineers in such a way that after the training these employees have sufficient insight into the use of the installations (especially maintenance instructions), possibilities and impossibilities in the event of malfunctions and breakdowns, and conditions for any extensions and modifications. Four employees (in one group) need to be trained.

L-MT-098-006 Settlement of initial training costs

The Contractor must assume in the training plan that a complete training package (in accordance with requirements 4700 to 4704) is offered once for each basic installation, namely:

1. Complete tram rectifier installation
2. Complete rectifier installation metro

A price quote should be given on the price sheet for initial training.

L-MT-098-007 Availability and settlement of costs of additional training

At a later stage, a specific training package should be offered for:

1. Complete switching station metro
2. Application of a recovery unit in a subproject

During the term of the agreement, Client will periodically need to instruct and train new employees or refresh the knowledge level of existing employees.

The Contractor shall provide with his training plan a quotation for the on-call provision of instruction and training.

At the first request of Client, Contractor shall ensure the execution of education and training within a period of 30 working days.

6 Project control

The Project Control process is divided into six sub-processes:

1. Risk management
2. Purchasing management
3. Financial management
4. Configuration management
5. Management Information Systems
6. Cybersecurity management

6.1 Risk management

6.1.1 Objective Risk management

The Client requires the Contractor to actively and explicitly implement risk management in all phases and in all aspects of the design and execution phase, with risk management being an integral part of its project and process management. By means of risk management, choices in the design and execution must be made in a deliberate and demonstrable manner, so that risks are optimally controlled and opportunities are exploited.

6.1.2 Risk management activities

- Identify and analyse risks and opportunities.
- Quantifying risks and opportunities.
- Demonstrable management of risks by establishing, implementing and evaluating control measures.
- Establishing and keeping up-to-date a risk register.

6.1.3 Requirements and products Risk management

L-MT-099-001 Risk Management

The Contractor must perform risk management (risk analysis and risk control) throughout the term of the Agreement and for all parts of the Supplies and Services. The Contractor must strive for completeness of the risk register.

L-MT-099-002 Identifying and analysing risks

During the Design Activities, the Contractor must identify, analyse and control the risks of the design not meeting a requirement.

L-MT-099-003 Identify and analyse risks

The Contractor must include the risks identified by the Client in its risk inventory and treat them as equivalent to the risks of the Contractor.

The Contractor must contribute to periodic (in line with the frequency of the progress report) coordination of risks with the Client, including the mutual possibilities of taking control measures in relation to the other party's risks.

L-MT-099-004 Establishing, implementing and evaluating management measures

The Contractor must demonstrate and record that control measures have been taken, when they were taken and include a reference to the evidence document that demonstrates this.

The Contractor shall evaluate and report the effect of the control measures on the risk periodically, at least every six weeks.

L-MT-099-005 Establishing and maintaining a risk register; Quantifying risks

The Contractor will apply the Risk Inventory & Management dossier (RIM) as submitted with the tender whereby:

1. use quantitative estimation of the probabilities between 0% and 100%;
2. use a quantitative estimation of the impact on time and money, whereby the impact is expressed in the time units and euros used in the RIM;
3. Use is made of a qualitative classification of the consequence for the aspects time, money, quality, environment, safety and image, using 5 classifications per consequence;
4. the number and classification for the probability and consequence classes is set up in such a way that it is possible to distinguish between risks.
5. The quantification of a risk should be done on the basis of the current estimate, whereby it is not permitted to correct the size of the risk in anticipation of the (risk reducing) effect of control measures that have not yet been taken.
6. The Contractor shall determine control measures for each identified risk, which mitigate the probability of occurrence and/or the consequences of the risk (either partially or entirely).
7. the Contractor shall assign each risk to a responsible risk owner and shall also assign the control measures to a responsible implementation officer (action holder).
8. The Contractor must establish a risk register as described here and ensure that the risks are recorded.
9. The Contractor shall keep the risk register up to date.
10. The Contractor must include any risks identified by the Client and passed on to the Contractor in the risk register and treat them as equivalent to the risks of the Contractor.

6.2 Purchasing management

6.2.1 Objective Procurement Management

Guaranteeing a traceable, controlled and transparent procurement process. The Client expects the Contractor to ensure that supplies from independent auxiliary persons and suppliers are delivered on time and in accordance with the requirements of the Agreement.

6.2.2 Procurement management activities

- Drawing up purchasing specifications.
- Purchasing.
- Guaranteeing compliance.
- Independent auxiliaries and requirements Integrity.

6.2.3 Requirements and products Procurement management

L-MT-099-100 Purchasing

The Contractor shall draw up purchase specifications such that the realisation of the design and the delivery with raw materials, components and installations acquired on the basis of the purchase specifications will not lead to deviations.

In doing so, the Contractor must also take into account the processes and schedules used by subcontractors and independent auxiliary persons.

L-MT-099-101 Purchasing

The Contractor shall ensure that all raw materials, components and installations purchased, as well as the processes and schedules used by independent auxiliary persons, comply with the specifications drawn up or established for these.

L-MT-099-102 Subcontractors, self-employed persons and integrity requirements

In the event that the Contractor has subcontractors and/or independent auxiliary persons carry out parts of the Work, the Contractor must obtain the Client's prior approval for the use of these subcontractors and/or independent auxiliary persons. The Client will not withhold its permission on unreasonable grounds.

L-MT-099-103 Subcontractors, self-employed persons and integrity requirements

The Client has the right to require the subcontractors and independent auxiliary persons to be deployed by the Contractor to submit a completed and duly signed statement in accordance with the model of the 'Uniform European Tender Document' to the Client. The absence of a completed and validly signed statement or the inability to submit the relevant evidence may constitute grounds for refusing permission to deploy the relevant subcontractor and self-employed auxiliary persons.

L-MT-099-104 Subcontractors, self-employed persons and integrity requirements

If the assessment shows that the subcontractor or independent contractor is in one of the circumstances referred to in Sections 2.86 and 2.87 of the Tender Act 2012, the Client may decide that:

1. the subcontractor or independent auxiliary person chosen by Supplier is not accepted; and
2. the Contractor is given the opportunity to find another independent auxiliary person to perform the Work in question or to indicate that he will perform the part in question himself.

