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1 Subject of specification

This specification used in conjunction with other technical specifications of the LOTOS Group establishes the minimum requirements for the preparation of Erection documentation.

2 Scope of validity

This specification applies to the preparation of tender documents, inquiries and contracts concerning new investments and modernisation projects planned by LOTOS Group.

It shall also be a basis for preparing both detailed specifications and inquiries for individual or package supplies.

2.1 Deviations

Any deviations from this specification and relevant specifications, standards and documents, including the bidder's proposals indicating a more economic design or solution, shall be submitted in writing for checking and approval by LOTOS Group.
No deviation or modification shall be permitted unless confirmed by LOTOS Group.

The bidder shall present in written form any ambiguity in this standard or any other LOTOS Group S.A standards as well as conflict with referenced documents/standards, and shall receive LOTOS Group's written explanation.

3 Definitions and designations

- CNBOP –Fire Protection Research and Development Centre
- DCS – Distributed Control System
- ESD – Emergency Shut Down
- HAZOP – Hazard and Operability Study
- P&ID – Piping and Instrumentation Diagram
- SIL – Safety Integrity Level

4 Erection documentation

The erection documentation should be supplied in 5 copies and also in an editable electronic form. All printed related documents, such as legal regulations, standards, catalogues etc. should be supplied in 2 copies.

The erection documentation should include all documents being a part of the "Basic Documentation" (see Specification No. 6300), which have been changed or updated.

In addition, the erection documentation should include:

4.1 Process documentation

4.1.1 An updated P&ID drawing for the process system, auxiliary media, dumps and sewerage

4.1.2 Energy media and chemicals consumption indicators

4.1.3 Detailed guidelines for disciplines

4.1.4 Description of start-up preparation procedures

4.1.5 Description of special operations, such as charging and discharging of the catalyst, passivation, pickling, etc.

4.1.6 A complete Process Operation Manual arranged as follows:

Table of contents

1 Introduction

1.1 Definition of the plant

1.2 Throughput, material balance and consumption indicators

1.3 Schematic diagram of process connections with other plants

1.4 Physical and chemical mechanism of the process

2 Raw materials and auxiliary materials

2.1 Name

2.2 Physical and chemical properties

2.3 Standards in force

2.4 Origin

3 Description of energy media

4 Description of semi-finished products

5 Description of products, by-products and waste products

5.1 Name and the physical and chemical properties

5.2 The standard in force

5.3 Packing and storage

6 Process description

6.1 A short description of the process

6.2 A detailed description of the process

6.3 Leading process parameters

7 The plant equipment

7.1 Equipment

7.2 Control and measuring instruments

7.3 Safety valves

8 Procedures

8.1 Preparation of the plant for start-up

8.2 Start-up of the plant

8.3 Normal operation

8.4 Shutting down the plant

8.5 Preparation of the plant for an overhaul

8.6 Special operations

8.7 Emergency situations

9 Waste gases and sewage

10 Health and safety at work

11 Fire hazard

4.2 Documentation of mechanical equipment

4.2.1 List of vessels, machines and equipment

4.2.2 Technical specifications of all vessels and machines

4.2.3 For machines, documentation should include the documents specified in point 6 of Technical Specification No. 2400 – „ Machines and Drivers (Rotating)"

4.2.4 For vessels, documentation should include the documents specified in the below listed Technical Specifications:

- Technical Specification No. 2200 – „Pressure Tanks, Columns and Reactors" – point 9.
- Technical Specification No. 2210 – „Low Pressure and Atmospheric Storage Tanks" – point 4.21.
- Technical Specification No. 2230 – „Trays and Packing for Columns" – point 3.
- Technical Specification No. 2300 – „Heat Exchangers" – point 4.

Additionally, if necessary, the documentation should include directions for the erection of a vessel on site and the technical requirements for erection and testing.

