



TENDER DOCUMENTATION FOR SELECTION OF THE CONTRACTOR

**Refurbishment of the Combined Heat and Power Plant
in Mladá Boleslav**

Business Package OB 2

BOILER HOUSES

VOLUME III

TECHNICAL REQUIREMENTS

Annex A3 Binding Technical and Functional Requirements

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1 THE PURPOSE OF THE CONSTRUCTION AND TECHNICAL REQUIREMENTS FOR THE BUILDING CONSTRUCTION AS A WHOLE

1.1 List of Abbreviations

Note: Sorted alphabetically according to the Czech version.

Abbreviation	Text
AR	Administration procedure code
I&C	Automated management system of technological process
ATEX	ATEX Directions (Atmosphères Explosibles) for equipment and protective systems intended for use in areas with explosion hazards
BAT	Best Available Techniques
BEP	BIM Execution Plan
BIM	Building Information Modelling/Management
RR	Routine repair
OHS	Occupational safety and health
CE	Conformité européenne
CCTV	Closed Circuit Television
CEMS	Emission monitoring system
CDE	Common data Environment
No.	Number
CR	Czech Republic
ČSN	Czech technical standard
DIN	Deutsche Industrie Normen
DOSS	State administration authorities concerned
DPS	Documents required for building construction
DSP	Documents required for building permit
DSPS	Documents of as-built condition of the building construction
WCh	Wood chips
WRW	Waste rainwater
EIA	Environmental impact assessment
EIR	Exchange Information Requirements

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Abbreviation	Text
EMC	Electromagnetic compatibility
EN	European standards
EFAS	Electronic fire alarm system
FAC	Final Acceptance Certificate
FAT	Factory Acceptance Test
FC	Frequency converter
GO	General overhaul
H	Hold point
HMG	Harmonogram
HAZOP	Hazard and Operability Study
HW	Hardware
CHOPAV	Protected area of natural water accumulation
IAPWS	International Association for the Properties of Water and Steam
IEC	International Electrotechnical Commission
IFC	Industry Foundation Classes/format
IO	Engineering object
I/O	Input/output signals
IPPC	Integrated Pollution Prevention and Control
ISO	International organization for standardization
IT	Information Technology
ITS	Internal technical standards
ITE	Individual tests
k.ú.	Cadastral territory
KV	Comprehensive testing
LV	Low voltage
FWT	Feed water tank
NV	Government regulation
OB	Business package
SS	Steel structure

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Abbreviation	Text
parc.No.	Parcel number
PAC	Preliminary Acceptance Certificate
PED	Pressure Equipment Directive
P&I	Piping and instrument diagram
BC	Belt conveyor
PD	Implementation documentation
SIT	Schedule of inspections and tests
PBŘ	Fire Safety Concept
POV	Plan and organization of the building construction
PRE-BEP	Design plan of BIM implementation
PS	Operational file
SCR	Selective catalytic reduction
CGM	Combustible dust mixture
SEE	Stable extinguishing equipment
SIL	Safety Integrity Level
I&C	Instrumentation and Control system
SNCR	Selective non-catalytic reduction
SNIM	3D model non-graphic information standard
SO	Building object
CfW	Contract for work
SP	Building permit
QMS	Quality management system
SW	Software
CS	Control system
SP	Solid pollutants
ÚSES	Territorial system of landscape ecological stability
HV	High voltage
VOC	Volatile organic compound
ACS	Air-conditioning system

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Abbreviation	Text
HP	High pressure
W	Witness Point
WF	Workflow

1.2 Basic required technical and functional characteristics of the WORK

1.2.1 General requirements

The Time Proven Equipment

The machinery and equipment offered shall be of state-of-the art, and of time proven designs, the operational reliability of which has been verified at least in test operations with achieving high efficiencies. The CONTRACTOR will submit their statement in this respect, together with other references.

Low operating costs

The machinery and equipment offered shall show low consumption of energy, water, and auxiliary materials, while meeting all quality parameters. Therefore, the machinery must be of modern high-efficiency design, and the type and size of machinery must be selected, so that the desired operating range is in compliance with the optimum efficiency.

Low investment and maintenance costs

The investment and maintenance costs must be as low as possible (well-balanced and achievable), provided that the ultimate intent and ecological effect are not affected. These general requirements must be reflected in the technology, design and standardization of the machinery and equipment, general and detailed layout, minimization of construction operations and works, short and simple pipe and cable connection, easy access to the machinery and equipment for operation and maintenance, high automation, etc.

Technical adjustments of existing machinery and equipment

With respect to minimizing investment costs and time saving, the CLIENT prefers the use of existing components wherever it is technically possible, but in accordance with the concept of the expected minimum service life and reliability of non-replaced components and their suitability for a future operation.

Operation Safety

All risks arising from operation must be excluded. The operation must be safe, and all necessary precautions must be taken to avoid any danger to personnel, equipment, and the environment during start-up, normal operation, planned shutdowns, emergency shutdowns and outages.

Safety and signalling shutdown systems (automated) must be installed on equipment where a malfunction could result in an accident. Systems must be "fail safe", i.e., they must be capable of correct operations in the event of any loss of electrical power or regulatory air pressure.

Mobile equipment must be placed on the foundation structures in such a way that vibrations during the operation of the equipment are not transmitted to the foundation structures.

Ventilation systems must deal with the safe removal of released gases or vapours.

Drainage systems, both downflow and closed (pressure) ones must be installed to collect and return for re-using all discharged liquids that may contain hazardous or harmful substances and to prevent their discharge into the environment. This applies to both permanent and intermittent discharges.

