Employer
SAKO BRNO A.S.

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

Date
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PART III, APPENDIX A9
TECHNICAL SPECIFICATIONS FOR BUILDING

SAKO

RAMBOLL

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CONTENTS

SUPPLEMENTS

1. INTRODUCTION

1.1 Requirements

These specifications set out the functional requirements and minimum criterions to be utilized in the design of the Civil Works for the Line.

Civil Works consists of the following main elements:

- Demolition works
- Site Layout (access roads, car park, engineering networks, outside illumination, landscaping, site facilities, rigging and storage areas etc.)
- New Waste Bunker connected to existing waste bunker
- Process building
  - Waste Bunker
  - Boiler Hall
  - Flue Gas Treatment Hall
  - Turbine Hall/Condenser Room/Pump Room
  - Ancillary Rooms
  - Control room/Offices/Staff facilities
- Flue Gas Duct and Stack Pipe
- Clearance and cleaning of construction sites, site facilities and rigging and storage areas

1.2 Site Conditions and External Interfaces

The existing *site* conditions are described in following annexes to this appendix:

- *Appendix A9, Annex 1 Zoning permission documentation* (hereafter "Principal Design")
- *Appendix A9, Annex 2 Building standards*
- *Appendix A9, Annex 3 Architecture study*
- *Appendix A9, Annex 4 Geology survey* – informative nature
- *Appendix A9, Annex 5 Geodetic survey* - informative nature

Furthermore, reference is made to appendix E1 *External Utilities Specificatio*n while the Contractor had the opportunity to carry out all needed additional site investigations prior to submitting his tender as well.

The design and construction shall accommodate for the actual site conditions included connections to the external utilities.

1.3 Functional design of buildings

The Contractor shall use the existing Principal Design as a basis for his design.

The Principal Design represents binding requirements on maximal main buildings dimensions based on Authorities permit. These dimensions represent limitations in regards to the zoning permission obtained by Employer.

The Contractor will be responsible of obtaining all needed approvals, permissions and consents regarding Civil Works according to local Legal regulation.

The Contractor may propose appropriate changes to site layout and building layout. However, these changes are subject to approval by the Employer, and shall not contain any enlargement of main dimensions or elevation levels already permitted.

It is understood that the buildings layout may be subject to change based on variations in equipment arrangement and site layout proposed by the Contractor unless otherwise required by the technical specifications. However, the Contractor shall optimize the site layout and areas within the buildings to provide adequate space in accordance with the technical specifications, giving preference to a high level of maintainability and access.

All building elements designed for use in construction will be new, not used and in perfect quality, with minimal properties according to the appendix A9*, Annex 2 Building standards*.

The Contractor shall present an architectural design, based on the architectural concept of the existing Principal Design, to the Employer for review and approval. The architectural design shall visualize the Contract Object from several viewpoints using a 3D model and photo montages. A superstructure above the roof of the boiler building for the location of a part of the boiler's technological equipment is considered in the documentation for the zoning procedure. In his design, the Contractor shall minimize the floor plan dimensions, including the height of this superstructure, provided that in no case may the position be changed, the floor plan maximal dimensions or the height increased compared to the assignment in the Principal Design.

Before the issuing of any application to the Authorities (i.e. building permit), the Contractor shall present samples of facade cladding, floors and ceilings, fixtures and other materials to the Employer for review and approval prior to ordering or purchase. The final architectural scheme including colors, patterns and banding shall be approved by the Employer.

2. FUNCTIONAL REQUIREMENTS

2.1 General

The design of the buildings must allow for the needed escape routes according to local legislation. The Contractor is responsible of obtaining the needed approvals and consents by the Authorities.

The design of the buildings must allow for adequate space for operation and maintenance of the process equipment. Needed space for operation and maintenance must be indicated in the 3D-model. Needed space for operation and maintenance must be approved by the Employer.

The design of the building and process equipment must allow for needed galleries and stairs for operation and maintenance of the process equipment. Ladders will not be approved. Needed galleries and stairs for operation and maintenance must be indicated in the 3D-model. Needed galleries and stairs for operation and maintenance must be approved by the Employer.

The design of the building and process equipment must allow for needed access for overhead cranes, tackles and hoists for operation and maintenance of the process equipment. Needed access for overhead cranes, tackles and hoists for operation and maintenance must be indicated in the 3D-model. Needed access for overhead cranes, tackles and hoists for operation and maintenance must be approved by the Employer.

Specific functional requirements for each room are stated in part 0.h *Room Data Sheet*. The Contractor shall as a part of his proposal submit the Room Data Sheet including the all requested data.

Contractor shall make special provisions in the design to minimize the amount of heat build-up at the top of the building. The building shall be clad with insulated wall panels and polycarbonate suitable for the local climate conditions. Secondary combustion air inlet ductwork shall extend to

the top of Boiler Hall to improve air exchange rates. Powered roof ventilators shall be provided to assist in the air changes as necessary.

Any vents and louvers shall have a gravity closing mechanism to that they can remain closed when not in operation.

All vibrating and/or rotating equipment shall be dynamically balanced with maximum permitted vibrations and noise levels in accordance with related applicable Czech standards. Structural dynamic principals shall be employed in the design of the support structure to minimize the transference of vibrations, unacceptable deflections or loads to the support structure. Noise attenuation shall be employed as required to minimize the propagation of unacceptable levels of noise.

Installation details, weather-tight performance, sealants, closures, accessories and overall design shall be the responsibility of the Contractor to secure a fully functional building and civil work design.

Unless otherwise stated, all floors in technology dedicated areas shall be drained to a floor drain or trench using a 1% slope.

2.2 Demolition of existing buildings at the site of the future construction of line K1

Existing buildings to be demolished:

Building No. 03 – Warehouse, hall I, lot No. 7884/60 - built-up area of approx. 552 m^2
Building No. 04 – Warehouse, lot No. 7884/63 - built-up area of approx. 195 m^2
Building No. 18 – Not tempered warehouse, lot No. 7884/56 – built-up area of approx. 196 m^2
Building No. 19 – Tempered warehouse, lot No. 7884/56 - built-up area of approx. 165 m^2
Building No. 20 – Warehouse, hall II, lot No. 7884/1 – built-up area of approx. 153 m^2
Partially paved area, lot No. 7884/57 – built-up area of approx. 221 m^2

Demolition works has to be done in accordance to valid permissions which are obtained by Employer and available under part II.j *Planning and Permitting*.

