VOLUME 3

Technical Specifications

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Technical Specifications

Section 1
General Technical Requirements

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ABBREVIATIONS AND ACRONYMS

ac	alternating current
BS	British Standard
CNP	Cutting Neutral Post
dc	direct current
DIS	Draft International Standard
EIA	Environmental Impact Assessment
ER	Employer Requirement
ETS	Electric Traction Substation
EU	European Union
GIS	Gas Insulated Switchgear
HV	High Voltage
Hz	Hertz (unit of frequency)
IEC	International Electrotechnical Commission
IPA	Instrument for Pre-Accession Assistance
ISO	Standards referred to have been issued by the International Standards Organization
IT	type of network, electrical distribution system which has no connection to earth at all
km	kilometre (unit of length)
$km.h^{-1}$	kilometres per hour (unit of Speed)
kV	kilo Volt (unit of Electrical voltage)
kWh	kilo Watt hour (unit of Energy)
LV	Low Voltage
mm	millimetre (unit of Length)
MVA	Megavolt ampere (unit of Measure of Apparent power)
MWh	Megawatt hour (unit of Energy)
OCL	Overhead Contact Line
PCB	Polychlorinated Biphenyls
PDF	Portable Document Format
PEN	Protective earth neutral, conductor with function of protective earth and neutral conductor
RCT	Remote Control Terminal
RIoM	Railways Infrastructure of Montenegro
RwSt	Railway Station
SCADA	Supervisory Control and Data Acquisition
SCS	Station Control System
SF6	Sulphur hexafluoride
t	tonne (unit of Mass)
TN-C	type of network, a combined PEN conductor which fulfills the functions of both a PE and an N conductor
TNS-C-S	type of network, a part of the system which uses a combined PEN conductor, which is at some point split up into separate PE and N lines
TR	Technical Requirements

1. IDENTIFICATION DATA CHARACTERIZING CONSTRUCTION

1.1 PROJECT NAME

New Electric Traction Substation Trebešica – Railway Infrastructure of Montenegro (RIoM) (Design, Construction, Delivery and Installation of the Complete Equipment and Commissioning).

1.2 LOCATION

Around 36 km from Podgorica / Montenegro, on the railway corridor Bar – Vrbnica - Belgrade, within railway station Trebešica.

2. GENERAL INFORMATION

2.1 INTRODUCTION

The railway network of Montenegro includes 250 km of open track or 330 km including station tracks. All tracks are single. Almost 2/3 length of the railway line Vrbnica - Bar are consisting of structures. Similarly to the road sector, construction and maintenance costs are among the highest in Europe. The highest frequency of traffic, both freight and passenger is on the railway line Bar - Vrbnica, connected to Belgrade.

Density of the railway network in Montenegro is lower than in other similar EU member states and candidate countries. The railway is not a double track and the average speed is 55 km/h, which limits the competitive advantage that this kind of transport mode has. The railway line Vrbnica - Bar is electrified along the entire length.

The European Union (EU) through the EU Delegation to Montenegro with the Funds for Pre Accession Assistance (IPA) provides financial support to the Railways Infrastructure of Montenegro (RIoM) in its efforts to improve railway infrastructure.

2.2 OBJECTIVE

The objective of this project is the reconstruction of the Electrical Traction Substation (ETS) Trebešica which is located at km 75+415 of the railway line (Belgrade) – Bijelo Polje - Podgorica in the railway station (RwSt) Trebešica.

Reconstruction of the traction substation Trebešica will improve electricity supply and will eliminate possible outages at times of failure. The use of recent technologies will reduce negative environmental impacts of the substation technology. By increasing the installed capacity, the railway will become more attractive for operators and will open up opportunities for the future development of freight rail transport. By switching traffic to railway, the intensity of heavy freight transport on roads will decrease, decreasing at the same time the negative impact of the road transport on the environment and on public health and introducing the necessary prerequisites for improved railway safety.

The planned reconstruction of the electric traction substation Trebešica is in line with both the European and national transport policies as regards the modal shift to railway. The aim is separating the ever-growing traffic density from economic growth, fighting the heterogeneous growth in the individual modes of transport and stabilising the share of environmentally friendly modes of transport in the overall volume of transport.

These activities make priorities of the following strategic development documents:

- Transport Development Strategy of Montenegro,
- The Network Statement 2013,
- Spatial Plan of Montenegro until 2020.

2.3 DESCRIPTION OF EXISTING SUBSTATION

The electric traction substation 110/25 kV Trebešica is a power supply transformer station supplying power to the electric traction system 25 kV, 50 Hz of railway line Belgrade - Bar. In normal operating condition, this electric traction substation supplies the side line with energy:

- cutting neutral post (CNP)
- Bratonožići, CNP Kolašin.

If necessary, power can be supplied to extended power lines.

The existing ETS Trebešica is located at km 75+415 of the railway line Belgrade – Bar within railway station (RwSt) Trebešica. ETS Trebešica is connected to the existing 110 kV feeder Podgorica - Berane. The distribution facility 110 kV was built in an open area, while the distribution facility 25 kV is located inside a building.

The 110 kV equipment of the distribution plant is for outdoor installation and includes:

- single three phase 110 kV busbars,
- two three-phase feeder fields,
- two traction transformer fields with single phase regulation transformers and associated elements of the field,
- cross connection between the transformer fields, measuring field in two phases on the side of the busbar,

The 25 kV equipment is installed indoor and comprises of:

- the 25 kV distribution device. The 25 kV distribution device is a cell (module) with inlets, pigtails, service consumption field and cross-couplings. Connection between the 25 kV secondary side of the transformer and the 25 kV distribution building is by an overhead line,
- control devices in the substation, which are central remote, local remote and operated at the spot. Command protective managing voltage is 110 V dc. All devices are managed by the staff of the RIoM. The substation with its current infrastructure has been in continuous operation for 35 years. Due to technical obsolescence, it is necessary to build a substation technically and conceptually new, with modern technical equipment,
- Currently, signal and data are transferred from ETS Trebešica to dispatcher centre in Podgorica through metallic transmission media, which is a trunk cable. A 72-fibre optic cable is laid in parallel with the metallic trunk cable. Signals are transmitted from the existing ETS without any transmission system along a metallic line. The existing ETS is not equipped with a fire detection, fire alarm system, and camera system.

2.4 SUMMARY OF CONTRACT AND WORKS

The planned reconstruction of 110/25 kV ETS Trebešica will include dismantling of all existing electrical apparatus and civil structures and complete installation of new civil structures and 110 kV, 25 kV electrical elements and equipment.

The construction works of the ETS Trebešica shall comprise:

- dismantling of existing equipment and demolishing of existing structures,

- new retention wall,
- rehabilitation of the storm water sewerage system,
- new substation building,
- 110 kV/27 kV traction transformers with new transformer outpost,
- 25 kV switchgear located inside the building,
- 25 kV feeder and associated return conductor and bonding cables from the 25 kV switchgear to the overhead contact line equipment and rails,
- wiring, testing and commissioning,
- SCADA system design installation and commissioning includes matching with the existing traction SCADA system.

2.5 TIME FOR COMPLETION OF THE WORKS

The time for the Completion of the Works is defined in Volume 1, Section 2 – Appendix to Tender.

3. SITE CONDITIONS

3.1 DESCRIPTION OF CLOSER LOCATION

The new electric traction substation Trebešica 110/25 kV is located 36 km from Podgorica, on the railway line Podgorica – Kolašin. The location foreseen for the construction of the new electric traction substation Trebešica is on a part of the area on which the existing substation is located. The property is owned by the Republic of Montenegro.

The new substation will be constructed on the same area where the existing old substation is located. In order to construct the new substation, the old one must be demolished. The existing area of Trebešica substation had been formed in a cut during the construction of the railway line Beograd – Bar. The purpose of the railway station Trebešica and the old substation is to supply the existing track with power. There are three station marshalling tracks on the area. The area is located 800 m above the sea level. It is approximately 500 m long and about 20 m wide. The area can be reached immediately after exiting the tunnel from Podgorica.

Access roads to the plateau are:

- the railway,
- a trafficable forest track (restricted use during winter and rainy days).

3.2 DESCRIPTION OF WIDER LOCATION

In broad terms, the area on which ETS Trebešica will be constructed is located in a mountain area, above the canyon of Morača River and between mountain massifs of Maganik on the west and Komovi on the east, with mountain peaks between 1100 m and 1400 m above sea level. On the east is Tara River and on the west is Morača River. Both rivers run through the canyons. In the vicinity of the site is small river Sjeverica, left tributary of the Morača River. Besides the picturesque railway Podgorica - Kolašin (part of main railway Belgrade - Bar) there are no other traffic routes.

Rather far away from the railway are the main road E-80 (E-65) Podgorica – Kolašin in western direction and the regional road Kolašin – Matesevo – Podgorica. Both roads are not connected to the area, where the ETS Trebešica substation is located.

3.3 CADASTRAL PARCELS PLAN

Volume 5 includes the cadastral plan showing the layout of the facilities.
For the construction of ETS Trebešica, it is not necessary to purchase additional land.

3.4 SIZE OF LAND OCCUPIED BY THE PROJECT

The construction ETS Trebešica will not cause topographic changes of the terrain. It will not significantly increase the size and intensity of land use, compared to the current situation. During construction, particularly excavation of foundation, temporary land degradation will occur. This will not permanently deteriorate the soil quality.

Under natural conditions, the terrain is without traces of instability. Performance of the intended works will not jeopardize the stability, but all requirements and geotechnical recommendations for the development and construction must be respected, with permanent geotechnical supervision and control during the construction works.