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Equipment Arrangement (indoor or outdoor solutions)

The CONTRACTOR will propose solutions for individual parts of the equipment and building objects that will be optimal with respect to:

- Climatic conditions
- Technologic processes
- Operation and maintenance
- Investment and operating costs
- Reliability and safety

1.2.2 BAT and legislation requirements

The delivered WORK must comply with legislative regulations and standards valid in the Czech Republic, as well as it must comply with all BAT requirements. And furthermore, the CONTRACTOR must comply with all official regulations and directives of the Czech Republic and technological and health standards, including environmental regulations, regulations regarding waste, etc.

1.2.3 Language

The official language of the project is Czech language. During the coordination of OB 2, there is a possibility of communication in English, this fact must be confirmed by the customer and cannot be forced in any way. Project outputs necessary for operation and state authorities will be in the Czech language, some big parts of the documentation can be in English, see documentation A7.

All labels, operator's screens and descriptions placed on the machinery and equipment, markings of building objects, safety signs, warnings given by legal regulations must be in the Czech language.

2 OPERATING AND PERFORMANCE PARAMETERS

The purpose of the project is related to the decarbonization of the Combined heat and power plant (withdrawal of coal burning), which will be made possible by burning of biomass in the form of wood chips together with the co-combustion of plant pellets in the existing K80/K90 boilers and solely wood chips in the new K20 boiler. With this change, it is necessary to ensure and implement such a technological process that will ensure technically and technologically the entire reception, storage, and transport of wood chips, both to the existing reconstructed boilers K80 and K90, and to the new K20 boiler.

The new K20 boiler will be used to cover the missing steam output of the K80 and K90 boilers which occurs after the replacement of the fuel in these boilers from coal to wood chips and the necessary retrofit of the existing boilers, when the steam rated output of the existing boilers will be reduced.

Reducing steam rated output of the existing K80/K90 boilers from 140 t/h of high-pressure (HP) steam to 100 t/h results in a reduction of steam output of 80 t/h which will be replaced thanks to the new K20 boiler.

The K20/K80/K90 steam boilers will thus continue to be used for the production of high-pressure steam and use in steam turbines for highly efficient cogeneration production of electricity and heat for heating the city of Mladá Boleslav and the industrial zone as heretofore.

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2.1 Presumed performance parameters of the future PLANT

		boilers		
Biomass operation– wood chips		K90	K80	K20
		retrofit	retrofit	new
Steam rated output	t/h	100	100	80
Steam nominal temperature	°C	535	535	535
Superheated steam nominal pressure	MPa	12.5	12.5	12.5
Boiler nominal efficiency	%	90	90	91
Rated output	MW	71.1	71.1	57.2
Total rated output K80+K90+K20	MW	199.4		
Heat input at heat output	MW	79	79	63
Total thermal input of solid biomass	kW	221		
Fuel consumption 10MJ/kg	t/h	28	28	23

In addition to wood chips, as a fuel for K80/90 boilers there are co-burned plant pellets up to 40 percent of the input power and technological fuel (residual oil emulsions). Natural gas shall be used as the start-up fuel.

2.2 Automatic Operation of the OB 2 PLANT

The OB 2 PLANT operation will be fully automatic during normal operation, start-up and temporary shutdown will be controlled from the control room in cooperation of Operators.

The OB 2 WORK will place minimal demands on operation and maintenance. The OB 2 WORK shall be at such a technical level, and of such quality and such degree of automation and security that the operators' errand activity is limited to once every 2 hours within permanent operating conditions (except for running-in and temporary shutdowns).

2.3 Mode of Operation

All boilers will be designed for continuous operation with maximum efficiency. The boilers will complement each other in terms of performance to cover any needs of steam turbines (together with the existing K70 one), as well as heat supplies to the Plant, respectively to the city Mladá Boleslav.

It is assumed that the K20 boiler will be of hi-tech design and will work with a higher efficiency, therefore the primary loading of this unit is assumed.

2.4 Protection of technological equipment in winter season

The CONTRACTOR must take all measures necessary to operate the OB 2 PLANT in the winter. The buildings tempering and possibly other measures must be ensured, so that even after a longer shutdown of the unit in the winter season, the PLANT is fully operable, and primarily it is able to meet start-up requirements.

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3 COMMON OPERATION OF NEW AND OLD TECHNOLOGY

3.1 Construction Period

3.1.1 Organizational structure of the building construction

The construction is divided into seven supplier units OB 1 - OB 7 which must follow-up functionally, temporally, and organizationally.

For the Supplier structure – see the Annex A1, the Chapter 1.3.

The CLIENT is responsible for the project coordination and the project management, and they will do so via selected companies with the function of General Designer, as well as companies providing the project management.

General Designer

The General Designer appointed for the construction provides design and administrative and legislative activities in the field of construction and technological units (the planning permission, building permit process, documentation for the selection of contractors of technological units, etc.), as well as management, control and coordination activities during the implementation of the CHP PLANT refurbishment based on the boundary conditions and functionality of individual OBs in relation to each other and the functionality of the Project as a whole. The general designer is not responsible for the correctness of the project or the execution of individual OBs or the building construction management.

Project Management

At the same time, the CLIENT designated a company for providing project management within the whole construction period, consisting mainly of: the project management, management and coordination of the construction, value engineering, cost management, technical supervision of the CLIENT, coordination of OHS and FP.