4.2.5 Documentation for heaters shall include the following:

- Technical data of the heater
- Assembly drawings
- Plot plan, foundation drawing with anchoring details and specification of loads
- Structural analysis of steel structures
- Specification of equipment
- PFD drawings
- P&ID drawings
- Assembly drawings with dimensions and location of connections at battery limits
- Workshop drawings
- Material specifications
- Analysis/calculations for the pressure part
- Welding procedures
- Welding documents
- Material certificates

- Approvals
- Reports of quality control at the manufacturer's
- Weld test reports
- Pressure test certificates
- Subcontractors list
- Supplier's inspection procedures for all elements and equipment
- Directions for protection for the time of transport and storage at site
- Instructions for storage and handling on site, including the lifting procedure containing drawings of lifting equipment (beams, cross-beams etc.)
- List of spare parts for start-up period
- List of spare parts for 3 years' operation together with the necessary documents
- List of special tools for assembly and operation
- Transport drawings with the main dimensions and weights
- Assembly instructions with the necessary enclosures
- Instruments documentation (see 4.6)
- Electrical documentation (see 4.7)

4.2.6 Documentation for waste heat boilers shall contain the following documents:

- Technical data of the boiler
- Assembly drawings
- Plot plan, foundation drawing with anchoring details and specification of loads
- Structural analysis of steel structures
- Specification of equipment
- PFD drawings
- P&ID drawings
- Assembly drawings with dimensions and locations of connections at battery limits
- Workshop drawings
- Material specifications
- Analysis/calculations for pressure parts – piping, boiler drums, exchangers etc.
- Welding procedures
- Welding documents
- Material certificates
- Approvals
- Reports of quality control at the manufacturer's
- Weld test reports
- Pressure test certificates

- Subcontractors list
- Supplier's inspection procedures for all elements and equipment
- Directions for protection for the time of transport and storage at site
- Instructions for storage and handling on site including the lifting procedure containing drawing of lifting equipment (beams, cross-beams etc.)
- List of replacement parts for start-up
- List of replacement parts for 3 years' operation together with the necessary documents
- List of special tools for assembly and operation
- Transport drawings with the main dimensions and weights
- Assembly instructions with the necessary enclosures
- Instruments documentation (see 4.6)
- Electrical documentation (see 4.7)

4.2.7 Documentation for stacks shall include the following:

- Technical data of the stack
- Assembly drawings
- Plot plan, foundation drawing with anchoring details and specification of loads
- Structural analysis
- Assembly drawings with dimensions and location of connections at battery limits
- Workshop drawings
- Material specifications
- Welding procedures
- Welding documents
- Material certificates
- Approvals
- Reports of quality control at the manufacturer's
- Weld test reports
- Trial assembly reports and alignment examination reports
- Subcontractors list
- Supplier's inspection procedures
- Directions for protection for the time of transport and storage at site
- Instructions for storage and handling on site including the lifting procedure containing drawing of lifting equipment (beams, cross-beams etc.)
- List of replacement parts for 3 years' operation together with the necessary documents
- List of special tools for assembly and operation
- Transport drawings with the main dimensions and weights
- Assembly instructions with the necessary enclosures

4.2.8 Documentation for flares shall include the following:

- Technical data of:
  - the flare burner
  - pilot burners
  - the stack
  - the liquid separating tank
  - the water sealing
  - the pump and motor
- Assembly drawings
- Plot plan, foundation drawing with anchoring details and specification of loads
- Structural analysis and dynamic analysis of the steel structure
- Specification of equipment
- PFD drawings
- P&ID drawings
- Assembly drawings with dimensions and location of connections at battery limits
- Workshop drawings
- Material specifications
- Welding procedures
- Welding documents
- Material certificates
- Approvals
- Reports of quality control at the manufacturer's
- Weld test reports
- Pressure test certificates
- Subcontractors list
- Supplier's inspection procedures for all elements and equipment
- Directions for protection for the time of transport and storage at site
- Instructions for storage and handling on site including the lifting procedure containing drawing of lifting equipment (beams, cross-beams etc.)
- List of replacement parts for start-up
- List of replacement parts for 3 years' operation together with the necessary documents
- List of special tools for assembly and operation
- Transport drawings with the main dimensions and weights
- Assembly instructions with the necessary enclosures
- Instruments documentation (see 4.6)

- Electrical documentation (see 4.7)

Documentation for burners shall include the documents specified in point 9 of Technical Specification No. 2110 – „Burners for Fired Heaters and Boilers".