The total land area occupied by the new Project, i.e. ETS Trebešica is approximately 1065 m^2, which is approximately 160 m^2 larger than the area which is occupied by the old electric traction substation. Some bigger space will be needed during the construction of ETS Trebešica. The nearest track could be occupied in the length slightly more than the length of the location of ETS Trebešica. Upon the completion of construction and transition of ETS Trebešica to regular operation, this track will be set free for normal traffic. Another track which can be temporarily used during construction works is the adjacent dead-end track to a loading platform.

The future Contractor can also temporarily use areas shown in Volume 5, Drawings. The defined areas can be used for workshop facilities, office accommodations, material storage, etc. There are three areas defined in the drawing:

- 1. area close to the railway station building (the area is inclosed by the station building, a wall, and toilet building),
- 2. area close to the loading platform,
- 3. area close to the existing ETS.

3.4.1 Connection to Public Utilities

There is a possibility to connect to a water source and electricity on site for the future Contractor (area 1). For the use of water and electricity the Contractor will pay the same price as RIoM, based on real consumption (in kWh) or in accordance with valid act and prices of the provider. The Contractor shall provide own chemical toilets for workers during construction.

3.5 PEDOLOGICAL, GEOMORPHOLOGICAL, GEOLOGICAL AND HYDRO-GEOLOGICAL AND SEISMOLOGICAL CONDITIONS

3.5.1 Pedological Conditions

According to the rock samples from the uncovered rock wall directly from the premises of the proposed project, the construction of the geological sites involved rocks of Jurassic (lime stones and dolomites) and clay, silt sandstone of Middle Cretaceous (flesh). According to the documentation of uncovered limestone and dolomites, the rocks in the massif are set in the high weathering zone and in the low weathering zone.

3.5.2 Geomorphological and Geological Conditions

The site is located in the northern part of the territorial district of the capital city of Montenegro - Podgorica, near the border with the territorial district of Kolašin. The overall grade is part of the easternmost mountain range territory of Prekornica, defined by the Valley of the Morača River and Prekornica in the West and through the Valley of the River Tara in the East. The main factor forming

the current landscape is the erosion activity of both rivers and their tributaries, which has created deeply cut valleys and canyons with steep to vertical slopes. Another phenomenon creating the landscape in the affected territory was the erosion activity of glaciers during the last ice age on the continent, while at present it is also karstic erosion on the surface and underground karst formations of all types (karstic fields, caverns, caves, underground streams, etc.) affecting the rock complexes formed by carbonic rock (lime stone and dolomites), which are typical in this territory.

From the geological point of view the territory belongs to the northern part of what is called the high-karst zone (Sarajevska sigmoida) on the interface of the Prekornica massif (anticlinorium) and the massif of the Valley of the Morača (sinclinorium). The northern part of the Valley of the Morača is bounded by the Durmitor overlying rock.

The Prekornica massif is predominantly created by Triassic and Jurassic carbonates with the remains of Lower Cretaceous carbonates. Rocks are represented mainly by dolomites and lime stones. The

Valley of the Morača massif is formed by rocks of Middle Cretaceous formation with clay and silt sandstone, which is transgressively laid on the Jurassic carbonates.

The hydrogeological conditions are defined by geological and tectonic structures of the territory, where in the carbonic rock complex (The Prekornica massif) water-bearing of the rocks is prevailing with typical karst structures (caverns, karst groundwater flows) and with porosity. However the rock massif complex of the Morača Valley is made up of very heterogeneous environment, the most watered areas are those made of lime stones and sandstone formation with the crack-karst porosity, siltstone forming the throughput of impermeable environment. Ground water presence is unique only in the zone of weathering. The territory is drained by the River Morača in the West and by the River Tara in the East. Rivers Morača and Tara form the erosion basis of the two massifs and define the direction of the groundwater flow.

3.5.3 Engineering geology ratios of interest sites and geodynamic phenomena

The engineering geology conditions of the territory can be characterized on the basis of information from the site inspections carried out by the study specialists. The current ETS as well as the stretch of railway line is located in the right side of the rocky notch of the eastern slopes, where the rocky notch is protected by gravitational concrete walls. The left side of the railway leads in a low embankment, which - at the proposed site of the substation where the embankment is higher because of a terrain hollow - is protected by concrete walls.

Based on the general data the site is likely to be situated in the Morača Valley massif territory. According to the rock samples from the uncovered rock wall directly from the premises of the proposed project, the construction of the geological sites involved rocks of Jurassic (lime stones and dolomites) and clay, silt sandstone of Middle Cretaceous (flesh).

Jurassic lime stones are dark grey, dolomites are grey white, rocks are massive, and their nature is obvious from the large rock wall near railway station (RwSt) Trebešica.

The rock wall was probably created as a rock cut for the railway station platform, while in the upper positions in the zone of weathering rocks, or in the place of occurrence of stony debris, the cut is secured by concrete walls (concrete seal) and concrete ribs. According to the documentation of uncovered limestone and dolomites, the rocks in the massif are set in the high weathering zone and in the low weathering zone.

The rocks in the high weathering area are affected in particular by the influence of tectonic factors (cracks) and subsequently by climatic factors (water, frost cycles). The rocks have a character of solid blocks alternating with breaking rock character of broken stones. According to the classification (Euro codes) this is a heavily weathered rock rocks (weathering grade 3-4) with low strength (R4), in the places of intensive breaking up rocks with a very low strength (R5).

The rocks in the zone of low weathering are compact, broken only by irregular cracks, forming a hard block of rock massif. According to the classification (Eurocodes), the lime stones and dolomites in the zone can be characterized as weakly weathered rock (degree of weathering 1) with medium to high

strength (R2-R3).

The RwSt Trebešica platform is located in a relatively narrow erosive valley along the creek, which is recessing to the lime stone massif. The creek passes under the railway through a culvert and continues in its natural valley. The valley is parallel with the railway and it is assumed that the valley probably also is a lithological interface.

The massive Jurassic lime stones and dolomites in the right side of rock cut - in direction of the current RwSt - dribbles out and switches to lower Cretaceous rocks which are represented by clay, silt sandstone (flesh), which is likely to continue the railway line up to a short tunnel under the current substation.

The flesh course forms irregular positions of grey clay stone with a slip layer, dark grey slate siltstone with a thickness of layers up to 1 cm and a brown bench fine grain sandstone formation. As with the lime stones and dolomites we assume that in the flesh massif the rocks are in the zone of high weathering (grade 3-5), where they have a character of rocks with very low to extremely low strength (R5-R6), while parts of the earthy debris may be present locally, and low weathering zone (grade 1-2), where the rocks have mostly the nature of the rocks with low strength (R4) with a local occurrence of more solid blocks of rock with medium strength (R3).

As a comprehensive rock wall flesh formation has not been documented on the site and the formation is covered up with slope sediments, or the cut is supported by a concrete wall, the occurrence of flesh massif is assumed on the basis of flesh debris presence in the slope above the concrete walls. According to the nature of the territory (fairly steep slopes above the concrete walls with no signs of instability), we assume a favourable orientation of the flesh formation in the slope.

The quaternary cover of rocks is formed mainly by diluvia sediments made of detritus.

On the limestone base, the detritus is mainly stony with variable-size debris fragments from small-grained up to boulder debris. Their thickness is not significant, as the terrain is relatively steep. By Eurocodes, stony debris can be classified as gravelly soil (GP, G-F).

On the flesh base we assume that presence of mostly stony debris with a significant incidence of earthy-debris can be expected in the area of the shallow rough depression, in which the current substation is situated. By Eurocode, the earthy-stony debris can be classified as fine grain to gravelly soil (CG, GC).

In the valley of a creek, where the flow is of clearly erosive character, we do not see any occurrence of fluvial sediments.

A part of the embankments of the railroad is made up of anthropogenic sediments represented by earthy-stony debris, which is probably a mixture of rocks extracted from the railway cut and from the tunnels

The current geodynamic phenomenon in the territory is mainly erosion and weathering, karst corrosion, the creep of debris and seismic disturbance.

Erosion is bound to a local surface creek, which ensures mainly deep erosion, as well as lateral erosion of the slopes, which is obvious from the nature of the valley, which is fairly deep cut into the rock massif.

Clay stone, siltstone and sandstones have the tendency to weathering more than lime stones and dolomites, assuming that the zone of flesh formation weathering is thicker than the carbonic one. Weathering is conditional on climate, rainfall ratio and freezing cycles. By lime stones we can also expect significant karst corrosion, with typical karst phenomena.

Any significant slope deformations are not present in the territory, but we do not exclude that the depression in which the current substation is situated, is a relic of fossil landslide slope sediments, while its likely break area is at the top of the slope. Landslides may have been bound to the tectonic zone with more significant broken rocks. Accumulation of landslide materials was taken away probably by the surface creek. The current presence of instability of the territory can be characterized only in the form of a slow creep of debris with a shallow flat shear at the interface with the subsoil, which is primarily seen on vegetation damage (bent and uprooted trees).

3.5.4 Hydrogeological Conditions

Hydrogeological conditions of the site are a reflection of the geological structure of the territory. The part of the territory formed by lime stones and dolomites forms the hydrogeological collector with good conditions for the circulation and accumulation of groundwater. The part of the territory formed by flesh rocks forms the hydrogeological insulator (low permeable to impermeable environment).

Accumulation and circulation of groundwater in lime stone and dolomites is in predominantly cracks-karst regime, while the amount of accumulated water is dependent only on rain and snow. Due to the landscape of the territory and hydro-geological characteristics of the massif the rapid drainage of groundwater into the level erosive base occurs frequently. The erosive base is made up by the Morača River in the West and the Tara River in the East. Accumulated groundwater stocks at their low replenishment especially in the summer are rapidly losing due to the nature of karst environment.

In an environment of flesh, due to their hydro-geological characteristics, the rainfall infiltration into the massif is not present. The vast majority from precipitation due to landscape conditions run-off into the river network. In the area there is a nameless tributary creek of Sjeverice river. Non-significant part of precipitation, however, infiltrates into the environment, where it is accumulated only in the subsurface zone (in the debris or in the zone of weathering), but also with regard to relief, rather quickly drains into the valley, where it is drained by a surface flow.