Demolition of all building structures and equipment, including underground parts and removal of existing technology equipment is required.

Disassembly, cable removal or reconnection (in the case of light circuits) of all electrical equipment shall be performed in the demolished existing buildings in the closed SAKO Premises (cable routes, cables, wiring pipes, lighting, switchboards, junction boxes, control boxes, etc.).
Existing fire-fighting equipment (hydrants, sprinklers, etc.) will be dismantled. The existing fire water distribution systems, technological distribution systems will be shut down, cut off, secured and blinded.
Under no circumstances may the power supply and control in the main cable routes be interrupted, even for a temporary period!

The connections of the engineering networks to the individual buildings will be disconnected before the start of demolition work. Due to the nature of the site, other unrecorded connections cannot be ruled out – before starting demolition work it is necessary to delineate all surrounding engineering networks by their administrators and determine the exact places of disconnection of these networks/connections (in electrical distribution cabinets, installation shafts, heating system distributors, etc. check possible other network connections to the building).

A cursory inspection of the demolished buildings did not reveal the major presence of asbestos-based materials, however, a more detailed survey of the occurrence of asbestos, e.g. by probes into the structures, will be carried out before the start of construction work. In the event of further detection of the presence of asbestos-containing materials, the Contractor is obliged to proceed in accordance with Section 41 of Act No. 258/2000 Coll., on the protection of public health, as amended, in accordance with Government Decree No. 361/2007 Coll., on laying down conditions for the protection of health at work.

Nevertheless, it is necessary to point out that in the demolished part of the gable wall and especially in the part of the roof, including the roof cladding on the north-east side of SO 101 hall above the existing waste bunker, asbestos-cement wavy lines (Esterbit type) are probably placed under the waterproofing layer. According to Czech legislation, asbestos-cement wavy lines are included in the group of hazardous waste (Act No. 185/2001 Coll.) and according to the waste catalog in accordance with Decree No. 93/2016 Coll. these wastes are classified in group 170605. Here, it will be necessary for the Contractor to conduct a construction-technical survey to identify hazardous waste and according to the results of the survey to ensure cooperation in demolition work with a professional company for hazardous waste management and to ensure in accordance with Czech legislation handling and transport to the disposal site of an official landfill for hazardous waste.

During the construction, the surrounding buildings must not be affected mainly by excessive noise, vibrations and shocks above the specified limit. This is determined by the provisions of Decree No. 272/2011 Coll., on the protection of health against the adverse effects of noise and vibration.
Machines and equipment with reduced noise must be used. During the execution of all work, it is necessary to pay attention to the limitation of the time of deployment of noisy mechanisms, the sequence of their deployment or their less frequent use. Demolition activities will take place only during the day, between 7 am and 9 pm, but for a maximum of 10 hours per day.
Demolition produces solid (dust) emissions into the air, which need to be effectively reduced by appropriate measures, such as water spraying.
The main public access road – Jedovnická Street – will be burdened with increased passage of trucks during the removal of demolished structures, these vehicles must be checked before exiting to the public road, especially their cleanliness and securing the load (e.g. covering the cargo area with anti-dust tarpaulins, etc.).

During demolition, the site in question will be demarcated by mobile fencing and the surrounding area will be properly marked with appropriate warning signs. Demolition must not endanger the safety of operation on adjacent roads, the stability of surrounding buildings or the safety of persons moving around the Existing facility. Proposals for security measures must be discussed with the Employer. The excavations on the foundations will be properly marked until the backfill, so that people do not fall into the excavation. Roads outside the perimeter of the construction Site will be kept clean according to the Road Act. No material will be stored on the adjacent areas of the complex (i.e. outside the construction site, delimited by temporary fencing). No landfill areas are expected at the construction Site, the debris from the demolition will be immediately removed from the site for recycling or landfilling.

All material from demolition will be removed in a facility designated for it (landfill of the relevant group, recycling center), treatment (separation and recycling) will be preferred in order to allow further use of waste. Waste management must be provided by persons authorized for such activities under the Waste Act.

As part of the demolition of the existing SO 107 CHUV building (chemical water treatment building), the Contractor shall secure the adjoining SO 110 above-ground corridor, while its preservation and temporary support are being considered.

As part of other activities, the Contractor shall perform a static assessment and connection of the existing above-ground corridor to the newly built bunker building. The Contractor shall ensure the final execution of the above-ground corridor in accordance with the design of the architectural study according to Appendix A9*, Annex 3 Architecture study.*

As part of these activities, the Contractor shall provide everything necessary for the proper implementation and functionality of this system.

2.3 Site Layout

Traffic areas must be designed in accordance with the national regulations.

All outside areas allowed for traffic, parking or temporary maintenance must be tarmac.

The design must take into account the peak vehicle movements and any associated queuing or standing time in order to avoid trucks/cars cueing onto the public road. Furthermore the design will separate the heavy traffic from the light traffic for safety reasons.

Queuing outside of entrance will not be acceptable.

2.3.1 TRUCKS (SIZE AND FREQUENCY)

The waste will be transported to the plant in semi-trailer trucks. Likewise the bottom ash and the residual products from the flue gas cleaning will be picked up in semi-trailer trucks.

Traffic load and operating hours are defined by integrated permit.

The Contractor shall provide all outdoor works necessary for the successful and safe operation and maintenance of the Line in compliance with all Czech applicable codes and standards.

2.3.2 INTERIOR ROADS

Road geometry design shall be based on the local cored and regulations.

All roadways shall be designed for heavy trucks and 25m tractor trailer traffic to fully maneuver and successfully deliver materials to designated areas within the Line.

For the design of the road structure and the structure of paved areas for heavy freight transport, it is necessary for the Contractor to use a slightly modified proposal from Technical Regulation No. 170 (TP 170) issued by the Ministry of Transport – type of road structure marked D1-N with traffic load class TDZ IV.

The binding structure of the road structure is given in *Appendix A9, Annex 2 Building standards*.

A ramp with a maximum slope of 12 percent shall be established to provide access to the basement.

