



حديد الإمارات
emirates steel
إحدى شركات صناعات SENAAT company

Integrated Management System

Engineering Standards

Engineering Documentation

PRD-GR-GS-004

	Name	Title	Signature
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1. PURPOSE

The purpose of the ES Engineering Standards is to provide information and guidelines for the design, erection, installation and commissioning of plant and equipment across ES Sites.

2. SCOPE

The standards referenced in this document are issued to all contractors and form an integral part of the contract documentation.

Compliance is mandatory by all Contractors, ES Departments and personnel, whilst designing, erecting, installing and commissioning plant and equipment within ES sites, and any deviations require the explicit written approval of ES.

3. DEFINITIONS / ABBREVIATIONS

ES - Emirates Steel

MOC - Management of Change

4. RESPONSIBILITIES

VP of Marketing & Strategy - Is responsible for approving the Standards, and delegating members of his department to review them on a periodical basis, and / or write new standards when deemed necessary.

Construction Manager Projects - Is responsible for ensuring that all projects undertaken within ES comply with these standards.

Engineering Manager Projects - Is responsible for revising the Standards as requested by the projects and operations departments.

5. DESCRIPTION

This section describes the minimum requirements for engineering drawings and documentation and may be amended by the contract or other sections of these Standards.

5.1 DRAWING STANDARDS

All relevant ISO and DIN standards shall be adhered to in preparing engineering drawings.

5.1.1 SIZES OF DRAWING SHEETS

All drawing sheet sizes shall conform to DIN 823. The drawing sheets shall be no smaller than A3 and no larger than A0.

Electrical and instrumentation parts lists, data sheets and other tabulated material may be submitted on A4 sheets.

5.1.2 SCALES

The following scales shall be applicable:

1 : 1	1 : 10	1 : 200	2: 1
1 : 2	1 : 20	1 : 500	5: 1
1 : 2.5	1 : 50	1 : 1000	10 :1
1 : 5	1 : 100	1 : 2500	

Other scales shall be avoided if possible.

5.1.3 VIEWS AND SECTIONS

Views and Sections shall be presented in accordance with ISO Method E (first angle projection) and dimensioning and designation of sections shall conform to DIN 406.

5.1.4 TITLE BLOCK

All drawings shall bear a title block which describes the project.

Example: EMIRATES STEEL (ES) HEAVY SECTION MILL

5.1.5 DRAWING TITLES

The drawing titles shall consist of no more than three lines and shall contain the following information in the English language:

- The Plant Area.
- The Equipment Area
- Further Equipment or Structure related Information, if required.

5.1.6 PARTS LISTS

Mechanical parts lists, bill of materials, shall be integrated into the associated drawing.

5.1.7 REVISION INDEX NUMBERS

- Document revisions shall be clearly marked by revision index letters, all 'for approval' drawings begin with the revision letter 'A'. This use of letters will then continue through

the approval process until a drawing is deemed 'approved' and is to be 'issued for construction/manufacture', at which point the drawing becomes revision '0'. Future revisions will then use the normal number system.

- All revisions shall be flagged in the drawing itself and, additionally, described and dated in a dedicated revision box. 'General' revisions shall be avoided.

5.1.8 DRAWING LIST

- All Contractors shall submit a numerical list of all drawings produced by them and their Sub-Contractors which shall be continually updated and kept current for the duration of the contract. This drawing index shall become part of the final documentation (see Section 8).
- The drawing list and the drawing numbers shall be organized in such a way that the individual engineering disciplines (Civil, Structural, Mechanical, Piping, Electrical, Air Conditioning, Instrumentation, etc.) are logically separated and clearly identifiable.

5.1.9 NOTES

Document notes shall cover the following information:

- References to codes and standards and explanations necessary for understanding of the drawing.
- An explanation of all abbreviations and symbols used.
- Relevant data on materials, heat treatment, tolerances, surface quality, hardness, flow rates, media, etc.
- Basic data regarding the design, tests and operation of the structure or equipment.

5.1.10 REFERENCE DOCUMENTS

- The numbers and titles of associated drawings and documents shall be clearly indicated under this title.

5.1.11 KEY PLAN

- A Key Plan shall be provided on each general arrangement drawing, main equipment drawing and other overview documentation. The location of the area or object depicted shall be shaded in the Key Plan.

5.1.12 NORTH ARROW

- All plan views shall be shown in accordance with the North Arrow indicated in the Key Plan.

5.1.13 LANGUAGE

- All correspondence, drawings including record drawings, design information, documentation and operating and maintenance instructions shall be in the English language.
- International Standards and other ES approved documents not available in English shall be professionally translated into English at the Contractor's expense and 3 (three) copies forwarded to ES.

