

GENERAL SPECIFICATION

ELECTRICAL

GS EP ELE 460

Engineering Studies

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General Specification		GS EP ELE 460
Engineering Studies		
Rev.: 04	Effective date: 10/2012	Page: 2 of 30

Contents

1. Scope	4
2. Reference documents.....	4
3. General.....	5
4. Contractor documents.....	5
4.1 Electrical Deliverable List	5
4.2 Basis of Electrical System Design, Protection and Control Philosophy.....	6
4.3 Electrical Consumer List and Load Balance	6
4.4 Electrical Equipment List.....	7
4.5 Cable Schedule.....	8
4.6 Project Particular Specifications	8
4.7 Equipment Data-Sheet.....	8
4.8 Long Lead Item Specifications, Data-Sheets, Requisition	8
4.9 Long Lead Item Technical Bid Evaluation	8
4.10 Electrical Equipment Requisition	9
4.11 Electrical Equipment Technical Bid Evaluation.....	9
4.12 Single line Diagrams	9
4.13 Typical Protection Diagrams	10
4.14 Interlocking and Intertipping Diagrams.....	11
4.15 Logic Diagrams (including Automatic Transfer Diagrams).....	11
4.16 HV & LV Typical Schematic Diagrams	11
4.17 HV & LV Schematic Diagrams	12
4.18 Switchgear and distribution board schedule	12
4.19 Interconnection Wiring Diagrams	13
4.20 Trouble Shooting Diagrams.....	13
4.21 Load Shedding specification	13
4.22 Motor Starting Study	14
4.23 Black Start Specification / Procedure	14
4.24 Electrical I/O list	14
4.25 VDU Graphic Displays Requirements	14

General Specification		GS EP ELE 460
Engineering Studies		
Rev.: 04	Effective date: 10/2012	Page: 3 of 30

4.26	Electrical Control System Design Specification and relevant documents (exchange tables, Architecture, etc.)	14
4.27	Sizing of Equipment	15
4.28	Load Flow and Short-Circuit Calculation	15
4.29	Dynamic Stability Study	16
4.30	Governor and AVR Models and transfer function block diagrams	17
4.31	Start-up and ramp-up simulation	17
4.32	Cable Sizing Calculation note and Charts	17
4.33	Harmonic Distortion studies	17
4.34	Selectivity Study and relay setting booklets for AC and DC systems	18
4.35	Earthing Grid Sizing Note	18
4.36	Lightning Protection study & Risk analysis	19
4.37	Substation location drawings and main cable routings	19
4.38	Substation Layout	19
4.39	Cable routings and routing cross sections including cable transits schedule/arrangement	20
4.40	Typical Installation standard drawings (Earthing, Power, Lighting, Control)	21
4.41	Detailed Installation standard drawings (Earthing, Power, Lighting, control)	21
4.42	Earthing and Lightning Layout	21
4.43	Lighting and sockets layout	21
4.44	Lighting circuit diagrams	21
4.45	Lighting Calculation note	22
4.46	External grid connection study	22
4.47	Material Take Off	22
4.48	Inspection and Test Plans	22
4.49	Electrical system Operating Manual	23
4.50	Verification Dossier	23
4.51	Electrical Equipment Obsolescence Dossier	24
5.	Other requirements	25
	Appendix 1	26

General Specification		GS EP ELE 460
Engineering Studies		
Rev.: 04	Effective date: 10/2012	Page: 4 of 30

1. Scope

This document is intended to define the minimum requirements for documents to be issued by Contractor.

These requirements are the minimum one's and any additional information necessary for the complete execution of the Basic Design and/or Detailed Engineering and for the final documentation shall be prepared and added by the Contractor.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

Design and engineering shall conform to the appropriate sections of the latest editions (with amendments) of the relevant IEC, CENELEC standards and codes.