Pavement design shall be in accordance with local codes and regulations.

Contractor shall bring all the internal roads affected by implementation of Contract Object including roads routed to the Site, rigging and storage areas related to construction to a state as before the construction works begun.

2.3.3 SIDEWALKS

The Contractor shall provide sidewalks to allow pedestrian access to all buildings and structures. Sidewalks shall be designed and constructed in accordance with local codes and regulations

2.3.4 SIGNAGE

A traffic and facility sign plan shall be developed and implemented for the entire site.

The signage plan shall be reviewed with the Employer prior to procurement of any signs.

2.3.5 GREEN ROOF

The Contractor shall design a green roof for intensive greenery on part of the building roofing.

The required minimum composition of the green roof is given in Appendix A9*, Annex 2 Building standards.*

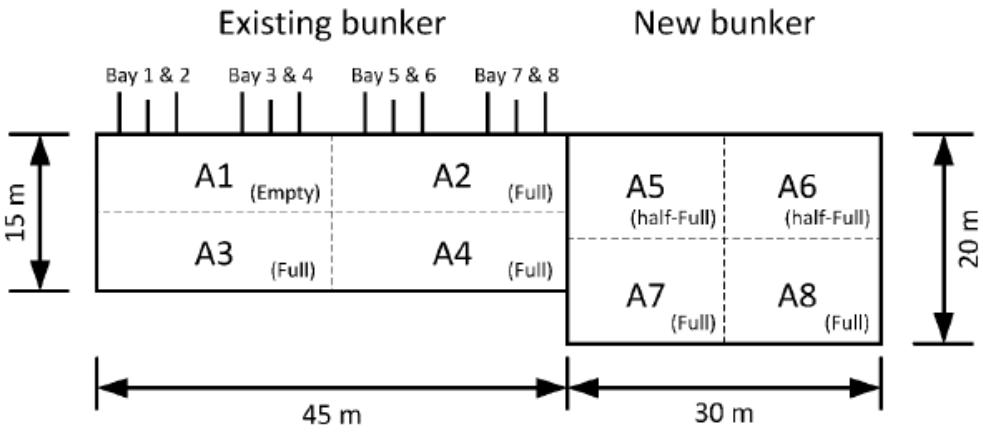
Green roof design shall contain a complete green roof "garden", including vegetation with pathways (as a route for excursions), or with other suitable garden elements.

2.4 Process Building

General requirements of the Employer for the construction and equipment of process buildings are specified in part 0.h *Room Data Sheet*. This information represents the minimum design basis requirements of the Employer which the Contractor must follow in its design.

2.4.1 WASTE BUNKER

New waste bunker to increase the storage capacity shall be constructed as expansion to the existing SO 101 - Waste bunker. Expansion shall be in the northeast direction according to the picture below. It is proposed to construct the new waste bunker with dimensions (HxWxL) of 25m x 20m x 30m which results in a bunker volume of 15,000 m^3. This volume is required by Employer.



Total storage capacity with new bunker shall achieve at least 8 days compared to the existing 4 days of storage capacity at a waste treatment capacity of 44 ton/h. The new bunker shall be operationally divided into four areas, i.e. A5 to A8. In a situation with when bunker areas A7 and

A8 are kept completely full, areas A5 and A6 are kept half-full to allow for mixing of the waste. This gives a utilization volume of approximately 11,500 m3 corresponding to 4,000 ton of waste at a density of 350 kg/m3. This addition will give a total bunker capacity of 8,400 ton of waste, which corresponds to 8 days of storage capacity in case of full plant operation.

The new waste bunker shall be designed without tipping hall, whereas existing tipping hall shall be fully utilized. New waste crane shall cover bunker in whole extend, i.e. old and new part.

The design of the building includes the control room as well as the administrative premises. Thus, the design must allow for full view of tipping hall from the crane control room.

Removal of the existing runways and rails including waste cranes and establishing of new equipment is included in the scope of Contract Object. Existing concrete support structure should be sufficient for new cranes installation. However, Contractor shall conduct static inspection and alternatively propose necessary modification to the existing concrete support structure of runways and rails based on new waste cranes proposed design. Any modification of existing concrete structure needs to be approved by Employer.

Within the bunker, there must be a dedicated area for maintenance work for the waste cranes. A drop void, with removable cover, shall be incorporated into this building running full height from the ground level. The drop void cover shall have a live-load rating the same as the adjacent floor. The purpose of such drop hatch will be to remove and exchange grabs for service/maintenance.

The substructure and superstructure shall consist of a reinforced concrete suitably sized to meet the demands of the Line and the waste storage requirements of the adjacent bunker. Special attention must be paid to the dividing wall between the two spaces. The superstructure shall be designed with long span girders or trusses without any internal columns. Further structural details are described in Principal design and in *Part III, Appendix D*.

The waste bunker walls and floors subject to tear and damage through repeated impacts by crane grabs shall be constructed of high strength concrete. The design must prevent structural deterioration of the walls and floors.

Ventilation in the waste bunker must be designed to eliminate the emission of odors and noise to the surrounding environment. Please note that minimum 50% of the needed combustion air to the process must be taken from the waste-bunker.

Minimum clearances between the roof and waste cranes shall be obtained as specified by the crane manufacturer to allow for crane maintenance. This clearance shall also take into consideration the overhead fire protection system and lighting to be installed above the crane level. Access to the cranes and along each rail and cable system shall be provided.

This waste bunker shall be equipped with a fire protection system, water cannons and an infrared heat detection system.

2.4.2 BOILER HALL

The Boiler Hall shall accommodate the incinerator/boiler incl. combustion grates and associated hydraulics, boilers, auxiliary burners, shower cleaning system, SNCR System, access platforms and ladders, full height equipment drop hatch to grade with maintenance hoist above, and other auxiliary equipment. Furthermore, the Boiler Hall must accommodate the primary and secondary air fans and combustion air ductwork along with the steam coiler air pre-heaters. In the lower

level of the Boiler Hall will be the bottom ash expellers, the bottom ash vibro-conveyor and the bottom ash conveyors.

The substructure of the Boiler Hall shall be a concrete structure. The superstructure shall be a steel structure. The building steel shall not be combined with the boiler and grate support steel. Further details described in Principal design and in *Part III, Appendix D*.