6. PRESENTATION OF DOCUMENT

6.1 DRAWING FORMAT

6.1.1 PREPARATION OF NEW DRAWINGS

All drawings shall be prepared using AutoCAD software or in case of using other CAD software the drawing files shall be converted to AutoCAD.

6.1.2 MODIFICATION OF THE EXISTING DRAWINGS

Any modification to the existing drawings shall be made using the AutoCAD software.

6.1.3 DRAWING ATTRIBUTES

The Contractor shall allocate a number according to the Plant Coding Structure (See Section 6) which must be clearly displayed on each drawing.

6.2 DRAWING SUBMITTAL

Unless agreed otherwise with ES, the Contractor shall submit the following as a minimum requirement.

6.2.1 DESIGN REVIEW DRAWINGS

- One (1) set of drawing files in AutoCAD format.
- Three (3) paper copies

Note: A list of all Design Review drawings which will be submitted shall be prepared according to sub-section 2.9.

6.2.2 MANUFACTURING AND CONSTRUCTION DRAWINGS

- One (1) set of drawings files in AutoCAD format.
- Three (3) paper copies.
- Ten (10) prints reduced in size to A3 format and collated in a suitable 'book'.

6.2.3 DRAWINGS FOR FINAL DOCUMENTATION 'AS BUILT'

- **PROCEDURE:**

- The Contractor shall send to ES one (1) set of prints of final 'as-built' drawings and drawing list as required by sub-section 2.9 for final review of completeness.
- Each drawing shall have a unique drawing number. In case the Contractor have their own drawing numbering system it must be approved by ES otherwise ES will allocate a set of numbers to the Contractor.
- All plant and equipment supplied by the Contractor shall have their unique documentation. NO COMMON DRAWINGS ARE ACCEPTED (e.g. If the Contractor supplied two identical furnaces, each furnace shall have its own documentation and unique drawing numbers.)

- **THE FINAL DRAWINGS SUBMITTAL SHALL BE:**

- One (1) sets of drawing files in AutoCAD format.
- Six (6) paper prints.
- Two (2) paper prints of drawing attributes.
- Unless an alternative is agreed between the Contractor and ES.

6.3 MANUALS

The same procedure as described above in Section 3.2.3 applies also to calculations and test certificates. The final documents shall be sent in:

6.3.1 PRELIMINARY SUBMITTAL OF MANUALS

- Three (3) sets.

6.3.2 MANUALS FOR FINAL DOCUMENTATION

The same procedure as described above in Section 3.2.3 applies also to manuals. The final approved manuals shall be sent in:

- One (1) set of manuals in an electronic format (MS Word or PDF).
- Six (6) copies.

6.4 CALCULATIONS AND TEST CERTIFICATES

- One (1) copy in electric PDF format.
- Four (4) copies as part of the final documentation.

6.5 SPARE PARTS LIST

Spare Parts Lists shall be provided as described in Section 5 of this standard.

- One (1) copy in electronic format (MS Office & SAP compatible).
- Three (3) copies

7. CALCULATIONS

7.1 GENERAL

- All engineering Calculations and Design Studies shall be carried out by competent and experienced personnel qualified to undertake such work.
- All calculations shall be presented in a logical and clear manner which allows their easy verification by a qualified third party.
- All calculations and computer printouts shall be in the English language and the software employed shall be well proven and of international reputation and quality.

7.2 CALCULATIONS REQUIRED BY ES

- All engineering calculations and design studies pertaining to the Contractor's Work shall be submitted to ES and shall form part of the final documentation.
- However, ES reserves the right to request copies of calculations relevant to the Contractor's Work at any stage during the design, erection and assembly of the structures and equipment.

7.3 INDEX AND REFERENCES

All calculations submitted to ES shall contain at least the following:

- The originating Company or Consultant
- The date and signatures of those persons who carried out, checked and approved the calculations, on every sheet.
- A heading, clearly indicating to which part of the Works the calculations pertain, preferably including the relevant drawing number, on every sheet.
- A reference number, according to the Plant Coding Structure (See Section 6).

- A list of References -i.e., standards, codes of practice, papers, drawings, specifications, textbooks, etc.
- An Index of all calculations, broken down into reasonable sections.

7.4 COMPUTER GENERATED CALCULATIONS

Computer generated calculations are acceptable, provided they are presented in the same manner as, and fully integrated in, the main body of the design and analysis documentation. See Sections 4.1 to 4.3 regarding their presentation.