3.5.4.1 Description of the current situation

The existing traction power station and the adjacent section of the railway track, with the nearby Trebešica railway station, are located in a cutaway from the mountainside, fortified with gravitational retaining walls made of concrete. The retaining walls are lined with a drainage channel, collecting water from the retaining wall drainage as well as precipitation runoff from the mountainside. A concrete chute is used to drain runoff water from the vicinity of the traction power station into the drainage channel. Both the concrete channel and the chute are in the state of disrepair, with considerable amount of deposits in some places. The locally damaged and clogged channel could cause problems during torrential and/or lasting rainfall, while flooding of the traction substation with surface runoff.

The left side of the railway track bed is positioned on a small embankment. The embankments near the traction substation were made higher, due to a depression in the terrain, and supported by a

gravitational retaining wall.

The platform of the Trebešica railway station and the traction power station are located in a narrow erosion vale, cut by an unnamed stream (sometimes referred to as the Trebešica Brook). The brook passes underneath the track bed through a culvert near the railway station and continues through its natural bed approximately parallel to the rail track. The brook receives all drainage water from the abovementioned concrete channel running alongside the retaining walls, drains water from a relatively long section along the rail track, including the existing traction substation and a part of the adjacent mountainside.

3.5.5 Seismological Conditions

According to the regional classification, the territory of the site belongs to an area with abundance seismic shocks of magnitude 5,6° (Richter scale).

3.6 WATER SUPPLY SOURCES

In the immediate vicinity of the location (ETS), there is no water source. Hydrogeological and hydrological characteristics of the surrounding areas are described above.

Surface water courses are fairly far away. On the East, there is Tara River, and on the West, there is Morača River. Both rivers run in canyons. In the vicinity of the site, there is a small river Sjeverica, a left tributary of the Morača River.

RwSt Trebešica is supplied with drinking and sanitation water from a local well in the vicinity. This source will be used for potable and sanitation water supply in periods of construction and operation of ETS Trebešica.

3.7 HYDRO-METEOROLOGICAL AND CLIMATE CONDITIONS

The climate in Montenegro is primarily influenced by the Adriatic Sea and the mountain ranges. The local climate reflects the elevation, with several climatic zones present in relatively small territory: from Mediterranean to Alpine. The time of sunshine increases with proximity to the seashore. Precipitation is irregular across the country, with the highest precipitation rates in the mountain areas close to the seashore, gradually decreasing away from the shore, especially to the north and northeast.

The data on climate, precipitation, the quantity and quality of water in the country's watercourses is collected by the Hydro-meteorological Institute of Montenegro, operating nine regional offices across the country.

The station closest to the traction substation is located in the town of Kolašin. The inland climate is of mild continental character, with average temperatures of -3 °C in January, and 18 °C in July. The distribution of some meteorological conditions during the year is indicated in the following figure.

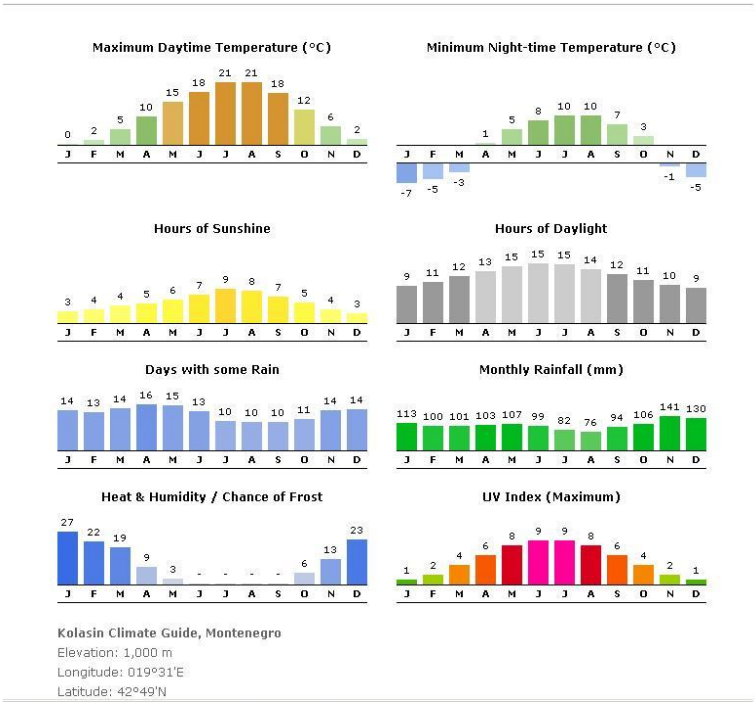

Figure 1 Distribution of some meteorological conditions throughout the year in Kolašin

3.8 FLORA AND FAUNA, PROTECTED NATURAL RESOURCES, RARE AND ENDANGERED PLANT AND ANIMAL SPECIES AND THEIR HABITATS

A location concerned is a small part of a plateau with railway station Trebešica and three marshalling tracks. On this small part of the plateau, as well as throughout the plateau, there are no conditions for the growth of any flora and fauna species. Once (during the construction of the Belgrade - Bar railway), terrain has been cleared, and plateau is formed from cuttings and embankments.

There are no protected rare and endangered plant and animal species and their habitats there.

There are no protected natural resources in the vicinity of the location. Canyons of Tara and Morača rivers are to the West and East relatively far away. The project has no influence on them.

3.9 LANDSCAPE

The basic features of the landscape are limited by appearance of the plateau where the marshalling tracks are, while the main feature of the surroundings is mountain environment and abundance of low and high vegetation.

3.10 PROTECTED FACILITIES AND ASSETS OF CULTURAL AND HISTORICAL HERITAGE

At this location and in the wider surroundings, there are no protected facilities and assets of cultural and historical heritage, or other protected areas, areas envisaged for scientific research, archaeological sites, particularly sensitive areas, and special purpose areas or similar.

3.11 POPULATION DENSITY, CONCENTRATION AND DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION

In the area and in the wider surroundings, there are no settlements, so that data on population,

population density and demographic characteristics of the planned Project does not exist, and has no significance.

3.12 EXISTING ECONOMIC AND RESIDENTIAL BUILDINGS AND INFRASTRUCTURE FACILITIES

In the relevant area and in the wider region too, there are no commercial and residential buildings, nor infrastructure facilities, except the railway and high-voltage transmission lines (110 kV), so that the data on mutual influence of the planned project have no significance.

4. PREPARATORY WORKS AND DESIGN INPUT DATA

4.1 SITUATION PLANS

In Volume 5 - Drawing No. 1 (Situation of broader relationships and Situation of railway station Trebešica) the proposed location for the new ETS is shown.

Furthermore, the drawings show access routes and the main high voltage feeder line.

4.2 TOPOGRAPHICAL SURVEY

A topographical survey of the ETS area was made in December 2012 during preparation of the Conceptual Design and the Feasibility Study. The results of the survey were incorporated into the drawings. As a basis for measuring, the points P177 and P178 were taken from the existing polygon network, whose coordinates were provided by the Beneficiary. The survey was made in the State system of coordinates - Gauss Kruger projection 6. Zone.

Nevertheless, the future Contractor will be obliged to carry out his own topographical survey, which will be the basis of his detail design.

4.3 GEOTECHNICAL SURVEY

A geotechnical survey has not been carried out during preparation of Conceptual Design and Feasibility Study.

Nevertheless, the future Contractor will be obliged to carry out his own geotechnical and hydro geological surveys, which will be the basis of his detail design.

5. SCOPE OF WORK

The scope of work covered by this Contract shall comprise the following:

- site installation; setting up of Contractor's site facilities, temporary fencing, etc., maintenance during Contract period and removal of site facilities at end of the Contract, etc.,
- detailed design documents, drawings including schematic and wiring diagrams for preparation of civil, electrical and mechanical detailed designs, erection/installation drawings, instruction drawings, operation & maintenance manuals, tests programme and tests reports, programme, time schedules and reporting,etc.,
- manufacturing,
- packaging and marking for transport, shipment and transport, loading and unloading,
- temporary storage (on site),
- all the tests of raw materials and parts for installation,
- tests in accordance with Volume 3, Section 4 - Testing, Operation, Maintenance and Training Requirements, which specify workshop tests,
- tests on completion consist of type tests, routine tests and special tests, defects remediation.

In addition, the Contractor shall furnish the goods as listed below:

- mandatory spare parts and tools,
- recommended spare parts, subject to agreement with the Employer as detailed in Volume 4,
- special equipment and tools needed for regular maintenance,
- complete steel structures, walkways, stairs, handrails and ladders required for erection and maintenance,
- all the necessary equipment and material for the completion of the Works and for the completeness and functioning of the Equipment covered by this Contract.

The scope of supply and limit of the Contractor's responsibility for the various components and systems is defined generally and shall be understood to include, even though not mentioned, all other necessary components and appurtenances obviously required for a proper and smooth operation of the Equipment.

6. GENERAL CONSTRUCTION AND DESIGN REQUIREMENTS

6.1 DESIGN CONDITIONS AND REQUIRED PERMIT APPLICATIONS

The Contractor will be responsible for preparing all required applications in order to receive all relevant local permissions for authorization, accreditation, construction, testing, commissioning and operation of the new ETS Trebešica. Furthermore, the Contractor will be responsible for preparing any additional studies, reports and design documents required for the permit application documents, plant implementation, commissioning, and operation.

Furthermore, applications for the locally relevant technical design conditions (covering all other utilities and services, right of way, etc.) need to be filed.

6.2 DOCUMENTATION

6.2.1 Required Documentation

The following clauses specify the information and documents required from the Contractor during the implementation of the Contract.

The Contractor shall submit to the Employer documentation as may be required herein or as requested in the Technical Specifications.