L-MT-099-105 Subcontractors, self-employed persons and integrity requirements

The provisions of Requirements L-MT-099-100 to L-MT-099-104 do not affect the responsibility and liability of the Contractor for the correct and timely completion of the delivery and services. In the event that a subcontractor or independent contractor is not accepted by the Client, the Contractor will not be entitled to any compensation, additional payment or extension of time.

6.3 Financial management

6.3.1 Objective Financial management

Ensuring a traceable, controlled and transparent payment process.

6.3.2 Activities Financial management

Establishing and revising payment schedule

6.3.3 Requirements and products Financial management

- Draw up a payment schedule
- Drawing up financial reports

L-MT-099-200 Payment schedule delivery 1 installation

On the basis of the agreed planning, the Contractor will draw up a payment schedule that makes it clear at what times the Client can expect to receive which invoices (including indication of invoice amounts). The payment schedule also indicates when the required bank guarantee will be submitted by the Contractor. The payment schedule will meet the minimum requirements as set forth in the Framework and Further Agreement.

If the schedule is changed after approval by Client during the execution of the sub-project, the payment schedule must be adjusted by Contractor in consultation with Client.

L-MT-099-201 Payment scheme for multiple installations

On the basis of the agreed planning, the Contractor will draw up a payment schedule that makes it clear at what times the Client can expect to receive which invoices (including indication of invoice amounts) for each phase of the subproject. The payment schedule also indicates when the Contractor will submit the required bank guarantee for each phase of the sub-project. The payment schedule meets the minimum requirements as specified in the Framework and Detailed Agreement. If the schedule is changed after approval by Client during the execution of the sub-project, the payment schedule must be adjusted by Contractor in consultation with Client.

L-MT-099-202 Financial reporting by sub-projects

The Contractor shall provide a quarterly financial statement for each subproject, containing at least the following information:

- Purchase order number and name of subproject
- Subproject status (tendered / commissioned / delivered [insert date] and under guarantee up to [insert date] / completed)
- Value of order based on quotation / supplementary agreement
- Order value already invoiced
- Contract value to be invoiced
- Value of bank guarantee and planned date of completion & acceptance
- Value of additional work offered
- Value of commissioned additional work
- Value of reduced work offered
- Value of commissioned less work

L-MT-099-203 Overall financial report all current sub-projects

The Contractor shall provide a quarterly overall financial overview of all ongoing subprojects. Ongoing subprojects means all active subprojects with the status in tender up to and including the end of the guarantee period. This overview contains at least the following information:

- Overview of all current Purchase Order numbers and names of all current sub-projects
- Status overview per subproject (in quotation / on order / completed [insert date] and in guarantee up to [insert date])
- Total value of all current orders on the basis of the quotation / supplementary agreement
- Order value already invoiced for all current sub-projects
- Contract value to be invoiced of all current sub-projects
- Value of bank guarantee and planned date of completion & acceptance of all current sub-projects
- Value of additional work offered for all current subprojects
- Value of additional work ordered from all current sub-projects
- Value offered less work of all current subprojects
- Value of contract reductions of all current sub-projects

6.4 Configuration management

6.4.1 Objective Configuration Management

The aim of configuration management is to document, administer and control the current configuration of the Contract, the Schedule of Requirements and the traction power supply components and traction power supply installation to be delivered, so that the most up-to-date information is available at all times. Good configuration management ensures that requirements and resulting information and interfaces are defined and traceable.

6.4.2 Activities of configuration management

- Execution of Configuration Control
- Securing the baselines at the transition of the project phases (VO>DO>UO)
- Managing contract changes

6.4.3 Requirements and products Configuration management

300Configuratiecontrol

The Contractor shall keep the current configuration of the objects (or assets under construction) synchronised with the corresponding information, in order to have the most current information available at all times.

L-MT-099-301 Configuration management plan

The Contractor shall draw up a Configuration Management Plan.

The configuration management plan shall include at least the following elements:

1. Configuration item management
2. Configuration change management
Baseline management
4. Configuration status overview
5. Auditing the configuration

The starting point is:

- The Authority is and will remain the owner and manager of the Framework and Further Agreement, the Schedule of Requirements and all appendices to it.
- The Contractor is and remains the owner of all other documents such as Contract Management Plan, Project Plan and all other documents described in this document.

L-MT-099-302 securing baselines between project phases

The Contractor shall ensure traceability of formal configuration statuses (Baselines) between different project phases (including VO, DO and UO).

The baselines used, as defined in the Configuration Management Plan, must be in line with the various deliverables listed in the Acceptance and Transfer procedure [Inf-VS2-TM01].

Released baselines remain valid and can only be changed through a formal amendment process. For each new baseline, the Contractor must indicate the changes compared to the previous baseline.

L-MT-099-303 Change Management

Changes must be dealt with as soon as possible in accordance with the Client's model forms (see Inf-VS2-PO01a and Inf-VS2-PO01b). The Client shall provide serial numbers for new Amendments.

301Wijzigingenregister

The Contractor must keep a register of Changes and update it weekly with at least the following information:

- signature of the amendment,
- date of initiation of the Amendment,
- Initiator of the Amendment (OG or ON)
- status of the Amendment (in categories to be determined),
- brief description of the amendment,
- requirements to which the Amendment relates,
- date of signature.

6.5 Management information systems

6.5.1 Objective management information systems

The aim of Information System Management is to ensure the operational functioning of control, operation and analysis software as it is delivered to secure local control and remote control via a link to the CBI system, and to properly organise and execute the management and maintenance of local control and the link to the CBI.

6.5.2 Information systems management activities

- Implementation Information System per subproject
- Acceptance Information System per subproject
- Software maintenance and support
- Software and data usage rights Information systems
- Intellectual property Information systems
- Other requirements Information systems

6.5.3 Requirements and products Information system management

L-MT-083-001 Implementation of information system per sub-project

The Contractor shall design the local controls in accordance with the steps and process described in section 5.2 Design.