4.3 Documentation for pipelines

4.3.1 General documentation

- Plot Plan (general equipment layout)
- Piping classification (in Polish language)
- Technical specifications
- Supports standards
- Welding procedures
- Instruction for tie-ins execution
- Procedure for piping execution and inspection (in Polish language)

4.3.2 Documentation for the Plant

- Equipment layout for the Plant
- Key Plan
- Piping Lay-out
- Drawings of connections at battery limits
- Line list according to the model given in Specifications No. 6600 (in Polish language)
- Operation manual (in Polish language)
- Hazard analysis (in Polish language)
- Isometric drawings of pipelines (for diameters DN > 1"). The required form is given in Specifications No. 6600
- Material list for every line according to the model given in Specifications No. 6600
- Summary bill of materials
- Drawings of special supports
- Elastic support cold and hot regulation and start-up manual
- Summary list of supports
- Summary list of elastic supports
- Specification of tie-ins
- Revised existing isometric drawings of the modernised lines including tie-ins
- Revised material list of the modernised lines including tie-ins
- Documentation of steam heating
- Documentation of pressure tests

- Material certificates of pipeline elements
- Documentation of anticorrosion protection and insulation
- Documentation required by JN, UDT, ZDT – acc. to Specifications No. 8800 and 8820
- As-built documentation (isometric drawings, material list and supports)

4.3.3 The documentation of steam heating

The documentation of steam heating has to contain at least the following:

- The situation of the steam-supply and condensate-draining mini-stations on piping layout drawings
- Isometric drawings of steam-supply and condensate-reception lines from collectors to mini-stations
- Drawings of steam and condensate manifold headers with a description of branches
- Summary bill of materials
- List of steam-traced pipelines

4.3.4 Isometric drawings have to be done according to the form given in Specification no 6600:

- Axonometric projection of the line
- An arrow indicating the geographical orientation (the northern direction directed into the right upper corner of the isometric sheet)
- Flow direction
- Name of the medium
- Description of connections to vessels and pipelines (process number of the adjacent pipeline, stating the isometric drawing sheet number, or assembly-field number with relevant sheet number only if piping is divided in to the assembly-fields)
- Table with revision description (revision number, referring to, designer name, revision date)
- Clouds showing revision changes described in the table (cloud refers only to the last revision)
- The number of the assembly-field for the running sheet the isometric
- Numbers of all assembly-fields through which runs the given pipeline
- All valves, safety valves with set pressure [bar], flanges, fittings etc.
- Instruments (location and marking)
- All necessary dimensions
- Type, quantity and location of required supports in fig. and other data in the list of supports, visible on the enclosure of 12 of Technical Specification 6600
- For elastic supports and expansion joints – the value of initial stress
- Location of nameplates CE attached to the pipe at the beginning and end of the pipeline, in a possibly accessible place
- Earthing location (according to Technical Specification no 4500)
- Line number – complete designation with piping class symbol
- Drawing number of the documentation Contractor

- LOTOS Group's archival number
- Number of P&I diagram
- The table with used diameters of pipelines (NPS in inches) together with the information of the material, with the nominal thickness (NOM), minimum thickness (MIN) and the alarm thickness
- Working pressure [bar] and temperature [^{o}C]
- Highest allowable pressure PS [bar] and highest allowable temperature TS [^{o}C]
- Hazard category acc. 97/23/EC [for pipelines subject to JN or UDT inspection] or pipeline class as per Technical Specification No. 8800 of LOTOS Group [for pipelines subject to ZDT inspection]
- Vapor pressure in the maximum working temperature [bar]
- The value of the product PS x DN [bar] (DN – nominal diameter of pipe)
- The technological number of the PSV valve intended exclusively to the protection of the pipeline with the information of the set pressure [bar]
- Pipeline length only for lines under UDT/ZDT inspection during operation.
- The pressure [bar] of the pressure test
- Postwelding heat treatment
- Type and thickness of insulation
- Conformity assessment module
- Welds quality level acc. to PN-EN-25817
- Legend describing types of attachments
- Number and name of the installation
- Isometric revision number
- Description and date of the isometric revision
- The medium group as per Directive 97/23/EC
- Hazardous medium according to UDT
- Hazardous medium according to ZDT
- The number of the running sheet the isometric / total quantity of isometric sheets
- The inspection on the construction stage JN/UDT/ZDT/SEP
- The inspection on the operation stage UDT/ZDT/SEP
- Examination RT [%]
- Examination UT [%]
- Positive material identification PMI [%]
- Hardness tests after PWHT [%]

4.4 Documentation required to obtain building permits

Documentation required to obtain building permit shall be prepared in compliance with the requirements of the Building Law and the Regulation by the Minister of Infrastructure of 3 July 2003 on the detailed scope and form of a building design (Dz. U. No. 120, pos. 1133).