The quality of the submitted documents must be in accordance with acceptable international practice and allow a prompt checking procedure. Documents not fulfilling these requirements will be returned to the Contractor for improvement and resubmission. It is solely at the discretion of the Employer to decide whether or not documents are acceptable.

All dimensions marked in international systems of units in the drawings shall be considered correct although measurement by scale may differ therefrom. All drawings shall be black lines on white background, with all revisions clearly marked.

The documents shall be drawn up so as to contain all the necessary elements for issuing the notice of approval and for obtaining the building permit. The content and scope of the building permit must comply with the approved structure reflecting the practice of both the Employer and the Contractor. The content and scope of the detail design must comply with the Employer´s requirements and comprise, as a minimum:

- general specification indicating the kind, purpose and location of the Works, data identifying the Works owner, an assessment of the outcomes of surveys, a detailed description of the technical solution, data concerning utility services of the Works, energy consumption, safety provisions, fire security solution, labour safety, static calculations, an inventory of plant and equipment, a list of cable lines, determination of environment types,

- geotechnical and hydrological report, drawings made out in the applicable scales, a setting-out plan with an indication of the applied system of coordinates and vertical datum,
- drawings of excavations and foundations, shapes, reinforcement, layouts, sections and elevations,
- layout plans of cable routes, cable channels, lateral and longitudinal sections, drawings of junctions and crossovers, housings and structures,
- layout diagrams, diagrams of distributions, controls, couplings, locking, detailed installation diagrams, drawings of earthing system, calculation of protections settings.

6.2.2 Mistakes in Drawings and Information

The Contractor shall be responsible for any discrepancies, errors or omissions in the drawings and other particulars supplied by him, whether such drawings and particulars have been approved by the Employer or not. The Contractor shall be responsible for checking and verifying of all drawings and information supplied in prints to the Employer and for assessing the details of special works specified by either of them.

6.2.3 Outline Drawings

The Contractor shall submit to the Employer for review and approval:

- outline drawings of the equipment to be furnished under this Contract together with estimated weights, anchoring details, and sufficient overall dimensions, to facilitate preparation of final designs of the structures into which the equipment is to be incorporated.

6.2.4 Wiring Diagrams

The Contractor shall prepare and submit to the Employer:

- complete full-line wiring diagrams and connection diagrams covering all equipment furnished. The drawings shall show the external connections of all the instruments and control switches and also internal connection diagrams for all instruments, relays and other devices. The diagrams shall show all device identifications, terminal numbers, wire numbers and colour coding.

6.2.5 Detail Drawings

Before proceeding with manufacture of the equipment, the Contractor shall submit to the Employer for approval:

- general assembly drawings, sufficient sub-assembly drawings, and details to demonstrate fully that all parts will conform the provision and intent of the Contract Documents and the requirements of their installation, operation and maintenance,
- these drawings shall show all necessary dimensions and sub-assemblies in which the Contractor proposes the equipment schematics, connection wiring diagrams; the terminal boxes and cross sections of wires for electrical circuits.

6.2.6 Calculations/Design Criteria

Likewise, in addition to the drawings or whenever the contractual documents may so require, the Contractor shall submit to the Employer for checking and approval:

- the appropriate calculations for determining the main sizes, dimensions and operational characteristics, clearly indicating the principles on which the calculations were based.

6.2.7 Erection and Commissioning Instructions

The Contractor shall submit to the Employer for approval:

- All information necessary to permit a satisfactory erection, assembly and commissioning of the equipment.
- The instructions and drawings shall include information on handling and slinging the major pieces of equipment, erection, tolerances and special precautions to be taken in installation.

6.2.8 Operation and Maintenance Instruction Manuals

Two (2) months prior to the issue of the Taking over Certificate, the Contractor shall forward to the Employer for his approval a copy of Operation and Maintenance Instruction Manuals.

The Operation and Maintenance Instruction Manuals shall be in English and Montenegrin Languages. After checking and approval by the Employer, the Contractor has to provide four (4) copies of the Operation and Maintenance Instruction Manuals.

The Instruction manual's contents shall conform to the table of contents and be as complete and specific as possible. The documentation shall be specific to the materials and equipment supplied under the Contract. The nomenclature or references to any one item shall be consistent throughout the manual.

The instructions for operation shall be accurate and easy to understand and shall contain the sequence of individual manipulations required for operation. The information shall be prepared in such a manner that the content can be also used for instructing untrained personnel in the operation of the control system and its components.

The maintenance manuals shall contain a complete and accurate description of the equipment, its assembly and dismantling as well as of all components, and a copy of the relevant test reports. An accurate list stating clearances, tolerances, temperatures, fits etc., is required.

One section shall be concerned with regular and preventive maintenance and shall indicate the inspections required at regular intervals, the inspection procedure, the routine for equipment calibration and adjustment, regular safety checks and similar steps.

The Contractor shall provide copy of this documentation on storage media (e.g. a CD, DVD, flash drive etc.). The final version of Operation and Maintenance Instruction Manuals shall also be prepared in the PDF format.

6.2.9 As-Built Documentation

After the completion of work on Site, all documentation shall be revised where necessary to show the equipment as installed and two (2) copies of revised drawings shall be submitted for approval.

A complete set of approved records shall be provided comprising two full size prints. Record drawings shall be endorsed "As-Built" and shall be correctly titled and carry the Employer's approval number, Contractor's drawing number and where appropriate the Employer's number allocated to the item.

The Contractor shall use a commercially available PC compatible word processing and adequate graphic software to produce its as-built deliverable documentation. The Contractor shall provide copy of this documentation on storage media (e.g. a CD, DVD, flash drive etc.). The media copy shall be a copy containing only the final version of each document. The final version of As-Built Documentation shall also be prepared in the PDF format.

6.2.10 Photographs

From the beginning of site works, the Contractor shall keep on Site photographs of the works, from positions to be selected by the Employer, at monthly intervals.

The Contractor shall provide additional photographs of the Contract Works to record or illustrate specific events at the request of the Employer.

6.3 GENERAL DESIGN REQUIREMENTS

6.3.1 Design Regulations

The design shall be in accordance with the specifications included in this Volume and shall comply with all relevant EU standards (Eurocode, EN standards) and other relevant documentation forming part of the Tender and of the subsequent Contract. A list of the most relevant standards is provided in Annex 1. A list of the most relevant laws is provided in Annex 2.

The design requirements refer to the construction of a new ETS Trebešica with installed power of 2x 10 MVA. The general objectives of the project include:

- dismantling of existing equipment and demolishing of existing structures,
- new retention wall,
- rehabilitation of the stormwater sewerage system,
- new substation building,
- 110 kV/27 kV traction transformers with a new transformer outpost,
- 25 kV switchgear located in the building,
- 25 kV feeder and associated return conductor and bonding cables from the 25 kV switchgear to the overhead contact line equipment and rails,
- wiring, testing and commissioning,
- SCADA system design installation and commissioning plus matching with the existing traction SCADA system.

The specific requirements of the project include:

- locate the new ETS in the existing place,
- with regard to the climate of the building site and in order to minimise negative environmental impacts, accommodate the traction transformers under the roof,
- due to climate conditions, design the traction substation building in a standard version (no reinforced concrete containers),
- prepare rooms for occasional stays of attendants in the traction substation building,
- provide for power supply in case of failure by an alternative automatic start-up source (Diesel generator) and low voltage feeder cable,
- data transmission over fibre-optic cable, building of a telecom system, electric fire signalling, intrusion alarm system,
- connect the new ETS to the prepared control system introduced during the reconstruction of ETS Podgorica.

As a minimum, EU harmonized standards and codes shall always be satisfied, if applicable. Other internationally acknowledged standards and codes may be used if:

- the use of other official standards that provide equal or better quality than the standards and codes specified in the Tender Dossier can be accepted after the preliminary review by the Engineer and his written approval,
- applicable local standards and codes exist for the specific case (i.e. earthquake regulations).

In this case, the Contractor shall submit all necessary information in compliance with the Employer's instructions. The Employer shall issue his decision within 28 days of the receipt of that information. If the Employer decides that the standards and codes proposed by the Contractor do not guarantee equivalent or better quality, the Contractor shall be obliged to apply the standards and codes specified in the Tender Dossier.

A standard of operator comfort according to the actual "state of the art" level, shall be provided for good access, separate storage facilities for chemicals, adequate ventilation and lighting of all operating areas, machinery guards, proper electrical insulation facilities, noise suppression and insulation, suppression of vibrations, stairs, handrails, covers, etc.

6.3.2 Design Life

Civil, structural and building works shall be designed on the basis of a 50-year service life. Electrical equipment shall be suitable for 24/7 operation, as well as for all local climate conditions and be designed so that complete replacement shall not be necessary until at least 30 years after the date stated in the Taking Over Certificate.

Description/Subject	Design Life [Years]
New concrete structures (retaining walls)	50
Buildings	50
Steel & metal engineering constructions	50
Cables & accessories	30
New electric equipment	30
Process control & SCADA Equipment	30
Cesspool, rainwater accumulation tank	25

Table 1: Design Life Parameters

The design of facilities shall be in accordance with best recent European practice and applicable local design standards, and shall be so as to facilitate construction, operation, inspection and maintenance of all processes and equipment. All mechanical and electric equipment to be supplied shall, wherever possible, have a proven reliability record in similar works.

6.3.3 Defect Liability for Materials Incorporated in the Works

The Design Life specified for the Plant, a defect liability made out on behalf of the Beneficiary shall be provided by manufacturers of the materials listed below. The defect liability shall include appropriate dimensioning of components, correct choice of materials (including auxiliary materials like ancillary materials of welding, rust preventing coats) and workmanlike installation for periods shown.