CONTRACTOR's Responsibilities

The Contractors of individual OBs are obliged to cooperate actively with the General Designer and the Project Management Company, whether under the terms of the project preparation, the project development, the building construction execution, including change management process, and actively point out to any non-conformities.

3.1.2 Construction procedure

3.1.2.1 General conditions

1. During construction, the operation of other non-modernized boilers must be maintained and must not be endangered or restricted, in regard to the K70 gas steam boiler and the other K40, K50 and K60 gas-fired boilers. In case of necessity to reduce their operation, this activity shall be planned together with the CLIENT and well in advance,
2. The required supply of heat from the CHP must be ensured without shortage of supplies,
3. The supply of electricity must be ensured according to the requirements of the CHP in accordance with possible planned shortages of supplies.
4. Any impacts on the Company Škoda Auto production must be avoided as much as possible.

Among other things it relates to a period of temporary over-switching, separation or disconnection of systems and their subsequent connection without prior agreement with the CLIENT.

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3.1.2.2 Phased construction

Within 1st stage of construction, the CLIENT requests the simultaneous construction of a new K20 boiler, the refurbishment of the K80 boiler, while the K90 boiler for coal and plant pellets, including the combustion of technological fuel is still working, the unloading point construction, a checkpoint, transport, and storage of wood chips, including the extension of the industrial railway lengthening, the construction of the SEE.

After the stage of running-in and testing the K20 and K80 boilers and the fuel handling of wood chips, with simultaneous reliable operation of the K90 coal operation, the 2nd final stage will follow.

Within the 2nd stage, the following operations will be carried out: the refurbishment of the K90 boiler during the simultaneous operation of the K20 boiler for wood chips, and the K80 boiler for wood chips and plant pellets and technological fuel, as well as the final dismantling and demolition works, incl. the coal dump disposal, followed by trial run of the whole WORK.

3.1.2.3 Some problems related to simultaneous refurbishment and K80/90 operation

In order to burn biomass in the K80 boiler, in addition to the infrastructure (the sorting house, the crushing house, the external fuel silos and the relevant conveyor routes), the transport route between the K20 boiler room and the K80/90 boiler room must also be completed. As for the new K20 boiler room is concerned, the conveyor part must be completed before the K80 boiler is put into operation (within the scope of OB 1).

Description of the anticipated measures for the reconstruction of the K80 and the simultaneous operation of K90 in terms of maximum dimensional restrictions incl. a possible roof superstructure:

- New transport conveyors for wood chips designated as BC13b and BC13c will be installed in the area of E1A boiler house (within the scope of OB 1).
- Prior to dismantling the coal feeding of the K80 boiler, the existing coal handling belt conveyor above the K90 boiler hoppers will be moved to a position above the rear hopper and will be supplemented with a coal plough for dropping coal into the front hopper (within the scope of OB 1).
- This is followed by the demolition of the K80 boiler coal hopper and the installation of two circular hoppers for the K80 boiler with a coal feed system.
- From the BC13b conveyor there will be a provisional leader/conduit and will be entered into the first newly installed storage tank for wood chips of the K80 boiler. The leader/conduit will be made, so that it does not damage the existing coal transport and will be connected to the location of BC16a track. A provisional conveyor can then be installed on this track to the second storage tank for wood chips (within the scope of OB 1).
- In this version of fuel filling, the K80 boiler can be put into operation after its retrofit on a trial basis.
- After the K80 boiler is put into operation, the demolition of the coal feeding and existing coal storage tanks of the K90 boiler will be started.
- After the subsequent installation of two new circular wood chip containers for the K90 boiler, the BC15b conveyor with a platform and the BC16b conveyor can be installed, including the connection to the BC13c conveyor (within the scope of OB 1).
- After the conveyors are installed, tests will be carried out on the retrofitted K90 boiler.
- After dismantling the provisional leader/conduit from BC13b and the provisional on the BC16a conveyor track, the BC16a conveyor will be installed together with the second BC15a conveyor (within the scope of OB 1).

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- The BC16a and BC16b Conveyors will be installed through the opening on the side of the K90 boiler room (within the scope of OB 1).

The OB2 CONTRACTOR will coordinate all procedures with the OB1 CONTRACTOR.

Cleaning operations

Cleaning operations on boilers and pipes must be carried out in such a way that they do not disturb the any operations in other parts of the UNIT or the PLANT.

For other construction conditions see Annex A 9.

4 REQUIREMENTS FOR LIFETIME AND RELIABILITY

4.1 Lifetime period of the OB2 WORK

All new UNIT equipment and components must have a design life of at least 200,000 operating hours, in accordance with the procedure described in ČSN EN 12952-3.

The OB 2 CONTRACTOR shall prepare a report on the expected service life of the K80 and K90 boilers in light of the target service life of further 15 years. In the case of a shorter service life, the CLIENT shall be notified of such fact. For the purpose of such evaluation, a detailed inspection of the boiler shall be allowed to be made after the signing of the agreement. All particulars of the report and of the possible inspection of the boilers are described in Annex A7.

Building objects, installations and building service systems must meet the criteria of a designed service life of 70 years.

The PLANT project proposal must guarantee that any load changes and a cyclic operation do not exceed the allowable limit values guarantee the design life, provided that the CONTRACTOR takes into account the following conditions related to start-up / shutdown and load change during the lifetime:

The number of cold starts per year - valid for each boiler: 4
The number of warm starts per year - valid for each boiler: 12

4.2 Repairs

It is required that:

- Routine repairs and inspections shall be carried out once a year in the course of summer shutdowns.
- The scope of routine repair is defined by the Supplier of the equipment.