4.5 Documentation for building objects

4.5.1 Technical (as-built) documentation shall be prepared in compliance with the respective Specifications: 5100 point 3.2, 5110, 5120, 5200, 5210, 5300.

4.6 Documentation of instruments systems

4.6.1 General documentation

- P&ID drawings
- Instrument index
- Instrument data list
- Instrument field layout
- Control-room equipment layout
- Cable route diagrams
- Circuit diagrams of instruments

4.6.2 Documentation of automatic control instruments.

- General Engineering specification
- Instrument data sheets
- Technical specifications of operator's panels
- Technical specifications of ancillary systems, such as: machinery monitoring, flame monitoring, multiplexer system, etc.
- Technical specification of analyzers
- Technical specification of the instruments heating system
- Instrument cable list
- Specifications of erection materials
- Instrument junction box arrangement
- Measuring elements installation diagrams (Primary hook-up)
- Actuating elements installation diagrams (Secondary hook-up)
- Instruments earthing diagrams
- Installation drawings
- Protecting functions. SIL levels verification
- Specification of explosion-proof equipment.
- Calculations of the parameters of spark-proof circuits.
- Ex certificates of instruments.

4.6.3 Control system (DCS) and control-room documentation.

- A general specification of the control system (DCS Engineering specification).
- Technical specification of the process control – a functional description (Process control description)
- Inputs/Outputs list
- Functional block diagrams DCS
- Technical specification: Calculation, notes and clarification to DCS functional block diagrams
- DCS database
- DCS custom graphic displays
- DCS group & trend displays
- Electric supply diagram
- Documentation of the interface with the electrical discipline

4.6.4 Documentation of the interlocking system (ESD).

- Engineering specification: Control, interlock and safeguarding concept
- Technical specification: Process safeguarding (ESD) description
- Inputs/Outputs list
- Functional diagram of the interlocking system (Cause & effect diagram)
- ESD logic diagram – in the form of functional blocks
- Technical specification: Calculation, notes and clarification to ESD logic diagram.
- ESD database

4.7 Electrical documentation

4.7.1 Description.

4.7.2 Material specifications

4.7.3 External and internal agreements and arrangements, opinions, permissions and other documents concerning the electrical discipline

4.7.4 Balances of installed power and demanded power

4.7.5 Calculations of power, short-circuit currents, switchboard self-starting currents

4.7.6 Full single-line diagram of consumer power supply

4.7.7 List of motors and other consumers with the necessary technical data

4.7.8 Cable list

4.7.9 Cable selection table for long-lasting cable capacity and short-circuit capacity, checking the efficiency of quick cut-offs and voltage drops

4.7.10 Selection of protections with settings.

4.7.11 List of electric consumers in the form of a table, with the following elements:

- Motor / consumer electric parameters (Pn; Jn; Un)
- Place of supply
- The current variable of the power supply
- Supply cable type
- Supply cable diameters /outer and under armouring – if applicable
- Box or cassette type with the indication of the sizes of the terminals and min. and max. diameters of cable glands for cable inlets
- Flexible cable type
- Flexible cable diameter
- Motor glands – min. and max. diameters for cable inlets
- Motor/consumer current terminal size

4.7.12 General plan of explosion hazard zones with Ex parameters

4.7.13 Explosion-proof equipment selection table

4.7.14 Location plan of switchboards, power consumers, motors, boxes, cassettes

4.7.15 Plan of cable routes of indoor electric consumers

4.7.16 Single-line diagram of the medium-voltage switchboard

4.7.17 Single-line diagrams of low-voltage switchboards and Motor Control Centers

4.7.18 Schematic diagrams of the primary and secondary circuits of switchboards, tables, boxes and electric consumers

4.7.19 Assembly diagrams of the primary and secondary circuits of switchboards, tables, boxes and electric consumers

4.7.20 Supply, control, assembly diagrams – of every electric consumer

4.7.21 Plan of the lightning protection system, stating the parameters, method and place of connection of vessels and equipment with the necessary erection details

4.7.22 Plan of the installation protecting against the generation of static electricity, definition of the hazard degree, parameters, and erection detail

For pipelines, indicate the place of the direct metallic connection to grounding.

4.7.23 The lighting system should include.

- Electric lighting circuits with powers and currents
- Required and designed lighting intensity levels in individual lighting zones
- Plan of cable routes
- Locations of fixtures, their type and the way of mounting
- Locations of switches
- Erection details

4.7.24 The installation of electric dampers should be included in the electric discipline.

The documentation should show the power supply circuits and the internal power, control and signalling circuits.