As part of its design, Contractor shall clearly indicate how future maintenance of the superheater and other convective surfaces in the horizontal pass is to be performed. Minimum maintenance clearances between the roof and cranes shall be provided as necessary.

Galleries and stairs towers must be arranged to allow for the safe and comfort approach of each technology or building part.

2.4.3 FGT HALL

The FGT Hall shall accommodate the flue gas treatment system incl. conditioning tower, bag house filter, flue gas condenser (Option1), activated-carbon injection system, fly ash conveying system, associated flue gas ductwork, ID Fan, reagent storage silos, and auxiliary equipment.

The substructure of the FGT Hall shall be a concrete structure. The superstructure shall be a steel structure. The building steel shall not be combined with the support steel of FGT equipment. Further details described in Principal design and in *Part III, Appendix D*.

Adequate space shall be provided at the top of the Fabric Filter for maintenance as specified by the equipment suppliers.

Galleries and stairs towers must be arranged to allow for the safe and comfort approach of each technology or building part.

2.4.4 TURBINE HALL/CONDENSER ROOM/PUMP ROOM

Turbine Hall/Condenser Room/Pump Room shall accommodate the turbine-generator set, lube oil modules, district heating condensers, district heating pumps, condensate pumps set, make up water system, absorption heat pump (Option1) and related auxiliary equipment.

The structure of the Turbine Hall/Condenser Room/Pump Room shall be a concrete structure. Suitable noise attenuation shall be incorporated into this enclosure to minimize the spreading of noise beyond its boundary. Further details described in Principal design and in *Part III, Appendix D*.

An overhead crane must be provided, allowing for full access to the Turbine Hall and allowing for hoisting equipment to the Condenser Room and Pump Room.

Minimum clearances between the roof and crane shall be maintained as specified by the crane manufacturer to allow for crane maintenance.

Adequate laydown area shall be allowed on the floor, adjacent to the turbine-generator set, within reach of the maintenance crane to disassemble the turbine and/or generator during maintenance activities. The turbine hall floor shall be designed to support the weight of the heaviest piece(s) to be disassembled during turbine generator maintenance. If the turbine-generator is situated on an elevated turbine table, there shall be a drop hatch, within reach of the maintenance crane, so that

the largest piece can be lowered down to a waiting flat-bed truck below in the case of off-site maintenance.

2.4.5 ANCILLARY ROOMS

The Ancillary Rooms shall each be dedicated to a specific use, and shall accommodate the specific process equipment.

Each Ancillary Room shall be a concrete structure. Further details described in Principal design and in *Part III, Appendix D*.

Electrical rooms shall accommodate transformers, switchboards, frequency converters, cable routes and all related auxiliary equipment.

Electrical room shall be designed with double floor (server room floor) to allow for easy cable routing below the electrical cabinets. Finished floor must be leveled with the adjacent rooms.

Suitable noise attenuation shall be incorporated into this enclosure to minimize the spreading of noise beyond its boundary.

2.4.6 CONTROL ROOM/OFFICES/STAFF FACILITIES

Control Room, office areas and staff facilities shall be located next to the WASTE bunker. Further details described in Principal design and in *Part III, Appendix D*.

The proposed layout of the control room must be submitted for approval by the Employer.

Control Room, office areas and staff facilities must be equipped with fixed and loose furniture and by additional equipment based on appendix A9, *Annex 2 Building standards*.

Elevator:

The Contractor shall provide as a minimum one passenger/goods elevator with access to all floors and levels including the feed hopper deck. The elevator shall have a lifting capacity of 2 tons 26 people maximum with an internal height of 2.5 m traveling at 1 m/s. Door minimum 1,3 x 2.3 m (W x H). Elevator design shall comply with relevant requirements from appendix A9, *Annex 2 Building standards.*

2.5 Architectural design

ARCHITECTURAL SPECIFICATION

Architectural Scope

The Contractor is to design and construct the architectural requirements for the Line comprised of, but not limited to the elements listed below. All architectural requirements are to be fully coordinated with Authorities and Legal regulation requirements and all relevant specialist packages including but not limited to structural; civil engineering; mechanical, electrical and plumbing engineering and fire requirements.

Overall architecture scope of Contract Object includes:

- Architecture of any new/existing building for the installation of the technology in scope of Contractor's Contract Object (reference to Appendix A9*, Annex 3 Architecture study* "PHASE 1" except "new covered area")

- North east façade on the existing SO 101 - waste bunker building to provide uniformity with new building

ARCHITECTURAL REQUIREMENTS

This section describes the design intent and provides parameters for each of the elements set out in the architectural scope above.

The Contractor shall design and construct the Line to include the architectural requirements using the design proposed by Appendix A9*, Annex 3 Architecture study* (hereafter "Reference Design") as a baseline for developing its detailed proposal. Any variations from the Reference Design shall be of 'equal or better quality' than that included within the documentation submitted by the Employer.

Main Reference Design requirements in brief:

- Concrete bottom part of the main building with greenery (reference to "SAKO TURNING GREEN")
- Transparent polycarbonate as the main façade-material for NW and NE facades (reference to "THE ENVIRONMENTALLY FRIENDLY PLASTIC FAÇADE MATERIAL" in scale of "phase1")
- Accessible green roof in combination of photovoltaic panels (reference to "GREEN ROOF")
- Architectural lighting (reference to "FLUORESCENT SAKO")

The quality of the used constructions with an influence on the architecture must meet at least the requirements according to appendix A9, *annex 2 Building standards*.

With regard to the considered architectural lighting, the Contractor shall perform a detailed study of the interfering lighting as a part of the building permit application. Architectural lighting must be designed in accordance with the relevant standards. The resulting expression of illumination must form a uniform dispersion over the surface of the façade without visible light breaks between the individual luminaires.

ARCHITECTURAL REQUIREMENTS - CONSTRUCTION QUALITY

The Contractor shall produce integrated and coordinated architectural drawing documentation, showing how it addresses the architectural requirements for the Contract Object. Any documentation shall be submitted to the Employer for comment and acceptance before the commencement of work on Line. Refer to the *Part III*, Appendix *C1 Reviewable Project and Design data.*

The Contractor shall comply with and be solely responsible for all provisions and requirements determined in documents in accordance with the Contract.