Specifically for implementation of the software, a plan will be submitted in accordance with Article 5 of the Bind-VS2-TM29 GIBIT conditions document and presented to the Client for approval.

L-MT-083-002 Acceptance of information system per subproject

The Contractor shall draw up a test protocol setting out the manner in which the Test and Acceptance procedure will be carried out.

Specifically for the acceptance of the software, a plan will be submitted in accordance with Article 7 of the Bind-VS2-TM29 GIBIT Conditions document and presented to the Customer for approval.

The tests to be performed are included in the Test plan (see 5.4 of this document).

L-MT-083-003 Software maintenance and support

Contractor shall draw up a plan of approach in which the manner is worked out in which the management and maintenance of the software will be carried out. The management and maintenance of the software to be carried out meets the requirements as included in Article 8 of the Bind-VS2-TM29 GIBIT conditions document and is submitted to the Customer for approval. The approach to management and maintenance of software is included in the Contract Management Plan (see 4.1 of this document).

L-MT-083-004 Right to use software and data

The Contractor shall arrange for an appropriate right of use for the use of the software in accordance with the conditions as included in the document Bind-VS2-TM29 GIBIT Conditions. The Contractor will arrange access to the data and appropriate authorisations for the Contractor and any third parties designated by the Contractor in accordance with the requirements set out in Article 18 of the Bind-VS2-TM29 GIBIT Terms and Conditions document.

L-MT-083-005 Intellectual property software and data

The intellectual property of software and data complies with the conditions as included in the document Bind-VS2-TM29 GIBIT conditions.

L-MT-083-006 Other requirements Information systems

If additional services regarding Information Systems are purchased by Customer from Contractor, the conditions as included in the document Bind-VS2-TM29 GIBIT conditions will apply to these services.

6.6 Cybersecurity management

6.6.1 Objective Cyber Security Management (CS Management)

The goal of cyber security management is to ensure the operational safety, availability and privacy of all stakeholders in the metro and tram operation by mitigating the impact of risks from cyber attacks and cyber infections on the systems.

6.6.2 Work on cyber security management

- Appointment of a CS manager
- Cooperating with Client's CS Manager
- Preparation of CS plan (including H&S and risk management for CS) for all project and management phases
- Conducting cyber risk analyses
- Design, realisation and implementation of CS measures

6.6.3 Requirements and products Cybersecurity management

L-MT-080-001 Appointment of a cybersecurity manager

The Contractor must appoint a cyber security manager (CS manager) as the primary contact person for the Client's CS manager in particular.

L-MT-080-002 Drawing up a cybersecurity management plan (CS plan)

The Contractor must draw up a cyber security management plan (CS plan) on the basis of the provisions of CS regulation CEB-OVG-21876 (Bind-VS2-TM30-1) and CS requirements CEB-OVG-18908 (Bind-VS2-TM30-2) and have this plan approved by the Client before commencing the project.

The CS Plan should also describe the H&S for cyber security during all phases of the Work and include all formal moments of approval by the Client.

L-MT-080-003 Design, realisation and implementation of CS measures

The Client must design, realise and implement CS measures aimed at guaranteeing the operational objectives set by the Client for security, availability and privacy and substantiated on the basis of cyber risk analyses to be performed by the Contractor and on the basis of the CS Requirements CEB-OVG-18908 (Bind-VS2-TM30-2).

Note. The operational objectives for security, availability and privacy will be made available by the Client after the contract is awarded.

The Client shall implement all CS Requirements CEB-OVG-18908 (Bind-VS2-TM30-2). Deviations from the CS Requirements are permitted on the basis of a written cyber risk analysis approved by the Client and an approved proposal for alternative measures.

Note. The CS Requirements are based on the Rijkswaterstaat CSIR (CyberSecurity Implementation Guidelines), which are based on the IEC62443 and is the defacto market standard for Operational Technology (OT) for governments in the Netherlands. These requirements/measures are supplemented with some specific measures of the Client.

L-MT-080-004 CyberRiskAnalysis Approach (CRA Approach)

The Client shall perform cyber risk analyses to substantiate the CS measures to be chosen. Client should perform the cyber risk analyses on the basis of Client's cyber risk management approach CEB-OVG-18786 (Bind-VS2-TM30-6). Cyber risk analyses must be explicitly approved by Client.

Remark. The threat assessment CEB-OVG-22124 (Bind-VS2-TM30-10) must also be used as input for the risk analyses and will be made available by the Client after the award of the contract (in connection with its confidentiality).

7 Quality assurance

7.1 Quality assurance objective

The Contractor will ensure that the required product and process quality is delivered. The cooperation between the Client and the Contractor via this contract is aimed at the mutual identification of errors and learning points and the translation of these points into product and process improvements.

7.2 Quality assurance work

- Set up, implement and maintain a quality management system.
- Cooperating with audits and tests of the Client.
- Plan, execute and record project and contract evaluations.
- Identifying and recording deviations, learning and improvement points.
- Implement improvement measures.
- Implementing and monitoring improvements.
- Set up and manage a register of deviations learning and improvement points.

7.3 Requirements and products quality assurance

L-MT-099-400 Establishment, implementation and maintenance of a quality management system
During the term of the Agreement, the Contractor must have a quality system certificate based on the (NEN-)EN-ISO 9001:2015 standard, which is applicable to the nature of the Work. This certificate must have been issued by a certification body recognised in the European Union.

L-MT-099-401 Setting up, implementing and maintaining a quality management system

During the term of the Agreement, the Contractor must operate a single quality management system (KMS) that applies to all work and processes related to the Framework Agreement, sub-projects and other supplies and services provided.

In accordance with ISO 9001, the Contractor must immediately identify, register, communicate, assess, correct, evaluate and implement the desired improvements in respect of deviations from the Agreement (and all Documents arising from it). In addition to this, an overall contract evaluation takes place once a year to list deviations, learning and points for improvement.