Description/Subject	Defect Liability Period [Years]
New concrete structures (retaining walls)	2
Buildings	2
Steel & metal engineering constructions	2
Cables & accessories	2
New electric equipment	2
Process control & SCADA equipment	2

Table 2: Defect Liability Periods

Over and above the design life specified for the Plant, a Defect Liability made out on behalf of the Beneficiary shall be provided by manufacturers of the technological equipment listed below. The Defect Liability shall include appropriate dimensioning of components, correct choice of materials (including auxiliary materials like ancillary materials of welding, rust preventing coats) and workmanlike installation for the periods shown.

Description/Subject	Warranty Period [Years]
110 kV Gas insulated switchgear	2
110 kV Air insulated switchgear	2
Traction transformers 110/27 kV	2
25 kV switchgear	2

Table 3: Defect Liability Periods for Main Technological Equipment

6.3.4 Spare Parts and Tools

Spare parts shall be defined as components or parts, either consumable or repairable, used to maintain or repair the equipment.
The Contractor shall list in detail the recommended spare parts and tools he considers necessary for safe and reliable operation and maintenance, together with their individual prices, in Volume 4, Section 5. The Employer reserves the option to order all or part thereof or supplementary spare parts. These prices shall be kept fixed any time before the expiration of the Defect Liability Period of the facility.
A complete set of tools including spanners and special tools, necessary for the servicing, maintenance and dismantling of the most critical parts of the ETS shall be handed over by the Contractor immediately before Taking-Over.

6.3.5 EIA Requirements

During construction of ETS Trebešica, the Contractor shall respect defined environmental and monitoring measures in order to minimize potential impact of an accident. From the standpoint of environmental impact, the construction and operation of the 110/25kV ETS Trebešica as an
important energy facility in the power network of the railways of the Republic of Montenegro, shall guarantee good quality of the environment and sustainable development.

At the location chosen for the construction, there are no threatened or endangered plants or animal species; there are no archaeological, cultural or protected values-resources. There will be no disruption of the climate or of the baseline environmental conditions.

In the case that PCB substances need to be stored as a hazard waste, it must be treated in line with the Directive 96/59/EC on the disposal of PCBs and PCTs.

7. TECHNICAL AND PARTICULAR REQUIREMENTS FOR THE NEW ETS

The following information specifies the outline design for the preferred technological solution.

7.1 TECHNOLOGICAL SOLUTION

This project provides a new facility with the same function as the old one, which will be built on the same site and occupy almost identical space.
The area for the new ETS Trebešica is already occupied, so a convenient connection of the existing transmission lines up to area is possible. The position of the new ETS Trebešica will be the same position as the old one, with small adaptations of the retaining wall.

The main technological parts of the new ETS:

- two input three poles gas insulated switchgear (GIS) 110 kV modules with cross connection,
- two output two poles air insulated 110 kV fields with additional cross connection,
- two single phase 110 kV/27 kV traction transformers with power 2x 10 MVA,
- 25 kV switchgear located in the substation building,
- auxiliary equipment for service consumption, protection and remote control.

The main construction parts of new ETS:

- retaining wall with a draining ditch,
- foundations for the 110 kV substation equipment,
- traction transformer outpost,
- substation building with a cesspool and a rainwater accumulation tank.

The design provided in this tender is proposal preliminary design. The dimensions, layout/positioning and markings of the structures shown in the drawings included in Volume 5 are indicative only. The design shall be in full compliance with Volume 3 - Employer's Requirements.

8. DESCRIPTION OF WORKS AND SUPPLIES

The existing traction substation site is located close to the track, in a slope cutting. The cutting walls are strengthened by reinforced concrete retaining walls; there is a draining ditch in the wall footing to carry away rainwater from the slope over the walls outside the substation site. The site of the traction substation is enclosed by a fence. The 110 kV substation is outdoor, air-insulated, the 110/27 kV transformers are not under roof but are exposed to atmospheric condensation.

The basic problem with siting the traction substation results from the lack of space. Another challenge is posed by the position of the 110 kV feeding line whose terminal poles are in the slope above the existing traction substation. A change in the substation siting may necessitate re-erection of the poles or even re-erection of additional neighbouring poles.

All works on ETS Trebešica will be conducted in accordance with the solutions elaborated in the detail electrical, architectural – civil, mechanical and other designs, in accordance state-of-the-art technologies. Construction phases of the ETS Trebešica:

- surveys - topographical and geotechnical,
- adaptation of the end part of 110 kV feeding line,
- dismantling of the existing equipment in the old substation,
- organized and safe removal of the dismantled equipment,
- demolition of existing structures and preparation of the terrain for the Project works,
- construction of a new retaining wall with draining ditches,
- construction of a new facility according to the main electrical, architectural – civil, mechanical and other designs,
- installation of new equipment,
- testing, commissioning and running in of the system,
- maintenance during DNP.

The design provided by the Tenderer for the new ETS Trebešica shall respect the following:

- preparation of the territory,
- construction of a new retaining wall with drainage ditches, including cleaning and rehabilitation of existing drainage ditches,
- a new 110 kV substation with two incoming three-pole GIS modules with a cross connection (air or gas-insulated), two outgoing two-pole air-insulated 110 kV feeder bays,
- to save room, the outgoing 110 kV feeder bays will be connected to traction transformers by single-conductor 110 kV cables. The cables will be terminated by cable heads and surge arresters mounted on steel supports,
- two single-phase 110 kV/27 kV traction transformers with power 2x 10 MVA will be situated at transformer outpost covered by a roof,
- 25 kV single-phase gas-insulated cabinet-enclosed indoor switchgear,
- digital protections and control system and remote control (SCADA),
- connection to the contact line,
- service consumption for feeding of the control circuitry and process protections of the R110 and R25 switchgears, interior wiring of the R25 switchgear and remote control, outdoor lighting of the traction substation site, communication and transmission systems of the ETS, fire detection and fire alarm systems, electronic security signalling, intrusion detection systems, an outdoor camera,
- alternative power supply (an automatic start-up diesel generator),
- outdoor lighting,
- protective and operating earthing,
- substation building with a cesspool and a rainwater accumulation tank,
- substation fence,
- transmission and telecom systems,
- fire detection and fire alarm systems, physical security and an outdoor camera.

9. WASTE AND TECHNICAL SOLUTIONS FOR ENVIRONMENTAL PROTECTION

The cost of generation, treatment and disposal of waste must be included in the Contract Price. The Agency for Environmental Protection keeps and updates the database on waste management in the information system of environmental protection, in accordance with the definition of the law governing environmental protection.

For the construction of ETS Trebešica, the materials shall neither contain hazardous materials, nor hazardous waste. Quantities of these materials will be defined by the main architectural and

structural, electrical, mechanical and other designs. The waste generated during construction will be mostly municipal waste and various non-hazardous construction wastes, both in relatively small quantities. But there is a real possibility of certain amount of waste contaminated by dangerous substances. This is primarily related to the presence of PCB oils in the soil.
Sorting and temporary storage of waste materials have to be in accordance with the law on waste management. All waste, generated during construction works, should be classified and transported to the location provided by a company responsible for temporary waste storage.
Material from the excavation shall be tested for the presence of certain pollutants (PCBs, heavy metals, etc.). Accredited laboratory needs to certify that the soil is not contaminated and can be used for backfilling of certain locations. All waste characterised as hazardous substance shall be stored separately up to its delivery to an authorized operator.
Soil under the existing transformers is contaminated with transformer oil. The Contractor shall analyse a soil sample and, if necessary, store the contaminated soil in a special waste storage. Material must be secured from leaking, falling or rollover during transport.

Testing, treatment and/or storage of the contaminated soil/hazardous material will be performed in line with the relevant Montenegro Laws and regulations. No contaminated soil and/or any other hazardous material will remain on the site at the date of issuance of the Taking-Over Certificate. All relevant cost is considered to be included in the Lump-Sum Contract Price. More information can be obtained from the Agency for Environmental Protection of Montenegro at the following web-link: http://www.epa.org.me/

10. INSTALLATION REQUIREMENTS

10.1 GENERAL

All work in connection with the assembly and installation of the supplied equipment, including all accessories according to the Contractor's approved drawings and written instruction manuals, shall be provided by the Contractor.

10.2 TRANSPORT AND HANDLING OF MATERIAL AT SITE, CRANE FACILITIES

The Contractor shall be responsible for unloading, safe keeping, handling and storage of all his equipment and supply at Site. The Contractor shall provide all necessary lifting and transport equipment for handling of all materials supplied to the site storage.

10.3 MEDICAL FACILITIES

Provision for the medical needs of all working personnel at Site, is the responsibility of the Contractor.

10.4 WORK SAFETY AND SECURITY AND ENVIRONMENTAL PROTECTION

Prior to commencement of works, the Contractor shall prepare and submit to the Engineer for approval a fully developed protocol for Work Safety and Environmental Protection, including mitigation measures during construction, operation and maintenance period.
None of the supplied equipment, parts or components may contain harmful or hazardous materials, including substances such as PCB, asbestos, etc.The Contractor shall take all measures to prevent water pollution by any fuel or oil or other hazardous or polluting substances. All staff and workmen of the Contractor shall be provided with safety helmets, gloves, safety boots, life jackets and other protective clothing and equipment, as may be required for the work.
The personnel shall be trained in the use of safety equipment and the Contractor shall ensure that such equipment is used in all situations that require it.
Warning signs and notices shall be provided by the Contractor for all equipment and areas where required by the Engineer for safety purposes and as required by the Safety Rules.

10.5 FIRE PROTECTION AND FIRE FIGHTING

The Contractor shall be responsible for the fire protection of his equipment and shall assist in the fire protection of the buildings, plant and equipment of the Employer / Engineer.

All apparatus, connections and cabling shall be designed and arranged so as to minimize the risk of fire and any damage which might be caused in the event of fire. When cabling is carried out as part of this Contract, the Contractor shall be responsible for sealing all holes in floors, walls, roofs etc. through which the cabling may pass.