Where requirements apply to a Subcontractor, the Contractor shall manage coordination and work at all interfaces and shall be entirely responsible for ensuring that all procedures, materials and workmanship fully comply with architectural requirements and that the finished installation meets the design intent to the satisfaction of the Employer.

The Contractor shall ensure that all systems, elements, products, materials, finishes, submittals, tests, inspections, and performance levels shall comply with the requirements of the architectural design.

The Contractor shall ensure that the finished appearance of the building and external architectural elements fully satisfy the Employer requirements. The Contractor shall ensure that all aspects of the works are finished to the highest construction standard as outlined in standards and codes, this includes but is not limited to CSN and EN standards and codes.

Finished architectural work must comply with all relevant permits (i.e. Environmental; Zoning; Building etc.) and meet quality standards set for Line in the architectural design and in the outline

architectural specification. Any materials or workmanship which do not meet any applicable quality standards will be rejected by the Employer and replaced by the Contractor.

The Contractor shall:

- Submit all required architectural submittals for review and comment before proceeding with final procurement and construction. For general minimal requirements on quality of materials refer to *Appendix A9, Annex 2 Building standards*
- Prepare required architectural submittals to demonstrate compliance with all relevant regulations, codes and standards as detailed in the architectural outline specification.

Architectural submittals include but are not limited to:

- CE certificates and compliance with Czech standards
- product - technical data; samples; shop drawings
- mock-ups - benchmarks - control samples
- test data – records, calculations
- warranties – guarantees, certificates
- reports - various types
- architectural specifications
- architectural performance criteria
- architectural logbook
- as-built drawings and data
- fire certificates
- any special tools and spare parts

NON-COMPLIANCE

Non-compliant architecture-related submittals will be rejected and the Contractor shall bear all costs arising from this as well as the implications of any resultant delay.
The Employer may reject non-compliant architectural products and materials or require additional tests, inspections or evidence of suitability of architectural elements.
Architectural work which proceeds without shop drawing reviews may be rejected. Where the required architectural shop drawings have not been issued or accepted by the Employer, the Contractor is still required to submit shop drawings for review without further delay.

The basic shape of buildings and exterior structures is based on technological needs. The subject of the architectural design is the arrangement and visual harmonization of these materials into a set of buildings of a logical and color-solved and, in terms of installed technology, uniform order.

At the same time, this architectural design must be based on the maximum dimensions and heights of the buildings which are accepted in the valid permits, referring to part II.j *Planning and permitting*.

Therefore, the Employer requires the Contractor to submit the architectural design of the building in the following steps:

1. Submission of an architectural design of the distribution of materials with the main floor plan and height dimensions for the entire group of buildings
2. Submission of designed general views, including openings (gates, doors, windows, penetrations for the main pipeline, including the flues, blinds, air vents, etc.)
3. Presentation of the ideological design of the green roof and architectural lightings, including possible pathways and the location of the main planting of greenery and overall concept of architectural illumination and its control
4. Material and colour design of facades and lighting, as well as designs for filling openings, including framing elements and possible art elements. The proposed design will be based on the detailed minimum requirements contained in Appendix A9*, Annex 2 Building standards*

5. The architectural design of the interior of buildings will be solved according to the minimum requirements contained in Appendix A9*, Annex 2 Building standards*. The design of the architectural part of the documentation according to points 1 to 4 will be included in the documentation according to the requirements in annex Part III, *Appendix C1 Reviewable Project and Design data*

2.6 Expected impact of the Contractor's work on existing buildings

Following impact on existing Employer's facility described below shall be anticipated as minimum but not exhaustive list of all associated works.

All works with impact on existing buildings shall be carry out in accordance with requirements specified in *Principal Design* and after approval by Employer. Contractor shall establish all necessary precautions associated with his works to not interfere in negative way with operation of Existing facility, i.e. temporary facades covers, dividing walls, supports, corridors, etc.

2.6.1 EXISTING BUILDING SO 101 – WASTE BUNKER

Here, the Contractor shall dismantle the partition wall above the level of the existing boiler hoppers, dismantle the crane cabins and fire-fighting equipment. Further details described in Principal design; *Part III, Appendix A13 Process and design data* and in *Part III, Appendix D.*

Furthermore, the Contractor shall install new cranes, a new control room and all accessories (electric fire alarm system, fire safety, etc.).

2.6.2 EXISTING BUILDING SO 102 – BOILER HALL

Here, the Contractor shall connect and take out the new slag conveyor from the boiler K1, make the holes in the gable wall and connect the service platforms at the levels specified in the Principal design. The final design will be submitted to and approved by the Client.

When choosing the route of the slag conveyor, the Contractor must respect the position of the existing main columns of the steel structure of the stair tower and the columns of the elevator shaft in the SO 102 building.

The Contractor shall also connect (or install) new fire pumps.

2.6.3 EXISTING BUILDING SO 103 – IBA TREATMENT HALL

The Contractor shall connect the IBA discharge from the new K1 line to the existing IBA bunker. The Contractor shall also connect the wastewater to the IBA wastewater pit.

2.6.4 EXISTING BUILDING SO 106 – TRANSFORMERS STATION

The Contractor shall demolish part of the building (stair tower) to connect the service route and the slag conveyor take out. Only small impacts are expected in the substation resulting from the installation of the new K1 line and its connection to the electricity network.

2.6.5 EXISTING BUILDING SO 107 – CHUV BUILDING

The Contractor shall demolish the entire building.

All the preservation and temporary supports of the existing gangway which during construction needs to be preserved and temporary supported. The gangway is connected to the SO 107 building from the existing administration building. The gangway shall then be reconnected to the new waste bunker building and put into operation, including compliance with the architectural design. All related works are part of the Contract Object.

Furthermore, the Contractor shall make a permanent connection of the sewage system from the sewage pump in the basement of the SO 106 building to the existing branch of the sewage system in the road between the new boiler hall K1 and the administrative building.

2.6.6 EXISTING BUILDING SO 108 – MAINTENANCE AND LOCKER ROOM BUILDING

Here, the Contractor shall carry out the complete demolition of the building.