Finally, after completion of each sub-project, an evaluation is organised by the Contractor to list deviations, learning points and points for improvement.

The Contractor will keep a record of the nonconformities, lessons learned and points for improvement in a nonconformity register in accordance with ISO 9001.

The Supplier shall keep a Deviation Register in which at least the following information is recorded:

1. Unique serial number of the deviation;
2. description of the deviation;
3. date of observation;
4. audit number (if applicable) from which the deviation originated;
5. observing party;
6. risks to which the deviation relates;
7. processes from the KMS and the PMP to which the deviation relates;
8. responsible actor;
9. status of the deviation;
10. description of the correction;
11. status of the correction;
12. description of the corrective and preventive measures;
13. per corrective and preventive action:
 - date when it will be executed;
 - status;
 - Planned date of implementation;
 - Actual date of implementation;
14. Date of closure of the derogation report.

The Contractor must deal with shortcomings, deviations or 'negative findings' identified by the Client and reported to the Contractor in the same manner as deviations identified by the Contractor. For all deviations, the recovery of deviations must be demonstrable.

The correction of a deviation must take place at the latest before completion of the subproject concerned.

L-MT-099-402 Recording and resolving deviations, learning and improvement points

In accordance with ISO 9001, the Contractor must immediately identify, register, communicate, assess, correct, evaluate and implement the desired improvements in respect of the Agreement (and all Documents arising from it).

The Contractor shall take measures to minimise the recurrence of deviations or the occurrence of similar deviations.

The Contractor must have processed all measures to be taken, including planning data, in a deviation report within ten days of identifying deviations.

In the event that it concerns a deviation drawn up in response to a shortcoming reported in writing by the Client, the Contractor must report the measure and the planned date back to the Client in writing.

The Contractor must submit a change proposal within 10 days, if the Contractor believes that a deviation cannot be corrected and is of a permanent nature.

L-MT-099-403 Identifying and recording deviations, learning and points for improvement

Deviations and measures to be taken or taken must be reported in the progress report.

L-MT-099-404 Cooperation with audits and tests of the Client

The Contractor must always render the Client's cooperation in order to perform an audit, system, process or product test or to have such an audit performed and to provide the necessary Documents and information. In this connection, the Client will at all times have the power to enter all building and work sites, factories, workshops and warehouses of the Contractor, independent assistants and suppliers where Work is carried out on behalf of the Agreement and to have itself accompanied by third parties or experts.

8 Aftercare and warranty

8.1 Aftercare

8.1.1 Objective Aftercare

After delivery, residual points may remain that do not impede the proper functioning of a traction power substation, so that the traction power substation can be put into operation. Residual points can also arise in the period shortly after delivery and acceptance. A good follow-up process ensures that these remaining points are dealt with properly and (contractually) correctly by the Contractor and/or Installer. Once the physical and financial settlement of a sub-project has been completed, the sub-project must also be administratively completed and delivered. The responsibility for dealing with residual points lies with the Installer as regards installation work, construction work and civil engineering work. The Contractor is responsible for dealing with residual points relating to the Traction Supply Components.

8.1.2 Work aftercare

- Inventory and keep track of residual points in a residual point file
- Identify, analyse, quantify risks associated with the residual items
- Resolving residual issues
- Adjusting Delivery and Completion File

8.1.3 Requirements and products Aftercare

L-MT-100-100 Set up, implement and maintain a residual points list

The Installer and the Contractor (only for traction power components) must keep a record of all remaining points for the sub-project until all remaining points have been demonstrably resolved. The list of remaining points provides at least insight into:

- Description of the residual item;
- Location of the residual point;
- Potential risks and impact of the residual point on the availability of the traction power substation;
- Responsible for solving the residual point;
- Proposed recovery date or recovery period;
- Other repair work to be carried out (e.g. electrical cleaning of installations);
- Documentation and spare parts to be provided at the residual point.

L-MT-100-101 Plan of approach and schedule for recovery of residual items

Based on the list of remaining points, the Installer and the Contractor (only for traction power components) together draw up a plan for remedying the remaining points. An approach and planning will be determined for each remaining point, whereby attention will be paid to the following aspects in any case:

- Time
- Money (costs / resources / benefits)
- Risks
- Dependencies
- Client interests
- OV operation
- Interests of Installer/Contractor

When generating solutions, the Contractor must explicitly lay down the considerations involved. When the various solutions have been worked out in more detail, the effects of the solutions must be considered in relation to the assessment criteria. The choice should be made, on the basis of a trade-off matrix, with the accompanying argumentation for each assessment criterion. The solution that scores best (i.e. represents the highest "value") is ultimately chosen. This choice must be made explicit and must be recorded.

8.2 Warranty

8.2.1 Warranty objective

During the period that the Traction Power Components are operational, defects or malfunctions may occur that are covered by warranty provisions in the contract. A well-organised process for handling guarantees ensures that these are dealt with properly and (contractually) correctly by the Supplier and/or Installer.

When the first two-year warranty period of a sub-project ends, the sub-project must also be administratively completed and delivered. The responsibility for dealing with warranty points lies with the Installer. The Contractor is responsible for dealing with warranty points relating to the Traction Power Components.

8.2.2 Warranty work

- Inventory and track warranty issues in a Warranty Issue List
- Identify, analyse, quantify risks associated with the guarantee points
- Resolving warranty issues
- Adjusting Delivery and Completion File

8.2.3 Requirements and products Warranty

L-MT-101-100 Set up, implement and maintain a Guarantees Issue List

The Installer and the Contractor (only for traction power components) must draw up an issue report for each guarantee issue until all remaining points have been demonstrably resolved. A total overview is kept of these issuer reports that provides at least insight into:

- Description of the guarantee item;
- Location of the guarantee point;
- Possible risks and impact of the guarantee point on the availability of the traction power substation;
- Responsible for resolving the warranty issue;
- Proposed recovery date or recovery period;
- Other repair work to be carried out (e.g. electrical cleaning of installations);
- Documentation and spare parts to be provided at the warranty point.