The Contractor shall be responsible that attention is paid to all necessary precautions for the prevention of fire. Particularly the following precautions shall be warranted:

- no open fire within the site,
- flammable materials, if possible, shall be stored at places where the spread of fire is limited to a minimum. Non-flammable plastic foils shall be used,
- in cases where open flames are required by the kind of work (such as welding), all flammable material shall be removed from such working areas. If such removal is impossible, the working area shall be particularly protected by suitable firefighting equipment.

11. LABELS AND PLATES

Each apparatus shall be labelled indicating the purpose, service positions, and shall have classification numbers identical with those which shall appear in all drawings, lists and documents to be prepared by the Contractor. Engineer standard numbering scheme shall be strictly adhered to.

Each such piece of equipment shall be provided with nameplates, indicating the name of manufacturer, type, serial number, year of manufacture, main characteristics, and all further information that may be necessary for a precise identification of the equipment.

In addition, the Contractor shall supply all instruction and warning plates necessary for safe operation and personnel.

Labels and nameplates for plant and equipment identification and record purposes shall be made of stainless steel with a matt or satin finish to avoid dazzle from reflected light, and engraved with black lettering of a size which is legible from the working level.

Warning plates shall be made of stainless steel with a matt or satin finish, engraved with red lettering and sited in a position, which affords maximum personnel safety.

All equipment within panels and desks shall be individually identified by satin or matt finish stainless steel labels or laminated plastic labels where approved.

All labels, nameplates, instruction and warning plates shall be securely fixed to items of plant and equipment with stainless steel rivets, stainless steel self-tapping screws or other approved means. The use of adhesives will not be permitted.

A label on top of each board, on the front and also on the rear, if accessible, shall denominate its function. Further, labels next to each device mounted on the board shall identify such devices by means of a code number, and, if necessary, a proper name.

Each single piece of equipment mounted inside the boards shall bear a clearly visible identifying tag with an item number. No loose tags are acceptable.

Cable terminals shall be labelled equally and bear item numbers as well as an abbreviation of their destination. Plastic strips shall not be used.

Terminal blocks as well as all wires shall also be labelled with a code number and colour codes where applicable. IEC standard shall be followed.

All inscriptions shall be generally in Montenegrin language. Warning plates shall be in Montenegrin only. The size, content and lettering of labels and plates shall be subject to approval by the Employer.

12. INSPECTION AND TESTS

12.1 GENERAL

All materials and equipment used in the Contract Works are subject to inspection by the Engineer. Representatives of the Engineer shall witness the inspections as well as type test of all the equipment. The Contractor shall be responsible for all the costs of such visits by the Engineer's personnel. The Contractor shall bear all costs including but not be limited to, hotel expenses, local transport, and return economy class air fares from Podgorica to such locations where the inspection/tests are scheduled to take place.

The Contractor shall at his own cost and expense execute shop and site tests of all materials and equipment supplied by him or his sub-Contractor required in the Technical Specifications, in accordance with the provisions thereof and those of the applicable standards. This shall not prevent the Engineer's right to call for further tests, if he considers them necessary.

Where the methods of tests are not specified in standards or if there are options in the relevant standards, the Contractor shall submit to the Engineer for approval the methods by which he proposes to conduct the tests. The Contractor is responsible for advising when equipment and materials are available for inspection and tests.

All equipment and materials necessary for the execution of tests shall be furnished by the Contractor. Measuring apparatus and their calibration certificates shall be approved by the Engineer. The Contractor shall submit to the Engineer for approval the test results showing conditions of tests performed, the test circuits and oscillograms, etc.

In the event of test results are not satisfying the requirements of the Technical Specifications or guaranteed performance, the Contractor shall improve the Equipment until satisfactory results are obtained and shall conduct retests at his own expense. The retests may be witnessed by the Engineer.

Any delay in the delivery due to the retest shall not constitute a release of the Contractor from his responsibilities for delay. Any expenses incurred by the Engineer in attending the retest shall be borne by the Contractor.

No inspection or lack of inspection by the Engineer of work, plant or materials, whether carried out or supplied by the Contractor or Sub-Contractor, shall relieve from his liability to complete the Contract Facilities in accordance with the Contract or exonerate him from any of his guarantees.

Procedures for those tests which are beyond the service conditions specified in the relevant standard(s), shall be as laid down by the Engineer.

12.2 SHOP TESTS

The shop test shall be divided into type tests, sample tests, routine tests and special tests.
The tests generally described in the Technical Specifications as type tests, shall be carried out on one item of apparatus, etc., of each type and rating. If evidence is available of successfully carried out type tests on identical apparatus or apparatus which is for practical test purposes similar, in a recognized independent testing laboratory or independently witnessed, this may be accepted in lieu of these tests, if not otherwise specified in the Technical Specifications. The decision of the Engineer shall be final in that respect.
The type test documents must be submitted and evaluated in the Tender Document. Type test certificates shall not be older than five (5) years for electronic equipment and ten (10) years for other equipment.
The tests generally described as routine tests, shall be made on each piece of equipment to be supplied.
The tests generally described as special tests, shall be made as required by the Specifications.

The shop-assembled units shall be completely assembled, adjusted and tested at the shop. After their assembly the complete units shall, as far as possible, be tested for operation under design conditions to assure the proper functioning of the equipment.

12.3 TEST REPORTS AND PROGRAMMES

12.3.1 Test Reports

The results of all tests shall be recorded in test reports containing the data necessary to prove compliance with the Technical Specifications and with these General Technical Requirements. The results of all tests shall be recorded in an approved format. Test certificates shall show the actual results and conditions of the tests performed, the test circuits, oscillograms, etc.
All test certificates and reports shall be submitted to the Engineer in four (4) copies.

12.3.2 Test Program

The final test program will be set out by the Contractor and approved by the Engineer. Any tests to be performed during Commissioning are indicated in the Technical Specifications Volume 3, Section 4 - Testing, Operation, Maintenance and Training Requirements.

13. PROGRAMME, PROGRESS OF WORK AND REPORTING

13.1 PLANNING OF WORK

The Contractor shall seek information about and make due allowance in his programme for the situation in the plant area and in the country´s major centres during the periods of special public holidays.

13.2 MONTHLY PROGRESS REPORT

At monthly intervals on the 5th day of the following month during the contract at the latest, the Contractor shall submit two (2) copies of detailed progress reports.
The reports shall show clearly and accurately the position of all activities associated with design, material procurement, manufacture, shop tests, shipping, site erection, testing and commissioning with regard to the agreed contract Programme.
The design aspect of the progress report shall include a comprehensive statement on drawings, calculations, proposals and schemes submitted for approval up-dated in the above mentioned intervals. The up-dated drawings list will be included to show the latest situation concerning the submitted drawings and approvals.
The position on material procurement shall give the date and details of orders placed and indicate the delivery quoted by the manufacturer. If any delivery date has an adverse effect on the Contract Programme the Contractor shall state the remedial action taken to ensure that delays do not occur.
The position on manufacture shall indicate the arrival of material, the progress of manufacture and the date at which the equipment will be ready for transport. The information recorded shall also indicate all special occurrences (such as accidents, defects, etc.), which will affect the date of completion in the manufacturer's works.
The commencement of testing and commissioning, its duration details of any matters occurring during that period and the remedial action taken, the completion dates etc. shall be noted and separately for each group of the works.
All works tests executed shall be listed as well as the brief remarks on the test-results. Special indication shall be given to the equipment not having fulfilled the test-requirements. The workshop tests intended for the following month shall be indicated.
The shipping of each order to part order shall be monitored in the progress report giving the date by which the equipment will be available for shipping, the estimated time of arrival on Site and the actual arrival dates.

13.3 PROJECT MEETINGS AND MINUTES

Project meetings shall be held to review project status, to ensure fulfillment and correct interpretation of the Specifications, to review the design and to maintain the general coordination between the Engineer's and the Contractor's project personnel.
The meetings will be held at either the Engineer's location or the Contractor's premises, with approximately half being in each location. The Contractor shall prepare an agenda prior to each meeting for review and approval by the Engineer.
The Contractor shall keep minutes of each meeting and shall submit copies of these minutes within five working days after the meeting. Any disagreements about the minutes of a meeting shall be resolved prior to or at the subsequent meeting. Resolutions of the previous meeting shall be written in the subsequent meeting minutes and shall become the official minutes for the given meeting.

14. PROJECT IMPLEMENTATION

14.1 IMPLEMENTATION SCHEDULE

The Contractor shall prepare a detailed implementation schedule (detailed time programme, Contract Terms and Conditions, Sub-Clause 8.3). The Contractor shall consider also interruptions caused by winter. The phases stated below shall be broken down to the relevant Sub-tasks. At the beginning of each phase, the Contractor shall agree with the Engineer all essential steps of the forthcoming phase. An indicative time schedule is presented below.

Description/Subject	Duration in MONTHS (22)																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Start	X																					
Design phase																						
Design Review																						
Construction permit																						
Preparation of site facilities																						
Demolition works + retaining walls																						
Construction works																						
Installation of Transformers																						
Installation of Technology																						
Testing and Commissioning including Use permit																						
Start of Trial operation (DNP)																						X

Table 4: Implementation schedule

The duration of the Defects Notification Period is defined in the Contract

15. SUPERINTENDENCE

The carrying out of all works covered by this Contract shall be supervised by a sufficient number of qualified representatives of the Contractor, and full cooperation and assistance shall be afforded by the Contractor to the Engineer to check all Works at any request.

The Contractor's superintendents shall be responsible for the care and maintenance of the Contractor's equipment, for the adherence to all applicable safety standards and regulations.

16. FACILITIES FOR THE ENGINEER

The future Contractor shall provide an office on site for the Engineer. None of the mentioned furniture and office equipment shall be transferred to the Engineer after completion of the project. At the end of the Contract all shall be returned to the Contractor.