The following order of precedence applies specifically to electrical equipment:

- Applicable laws, rules and regulations of the country in which the system will be operated. In cases where no "local" regulations exist, then French laws and regulations shall be used
- Company Particular Specifications and data sheet (if any)
- Company General Specifications
- Applicable International Electrotechnical Commission (IEC) standards
- Applicable European Standards by CENELEC
- Applicable recognised standards and codes (UTE-NFC, BS, VDE, etc.) when IEC publications have not yet been issued.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
IEC 60027	Letter symbols to be used in electrical technology
IEC 60050	International Electrotechnical Vocabulary
IEC 60071 (Parts 1; 2)	Insulation co-ordination - Parts 1; 2
IEC 60079 (Parts 0; 10; 14; 17; 19)	Explosive atmospheres - Parts 0; 10; 14; 17; 19
IEC 60617	Graphical symbols for diagrams
IEC 60865 (Parts 1; 2)	Short-circuit currents - Calculation of effects - Parts 1; 2

General Specification		GS EP ELE 460
Engineering Studies		
Rev.: 04	Effective date: 10/2012	Page: 5 of 30

Reference	Title
IEC 60909 (Parts 0; 1; 2; 3; 4)	Short-Circuit Current Calculation in 3 phase AC Systems - Parts 0; 1; 2; 3; 4
IEC 62305-2	Protection against lightning - Part 2: Risk management

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP ELE 001	Electrical design criteria
GS EP ELE 021	Electrical design criteria for floating units
GS EP ELE 061	Minimum requirements for HV & LV cable sizing
GS EP ELE 091	Minimum Contractor document requirements
GS EP ELE 221	Electrical Control System (ECS)
GS EP INS 134	Design and supply of integrated control and safety system
GS EP TEC 007	Obsolescence and Lifetime Cycle Management

3. General

Any deviation to the Electrical General Specifications shall be subject to Company approval.

All documents shall have a date, a revision number and the clear explanation of the revision (issued for comment, as built, etc.).

The revised portion of the document shall be highlighted.

All documents shall be in a standardised format, the recommendation is ISO A0, A1, A2, A3 and A4.

Units shall be from SI.

On all drawings, a legend shall give a clear explanation of all symbols and markings used.

At the end of each project stage (basic engineering, detailed engineering, as-built etc.) project documents shall be provided in electronic file (native and Acrobat formats).

4. Contractor documents

4.1 Electrical Deliverable List

The documents required are listed in **GS EP ELE 091**. A schedule of electrical document delivery shall be prepared and shall be updated periodically.

General Specification		GS EP ELE 460
Engineering Studies		
Rev.: 04	Effective date: 10/2012	Page: 6 of 30

4.2 Basis of Electrical System Design, Protection and Control Philosophy

The purpose of this document is to define the general principles for the design, control philosophy and installation of the power generation, distribution and associated electrical systems required for the project.

It shall be based on the relevant pre-project documents (e.g.: Statement of Requirements) and **GS EP ELE 001** or **GS EP ELE 021**.

All applicable items as described in the general specifications **GS EP ELE 001** or **GS EP ELE 021** shall be developed as required and options shall be chosen.

4.3 Electrical Consumer List and Load Balance

This document shall include:

- Electrical loads issued from the process equipment list
- Utility loads (Air compressor, HVAC, UPS's, etc.)
- Packages auxiliary loads
- Lighting and small power
- Any other miscellaneous loads not included in the above categories.

All the loads, including standby units, shall be listed under the switchboard/motor control centres/bus section to which they are connected so that the load and size of each switchboard/MCC can be determined.

All the loads shall also be listed per process unit and package so that the loads of each package can be determined.

One sheet per type of power source (normal, essential, emergency) shall be prepared.

This document shall include the following data:

- Revision index per item
- Tag number and designation
- System number
- Validity (power rating has been: Estimated, Confirmed or Final)

Note: The validity column does not appear in the example given in Appendix 1, however this column shall be added to the load list.