4.3 Lifetime of new components

The quality of materials, internal anti-corrosion protection, structural and project design and dimensioning of individual devices and components shall meet the following requirements, if their replacement is necessary after agreement with the CLIENT.

- Service life of the fan wheel of the boiler air fans - 120,000 operating hours, as a minimum.
- Service life of the fan wheel of the flue gas fans of the boiler – 80,000 operating hours, as a minimum.
- The fans bearing service life of 40,000 operating hours at maximum load is required.
- Larger ball and roller pump bearings must have the service life 40,000 hours at maximum load.

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- The shortest permissible lifetime of individual boiler components is 10,000 operating hours, if they can be replaced during the planned routine repair (RR) within a period of 3 weeks.
- Parts that cannot be repaired or replaced within scheduled routine repairs (RRs) must have their service life longer than 75,000 operating hours and will only be changed or repaired within scheduled general overhauls (GOs).
- The service life of individual equipment components shorter than 10,000 operating hours is not allowed.

The CONTRACTOR is required to specify the equipment and devices that have their service life shorter than 20,000 hours, i.e. those threatened by replacement during the implementation of the project or during the guarantee period, and to notify the CLIENT thereof.

4.4 Required availability of the PLANT

See the A6 Annex for definitions and required availability.

5 MAINTENANCE REQUIREMENTS OF THE PLANT

Environmental conditions and outdoor installation principles must be considered when designing maintenance and service arrangements for the PLANT equipment and systems.

The CONTRACTOR shall ensure all conditions for the proper maintenance of the PLANT equipment and systems.

5.1 Expected Maintenance System

Maximum required length of the general overhaul: 6 weeks

Length of a routine repair: 20 days / a year, as a maximum

- If during maintenance and repair works there are some waste substances that cannot be drained directly into a sewerage system, the CONTRACTOR must deliver equipment for their ecological disposal.
- In the interest of the Operator is to maintain the equipment at the project parameters for as long as possible.
- The maintenance of the whole facility will be carried out according to the maintenance regulations which will include the organization, scope and time schedule of works, shutdowns during the year, repair cycles.
- All regulations regarding individual equipment, machines, devices, etc. will be delivered together with the delivery of the equipment.

From the maintenance point of view the equipment will be divided into the following groups:

- Equipment that can be serviced when it is put out of operation (for operational reasons, there shall be a spare equipment available).
- Equipment the maintenance of which can be carried out during its operation (tightening of fitting seals...)
- Equipment the maintenance of which is not carried out during its operation (between shutdowns).

Equipment maintenance will be performed on the basis of monitoring the operating hours of individual equipment. Repair cycles will be determined on the basis of the knowledge of the service life of individual

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parts of the equipment, with an effort to accumulate interventions on the equipment into larger repairs and extend operating periods.

5.2 Serviceability

The EQUIPMENT layout must provide a sufficient access to the equipment for operation and maintenance. Equipment requiring access for operation or maintenance shall be accessible from ground floor level or by stairs. Any use of vertical ladders as an operation or maintenance route must be approved by the CLIENT.

Individual parts of the WORK shall have sufficient handling space for operation and maintenance.

Measuring points, fittings, manholes, observation windows and parts of the WORK where it is necessary to carry out cleaning or maintenance, for example, must be accessible without auxiliary scaffolding or other structures. The WORK and its parts are to be designed in such a way that it is not necessary to dismantle additional technological equipment unrelated to the intervention during their maintenance or repairs.

5.3 Maintenance

Any heavy equipment that requires disassembly will be lifted by an internal hoist or with the aid of an external lifting equipment, such as a mobile crane, etc. The lifting equipment and transport routes and an expected service space will be implemented in the initial stages of the project and implemented into the layout solutions. The possibility of disassembly for some devices must be proven already during the design phase.

Equipment and other technological elements must be located in operational areas, so that they are easily accessible even when in operation and easy to maintain. All equipment and its parts, the weight of which exceeds 50 kg must be accessible for any manipulation with a permanent hoist or auxiliary mobile hoists or a load-bearing structure.

The equipment must be equipped with lifting eyes, a hoist beam, and an accessible station or handling place must be provided for their maintenance. Only vertical lifting is allowed, any deflection when lifting the load is prohibited.

Lifting equipment shall be designed to be capable of unloading the lifted equipment to the nearest accessible road or a passage for traffic. Lifting devices with a capacity of more than 3t and a lift of more than 5m will be designed with an electric drive secured against an operator error.

6 SAFETY OF WORK AND TECHNICAL EQUIPMENT

6.1 General Risks

All risks arising from operation must be excluded. The operation must be safe, and all necessary precautions must be taken to avoid any danger to personnel, equipment and the environment during start-up, normal operation, planned shutdowns, emergency shutdowns and outages. Release and ventilation systems will ensure the safe removal of gases or vapours released

The equipment will be designed and implemented in accordance with valid safety regulations, decrees and ČSN. Also, all works will be carried out in accordance with these regulations, decrees, and standards.

The UNIT and directly related parts of the PLANT will be assessed in accordance with the Government Regulation 406/2004 Coll. on more detailed requirements for ensuring safety and health protection when working in an environment with a risk of explosion and with other legislative regulations assessed and subsequently provided with such a technological solution, ensuring compliance with these regulations.

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6.2 Reserved technical equipment

Standards relating to dedicated technical equipment will be strictly observed; no exceptions to the detriment of occupational safety will be allowed.