L-MT-101 Plan of Action and Schedule for Recovery of Guarantee Points

Based on the list of remaining points, the Installer and the Contractor (only for traction power components) together draw up a plan for remedying the guarantee points. For each guarantee point, an approach and planning will be determined on the basis of a thorough analysis in which all the steps in the design process are checked again, whereby attention will be paid to the following aspects in any event:

- Time
- Money (costs / resources / benefits)
- Risks
- Dependencies
- Client interests
- OV operation
- Interests of Installer/Contractor

When generating solutions, the Contractor must explicitly record the considerations made. It must also be made clear whether this concerns an issue that can be repeated and must therefore lead to a redesign.

If the various solutions are worked out in more detail, the effects of the solutions must be considered in relation to the assessment criteria. The choice should be made on the basis of a trade-off matrix, with the corresponding argumentation for each assessment criterion. The solution that scores best (i.e. represents the highest "value") is ultimately chosen. This choice must be made explicit and must be recorded.

The Client requires that the technical and aesthetic quality of the object after repair is at least restored to the level laid down in the Agreement.

9 Service, maintenance, special tools and spare parts supply

9.1 Service, maintenance and upkeep

9.1.1 Service, maintenance and upkeep objective

Ensuring that the traction power supply system functions reliably in conjunction with the entire traction power system within the set minimum requirements. It must be possible to maintain all components of the traction power supply system for the entire technical service life at the lowest possible cost.

The basic principle is that GVB carries out all maintenance under its own management with its own employees. The Contractor provides support on demand. At a later stage, GVB may decide to have (parts of) the maintenance carried out by the Contractor or a third party.

The client carries out maintenance based on the methodology of risk-driven maintenance and management. This is done via a number of fixed process steps:

1. Setting risk acceptance limits
2. Physical and functional decomposition
3. Risk assessment (FMECA)
4. Drawing up a maintenance concept
5. Determine risk-based maintenance measures and maintenance plan
6. Implementation and monitoring
7. Evaluation and adjustment

This maintenance concept is new to the Client and, in collaboration with the Contractor, it is intended to be applied to the maintenance, management and servicing of the traction power supply components to be delivered by the Contractor. The requirements in this chapter are designed to enable the Client and the Contractor to work together to arrive at an approach during the period after the delivery of the first subproject. Once a year during the remaining term of the Framework Agreement, the Client and the Contractor will determine, on the basis of the results of the execution, monitoring and evaluation of the maintenance carried out and the performance of the Traction Power Plants, whether the approach needs to be adjusted.

9.1.2 Service, maintenance and upkeep work

- Drawing up the object list
- Statement of technical service life of traction power supply components
- Making knowledge and capacity available for determining and implementing risk-driven maintenance
- Co-establishing the risk acceptance limits for the maintenance of traction power components
- Co-perform physical and functional decomposition for maintenance of traction power components
- Carrying out a risk assessment for the maintenance of traction power supply components
- Co-drafting of maintenance concept for traction power components
- Co-drafting of risk-driven maintenance and conservation plan
- Co-preparation of LCC calculation
- Supporting Client in monitoring, evaluation and adjustment of risk-based maintenance
- Ensuring availability of support in case of breakdowns and maintenance

9.1.3 Requirements and products service, maintenance and upkeep

L-MT-103-100 Drawing up the object list

In addition to the provisions laid down elsewhere in this Schedule of Requirements for the transfer of information, the Contractor must provide the Client with an Object Elements List (OEL) in accordance with the GVB system upon delivery of the traction power plant.

L-MT-103-101 Statement of technical service life of traction power plant

The technical lifespan of all components (except for electronic components) must be at least 30 years. The Contractor must indicate which parts have a shorter life span. The Contractor must state the expected life span of these electronic components.

L-MT-103-102 Provision of knowledge and capacity for determining and organising risk-controlled maintenance of traction power plant

At the start of the term of the framework agreement and throughout the term of the framework agreement, the Contractor will, in consultation with the Client, make personnel available with experience in the field of management and risk-driven maintenance of traction power plants. This concerns the following one-off activities at the start of the framework agreement:

Going through the following process steps together with the Client on a one-off basis:

1. Setting risk acceptance limits
2. Physical and functional decomposition
3. Risk assessment (FMECA)
4. Drawing up a maintenance concept
5. Determine risk-based maintenance measures and maintenance plan

In addition, the Client expects the Contractor to provide support in the following areas at least once a year:

6. Implementation and monitoring
7. Evaluation and adjustment

L-MT-103-103 Co-establishing the risk acceptance limits for the maintenance of traction power supply components

At the start of the framework agreement, the Contractor will support the Client with relevant knowledge and experience in drawing up a risk matrix in which the risks relating to the maintenance of traction power installations are elaborated. The risk matrix will provide an insight into:

- An axis with potential failure modes and a scale to show the probability of their occurrence
- Columns with effect categories and a scale with the weighting of the effect;
- A risk standardisation in the form of a colour scale and the cost of risk.

L-MT-103-104 Helping to carry out physical and functional decomposition for the maintenance of traction power components

At the start of the framework agreement, the Contractor supports the Client with relevant knowledge and experience in drawing up a physical and functional decomposition in which the maintenance of traction power plants is elaborated. The decomposition provides insight into:

The objects, their functions and the connection between these objects and functions:

- Drawing up an object register (description of traction supply equipment and relations with related systems);
- Physical consistency (drawings, diagrams, object tree, system and network map);
- Performance requirements of the systems and objects:
 - Functional requirements (capacity, efficiency,...);
 - Technical condition;
 - RAMS(SHEEP) requirements: requirements for reliability, availability, maintainability, safety, security, health, environment, economics, politics.
- Functional consistency:
 - Target tree / line of sight: translate KPIs or Service Level Agreements (SLAs) on a strategic level
 - to performance requirements for (sub)systems and objects;

L-MT-103-105 Contributing to the risk assessment for the maintenance of traction power components

At the start of the framework agreement, the Contractor will support the Client with relevant knowledge and experience in performing a risk assessment. The risk assessment will be carried out as follows:

- Performing a Failure Mode Effect & Criticality Analysis (FMECA) of objects in the system. This tests how bad it is when an object loses its function.
- Each object is thus given a risk classification (colour or risk number on an impact category).
- The results are processed in a risk matrix

L-MT-103-106 Co-preparation of maintenance concept for traction power units

At the start of the framework agreement, the Contractor supports the Authority, on the basis of the earlier process steps (Drawing up risk acceptance boundaries, Physical and functional decomposition and Risk assessment), in selecting and drawing up a maintenance concept with relevant knowledge and experience. The maintenance concept is composed of elements from the following maintenance concepts:

- Predictive Maintenance
 - Maintenance based on condition measurement
 - Inspection to prevent failure
 - Condition-based maintenance (TAO)
- Preventive Maintenance
 - Maintenance based on calendar time or running hours
 - Time-of-use maintenance (GAO)
 - Preventive Maintenance (Scheduled Restoration)
 - Scheduled Discard
- Functional testing (Failure Finding Maintenance)
 - Inspection to detect hidden failures
 - Preventing multiple failures
 - Detective maintenance
- Modification
 - Modifications
 - Design, material, impact mitigation measures
- Failure-dependent maintenance (Run-to-Failure)
 - Repairs of non-critical components
 - Failure-Specific Maintenance (SAO)
- Repair of critical assets

L-MT-103-107 Co-create risk-based maintenance and conservation plan

On delivery of subsequent subprojects for traction power installations, the Contractor shall provide a maintenance and conservation plan that details all the activities and instructions specified with regard to management and maintenance after delivery of the project. The plan shall comply with the maintenance concept established at the start of the framework agreement. The maintenance and conservation plan should at least detail each subproject:

- Specification of the newly realised objects that require maintenance during the operational phase
- A description of the inspection and maintenance intervals to be observed for the entire traction power plant, with accompanying instructions (at least description of inspection points, methods, maintenance work, necessary materials, tools and ICT tools and software)
- According to which, in the detailed design, maintenance rules should be applied
- Which third-party objects are located within the system boundaries
- What requirements there are to ensure that these third-party objects are maintained to ensure proper functioning and technical condition
- A logbook (or digital logbook) in which it must be possible to record the current status of maintenance, the maintenance history and malfunction registration for each traction power installation

L-MT-103-108 Drawing up the LCC calculation for the traction power installation

All components must be capable of being maintained at the lowest possible cost for the entire technical service life of 30 years. The Contractor shall provide the Life Cycle Costs of all components of the traction power substation over a period of 30 years. The LCC calculation is based on the established maintenance concept (see requirement L-MT-0103-107) and must be submitted to the Client for assessment during the design phase.

In addition, the Contractor must indicate in the LCC calculation which activities, how many man hours, which materials and the related costs will be required for the daily and periodic maintenance.

The starting points for the maintenance to be carried out are:

- The work is carried out on the basis of the Elektrotechnisch Bedrijfsvoering of GVB Infra B.V. (see: Bind-VS2-TM28 Elektrotechnisch Bedrijfsvoering Handboek)
- The installation meets the technical requirements as set out in part 1 of the Schedule of requirements during its entire technical lifecycle

L-MT-103-109 Requirements for availability of support from the Contractor in the event of disruptions

The Client performs all management and maintenance under its own management with its own personnel. The Client wishes to be able to call on the Contractor's support when carrying out maintenance. Octrooibureau Novopatent shall make the following employees available on call:

1. Engineers who possess the necessary knowledge and experience to solve more complex failures in the hardware and software of a traction power plant;
2. Software engineer who has the necessary knowledge and experience to realise software modifications and to solve more complex malfunctions in software of a traction power plant;
3. Commissioning engineer/tester who is able to test or commission traction power installations;
4. Engineer who has the necessary knowledge and experience to design standard traction power installations;

L-MT-103-109 Requirements for availability of support from the Contractor in the event of disruptions

5. Lead engineer possessing the necessary knowledge and experience to design more complex or customised traction power installations;
6. Traction power specialist with the necessary knowledge and experience to perform more complex design and control work, such as performing selectivity calculations.

The Contractor shall ensure that the employees to be deployed have the correct experience and qualifications and are equipped with all the tools and resources needed to perform the work properly.

L-MT-103-110 Requirements for accessibility of support from the Contractor in the event of disruptions

The Client performs all management and maintenance under its own management with its own personnel. The Client wants to be able to call on the Contractor's support when carrying out maintenance. Contractor provides a fault service that can be reached by Client 7 days per week 24 hours per day.

L-MT-103-111 Requirements for response times for availability of support from the Contractor in the event of disruptions

Client applies the following urgency and response times for failures and requests for support:

- Urgency 1 Critical (direct disruption of the primary process, public transport operation is disrupted): Within two hours of reporting a disruption, the contractor will start repairing it. The target repair time or safety is 1 hour. This class applies to the traction power supply installations and the local control installations of all traction power supply facilities such as traction power substations and switching stations;
- Urgent (consequential damage to rail operations is possible, direct disruption to primary process is imminent): Within four hours of reporting a malfunction, the contractor will start repairing the malfunction. Target repair time or safety is 2 hours. This class applies to the traction supply system and the local control systems of all traction supply systems such as traction power substations and switching stations;
- Urgency 3 Normal (functioning or aesthetics at stake): The Contractor shall start repairing the malfunction on the next working day following the notification of the malfunction, otherwise no later than 24 hours after the notification. The target repair time is 24 hours. This class applies, inter alia, to failures of measurements, displays and batteries of traction power substations and switching stations;
- Urgency 4 Non-urgent: Within three working days after reporting a malfunction, the Contractor shall begin remedying the malfunction. This class applies to all other malfunctions and installations. The target repair time is within 2 weeks.
- Requests for support for project-related work: Within five working days of a request from the Client, the Contractor shall make the requested employee available. The target time for the delivery of designs, recommendations, calculations and quotations is within two weeks after the request has been submitted to the employee concerned.