The Contractor shall design and erect at locations agreed with the Employer and the Engineer the following facilities for the use of the Employer and the Engineer:

Room	Size (appr.)	Furniture
1 Office	Approx. 15 m^2	3 desks, with a file drawer and drawers, all lockable, incl. keys 6 chair with rolling casters 1 file cabinet, steel, lockable incl. keys, 50 x 150 cm, 50 cm deep 1 bookshelf, 1 m x 2 m, 30 cm deep 1 coat rack 1 waste basket 1 AC heater/ air-conditioner
1 Kitchen - tea room	Approx. 3 m^2	1 cupboard 1 refrigerator, capacity ≥ 200 l 2 boilerplates 1 locker

Table 5: Facilities for the Engineer (permanent office at ETS Trebešica construction site)

External doors shall be fitted with a secure lock for which a minimum of four keys shall be provided. All windows shall have anti-mosquito nets and venetian blinds. Lighting shall be of the fluorescent strip type. The office shall have at least four grounded electrical sockets. Sufficient heating and cooling shall be provided.

The Contractor shall provide external lighting for the office and arrange for the collection and disposal of rubbish. The Contractor shall supply, install and maintain in the offices, equipment and furniture which shall be new, undamaged and complete with all necessary keys.

The Contractor shall supply, install and maintain furniture such as desks, cupboard, drawing tables and plan chests, stools and shelves, etc. in the numbers, trademarks and quality as approved by the Engineer.

The Contractor shall provide and maintain following working and office equipment, which will be returned to the Contractor at the end of the project:

1 No. 4 wd car >100 hp, 5 seats, AC, including fuel and maintenance,

2 No. desktop computers or notebooks; system specifications shall be in accordance with market availability at the time of delivery, fully equipped with licensed software for office work and viewing of technical drawings,

1 No. multifunctional colour laser/printer/scanner/fax-copy size A4 with scale up/down function, minimum 12 pages/min, automatic paper feeding,

1 No. document ring binding machine

ANNEXES

Annex 1: List of the Most Relevant Norms and Standards

All materials and equipment, construction details and structural computations must conform and be based on internationally accepted standards, latest edition.
Generally all internationally recognized norms and standards are accepted. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be accepted subject to the Engineer's prior review and written approval.

Nevertheless with respect to safety, health and working protection the related standards and laws which are directly linked to local legal provisions, the local law, or the relevant binding local standards and norms shall be applied.

The work must be performed according to the most recent relevant international codes, standards, accident prevention regulations and local rules and regulations.

The engineering documentation shall comply with ISO standards.
Used symbols on drawings etc. conforming to the following systems and standards (DIS = Draft International Standard).
Electrical:
International Electrotechnical Commission (IEC)
Instrument:
ISO 8545: Graphical symbols for automatic control

All materials and equipment supplied and all work carried out as well as calculation sheets, drawings, quality and class of goods, methods of inspection, specific design features of equipment and parts and acceptances of partial works shall comply in every respect with the technical codes of the International Organization for Standardization (ISO) and of the International Electrotechnical Commission (IEC).
Technical solution has to be prepared with following European standards and norms:

	Basis of structural design
EN 1990	Eurocode. Basis of structural design
	Actions on structures
EN 1991-1-1	Eurocode 1: Actions on structures. Part 1-1: General actions. Densities, self-weight, imposed loads for buildings
EN 1991-1-2	Eurocode 1: Actions on structures. Part 1-2: General actions. Actions on structures exposed to fire
EN 1991-1-3	Eurocode 1. Actions on structures. Part 1-3: General actions. Snow loads
EN 1991-1-4	Eurocode 1: Actions on structures. Part 1-4: General actions. Wind actions
EN 1991-1-5	Eurocode 1: Actions on structures. Part 1-5: General actions - Thermal actions
EN 1991-1-6	Eurocode 1:Actions on structures. Part 1-6:General actions. Actions during execution
EN 1991-1-7	Eurocode 1. Actions on structures. Part 1-7: General actions. Accidental actions

	Geo-technical Investigations
EN 1997-1	Eurocode 7: Geotechnical design. Part 1: General rules
EN 1997-2	Eurocode 7: Geotechnical design. Part 2: Ground investigation and testing
EN 996+A3	Piling equipment - Safety requirements
EN 12063	Execution of special geotechnical work. Sheet-pile walls
EN 12699	Execution of special geotechnical work. Displacement piles
EN 12715	Execution of special geotechnical work. Grouting
EN 12716	Execution of special geotechnical work. Jet grouting
EN 14199	Execution of special geotechnical works - Micropiles
EN 14475	Execution of special geotechnical works. Reinforced fill
EN 14490	Execution of special geotechnical works. Soil nailing
EN 14679	Execution of special geotechnical works - Deep mixing
EN 14731	Execution of special geotechnical works - Ground treatment by deep vibration
EN 1536	Execution of special geotechnical work. Bored piles
EN 1537	Execution of special geotechnical works. Ground anchors
EN 1538	Execution of special geotechnical work. Diaphragm walls
	Soil Investigations
ISO 15709	Soil quality - Soil water and the unsaturated zone - Definitions, symbols and theory
ISO 10381-2	Soil quality - Sampling - Part 2: Guidance on sampling techniques
ISO 10381-4	Soil quality - Sampling - Part 4: Guidance on the procedure for investigation of natural, near-natural and cultivated sites
ISO 22476-2	Geotechnical investigation and testing - Field testing - Part 2: Dynamic probing
ISO 22476-12	Geotechnical investigation and testing - Field testing - Part 12: Mechanical cone penetration test (CPTM)
ISO/TS 17892-1	Geotechnical investigation and testing - Laboratory testing of soil - Part 1: Determination of water content
ISO/TS 17892-2	Geotechnical investigation and testing - Laboratory testing of soil - Part 2: Determination of density of fine-grained soil
ISO/TS 17892-3	Geotechnical investigation and testing - Laboratory testing of soil - Part 3: Determination of particle density - Pycnometer method
ISO/TS 17892-7	Geotechnical investigation and testing - Laboratory testing of soil - Part 7: Unconfined compression test on fine-grained soils
ISO/TS 17892-8	Geotechnical investigation and testing - Laboratory testing of soil - Part 8: Unconsolidated undrained triaxial test
ISO/TS 17892-9	Geotechnical investigation and testing - Laboratory testing of soil - Part 9: Consolidated triaxial compression tests on water-saturated soils
ISO 11277	Soil quality - Determination of particle size distribution in mineral soil material - Method by sieving and sedimentation
	Concrete Works
EN 206-1	Concrete. Part 1: Specification, performance, production and conformity
EN 1992-1-1	Eurocode 2: Design of concrete structures. Part 1-1: General rules and rules for buildings

EN 1992-1-2	Eurocode 2: Design of concrete structures. Part 1-2: General rules. Structural fire design
EN 196-1	Methods of testing cement. Part 1: Determination of strength
EN 196-2	Methods of testing cement. Part 2: Chemical analysis of cement
EN 12350-1	Testing fresh concrete. Part 1: Sampling
EN 12350-2	Testing fresh concrete. Part 2: Slump-test
EN 12350-3	Testing fresh concrete. Part 3: Vebe test
EN 12350-4	Testing fresh concrete. Part 4: Degree of compactability
EN 12350-5	Testing fresh concrete. Part 5: Flow table test
EN 12350-6	Testing fresh concrete. Part 6: Density
EN 12350-7	Testing fresh concrete. Part 7: Air content. Pressure methods
EN 12350-8	Testing fresh concrete. Part 8: Self-compacting concrete. Slump-flow test
EN 12350-9	Testing fresh concrete. Part 9: Self-compacting concrete. V-funnel test
EN 12350-10	Testing fresh concrete. Part 10:Self-compacting concrete. L box test
EN 12350-11	Testing fresh concrete. Part 11:Self-compacting concrete. Sieve segregation test
EN 12350-12	Testing fresh concrete. Part 12:Self-compacting concrete. J-ring test
EN 12390-1	Testing hardened concrete. Part 1: Shape, dimensions and other requirements for specimens and moulds
EN 12390-2	Testing hardened concrete. Part 2:Making and curing specimens for strength tests
EN 12390-3	Testing hardened concrete. Part 3:Compressive strength of test specimens
EN 12390-4	Testing hardened concrete. Part 4: Compressive strength. Specification for testing machines
EN 12390-5	Testing hardened concrete. Part 5:Flexural strength of test specimens
EN 12390-6	Testing hardened concrete. Part 6:Tensile splitting strength of test specimens
EN 12390-7	Testing hardened concrete. Part 7:Density of hardened concrete
EN 1008	Mixing water concrete. Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industy, as mixing water for concrete

Concrete Repair

EN 1504-1	Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 1: Definitions
EN 1504-2	Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 2: Surface protection systems for concrete
EN 1504-3	Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 3: Structural and non-structural repair
EN 1504-5	Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 5: Concrete injection
EN 1504-6	Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 6: Anchoring of reinforcing steel bar

EN 1504-10	Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 10: Site application of products and systems and quality control of the works
EN 1799	Products and systems for the protection and repair of concrete structures. Test methods. Tests to measure the suitability of structural bonding agents for application to concrete surface
EN 12190	Products and systems for the protection and repair of concrete structures. Test methods. Determination of compressive strength of repair mortar