Machines, devices, tools, and other equipment the use of which could cause damage to the health of workers will be provided with instructions in which measures to protect the health of workers will be given.

When designing the project solution and own implementation, all valid regulations and decrees relating to health and safety for individual specific works and activities must be taken into account and observed (this is in particular Decree of the Czech Occupational Safety Office (ČÚBP) No. 48/1982 Coll., which lays down the basic requirements for ensuring occupational safety and technical equipment - only selected sections are now in force, especially the Government Regulation No. 101/2005 Coll., on detailed requirements for the workplace and working environment, Government Decree No. 362/2005 Coll. on detailed requirements regarding safety and protection at workplaces with a risk of falling from a height and in to a depth and all related other decrees, standards and regulations, or as amended by later implementing and amending decrees.

6.3 Protection against the risk of explosion of gases, vapours, and dust

The entire process will be evaluated in accordance with the requirements for ensuring the occupational safety and health protection when working in an environment with a risk of explosion, according to the Government Regulation (NV) 406/2004 Coll.

The technology of transporting and storing wood chips is a source of fire and explosion hazards. And as another source there is natural gas.

Wood chip dust can form an explosive mixture in a stirred state when mixed with air.

The risk of explosion during transport and storage is particularly higher in closed technologies. These are pneumatic conveying of powder materials, screw conveyors, enclosed belt conveyors, elevators, etc. in the area around conveyor pouring, and so on.

Storage facilities include silos and covered storage tanks. Inside these technologies, dust particles are stirred up during handling which can cause an explosive atmosphere. If this explosive atmosphere comes into contact with a sufficiently effective initiation source, an explosion will occur.

A separate transport system will be used for the transport of wood chips and pellets from silos to a boiler, which will be sealed, so that no dust leaks into the boiler room.

Depending on the pipeline type, this system will be equipped with an indication and signalling of a dangerous concentration of media.

Piping and equipment in which an explosion of flammable vapours or dust can occur will be equipped with safety devices (valves, diaphragms) if they are not designed to withstand pressure from explosion, if they have not been so equipped.

Areas with a risk of explosion will be provided with permanent ventilation.

Spaces where natural gas is burned will be ventilated with the minimum frequency of air exchange at least, according to the applicable regulations for the given space. Gas leak detectors will be installed here which will close the main gas valve at the entrance to the building in the event of a gas leak, thus the gas burning equipment will be put out of operation.

The equipment shall be designed in accordance with Government Regulation No. 116/2016 Coll. on conformity assessment of equipment and protective systems for use in potentially explosive atmosphere, when they are supplied to the market and as well as in accordance with Government Decree No. 407/2004 Coll.

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Areas with a risk of explosion must have a part of their outer case (peripheral, roof) designed as an exhaust surface. Other surfaces must withstand the impacts of a possible explosion. The OB 2 CONTRACTOR is obliged to also apply this in respect of parts that shall be newly supplied within the scope of his works.

In areas with a risk of escape and spillage of substances endangering the health and life of workers, air analysers with alarm triggering and automatic emergency ventilation starting-up must be installed.

Methods of protecting storage tanks and transport systems.

If the structure itself has such a pressure resistance that it can withstand the pressure from expansion without any damage, it is not necessary to interfere with the structure in any way. Such vessels and tanks can be divided into two groups, namely vessels and tanks that can withstand a pressure from explosion and these ones that can withstand the explosion impact.

This division is based on the fact, whether any permanent deformations of these vessels and tanks may. According to ČSN EN 14460 (structures resistant to a pressure from explosion), it will not be necessary to install a relief device for vessels and tanks resistant to pressure or impact of explosion.

In such a case that a tank / vessel is not designed as resistant to pressure from explosion or impact, a protection of tanks / vessels shall be executed by means of with a device for suppressing or releasing any explosion. Both systems reduce the maximum pressure from explosion to the so-called reduced pressure from explosion which is much lower than the maximum pressure from explosion.

Preventing explosion transfer to/from other parts of the technology.

Based on the evaluation within which the explosion prevention system is installed, it is used as a measure against explosion spreading from one device to another. e.g. rotary feeders, valves, quick-action slide valves) according to ČSN EN15089 or by means of preventing transfer through a layer of material.

It is also possible to use a system of screw conveyers preventing further explosion transfer to other parts of the technology.

6.4 Health Safety Regulations

When designing the equipment, the following Health Safety Regulations, and other regulations, as amended, shall be observed:

1. Act No.258/2000 Coll. On Protection of Public Health and amendment to some Related Acts
2. Act No. 262/2006 Coll. Labour Code, as amended, other related laws.
3. Act No. 309/2006 Coll on further requirements with regard to occupational safety and health ensuring safety and health protection during activities or providing services outside employment relationship (Act on ensuring additional conditions for safety and health protection at work)
4. Government Regulation No. 591/2006 Coll. on detailed requirements regarding safety and health protection during work on construction sites
5. Government Regulation No. 272/2011 Coll. on health protection from the adverse effects of noise and vibration
6. Government Regulation No. 361/2007 Coll. determining conditions of occupational health protection
7. Government Regulation No. 390/2021 Coll. on more detailed conditions for the provision of personal protective work equipment, washing, cleaning, and disinfecting agents

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From the point of view of health and safety (OHS) in the sense of the Labour Code (Coll. No. 262/2006 Coll.) and the related Act No. 309/2006 Coll., regulating other health and safety requirements (in the sense of the EEC) the CONTRACTOR is obliged to observe in particular:

1. Government Regulation No. 591/2006 Coll. on detailed minimum requirements for health and safety when working at construction sites., and No. 361/2007 Coll., which establishes the conditions for the protection of employees at work,
2. Act No.258/2000 Coll. On Protection of Public Health (as amended, and especially Act No 272/2011 Coll. on health protection from the adverse effects of noise and vibration
3. Government Regulation No. 432/2003 Coll., which establishes the conditions for work categorization, the limit values of biological exposure test indicators and the requirements for reporting work with asbestos and biological agents, and Government Regulation No. 378/2001 Coll., laying down detailed requirements for safe operation and use of machinery, technical equipment, instruments, and tools. Increased attention must be given when working with electrical equipment and building construction machinery and equipment. For these machines, workers must have the appropriate authorization and qualification.
4. Construction and assembly works will be carried out by a competent professional company, whose employees will be familiarized with the technological procedures and the relevant safety regulations in accordance with the applicable legislation before starting any works.
5. Before commencing any earthworks, it is necessary to re-check the affected area and the area of interest regarding the underground facilities and, if necessary, to mark them out precisely. The courses will be verified by hand-dug probes. Earth- and excavation works, carried out in close proximity to operating electrical underground equipment, must be carried out exclusively by hand. Works with machinery must be adapted to valid safety regulations and decrees, especially in the vicinity of live electrical equipment.
6. No Explosives will be used during any removal and demolition works on the existing building construction. All works must be carried out in such a way that the stability of the building construction itself or other buildings in the immediate vicinity and the operability of technical equipment networks within the reach of the demolition works are not threatened, according to a predetermined detailed technological procedure that takes into account the current condition of the building as discovered by a survey, processed by a qualified construction contractor in accordance with Decrees No. 499/2006 Coll. and 268/2009 Coll. And all other related and later amended laws, decrees or implementing regulations.

7 NOISE

The noise loading levels must not exceed the maximum hygienic noise limits given primarily by Act No. 258/2000 Coll. on the protection of public health as amended and Government Regulation No. 272/2011 Coll., on the protection of health from the adverse effects of noise and vibrations as amended.

7.1 Noise outside objects

The combined heat and power plant is located in the city near the housing development.

The noise conditions in the surroundings are described in Annex A.2

Requirements for noise pollution, that is, avoiding noise load raising, are described in Annex A6.

The CONTRACTOR must respect the following requirements for noise in the interior spaces:

- Acoustic pressure, measured at a distance of 1 m from the equipment or from the surface of the noise protection cover (ISO 3746) LpA less than 85 dB – if it is impossible to comply with this

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requirement, the OB 2 CONTRACTOR shall make a list of such equipment and shall discuss with the CLIENT about the resolution of such situation with the aim of complying with those requirements.

- Laeq technology for indoor working environment, 8h less than 80 dB.
- Indoor work environment, as a control room, offices, and laboratories Laeq, 8h less than 50 dB.

8 FIRE SAFETY

The basics of fire safety are provided by the Fire Safety Concept /Design of the Construction (PBR). See the PBR appendix in the Building Permit documentation.

9 OTHER REQUIREMENTS

9.1 Units used

Type	Unit of measurement
Electric voltage	V, kV
Electric current	A, mA
Energy, work, heat	J, kJ, MJ, kWh/MWh
Level	0 – 100%, m, cm
Noise	dB(A)
Weight	mg, g, kg, t
Frequency	Hz
Concentration, composition	% vol., % hm, mg/l, mg/m ³ , mg/m ³ , mg/kg
Quantity, consumption, flow	m ³ /h, Nm ³ /h, kg/s, kg/h, t/h, t/year
Volume	m ³
Volume of gases under normal conditions, pressure 1.0132 bar, temperature 0°C	Nm ³ (normal conditions)
Speed	s ⁻¹ , min ⁻¹
Temperature, temperature difference	°C
Pressure	MPa(g), MPa(a), kPa(g), kPa(a)
Conductivity (electrical)	μS/m
Power output, heat flow	W, kW, MW

9.2 KKS uniform designation system and its application

All marking of the newly delivered equipment will be done according to usual practice and requirements of the CLIEN – the KKS system will be used.

KKS will be used in all project documentation provided by the CONTRACTOR and for the physical marking of the delivered equipment during the WORK execution.

The CONTRACTOR shall prepare the KKS in accordance with the internal guideline on the use of KKS designations (for the Methodology – see Annex A13). Unless specified otherwise in the Methodology, the following shall apply to the KKS within the scope of OB 2:

- the KKS in accordance with DIN 6779 shall be prepared for systems connected directly to Procontrol P14
- for new systems under the 800x control system (K20 boiler hall), the current KKS methodology according to ČSN EN 81346-1 and later.