9.2 Special tools and spare parts supply

9.2.1 Objective special tools and spare parts supply

Since Client mainly carries out the management and maintenance under its own management, it needs all the special tools, ICT resources and software required for the management and maintenance.

In order to be able to exchange defective parts quickly and to guarantee the availability of the traction power substations and switching stations, it is necessary for the Client to have a spare parts package available. The Contractor shall ensure the timely delivery of spare parts.

The starting point is that GVB carries out all maintenance under its own management with its own employees.

9.2.2 Service and maintenance work

- Draw up list of safety, operating, ICT tools and software
- Drawing up a list of critical spare parts
- Supply of special tools, ICT aids and software
- Supply spare parts

9.2.3 Requirements and products service and, maintenance

L-MT-102-100 Special tools, safety and operating equipment

The Contractor must supply safety and operating equipment for all mechanics, among other things, for placement in their service vehicle. During the design phase, the Contractor must provide a list and specification of required tools and maintenance equipment. Account must be taken of 12 technicians and service vehicles.

The list shall contain at least the following information:

- Description article
- Business critical article yes/no
- Article number Contractor
- Article number Client
- Order unit (Minimum x pieces)
- Delivery time
- Price per piece
- Price per unit

L-MT-102-101 ICT auxiliary and operating equipment

The Contractor must provide the correct operating equipment and software for all mechanics. All mechanics shall have a Laptop with MS Windows operating system. The Contractor shall ensure the provision of software for 15 laptops with which PLC software and software of the local controls can be adjusted. The Contractor shall also provide 15 connection cables.

During the technical life of the installation, the contractor shall ensure that the software is kept up to date and shall upgrade the management software on PCs of the client.

L-MT-102-102 Drawing up a list of (critical) spare parts

In order to be able to exchange defective parts quickly and to ensure the availability of the traction power substations and switching stations, it is necessary for the Client to have a spare parts package available. The Contractor must provide a List of Required Spare Parts (RL) at the start of the Framework Agreement. The parts considered necessary by the Contractor to guarantee the required availability must be specifically marked on the list.

The list shall contain at least the following information:

- Description article
- Business critical article yes/no
- Article number Contractor
- Client's item number (to be provided by Client)
- Order unit (Minimum x pieces)
- Delivery time
- Price per piece
- Price per unit

L-MT-102-103 Logistic requirements

The Contractor shall ensure safe transport of the parts and tools to be delivered to the location Provincialeweg 2-4 in Diemen.

The Contractor shall specify its delivery times for the initial order and subsequent orders.

Spare parts and tools are called for by Client by means of a purchase order.

Receipt of goods

Delivery of goods to Client shall take place on Mondays to Fridays between 9:00 and 15:00. The Contractor is responsible for unloading the lorry (if necessary, carried out by the carrier's staff).

The Contractor will check the shipment delivered for damage to packaging, number of items and specifications. Quality and/or test certificates will be included in our quality system.

If delivered items do not meet the contractually agreed requirements and conditions, Client is obliged to return the goods immediately and at Contractor's expense. The present delivery will be considered as 'not delivered'.

Packaging goods

The parts must be delivered on pallets of 1200 x 800 mm (Euro format).

Deviations from this pallet format are only possible if they have been authorised by the Client's Goods Receiving Department. A maximum of 3 pallet (top) edges may be used. The displays must in all cases be safely secured on the pallet before transport.

L-MT-102-103 Logistic requirements

A delivery must at all times be accompanied by a correct packing slip, number in packaging, weight, article number and purchase order number of Client.

For each delivery, all quality and/or test certificates must be enclosed.

The pallets must be packed watertight on all sides, including the underside.

The packaging must be coded on at least 2 sides. (1x long side, 1x short side)

The coding must at least include:

Client item number (6-digit)

Purchase order number of the client beginning with 45.....

10 List of requirements

L-MT-000-901 Binding documents	12
L-MT-000-902 Informative documents	14
L-MT-091-001 Contract management plan scope, elaboration of requirements and products	16
L-MT-091-002 Contract management plan human resources.....	16
L-MT-091-003 Review and amendment of Contract Management Plan.....	17
L-MT-091-004 Project plan scope, development of requirements and products.....	18
L-MT-091-005 Project plan human resources.....	19
L-MT-091-006 Evaluation and Amendment Project Plan.....	19
L-MT-091-007 Interaction with the Client	20
L-MT-091-008 Preparation of progress reports	20
L-MT-091-009 Project start-up	20
L-MT-091-010 Project follow up	20
L-MT-091-011 Project progress meeting.....	20
L-MT-091-012 Contract Management Consultation Framework Agreement.....	21
L-MT-091-013 Invitation, representation and report.....	21
L-MT-091-014 Product requirements of progress reports	22
L-MT-091-015 Preparation of Planning and provision of input for Integrated Subproject Planning	23
I-MT-091-016 Product requirements for integrated planning.....	23
I-MT-091-017 Adjustment of planning and provision of adjusted input for the purpose of Integrated Subproject Planning	23
L-MT-091-018 Preparation of subproject planning.....	24
L-MT-091-019 Preparation of Total Supply Planning	24
L-MT-091-020 Product requirements for delivery planning	24
L-MT-091-021 Adjustment of Subproject Planning and Total Supply Planning	24
L-MT-091-022 Ontwerpcoördinatie.....	25
L-MT-091-023 Implementation coordination.....	25
L-MT-091-024 Test coordination Factory Acceptance Test (FAT) Site Acceptance Test (SAT), Commissioning, Site Integration Test (SIT) and Short Circuit Tests.....	26
L-MT-092-001 Managing the internal technical interfaces.....	27
L-MT-092-002 Setting up, implementing and maintaining an interface register linked to the risk register	28
I-MT-092-003 Setting up, implementing and maintaining an interface register linked to the risk register	28
L-MT-093-001 Provides information initial situation	29
L-MT-093-002 Installation technical baseline measurement (optional).....	30
L-MT-093-003 Objectspecificatie.....	30
L-MT-093-004 Preparation of design notes for requested objects	31
L-MT-093-005 Preparation of draft memos by means of design workshops (optional)	32
L-MT-093-006 Product requirements content Design notes for identified objects (1)	33
L-MT-093-007 Product requirements content Design notes for identified objects (2)	34
L-MT-093-008 Product requirements Integrated Preliminary Design (VO)	35
I-MT-093-009 Product requirements integral final design.....	38
L-MT-093-010 Product requirements integral implementation design.....	41
L-MT-094-001 Drawing up V&G and setting up V&G organisation for sub-project by Installer.....	44
L-MT-094-002 Start of work.....	44
L-MT-094-003 Health, Safety and Environment (OHS) coordination of work under own management by Contractor	45
L-MT-094-004 Health & Safety and H&S coordination activities under the coordination of the Installer	45
L-MT-094-005 Safety system requirements at organisation level	45
L-MT-094-006 Security system requirements at person level	45
L-MT-094-007 Requirements for professional qualifications of staff Contractor	46