4.7.25 Electric heating of pipelines and instruments should be included in the electric discipline (does not apply to package supplies).

The documentation should include:

- Heating cables selection tables with all necessary parameters
- Heating cables specification with numbering, cable types, lengths - in a tabular arrangement
- Isometric drawings showing heating cables and accessories
- Other, resulting from general requirements

Note:

It shall be allowed to combine drawings with related scopes specified above, unless it disturbs the clarity of those drawings.

4.8 Telecommunications documentation

4.8.1 The documentation of the fire detection and signaling network should include the following:

- A technical description of the fire detection and signalling system
- A block diagram of the fire detection and signalling system
- Equipment list
- Cable list
- Technical calculations
- Drawings of cable routes and indoor and field location of equipment
- Assembly diagrams
- Drawing containing, among other things, examples of mounting of detectors and signalling devices
- Material specifications
- Conformity certificates of equipment and cables used, issued by CNBOP
- CE conformity declarations and certificates of equipment intended for work in explosion hazard zones
- Guidelines for operation

4.8.2 The documentation of the telephone network should include the following:

- Technical description of the network with its connection with the existing telephone network
- Block diagram of the telephone network
- Equipment list
- Cable list
- Drawings of cable routes and indoor and field location of equipment
- Assembly diagrams
- Drawing containing, among other things, examples of mounting of telephones
- Material specifications
- CE conformity declarations and certificates of equipment intended for work in explosive conditions
- Guidelines for operation

4.8.3 The documentation of the local loudspeaker system shall contain the following:

- A technical description of the network together with its connection to the existing station equipment in control rooms
- A block diagram of the local loudspeaker system
- Equipment list
- Cable list
- Technical calculations
- Cable route drawings and equipment layout in facilities and in the field
- Assembly diagrams
- Drawing containing, among other things, examples of mounting of loudspeakers
- Material specifications
- CE conformity declarations and certificates of equipment intended for work in explosive conditions
- Guidelines for operation

4.8.4 The documentation of the closed-circuit television system shall contain the following:

- A technical description of the applied technical solutions
- A block diagram
- Equipment list
- Cable list
- Cable route drawings and equipment layout in facilities and in the field
- Assembly diagrams
- Drawing containing, among other things, examples of mounting of cameras
- Material specifications

- CE conformity declarations and certificates of equipment intended for work in explosive conditions
- Guidelines for operation

4.8.5 The documentation of the access control and burglar alarm system shall contain the following:

- A technical description of the applied technical solutions with connections with existing equipment
- A block diagram
- Equipment list
- Cable list
- Cable route drawings and equipment layout in facilities and in the field
- Assembly diagrams
- Drawing containing, among other things, examples of mounting of detectors
- CE conformity declarations and certificates of equipment intended for work in explosive conditions
- Guidelines for operation

4.9 Documentation of safety at work (process) and fire protections

This documentation should include the following:

- Description and location of all installed permanent work-safety equipment, e.g. emergency showers, eye-washing fountains, etc.
- Description, location and diagrams of permanent and semi-permanent fire-fighting equipment
- Description of used fire and explosion-hazard early-warning systems
- List of extinguishing agents expected to be used and their specification
- Description and rules of application of extinguishing steam
- Specifications and description of potential hazards related to the substances and materials used
- Conclusions from the analysis of safe process control (HAZOP) study)

5 Related documents

- Specification 2100 – Fired Heaters
- Specification 2200 – Pressure Vessels, Columns and Reactors
- Specification 2210 – Low Pressure and Atmospheric Storage Tanks
- Specification 2230 – Trays and Packing for Columns
- Specification 2300 – Heat Exchangers
- Specification 2400 – Machines and Drivers (Rotating)
- Specification 2600 – Technical Requirements for Pipelines
- Specification 5100 – Concrete and Steel Structures

- Specification 6300 – Basic Documentation

6 Record of changes

No.	Date	Description	Introduced by
1 rcc	 22.12.05	This specification entirely replaces the former LOTOS Group S.A. standard No. PR 07 640 with the same title. Added three documents	B. Kowalewski Cz.sacha
2	12-05-2011	Changed point 4.3	Z. Nowakowski
-	31-08-2015	Page layout corrections, no contents changes.	T. Wróbel