

Employer
SAKO BRNO A.S.

Project
**High-efficient combined heat and power facility utilizing renewable sources (OHB
II - line K1)**

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PART III, APPENDIX 14.9

PRESSURE VESSELS, TANKS AND PIPING



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(OHB II - line K1)**
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1. GENERAL

Pressure Vessels, Tanks, Equipment and Piping shall be designed and executed in compliance with the latest issue of the EC "Pressure Equipment Directive" (PED) and all relevant Legal regulation in the Czech Republic concerning pressure equipment.

Depending on the equipment category and the selected conformity assessment module applicable to the specific project, it can be necessary to involve a notified body to obtain the required approvals. Refer to Appendix A14.1 *Welding and Inspection of Pressurized Parts* for more information. All involvement of notified bodies shall be included in the Contract Object with full responsibility of the Contractor.

The Contractor is responsible for keeping up to date with requirements and submitting and maintaining all documentation required by national and local Authorities and EU regulations.

2. CODES OF PRACTICE, STANDARDS AND OTHER REQUIREMENTS

Unless otherwise specified the following codes and standards of the latest issue will apply for pressure vessels and pipe systems:

- The EC "Pressure Equipment Directive" (PED)
- EN 13445 "Unfired Pressure Vessels"
- EN 13480 "Metallic Industrial Piping"
- National and local codes of practice, standards and requirements

3. DESIGN OF PIPE SYSTEMS

Calculation methods and employed rules and regulations divided on the various types of piping systems included in the Contract Object shall be stated.

All pipes shall be laid in a practical and well-planned way according to the prior approval of the Employer and disregarding that the pipeline length may be longer than the shortest possible length. Routing of the pipes shall, to the greatest extent possible, follow the main routing of the system. The Contract Object shall include all necessary suspensions, supports and fittings. The Contractor shall take into consideration the extra space needed for insulation and cladding (appendix A14.4 *Insulation and Cladding for Process*) as well as removal of this during maintenance.

The Contractor shall take into consideration the extra space and weight as a result of the insulation and cladding (Appendix 14.4 *Insulation and Cladding for Process*) as well as removal of this during maintenance.

Pipe suspension / support shall not result in reduction of pipe insulation thickness.

Allowance shall be made for easy and handy disassembly for inspection and repair, and all external pipes under the Contract Object shall have adequate flexibility to absorb thermal expansion and shifting. The pipes shall be properly suspended/supported.

For steam, hot water and district heating pipes stress and elastic design shall be performed by means of established software verifying these conditions, and the design shall be submitted to the Employer.

Piping system shall conform to the latest issue of the EC Directive on harmonisation of the legislation of the member states on pressure equipment (PED).

It shall be possible to ventilate and drain all piping systems.

Exhaust pipes in the water and steam cycle must be free of compensators, except in special cases if agreed by the Employer and shall be steadily rising in the direction of the fluid flow.

4. PURCHASE OF PIPE COMPONENTS

Purchase of pipe components and quality control of purchased pipe components shall take place according to a pre-produced procedure. The Contractor shall describe the procedures and present these to the Employer.

5. PRODUCTION, ASSEMBLY AND TESTING

Production of piping systems in Contractor's or in Subcontractor's workshops and on site and quality control of these activities shall conform to a pre-produced procedure. The suggested procedures, divided on the following types of piping systems, shall be described and presented to the Employer.

- Contractor's workshop(s) activities
- Subcontractor's workshop(s) activities
- Site activities

All pipes shall be free of impurities after production and pipe ends shall be kept covered such that impurities do not penetrate into the pipes. Pipe end covering shall only be removed just before assembly.

Special care shall be taken when conducting hydrostatic pressure tests. The material of the pressure parts shall be the deciding factor in determining the minimum water temperature during pressure tests, in order to mitigate risk of brittle fracture. Only boiler water (demineralised water) will be accepted used during hydrostatic pressure tests.

6. DOCUMENTATION

For documentation in general, see Appendix A14.7 *Documentation*.

6.1 General requirements for handling of quality documentation

All quality documents shall be registered and available for inspection by the Employer.

All certificates shall, if necessary, be submitted for approval by notified body. Certificate must be stored safely and ultimately included in the final Documentation to be handed over to the Employer.

The quality documents for the materials purchased shall be considered part of the Contract Object and must be handed over to the Employer according to the article 16 of the Contract.

The Contractor shall provide full traceability for all alloyed materials as described in Appendix A14.1 *Welding and Inspection of Pressurized Parts*.

7. REQUIREMENTS FOR DESIGN AND ASSEMBLY OF PIPING

Gradient

Pipes shall be suspended to achieve a minimum gradient of 2 % towards the prescribed draining and emptying points in both cold and hot (operating) conditions. In situations where a smaller gradient is advisable, this shall be approved by the Purchaser. Drain direction shall follow the flow direction. All parts shall be drainable.

Insulation

Insulation works shall be performed according to Appendix A14.4 *Insulation and Cladding for Process*. Pipes shall be arranged to provide for sufficient space for the insulation. Vertical pipes shall be supplied with devices for fixing of the insulation.

Location of armatures

The location of armatures (equipment such as valves, measurement connections etc.) shall be easy-to-operate and easily accessible for maintenance works.

Drain and ventilation

Piping systems shall be supplied with drain and ventilation pipes, the location of which may not cause any water or air pockets. Drain and ventilation pipes shall as a minimum be of DN25 and pipe thickness shall be according to PED.

Discharge of drains shall be designed without risk of spillage and with separate piping for different pressure levels to a common drain header connected directly to an unpressurized drain/flash tank.

Ventilation pipes shall be connected to a common and open drain box without risk of steam release by e.g. installation of a lid.

8. DESIGN AND ASSEMBLY OF PIPE SUPPORTS

Supports may not be welded directly on the pipes.

Steel structures

Steel structures for suspension of pipe supports shall be fixed to concrete columns.

Where anchoring in concrete beams is expected, steel piping shall be embedded for fixing with continuous bolts.

All steel structures shall be surface treated as stated in Appendix A14.2 *Steel Constructions for Process*.

Hangers and supports

For the individual pipe supports the choice of hanger type and size shall allow for the movement of the pipe to correspond to the calculated movement, especially for the pipe to move back to its original position in cold condition.

Spring and constant hangers shall where possible be supported in the gallery levels and located in such a way that label and scale are easy to read, and control and adjustment easy to make from the present galleries.

The block and deblock of hangers during post-construction pressure tests or repair of the piping systems shall be easy and without the use of scaffolding.

The design of the suspensions shall allow for minimum heat transmission from the suspended pipe.

The hangers shall be provided with clear scales stating the movement of the supports in mm and labels indicating position in hot and cold conditions.

The choice of hanger type and size shall allow for a reasonable maximum movement compared to the calculated movement.

The hangers shall have a reasonable adjustment area compared to the calculated supporting strength and be easy to adjust.

The location and design of pipe supports shall prevent unacceptable deformations, forces or stress in the piping systems or the connecting pieces. This shall also apply under abnormal operation conditions such as pressure testing with water (steam pipes) or draining during repair (water pipe). Pipe supports shall be dimensioned for the loads from normal as well as abnormal operation conditions.

The structure of the suspensions shall allow for nuts and screws to be located outside the insulation wherever possible. Lock nuts shall be used.