Steel Reinforcement

EN 10080	Steel for the reinforcement of concrete. Weldable reinforcing steel. General
EN ISO 15630-1	Steel for the reinforcement and prestressing of concrete. Test Methods. Part 1:Reinforcing bars, wire rod and wire (ISO 15630-1:2010)
EN 13369	Common rules for precast concrete products
EN 14991	Precast concrete products. Foundation elements
EN 14650	Precast concrete products - General rules for factory production control of metallic fibered concrete
EN ISO 15630-1	Steel for the reinforcement and prestressing of concrete. Test Methods. Part 1:Reinforcing bars, wire rod and wire (ISO 15630-1:2010)
EN ISO 15630-2	Steel for the reinforcement and prestressing of concrete. Test Methods. Part 2:Welded fabric (ISO 15630-2:2010)
EN ISO 15630-3	Steel for the reinforcement and prestressing of concrete. Test Methods. Part 3:Prestressing steel (ISO 15630-3:2010)
ISO 6934-1	Steel for the prestressing of concrete -- Part 1: General requirements
ISO 6934-2	Steel for the prestressing of concrete -- Part 2: Cold-drawn wire
ISO 6934-3	Steel for the prestressing of concrete -- Part 3: Quenched and tempered wire
ISO 6934-4	Steel for the prestressing of concrete -- Part 4: Strand

Structural Steel and Iron Work

EN 1993-1-1	Eurocode 3: Design of steel structures. Part 1-1: General rules and rules for buildings
EN 1993-1-2	Eurocode 3: Design of steel structures. Part 1-2: General rules. Structural fire design
EN 1993-1-3	Eurocode 3.Design of steel structures. Part 1-3: General rules. Supplementary rules for cold-formed members and sheeting
EN 1993-1-4	Eurocode 3.Design of steel structures. Part 1-4:General rules. Supplementary rules for stainless steels
EN 1993-1-5	Eurocode 3: Design of steel structures. Part 1-5: Plated structural elements
EN 1993-1-6	Eurocode 3.Design of steel structures. Part 1-6:Strength and Stability of Shell Structures
EN 1993-1-7	Eurocode 3.Design of steel structures. Part 1-7:Plated structures subject to out of plane loading
EN 1993-1-8	Eurocode 3. Design of steel structures. Part 1-8: Design of joints
EN 1993-1-9	Eurocode 3. Design of steel structures. Part 1-9: Fatigue
EN 1993-1-10	Eurocode 3. Design of steel structures. Part 1-10: Material toughness and through-thickness properties
EN 1993-1-11	Eurocode 3.Design of steel structures. Part 1-11:Design of structures with tension components

EN 1993-1-12	Eurocode 3 - Design of steel structures - Part 1-12: Additional rules for the extension of EN 1993 up to steel grades S 700
EN 10079	Definition of steel products
EN 10027-1	Designation systems for steels. Part 1: Steel names
EN 70027-2	Designation systems for steel. Part 2: Numerical system
EN 10025-1	Hot rolled products of structural steels. Part 1: General technical delivery conditions
EN 10025-2	Hot rolled products of structural steels. Part 2: Technical delivery conditions for non-alloy structural steels
EN 10025-3	Hot rolled products of structural steels. Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels
EN 10025-4	Hot rolled products of structural steels. Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels
EN 10025-5	Hot rolled products of structural steels. Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance
EN 10025-6	Hot rolled products of structural steels. Part 6:Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition

Construction materials and building

ISO 3880-1	Building construction -- Stairs - Vocabulary
ISO 3881	Building construction -- Modular co-ordination -- Stairs and stair openings -- Co-ordinating dimensions
ISO 6511	Building construction -- Modular coordination -- Modular floor plane for vertical dimensions
ISO 6512	Building construction -- Modular coordination -- Storey heights and room heights
ISO 7361	Performance standards in building -- Presentation of performance levels of facades made of same-source components
ISO 9882	Performance standards in building -- Performance test for precast concrete floors -- Behaviour under non-concentrated load
ISO 9883	Performance standards in building -- Performance test for precast concrete floors -- Behaviour under concentrated load
ISO 11855	Building environment design -- Design, dimensioning, installation and control of embedded radiant heating and cooling systems
ISO 16813	Building environment design -- Indoor environment -- General principles
ISO 16814	Building environment design -- Indoor air quality -- Methods of expressing the quality of indoor air for human occupancy
ISO 16817	Building environment design -- Indoor environment -- Design process for visual environment
ISO 16818	Building environment design -- Energy efficiency – Terminology

Technological Equipment

EN ISO 13943	Fire safety. Vocabulary (ISO 13943:2008)
EN ISO 3864	Safety Colours and Safety Signs Information.
EN ISO 17660-1	Welding. Welding of reinforcing steel. Part 1: Load-bearing welded joints.
EN ISO 17660-1	Welding. Welding of reinforcing steel. Part 2: Non load-bearing welded joints.

HD 637	Power installations exceeding 1 kV a.c.
EN 12464-1	Light and lighting. Lighting of work places. Part 1: Indoor work places.
EN 12464-2	Lighting of work places. Part 2: Outdoor work places.
EN 50110-1 ed.2	Operation of electrical installations.
EN 50121-4	Railway applications. Electromagnetic compatibility. Part 4: Emission and immunity of the signalling and telecommunications apparatus
EN 50122-1	Railway applications. Fixed installations. Electrical safety, earthing and the return circuit. Part 1: Protective provisions against electric shock.
EN 50124-1	Railway applications. Insulation coordination. Part 1: Basic requirements. Clearances and creepage distances for all electrical and electronic equipment.
EN 50131	Alarm systems. Intrusion systems. Part 1: System requirements
EN 50133-1	Alarm systems. Access control systems for use in security applications. Part 1: System requirements
EN 50152-1	Railway applications. Fixed installations. Particular requirements for a.c. switchgear. Part 1: Single-phase circuit-breakers with Un above 1 kV.
EN 50159	Railway applications. Communication, signalling and processing systems. Safety-related communication in transmission systems
EN 50163 ed.2	Railway applications. Supply voltages of traction systems.
EN 50272-2	Safety requirements for secondary batteries and battery installations. Part 2: Stationary batteries
EN 50310	Application of equipotential bonding and earthing in buildings with information technology equipment
EN 50341-1	Overhead electrical lines exceeding AC 45 kV. Part 1: General requirements. Common specifications.
EN 54-1	Fire detection and fire alarm systems. Part 1:Introduction
EN 60038	CENELEC standard voltages
EN 60073	Basic and safety principles for man-machine interface, marking and identification. Coding principles for indicators and actuators.
EN 60071-1	Insulation coordination Part 1: Definitions, principles and rules.
EN 60071-2	Insulation co-ordination Part 2: Application guide.
IEC 60050-811	International Electrotechnical vocabulary. Chapter 811: Electric traction
IEC 60364-5-51	Electrical installations of buildings. Part 5-51: Selection and erection of electrical equipment. Common rules.
IEC 60364-5-523	Electrical installations of buildings. Part 5: Selection and erection of electrical equipment. Section 523: Current-carrying capacities in wiring systems.
EN 60445	Basic and safety principles for man-machine interface, marking and identification. Identification of equipment terminals, conductor terminations and conductors
EN 60446	Basic and safety principles for man-machine interface, marking and identification. Identification of conductors by colours or alphanumerics
EN 60664-5	Insulation coordination for equipment within low-voltage systems. Part 5: Comprehensive method for determining clearances and creepage distances equal to or less than 2 mm.
EN 60529	Degrees of protection provided by enclosures (IP code)
EN 60694	Common specifications for high-voltage switchgear and controlgear standards.
EN 60865-1	Short-circuit currents. Calculation of effects. Part 1: Definitions and calculation methods.
EN 60909-0	Short-circuit currents in three-phase a.c. systems. Part 0: Calculation of currents.

EN 61140	Protection against electric shock. Common aspects for installation and equipment.
IEC 364-1	Low-voltage electrical installations. Part 1: Fundamental principles, assessment of general characteristics, definitions.
IEC 364-3	Electrical installations of buildings. Part 3: Assessment of general characteristics.
IEC 364-4-41	Low-voltage electrical installations. Part 4-41: Protection for safety Protection against electric shock.
IEC 364-4-43	Low-voltage electrical installations. Part 4-43: Protection for safety. Protection against overcurrent.
IEC 364-5-51	Electrical installations of buildings. Part 5-51: Selection and erection of electrical equipment. Common rules.
IEC 364-5-52	Low-voltage electrical installations. Part 5-52: Selection and erection of electrical equipment Wiring systems.
IEC 364-5-54	Low-voltage electrical installations. Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors.
IEC 364-4-473	Electrical equipment and installations. Part 4: Protection for safety. Chapter 47: Application of protective measures for safety. Section 473: Measures of protection against overcurrent.
IEC 870	Telecontrol equipment and systems.
IEC 60364-5-523	Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Section 523: Current-carrying capacities in wiring systems.
IEC 364-6-61	Electrical installations of buildings. Part 6-61: Verification - Initial verification.

Annex 2: List of the Most Relevant Laws

Law on safety in railway traffic (Official Gazette of Montenegro 04/08 from 17.01.2008, 40/11 from 08.08.2011)

Law on spatial development and construction of structures (Official Gazette of Montenegro, No. 51/08 from 22.08.2008., 40/10 from 22.07.2010, 34/11 from 12.07.2011, 40/11 from 08.08.2011, 47/11 from 23.09.2011)

Law on occupational safety of Montenegro (Official Gazette of Montenegro, No. 79/04 from 23.12.2004, 26/10 from 07.05.2010, 73/10 from 10.12.2010.)

The Law on the protection of nature (Official Gazette of Montenegro 51/04)

Standard ISO/IEC 17025 General Conditions for competency of the laboratories for testing and laboratories for etalons (Reports on the testing, accreditation, inaccuracy of the measuring equipment, etc.) *Opšti uslovi kompetentnosti laboratorija za ispitivanje i laboratorija za etaloniranje (Izvještaji o ispitivanju, akreditacija, mjerna nesigurnost mjernih instrumenata* itd.), Laboratory materials and accreditation body of Montenegro.

Law on Waste Management (Official Gazette of Montenegro no. 64/11 from 29.12.2011, with addenda, if any).

Annex 3: List of the Most Relevant Directives

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

Directive 96/59/EC on the disposal of PCBs and PCTs