7.5 STYLE OF THE CALCULATIONS

Calculations may be handwritten, shall be illustrated with diagrams, charts, graphs, etc., as required, and should be cross-referenced to a professional standard, if applicable.

7.6 ISSUE

The calculation issue and issue date must be clearly shown.

8. SPARE PARTS

- The recommended list of spare parts submitted to ES shall contain at least the following:
 - Title: Item Description, Drawing Number, Plant Coding Structure Reference.
 - Total quantity installed in plant.
 - Quantity recommended in stock.
 - Quantity recommended for 2 years operation.
 - Spare part name.
 - Type/Specification/Drawing Number.
 - BOM Position.
 - Manufacturer / Supplier Part code.
 - Manufacture name.
 - Supplier name (indicate with * if mandatory).
 - Recommended (Desirable or Essential).
 - Delivery time (weeks).
 - Weight (kg).
 - Price
 - Total Price

- The spare part list shall be supplemented with ordering data including copies of all relevant purchase orders with full address of supplier, contact person, specification, written in English. The Contractor shall also submit detail manufacturing drawings and complete material specification for all spare parts which can be locally manufactured regardless, if they are considered wear and tear components or not.
- The spare parts list shall be submitted in advance to allow ES to procure the parts before start-up.
- One spare parts list shall be provided for each of the following: -
 - Capital Spares
 - Maintenance Spares
 - Operational Spares.

9. PLANT CODING STRUCTURE

Refer ES controlled document reference 00-00-000-GS004-01 for the “Plant Coding Structure” reference numbers.

The Contractor shall incorporate the Plant Coding Structure codes into the Engineering Documentation.

10. TEST CERTIFICATES

Test certificates for materials, constructions, equipment, systems, etc., issued by Test Authorities, Inspection Laboratories or Institutes, the Contractor’s own inspectors and suppliers, etc., shall be part of the Engineering Documentation.

11. FINAL DOCUMENTATION

11.1 GENERAL

For the proper operation and maintenance of the Plant, the Contractor shall submit the final documentation consisting of:

- Operating Manuals
- Operating and Maintenance Instructions for mechanical and electrical equipment and instrumentation.
- Spare Parts List. (Refer to Section 5 for requirements).
- Lubrication Instructions.
- As-Built Drawings.
- Design and Analysis Calculations. (Refer to Section 4 for requirements).

- Test Certificates.

Final documentation shall be issued for all new supply and, where existing structures and equipment have been modified, for all modified plant.

11.2 OPERATING MANUALS

Operating manuals shall contain the following items, as a minimum:

- A description of the sequence of operations with details of all necessary safety procedures.
- Start up and shutdown procedures.
- Information on temperature, pressure and other system conditions and parameters which are to be set and maintained.
- Lubrication instructions showing the exact places, type and number of lubrication points, together with the type/specification of lubricant to be used.
- System flow charts for all electrical and mechanical control systems with a description of the circuit/flow diagrams.

11.3 MAINTENANCE MANUALS

11.3.1 GENERAL

Maintenance manuals shall contain the following items, as a minimum:

- Proposed maintenance schedule.
- Detailed information for both disassembly and assembly of plant, including safety procedures.
- Information regarding the exchange or replacement of wearing parts like bearings, gaskets, etc.
- Information regarding the cleaning and proper maintenance, required for running the Plant in a satisfactory manner.
- All lubrication information.
- A list of preventive maintenance items together with the necessary measures to be taken and followed.
- Complete civil and structural details, including exact fixing details of equipment in relation to a specific area, major dimensions of the equipment, walkways, recesses, foundation cut-outs, foundation frames, cladding, air flow diagrams, etc.
- Detailed Spare Parts ordering data. (Refer to Section 5 for requirements).

- Layout diagrams showing the exact physical installation of mechanical and electrical plant.
- Binding dimensional drawings of individual plant items, consoles, cubicles, transformers, etc.

11.3.2 SPECIFIC MECHANICAL REQUIREMENTS

In addition to Sub-Section 8.3.1 the following items shall be included:

- Flow diagrams showing the operating conditions and identification of all equipment.
- Technical data sheets for plant items.
- Brief functional descriptions of plant items.
- General piping layout plans and isometric drawings showing major routes.
- A summary of the weld procedures and schedules.
- Hydraulic circuit diagrams containing the following:
 - Identification of all equipment by name and catalogue number.
 - The size and specifications, major dimensions, characteristic functions and operating parameters of all pipes, hoses, pumps, motors, valves, filters, reservoirs, accumulators, pistons, test points, etc.
 - The fluid type and viscosity range.
 - Time sequence charts.
 - Rates of flow, inlet/outlet temperatures, energy dissipation, and the maximum working pressures for hydraulic fluid and cooling media.