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Within the KKS methodology and in cooperation with the KKS administrator, the CLIENT specifies and requests for:

1. The CONTRACTOR will prevent duplication of KKS markings both within the WORK and collision resistance with the existing marking and designation partially used in the PLANT or other OBs, in cooperation with the KKS administrator.
2. In the machinery part, **the use of system-level decimal notation** is preferred for equipment and for main pipe routes, unless otherwise explicitly stated in the methodology and if it is possible in terms of the number of devices and other equipment.
3. As regards piping - **when the PS or TS value changes** (according to the definition of ČSN 13480), **the KKS code at the system marking level is always changed**, as well.
4. **A change in piping dimensions** means a change in the KKS code marking.
5. **The decimal notation** XXAABR010, BR020 etc. at a unit level is preferred for a **Route marking**,
6. The marking of fittings will be carried out by means of the decimal notation of the pipe route, using the KKS code of the fitting, i.e. e.g. on the XXXAA BR 020 route, the shut-off electric fitting will be marked as XXXAA AA020, another one as AA021, etc., the manual shut-off fitting as XXXAA520, and other ones AA521, AA522, a non-return valve on the same route as XXXAA820, which allows to identify the route on which the fitting is located
7. The Supplier's change always means a change at the level of the KKS system.
8. **Marking and designation of connection points within the project:** the system of marking and designation, as well as a serial number of the connection point will be used. The system marking and designation will be determined according to media transported into operational files (or the prevailing direction of transport), i.e., XXXAA.001. The CONTRACTOR will ensure unambiguity within the framework of coordination and uniformity as for the designation and marking of connection points within the WORK is considered.
9. In the implementing phase of the project, the required depth of the KKS system shall be consulted with the CLIENT with the aim of limiting it to basic necessary scope (a maximum scope of the KKS that is defined in the annexes is not necessary in most cases). Nevertheless, the scope of the KKS depends on the offered solution and cannot be thus defined without the knowledge of the defined solution.

9.3 Labels, Descriptions

As a Part of the OB2 WORK there is also provision of marking and designation:

- Designation and labelling the PLANT and its individual parts,
- Safety marking based on ČSN ISO 38 64, taking into account the Occupational safety and health (OHS) and the Fire prevention (FP) requirements applicable to the given nature of the WORK.

The whole technological equipment, pipe routes, fittings, measurement samplings and electrical appliances will be marked with labels and supplementary tables.

Labels will be placed in such a way to be easily legible. The pipeline will be provided with stripes at distances of approx. 15-20m.

The labels will correspond to the CLIENT's Regulations - see Annex A 13.

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9.3.1 Pipeline

In accordance with the project documentation, the colour marking of new pipelines and equipment will be supplemented with writing notices, labels and tables that will indicate:

- designation of the pipeline route or equipment with the KKS code,
- medium name,
- parameters of a medium being transported (maximum permissible pressure and temperature values),
- Direction of a medium transport,
- safety markings (in the case of dangerous substances).

The CONTRACTOR will replace the equipment marking labels with KKS codes damaged during repairs. These are labels designated pipe routes, fittings and equipment. Equipment nameplates, missing or damaged during repairs, shall also be replaced.

As for the pressure equipment is considered - there a type plate must be used according to the requirements of the Pressure Equipment Directive (PED) or ČSN EN 13480-4.

At the same time, the respective pipeline will be designed with the CE mark.

9.3.2 Equipment Description

Every and each equipment shall be designed with the equipment or a device Name and with the KKS code.

Every and each equipment and device must be equipped with a metal type plate indicating as a minimum:

- Producer Name,
- Equipment Name,
- Serial number,
- Year of construction,
- Main operating data (e.g., flow rate, rotation speed, electric power output, etc.).

Safety Marking

The CONTRACTOR will provide the WORK subjects with safety designation and markings in accordance with Government Regulation No. 375/2017 Coll., which determines the appearance and location of safety markings and the introduction of signals, as amended, and ČSN ISO 3864-1.

Designation of the platforms load-bearing capacity

The platforms will be provided with tables with the load-bearing capacity of the structure.

Designation of values on local measuring devices.

On the local measuring devices (for temperature, pressure measurements), the maximum and minimum allowed operating values will be marked on the scales with scale lines.

9.3.3 Labelling

The labelling is described in the A13 – Regulations for technical documentation.

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9.4 Colour solution

The architectural design of the newly designed buildings, or parts of them, will emphasize the architectural and colour harmony with the surrounding preserved buildings and technologies, especially the location of gates and windows, the architectural design of details, carefully processed.

When designing a colour solution, it is necessary to start from the colour harmony of newly designed and renovated existing buildings, including recently built buildings in the immediate neighbourhood.

The colour solution of pipelines and technological equipment is based on ČSN 13 0072 and the CLIENT's Internal Technical Standard (ITS).

In general, pipelines and technological equipment are painted in the shade of the main medium or a system to which they organically belong. Only in exceptional cases the equipment surface treatment is left in a colour state as the equipment is normally supplied by the manufacturer (electrical components, etc.) or it is left unpainted (stainless steel components, measuring sensors, etc.).

The surfaces of all non-insulated pipes, including fittings, will be painted over the entire surface with the colour shade specified in the CLIENT's Internal Technical Regulations.

The surfaces of the thermal insulation will be left in the natural shade of zinc with transverse stripes in the colour shade according to the CLIENT's Internal Technical Standard (ITS).

The colour solution (a shade) of the surfaces concerned will be processed by the CONTRACTOR and agreed upon by the CLIENT.

9.5 Standardization

The CONTRACTOR must standardize the equipment as far as possible. It is required that with using the same equipment of the same parameters in a larger number (e.g. fittings, etc.), an uniform type is used within the entire delivery. Certification of the ČMI (Czech Institute of Metrology) in accordance with the INMAT system is required for new natural gas measuring equipment, specifically for heat, pressure and flow meters.

9.6 Coatings

9.6.1 Corrosion aggressiveness

The determination of the corrosive aggressiveness of the atmosphere is carried out according to ČSN EN ISO 9223 with the following results:

C3 – medium level

This determination may be changed in case of major deviations from the solution presented in the documents required for building permit, it is essential to comply with applicable Czech standards and laws.