2.6.7 EXISTING BUILDING SO 401 – SORTING AND TURBINE HALL

The Contractor shall make a statically independent steel structure with a platform for the location of the summer coolers. All related works are part of the Contract Object.

2.6.8 EXISTING BUILDING SO 412 – DISTRICT HEATING STATION

Here, the Contractor shall connect the DH pipes to deliver heat from the new technology of the Line.

3. DESIGN BASIS, STRUCTURES

3.1 General

3.1.1 UNITS

For design and calculations, the SI System shall apply.

3.1.2 DESIGN RESPONSIBILITIES

These specifications describe the requirements for different parts of the Line.
Contractor to make detailed engineering based on the design information.

3.1.3 STANDARDS, CODES AND OTHER REQUIREMENTS

The design shall be in accordance with the applicable Czech and European Norms and Standards in force, hereof non exhaustive:

Basis of structural design **Eurocode 0:**
CSN EN 1990:2004. CE

Actions on structures **Eurocode 1:**
CSN EN 1991-1-1: 2004: General actions – Densities, self-weight, imposed loads for buildings.
CSN EN 1991-1-2: 2004: General actions – Actions on structures exposed to fire.
CSN EN 1991-1-4:2007: General actions – Wind loads.
CSN EN 1991-1-5:2005: General actions – Thermal actions.

CSN EN 1991-1-6:2006: General actions – Actions during execution.
CSN EN 1991-1-7: 2007 General actions – Accidental actions.
CSN EN 1991-3:2008: Actions induced by cranes and machinery.

Design of concrete structures **Eurocode 2:**
CSN EN 1992-1-1:2006 General rules and rules for buildings.
CSN EN 1992-1-2:2006: General rules – Structural fire design.
CSN EN 1992-3:2007: Liquid retaining and containment structures.
CSN EN 206+A1:2018: Concrete: Specification, performance, production and conformity.
CSN EN 13670:2010: Execution of concrete structures.

Design of steel structures **Eurocode 3:**
CSN EN 1993-1-1:2006: General rules and rules for buildings.
CSN EN 1993-1-2:2006: General rules – Structural fire design.
CSN EN 1993-1-5:2008: Plated structural elements.
CSN EN 1993-1-8: 2006: Design of joints.
CSN EN 1993-1-9: 2006: Fatigue.
CSN EN 1993-1-10: 2006: Material toughness and through-thickness properties.
CSN EN 1993-6:2008: Crane supporting structures.
CSN EN 1090 -22019: Execution of steel structures and aluminium structures. Part 2: Technical requirements for steel structures

Geotechnical design **Eurocode 7:**
CSN EN 1997-1: :2006 General rules.
CSN EN 1997-2: :2008 Ground investigation and testing.
CSN EN 1537:2014 Execution of special geotechnical work- Ground anchors.

Design of structures for earthquake resistance **Eurocode 8:**
CSN EN 1998-1:2006 General rules, seismic actions and rules for buildings
CSN EN 1998-3:2007 Assessment and retrofitting of buildings
CSN EN 1998-4: 2008 Silos, tanks and pipelines
CSN EN 1998-5: 2006 Foundations, retaining structures and geotechnical aspects
CSN EN 1998-6: 2007 Towers, masts and chimneys

National Annex's (NA) to be used where applicable.

In addition to the above codes, regulations and standards, the project must be in line with the national application of the Eurocodes, which define the conditions of use in the design covered by buildings and facilities in the Czech Republic. National applications of the Eurocodes are provided for free under Ordinance № RD-02-20-19 Works and can be downloaded from the website of the Czech Standards Institute.

3.1.4 DESIGN WORKING LIFE

The building shall have a design working life of 50 years.

3.1.5 RELIABILITY CLASS AND CONSEQUENCE CLASS

The building belongs to reliability class RC2 and consequence class CC2 according to CSN EN1990:2004 National Annex (NA).

3.1.6 ROBUSTNESS

The building shall have robustness suitable to the character of the environment.

To prevent damage, concrete bollards shall be installed at all building corners and access doorways (inside and outside) subject to truck traffic. Raised floor areas and supports shall be protected from vehicular impact with concrete bollards and/or protective steel barriers.

3.2 Materials

Asbestos Containing Materials (ACMs) and Chromated Cooper Arsenate (CCA) treated timber for external structures are prohibited and cannot be used in the project.

3.2.1 FOUNDATIONS

3.2.1.1 Reliability

Spread foundations and retaining structures are designed according to CSN EN1997-1-2006 and National Annex. Design Approach 2 (set "A1" for actions, set "M1" for soil parameters and set "R2" for resistances) in clause 2.7.7.3.4 is used according to National Annex.

The partial resistance factors are determined according to set R2 in National Annex:

$\gamma_{R,v}$ = 1,55	bearing resistance
$\gamma_{R,h}$ = 1,1	sliding resistance
$\gamma_{R,e}$ = 1,5	earth resistance

When checking against failure by uplift the partial factors for soil parameters and resistances are according to National Annex:

$\gamma_{\varphi'}$ = 1,25	friction angle (applied to *tan φ'*)
γ_a = 1,5	anchorage resistance

The constructions belong to Geotechnical Category 2.

3.2.1.2 Geotechnical investigations

"Geotechnical Investigation Report" has been made available by the Employer for information only. The Contractor is responsible of initiating all further geotechnical investigation needed for the design. Any further geotechnical investigations shall be submitted in a report as a subject for review by the Employer.

3.2.1.3 Ground conditions

Please refer to Appendix A9, Annex 4 *Geology Survey*, for information only.

The Contractor is responsible for carrying out any needed additional site investigations prior to Tender and after awarded Contract.

3.2.1.4 Spread foundations/Piling

The arrangements of the foundation shall be decided by the Contractor and agreed with the Employer.

3.2.2 CONCRETE STRUCTURES

3.2.2.1 Reliability

The partial safety factors of concrete and reinforcement are according to CSN EN 1992-1-1 2006 National Annex in the ultimate limit state and accidental design situation:

Design situations	γ_c **for concrete**	γ_s **for reinforcement**
Persistent and transient (ULS)	1,5	1,15
Accidental [1)]	1,2	1,0

[1)]: In fire design, $\gamma_c = \gamma_s = 1,0$ according to CSN EN 1992-1-2:2006 National Annex.