11.3.3 SPECIFIC ELECTRICAL REQUIREMENTS

- ES drawing numbers shall be according to the electrical designation and the drawing shall be filed according to the electrical designation, see Section 6.
- When the Contractor's electrical installation interfaces with ES's electrical distribution network, the Contractor shall produce interface drawing with all necessary cross references to existing ES drawings.
- In addition to Sub-Section 8.3.1, the following Standards and Rules shall be followed with regard to the production of all electrical drawings and other documentation:
 - DIN EN ISO 7200 Printed Forms for Technical Diagrams and A3 Circuit
 - DIN ISO 5457 Diagrams.


- EN IEC 61082 Graphical Representation in Electrical Engineering Diagrams, Charts and Tables.
 - EN IEC 61082-3 Definitions and Classifications.
 - EN IEC 61082-1
 - EN IEC 61082 Item Designations.
 - IEC 60 750 (IEC 60 750)
 - EN IEC 61082-2 Recommendations for the Preparation of Diagrams and Circuit Diagrams.
 - EN IEC 61082-3 Rules for Block Diagrams (Single Line Diagrams).
 - EN IEC 61082-4 Electrical Installations.
 - EN IEC 61082-2 Rules and Graphical Symbols for Function Charts
 - EN IEC 61082-4 Preparation of Interconnecting Diagrams, Unit Wiring
 - EN IEC 61082-3 Diagrams and Tables.
 - EN IEC 61082-1 Preparation of Terminal Diagrams.
 - EN IEC 61082-4 Preparation of Location Diagrams.
 - EN IEC 61082-1 Preparation of Logic Diagrams.
 - EN IEC 61082-2 Preparation of Diagrams for System Manuals.
- In addition, the following documents shall be provided:
 - Where supply is within the Contractor's scope, electrical services single line diagrams, circuit schedules, and power outlet and lighting location drawings.
 - Electrical single line diagrams.
 - Control system schematics and wiring diagrams.
 - Relay protection co-ordination study and relay setting schedules.
 - Cable lists with consecutive cable numbers, cross section, conduct or material, number of cores, type of cables and cable length.
 - Cable layout plans showing the cable raceways, conduits, ducts, trenches, etc. within the complete ES plant area.
 - Complete and detailed plans for production plant, baseplates and foundation earthing and earth electrodes.
 - Equipment, control panel and MCL location plans.
 - Substation layouts and sections.
 - Location plans for all field equipment.

- For Process-Instrumentation, the following additional documentation is required:
 - PID – Process and Instrumentation diagrams.
 - Instrumentation block diagrams.
 - Termination Schedules.
 - Instrument lists.
 - Data sheets.
 - Calculations for orifice plates and control valves.
 - Loop diagrams.
 - Hook-up diagrams

- The Contractor shall also provide:
 - Special equipment and device lists, explicitly indicating the number of different types of equipment installed, together with their specific type number and the exact location of installation. (This is required for warehouse stock control as well as easy maintenance planning).
 - Illumination diagrams, indicating the exact location of the individual luminaries and panels, together with all necessary circuit diagrams. Either on this diagram or on separate data sheets, the following information shall be provided:

- Luminaries:
 - Type of luminaries.
 - Manufacturer's number.
 - Catalogue number.
 - Lamp type (power, voltage).
 - Dimensions.
 - Mounting details.

- Lighting Control Panels:
 - Number of lighting circuits.
 - Number of poles for circuit breakers/switches.
 - Description of lighting circuits.
 - Load distribution of individual lighting circuits.
 - Spare switches and circuits.
 - Breaking capacity of circuit breakers.
 - Current carrying capacity of busbars.

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11.3.4 SPECIFIC ELECTRONIC/CONTROL REQUIREMENTS

Automation and control systems documentation shall be presented as PDF files in a logical Windows directory structure, easily accessible to users. In addition to the requirements of Sub-Section 8.3, the following items shall be included:

- Block diagrams, illustrating relationships and communications between modules, with all items clearly identified and referred to the corresponding circuit diagrams. For programmable equipment, a detailed representation of individual modules or parts should be provided, allowing all major functions to be identified.
- Signal diagrams representing all terminals, plug connectors, etc.
- Internal connection diagrams of all modules and components.
- Terminal and connector diagrams.
- Detail layout diagrams of individual racks, withdrawable units.
- Data sheets of all components and instruments, whether installed in panels or in the field.
- Function descriptions of all electronic equipment and systems.
- A list of input and output signals, together with process signal range details, logic polarity and addresses.
- For all programmable/configurable instruments, configuration data and settings, as commissioned.
- Lists of alarms, incorporating tests and destinations.
- Specifications of the installed and spare capacity.
- Specifications regarding the ambient conditions and basic environmental requirements of the installation area.
- Operating instructions for peripheral equipment (i.e., programming units, test equipment, etc.).
- Operating instructions to enable operators to control the Plant (type, function, system flow in respect to subsequent control, different system stages, sequential steps for starting, operating and stopping either the entire system or a part thereof, in relation to the freely programmable control system).
- Commissioning and maintenance instructions for individual items as well as of the total system.
- Standard documents for hardware and software.

Software tools for PLC's etc. shall operate under the Microsoft Windows operating system.

All software shall be year-2000 compliant, i.e. date format must have full century format, for example yyyy/mm/dd.

The software shall incorporate the representation of the control logic in statement lists, ladder diagrams or system flow-chart format and shall include display and print-out of:

- Assignment lists.
- Reference lists.
- Input/output point data.
- Cross-reference lists.
- Check lists.
- Program structures.

For each program block and segment, supplementary embedded comments regarding the control circuits shall be included. Each operand should have a symbolic identifier at least to 24 characters long and an operand comment at least 40 characters long.

- All documents shall contain all information and instructions required by the customer to repair the individual modules, trouble-shoot and localize problems in the shortest possible time.
- Spare parts lists, especially incorporating equipment designations, order numbers, the total number of parts used in the system, together with the recommended number of parts required as spares.
- A list of all standard documents, publications, catalogues, etc.
- All other information and documents required to understand the function of, to commission, maintain, trouble-shoot and repair the system.
- Automation software documentation shall be according to Section 12 - Process Automation, sub-section 5.5 'Application Software Document'.

11.3.5 SPECIFIC REQUIREMENTS FOR POTENTIAL HAZARDS

- In addition to Sub-Section 8.3.1- 8.3.4 the following items shall be included:
 - Information pertaining to the hazards of chemicals used or produced by the process.
 - Information pertaining to the technology of the process.
 - Information pertaining to the equipment in the process.
- Information pertaining to the hazardous chemical(s) in the process shall include:
 - Toxicity information

- Permissible exposure limits
- Physical data
- Reactivity data
- Corrosivity data
- Thermal and chemical stability data
- Hazardous effects of inadvertent mixing that could foreseeable occur.

- Information pertaining to the technology of the process shall include at least the following:
 - A block flow diagram or simplified process flow diagram.
 - Process chemistry
 - Max intended inventory
 - Safe upper and lower limits (temperature, pressure, flow)
 - Evaluation of the consequences of deviations – Hazards and Operability Study (HAZOP) or equivalent studies as required
 - Classification of hazardous areas – combustible dusts and gases.

- Information pertaining to the equipment in the process shall include:
 - Materials of construction
 - Process and Instrumentation diagrams (P&IDs).
 - Electrical classification.
 - Relief system design and design basis.
 - Relief valve type
 - Size
 - Capacity
 - Set pressure
 - Calculations
 - Manufacturer's data
 - Date of manufacturers
 - Serial number
 - Ventilation System design
 - Design codes and standards employed
 - Material and energy and energy balances for processes
 - Safety systems (Interlocks, detection or suppression system).

- Information pertaining to Electrical / Electronic design shall include:
 - Circuit / cable diagrams

- Component and loading specifications
- Emergency generation facilities
- Process control hardware
- Process logic controllers
- Interlocks Fire protection Software

11.4 AS BUILT DRAWINGS

- The Contractor shall submit "As Built" drawings not later than 6 months after start of hot testing or not later than 3 months after completion of performance tests, whichever is earlier. The "As Built" drawings shall include all modifications done during construction, erection, installation and commissioning.

11.5 118.5 SAFETY DOCUMENTATION

- Safety documentation shall be provided, both as separate documents, and appropriately integrated in the operations and maintenance manuals.
- Safety documentation shall include all information related to:
 - Personnel safety.
 - Safe operation and maintenance of equipment and machinery.
 - Material safety data sheets.
 - Materials of construction.
 - P&I diagram.
 - Relief system calculations.
 - Codes and standards.
 - Safety system (e.g. interlocks, detection or suppression systems), etc.

REVISION HISTORY

Issue No.	Date	Page/s	Cause of Revision
0	17.11.2019	All	First Issue