C4 in a strong degree of corrosion aggressiveness for both internal and external environments

The corrosion aggressiveness is not determined for parts of the WORK such as Internal fuel transport and other parts (including existing ones) where fuel will come into direct contact with any structures. However, they will be designed by the CONTRACTOR of such materials and with such anti-corrosion protection as to ensure a service life of more than 15 years.

9.6.2 General Requirements

All surface protection systems of the WORK and its parts will be designed and implemented according to the set of ČSN EN ISO 12944 and other related standards dealing with high service life (H) over 20 years and the C4 medium dry aggressive industrial environment. This determination may be changed

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in case of major deviations from the solution presented in the documents required for building permit; however, it is essential to comply with applicable Czech standards and laws.

Environmentally friendly materials will be used for the coatings.

All external metal surfaces of equipment and structures that could be subject to corrosion will be provided with an appropriate surface treatment.

This surface treatment will correspond to the temperature of the surface and the corrosivity of the environment. At present, the locality of the Building site is categorized as the level C4 of atmospheric corrosion aggressiveness.

The application of protective coatings will be carried out in accordance with applicable standards and according to the technology prescribed by the coating manufacturer.

Undercoats and topcoats and their shades shall be in accordance with applicable standards.

If the surface treatment will be solved by plating, only compact hot-dip galvanizing is allowed.

All equipment supplied for assembly will be finished with a final coat of paint. After assembly, only paint repairs will be carried out, using the prescribed paint system, technology, as well as shades.

The equipment surfaces of which will not be painted for operational reasons will be provided with a protective preservative coating layer suitable for storage at the Manufacturer's and CONTRACTOR's premises. Before transporting them to the building site, the preservative coating layer will be properly removed, and the surface will be adequately protected from dirt and moisture.

No part of the equipment may be left without preservative coating for more than 24 hours.

If the equipment cannot be transported without a conservation coating, it must be possible to remove this coating easily without the use of organic solvents.

The following requirements shall be met:

- All metal parts shall be protected against corrosion during storage, transportation, assembly, and operation.
- In the case of painting: welded joints will be painted only after inspection of the weld and a successful leak test.
- All metal surfaces must be cleaned and prepared for painting.
- Each metal surface must be coated with one coat of protective paint. After removal of dirt or rust, the pipes must be protected with one undercoat and one topcoat layers. The protective coating must be selected according to the maximum operating temperature of the medium.

The general requirements for coating systems are as follows:

- Only materials with a low content of volatile organic compounds (VOC) can be used for coating systems.
- Depending on the equipment nature, its dimensions, the conditions for its transport and storage at the building site, and according to the installation conditions, the following requirements shall be applied in particular to the surface protection of individual components:
- Metallurgical material (i.e. pipes, profile material) will be delivered to the building site with their surfaces being protected.
- The insulated surfaces will only be protected with a single-layer coating under the insulation made of a special resin, which burns ecologically at a temperature above 180 °C (unless otherwise stated in the production documentation). The insulation will be covered with sheet metal according to the insulation specification which will not be painted, but only marked with coloured stripes with a shade that determines a transported medium.

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- The Equipment surfaces intended for direct contact with building elements or components and materials - concrete, concrete screed or which will be directly encased in concrete / walled in, etc. – they will be uncoated, unless otherwise directly required in the documentation.
- The coating systems used will correspond to the corrosion aggressiveness of the environment as well as the ambient temperatures and the requirement for the expected lifetime of the anti-corrosion protection.
- The final surface treatment will be sufficiently resistant to the mechanical action corresponding to the operation in the given area.
- The coating materials will correspond to the underlying paint material, they will be sufficiently protecting, colour stable, they will create uniform layers, the diluents used will be safe and harmless to health.
- Related standards and technical sheets of the manufacturers of individual paint materials: they will be respected during the design of the building construction and for the application of paints (this mainly concerns the no closed profiles are used - everything must be painted, continuous welds and compliance with the maximum time between blasting and the application of the primer, depending on the climatic conditions).
- For parts / pipes / structures / equipment painted in production / in the workshop and these ones only installed / assembled at the building site, it is necessary to consider at least 10% of the area for correction of the coating after installation / assembly.
- The shade of topcoat – The colour solution of the topcoat will be carried out in accordance with the ITS and will be agreed in the final version by the CLIENT, as a part of the project documentation for the WORK.

Parts made of non-corrosive material (stainless steel) will not be fully protected by coatings or other surface protection systems, unless expressly stated otherwise

Hot-dip galvanizing

The following parts / components / elements / structures which are a part of the Contract, will be delivered with surface protection by hot-dip galvanizing or with protective coating (in accordance with common practice and as agreed with the CLIENT):

- ladders including protective baskets and safety barriers – unless expressly stated otherwise,
- stringers,
- lighting masts,
- booms for lamps and lights,
- cable trays including covers and transitions,
- external cable pipelines,
- handrails – unless expressly stated otherwise,
- control cabinet stands,
- walkable parts of steel floors and service gangways – unless expressly stated otherwise,
- elements of the grounding network – material FeZn.

As regards interior steel parts (bearing structures, platforms, access footbridges, ladders, etc.), only parts of the steel floors designated for walking may be hot-galvanized. All other elements may be protected by colour coatings.

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The above-mentioned rules will not be applied if the given parts are made of another material, such as stainless steel, plastic, composite, and others, for structural or operational reasons. All galvanized parts will not be protected by any protective coatings, except for markings, unless specified otherwise.