The partial safety factors can be reduced according to National Annex A.

3.2.2.2 Exposure classes

The structural elements belong to the following exposure classes according to CSN EN 1992-1-1:2006:

Structural element	**Exposure class**	**Further requirements**
Footings	XC2	
Bottom plate in WASTE bunker	Inside: XC3, XD3 Outside: XC2, XA1	Water-tight concrete
Walls in waste bunker and ash storage building	Inside: XC3, XD3 Outside below terrain: XC2, XA1 Outside above terrain: XC1	Water-tight concrete
Bottom plate in basement	Inside: XC3, XD3 Outside: XC2, XA1	Water-tight concrete
Basement walls	Inside: XC1 Outside: XC2, XA1	Water-tight concrete
Ground floor level	Upper side: XC3, XD3 Lower side: XC2	
Slabs, beams, walls and columns in residual discharge, FGT process, battery room/UPS room and boiler hall	Inside rooms: XC3, XD3 Outside rooms: XC1	
Ground floor in tipping hall	Upper side: XC4, XD3, XF2 Lower side: XC2	
Outdoor plate	Upper side: XC4, XD3, XF4 Lower side: XC2	
Slab , slab in hopper and slab around grab lowering shaft	Upper side: XC3, XD3 Lower side: XC1	
Deck on top of control room	Upper side: XC3, XD3 Lower side: XC1	
TTD102/240 ribbed slab above waste bunker	Lower side: XC3, XD1	
Prefabricated façade elements at the base	Outside: XC4, XD1, XF1 Inside in tipping hall: XC1, XF1 Inside elsewhere: XC1	

All other slabs, beams, columns and walls	XC1	

3.2.2.3 Concrete

According to CSN EN 206, CSN EN 1992-1-1:2006 and National Annex there are the following minimum requirements to the concrete strength and cover:

Exposure class	Strength class	Cover (mm)
XC1	C20/25	20/±10
XC2	C25/30	30/±10
XC3	C25/30	30/±10
XC4	C28/35	35/±10
XD1	C28/35	40/±10
XD3	C35/45	50/±10
XF1	C25/30 [1)]	30/±10 [1)]
XF2	C28/35 [1)]	40/±10 [1)]
XF4	C40/50 [1)]	50/±10 [1)]
XA1	C32/40	35/±10 [1)]

[1)] Not given in the codes.

The calculations of the structural elements and the demand for water-tightness can result in a higher strength class, and the demanded fire resistance and the execution of the structural elements can result in an increased cover.

3.2.2.4 Reinforcement

The reinforcement is minimum class B according to CSN EN 1992-1-1:2006:

Identi-fication	ϕ (mm)	f_{yk} (MPa)	f_{yck} (MPa)	$\varepsilon_{uk} \geq$ (%)	$\left(\frac{f_t}{f_y}\right)_k \geq$	$f_{R,min} \geq$	D $\phi \leq 16$	D $\phi > 16$
Z	8 – 32	500	500	5	1,08	0,040 for $\phi < 12$ 0,056 for $\phi \geq 12$	4ϕ	7ϕ

3.2.2.5 Functional requirements

3.2.2.5.1 STRESS LIMITATION

According to CSN EN 1992-1-1:2006 and National Annex it may be appropriate to limit the compressive stress to $0,6f_{ck}$ in the concrete under the characteristic combination of loads in areas exposed to environments of exposure classes XD, XF and XS. The compressive stress in the concrete under the quasi-permanent loads should be less than $0,45f_{ck}$.

Under the characteristic combinations of loads the tensile stress in the reinforcement should not exceed $0,6f_{yk}$ (or $0,8f_{yk}$ if the stress is caused by imposed deformations).

3.2.2.5.2 CRACK CONTROL

According to CSN EN 1992-1-1:2006 and National Annex the calculated crack width should be limited to w_{max} for the relevant exposure classes:

Exposure class	Reinforced members and pre-stressed members with unbonded tendons	Pre-stressed members with bonded tendons
	Quasi-permanent load combination	Frequent load combination
XC1	0,4 mm	0,2 mm
XC2, XC3, XC4, XD1	0,3 mm	0,2 mm [1)]
XD3	0,2 mm	Decompression
[1)] For these exposure classes, in addition, decompression should be checked under the quasi-permanent combination of loads.		

Allowable crack widths for basement walls and bottom plates with water pressure and walls and bottom plate in waste bunker can be determined from CSN EN 1992-3:2007. The walls and bottom plate in the waste bunker belong to tightness class 2 and the remaining basement walls and bottom plate belong to tightness class 1.

3.2.2.5.3 DEFORMATION CONTROL

The total deflection (w_{tot} in CSN EN 1990:2004 A1.4) under the characteristic load combination consists of a deflection due to long-term effects from the quasi-permanent load combination and a deflection due to short-term effects. The total deflection should be the lesser of 20 mm or L/400 for beams and L/300 for slabs where L is the span of the beam and the shortest span of the slab. If the deflection exceeds those values then the beam or slab should be given a precamber w_c approximately of the same size as the deflection under the quasi-permanent load combination (long-term deflection).

For walls and beams/columns supporting the wall the total deflection under the characteristic load combination should be the lesser of 50 mm or L/200 where L is the wall height or beam/column length.

3.2.3 STEEL STRUCTURES

Please refer Appendix A14.2 *Steel Constructions for Process.*

3.2.3.1 Reliability

The partial safety factors for steel structures are defined in CSN EN 1993-1-1:2006 inclusive National Annex section 6.1:

γ_{M0} = 1,00 to be used for resistance of cross-sections, f_y, E, μ
γ_{M1} = 1,00 to be used for resistance of members to instability
γ_{M2} = 1,25 to be used for resistance of cross-sections in tension to fracture, f_u og σ_{fat}

3.2.3.2 Structural steel

Pursuant to Table B.1 of CSN EN 10025-1:2005 profiles, hollow sections and plates for structural use shall be delivered with inspection certificate 3.1 according to CSN EN 10204:2005. Secondary steel for galleries and stairs etc. shall be delivered with inspection certificate 2.2 according to CSN EN 10204:2005.