- Equipment service (continuous, intermittent, stand by)
- Diversity factor (for intermittent loads)
- Load type (motor, passive load, etc.)
- Service voltage
- Load demand (shaft power)
- Nameplate rating

General Specification		GS EP ELE 460
Engineering Studies		
Rev.: 04	Effective date: 10/2012	Page: 7 of 30

- Rated speed
- Power factor
- Efficiency
- Calculated active absorbed power (shaft power/efficiency)
- Calculated reactive absorbed power
- Loads required for main power restarting.

The total design load is defined below:

Total design load = Continuous load + intermittent loads (affected by diversity factor) plus the rated output of the largest stand by motor.

Main power generation sizing shall consider the total design loads plus the required power margin (20% as per **GS EP ELE 001**).

Summary sheets shall give for each type of power source, voltage level, bus bar and for each specific configuration (process, summer/winter, offloading, etc.) the following values:

- Global apparent power
- Global power factor
- Global active and reactive power
- Generators rating
- Spinning reserve.

The individual power transformer ratings shall also be included in the summary.

All the calculation formula shall be made available for Company review.

An example of electrical consumer list and load balance is shown in Appendix 1.

4.4 Electrical Equipment List

The Electrical equipment list shall include electrical equipment such as Switchgear, MCC, UPS, Transformers, panels, etc.

Item to be listed shall be:

- Tag number
- Designation
- Manufacturer
- Type (Manufacturer model or reference no.)
- Rating
- Supply voltage
- Location

General Specification		GS EP ELE 460
Engineering Studies		
Rev.: 04	Effective date: 10/2012	Page: 8 of 30

- Overall dimensions
- Weight.

4.5 Cable Schedule

During basic design, a main cable schedule shall be established (main feeders, main consumer supply).

For the detailed design, a complete cable schedule is required.

It shall include at least:

- Tag number
- Origin and destination (from/to)
- Length
- Number of cores and cross section area
- Type (this may be in the form of alpha-numeric references to denote cable characteristic data as appropriate)
- Service voltage
- Equipment rated current.

4.6 Project Particular Specifications

The project particular specifications shall determine the options to be selected, and shall include amendments/deletions to the Company General Specifications in order to scope with the specific project requirements.

4.7 Equipment Data-Sheet

The Company Data sheet related to the described equipment shall be used.

Any modifications to the Data Sheet shall be brought to the Company attention.

Wherever no Company data sheet exists, a new one shall be issued.

4.8 Long Lead Item Specifications, Data-Sheets, Requisition

Long lead items have been defined during basic engineering by Company.

Basic engineering Contractor shall issue relevant specifications, data sheets and requisition for Company approval.

A price break-down form shall be provided in order to compare and evaluate the Supplier's bids.

4.9 Long Lead Item Technical Bid Evaluation

The bid evaluation sheet shall include all technical characteristics, a description of the options/deviations/amendments given by each Supplier and the price break-down as required in the requisition.

General Specification		GS EP ELE 460
Engineering Studies		
Rev.: 04	Effective date: 10/2012	Page: 9 of 30

Recommendations highlighting positive and negative aspects of each bid shall be issued for Company review.

4.10 Electrical Equipment Requisition

Requisition shall be issued for Company technical approval.

4.11 Electrical Equipment Technical Bid Evaluation

The bid evaluation sheet shall include all technical characteristics, a description of the options/deviations/amendments given by each Supplier.

Recommendations highlighting positive and negative aspects of each bid shall be issued for Company approval.

4.12 Single line Diagrams

Minimum requirements are:

- One overall single line diagram with all generators, external power supplies, and main power distribution networks (HV, LV)
- Substation(s) single line diagram(s) if necessary
- Auxiliary typical single line diagram (UPS's, heat tracing, lighting, etc.).

Single line diagrams shall include the following:

- Switchgear:
 - Rated voltage
 - Nominal current
 - Short circuit current withstand values (kA - s).
- Main isolating equipment:
 - Rating
 - Normal operating position (NO/NC).
- Transformers:
 - Rated power kVA
 - Primary and secondary voltages
 - Zcc%
 - Vector group
 - Neutral system
 - Tapping range
 - Cooling method.