L-MT-094-008 Laws and regulations on internal procedures	47
L-MT-094-009 Requirements for cleaning up the work site	47
L-MT-095-001 Drawing up the Test Master Plan	48
L-MT-095-002 Performance of inspections and tests by the Contractor	49
L-MT-095-003 Perform inspections and tests by installer	49
L-MT-095-004 Preparation of inspection and test reports	50
L-MT-095-005 Preparation of verification note	50
L-MT-095-006 Product requirements Test Master Plan	50
L-MT-095-007 Requirements Inspection and test plan	51
L-MT-095-008 Factory Acceptance Test (FAT) Requirements	52
L-MT-095-009 Factory Integration Test (FIT) Requirements	52
L-MT-095-010 Commissioning requirements	54
L-MT-095-011 Site Acceptance Test (SAT)	54
L-MT-095-012 Site Integration Test (SIT)	55
L-MT-095-013 Short circuit tests	56
L-MT-095-014 Integral release	56
L-MT-096-001 General requirements Verification and validation	58
L-MT-096-002 Verification plan	59
L-MT-096-003 Verificatierapport	60
L-MT-096-004 Verification note	61
L-MT-097-001 Drafting BIM protocol	62
I-MT-097-002 Moment of delivery	62
I-MT-097-003 Preparation of delivery dossier	63
L-MT-097-004 Preparation of opleverdossier	63
I-MT-097-005 Preparation of information file	65
I-MT-097-006 Preparation of commissioning file	65
L-MT-098-001 General Training Requirements	66
L-MT-098-002 General requirements Training plan	67
L-MT-098-003 Maintenance Technician Training Requirements (MBO level)	68
L-MT-098-004 Requirements for training of control engineers (MBO-level)	68
L-MT-098-005 Requirements Training Installation Manager and (Maintenance) Engineers (HBO-level)	68
L-MT-098-006 Settlement of initial training costs	68
L-MT-098-007 Availability and settlement of costs of additional training	68
L-MT-099-001 Risk management	69
L-MT-099-002 Identify and analyse risks	69
L-MT-099-003 Identify and analyse risks	70
L-MT-099-004 Determination, implementation and evaluation of management measures	70
L-MT-099-005 Establishing and maintaining a risk register; Quantifying risks	71
L-MT-099-100 Purchasing	72
L-MT-099-101 Purchasing	72
L-MT-099-102 Subcontractors, self-employed persons and integrity requirements	72
L-MT-099-103 Subcontractors, self-employed persons and integrity requirements	72
L-MT-099-104 Subcontractors, self-employed persons and integrity requirements	72
L-MT-099-105 Subcontractors, independent contractors and integrity requirements	73
L-MT-099-200 Payment schedule delivery 1 installation	73
L-MT-099-201 Payment scheme for multiple installations	73
L-MT-099-202 Financial reporting by sub-projects	74
L-MT-099-203 Overall financial report all current sub-projects	74
L-MT-099-300 Configuratiecontrol	75
L-MT-099-301 Configuration management plan	75
L-MT-099-302 Securing baselines between project phases	75

L-MT-099-303 Change Management.....	75
L-MT-099-304 Wijzigingenregister.....	76
L-MT-099-400 Setting up, implementing and maintaining a quality management system	79
L-MT-099-401 Setting up, implementing and maintaining a quality management system	80
L-MT-099-402 Recording and resolving deviations, learning and improvement points	81
L-MT-099-403 Identifying and recording deviations, learnings and areas for improvement	81
L-MT-099-404 Cooperating with audits and tests of the Client	81
 L-MT-100-100 Set up, implement and maintain a residual points list	82
L-MT-100-101 Plan of approach and schedule for recovery of residual items	83
 L-MT-101-100 Set up, implement and maintain a Guarantees Issue List.....	84
L-MT-101 Plan of approach and plan of repair Guarantee points	84
 L-MT-102-100 Special tools, safety and operating equipment	91
L-MT-102-101 ICT auxiliary and operating equipment	92
L-MT-102-102 Drawing up a list of (critical) spare parts	92
L-MT-102-103 Logistic requirements	92
 L-MT-103-100 Drawing up the object list	86
L-MT-103-101 Statement of technical service life of traction power supply system.....	86
L-MT-103-102 Provision of knowledge and capacity for determining and organising risk-controlled maintenance of traction power plant	86
L-MT-103-103 Co-establishment of risk acceptance limits for the maintenance of traction power supply components ..	86
L-MT-103-104 Helping to carry out physical and functional decomposition for the maintenance of traction power supply components.....	87
L-MT-103-105 Contributing to the risk assessment for the maintenance of traction power components.....	87
L-MT-103-106 Co-formulation of maintenance concept for traction power components	88
L-MT-103-107 Co-preparation of risk-based maintenance and conservation plan	89
L-MT-103-108 Drawing up LCC calculation for traction power plant	89
L-MT-103-109 Requirements for availability of support from the Contractor in the event of disruptions	89
L-MT-103-110 Requirements for availability of support from the Contractor in the event of disruptions	90
L-MT-103-111 Requirements for response times for availability of support from the Contractor in the event of disruptions	90