Steel quality S355J2+N is used for all profiles and plates for structural purpose.
Steel quality S355J2H is used for all hollow sections for structural purpose.

Steel quality S235 JR is used for all profiles, plates and CHS-profiles for secondary purpose in galleries and stairs etc.

The necessity for use of Z-steel (materials for through-thickness properties) according to SFS-EN 10164 for endplate connections shall be checked by design according to CSN EN 1993-1-10:2006 inclusive National Annex chapter 3.1 and chapter 3.2.

The following minimum yield strength and ultimate tensile strength applies for the different material thicknesses:

Steel quality	Material thicknesses	f_y (MPa)	f_u (MPa)
S235 JR	$t \leq 40$ mm	235	360
	$40 < t \leq 80$ mm	215	360
S355 J2	$t \leq 40$ mm	355	510
	$40 < t \leq 80$ mm	335	470

For the modulus of elasticity the following apply:

E_0 = 210000 MPa

The following additional nominal material values apply:

Shear modulus	$G = E/2(1+\nu) = 81000$ MPa
Density	$\rho = 7{,}85 * 10^3$ kg/m^3
Poisson's ratio in elastic stage	$\nu = 0{,}3$
Coefficient of linear thermal expansion	$\alpha = 12 * 10^{-6}$ °C^{-1}

Maximum permissible values of element thickness t in mm are determined according to CSN EN 1993-1-10:2006 inclusive National Annex Table 2.1. For the actual steel qualities the following applies:

Steel quality	Maximum permissible value of element thickness *t*
S235 JR	60 mm *(35 mm)*
S355 J2	90 mm *(50 mm)*

The values in ( ) are valid for the tipping hall.

The maximum permissible values of element thickness t above are valid for members subjected to non-fatigue as well as members subjected to fatigue. The required number n of in-service inspections should be determined according to section 2.3.1 in CSN EN 1993-1-10:2006 inclusive National Annex with m=5 applied for long life structure. In the scheme above has a reference stress level $\sigma_{Ed} = 0{,}75\ f_y(t)$ been presumed for the maximum permissible values of element thickness t.

3.2.3.3 Welds, quality requirements

All welds shall be closed.

Nondestructive testing (NDT) of welds shall be carried out according to CSN EN ISO 17635. The NDT shall include fillet welds. As described in CSN EN ISO 3834-3 the identification and traceability shall be maintained throughout the manufacturing process until the structures are

painted or hot dip galvanized. The NDT of welds is included in the scope of work for the steel contractor.

The welding is executed according to CSN EN/ISO 3834-3.

Welds shall be designed and calculated according to CSN EN 1993-1-8:2006 inclusive National Annex.

3.2.3.4 Bolted connections, quality requirements

Bolted connections shall be executed as category A: bearing type according to CSN EN 1993-1-8:2006 inclusive National Annex chapter 3.4.1 and category D: non-preloaded according to CSN EN 1993-1-8:2006 inclusive National Annex chapter 3.4.2 in class 8.8. Only bolts in dimensions M16, M20, M24, M27 and M30 are used.

Bolts shall be delivered according to CSN EN ISO 4014 and EN ISO 4017.

Bolted connections shall be designed and calculated according to CSN EN 1993-1-8:2006 inclusive National Annex.

The bolt material shall have the following strength:

f_{ub} = 800 MPa

According to CSN EN 1993-1-8:2006 inclusive National Annex table 3.4 the bearing resistance is calculated as:

$$F_{b,Rd} = \frac{k_1 \cdot \alpha_b \cdot f_u \cdot d \cdot t}{\gamma_{M2}}$$

According to CSN EN 1993-1-8:2006 inclusive National Annex table 3.4 the shear resistance per shear plane is calculated as:

$$F_{v,Rd} = \frac{\alpha_v \cdot f_{ub} \cdot A}{\gamma_{M2}}$$

According to CSN EN 1993-1-8:2006 inclusive National Annex table 3.4 the tension resistance is calculated as:

$$F_{t,Rd} = \frac{k_2 \cdot f_{ub} \cdot A_s}{\gamma_{M2}}$$

3.2.3.5 Functional requirements

3.2.3.5.1 DEFLECTIONS

The vertical deflections and horizontal deflections are treated as defined in CSN EN 1990:2004 inclusive National Annex Figure A1.1 and Figure A1.2 and furthermore as defined in CSN EN 1993-1-1:2006 inclusive National Annex chapter 7.2.1 and chapter 7.2.2.

The maximum deflections shall be within the limits stated in CSN EN 1993-1-1:2006 inclusive National Annex chapter 7.2.1 and chapter 7.2.2.

In the scheme below the most essential limits for the acceptable deflections are highlighted.

Max. acceptable serviceability limit states for deflection from one characteristic action:		
Girders in general		*l*/400
Girders in roofs		*l*/300
Roof purlins		*l*/200
Columns in multi-storey buildings:	For each floor	*h*/300
	For the total height	*h*/500

Concerning acceptable deflections for crane beams reference is made to CSN EN 1993-6:2008 inclusive National Annex section 7.3.

In cases where the deflections from dead actions are unacceptable it could be necessary to use camber.

Tolerances from fabrication and erection are defined in CSN EN 1090 section 11 and Annex D.

3.2.3.5.2 SERVICE TEMPERATURE

The lowest service temperature for interior steel structures in general is +5ºC.
For waste bunker, bottom ash storage and exterior structures the lowest temperature is -15ºC.

3.2.3.5.3 CALCULATION FOR FATIGUE

Crane beam system shall be designed for fatigue. Reference is made to CSN EN 1993-6:2008inclusive National Annex section 9 and CSN EN 1993-1-9:2006 inclusive National Annex.

3.2.4 CORROSION PROTECTION

Please refer Appendix A14.2 *Steel Constructions for Process.*

3.3 Actions

3.3.1 DESIGN VALUES OF ACTIONS

In the ultimate limit state (STR/GEO) the design values are according to CSN EN1990:2004National Annex:

Persistent and transient design situations	Permanent actions		Leading variable action	Accompanying variable actions	
	Unfavourable	Favourable		Main (if any)	Others
(Eq. 6.10a)	$1{,}35K_{FI}G_{kj,sup}$	$0{,}90G_{kj,inf}$			
(Eq. 6.10b)	$1{,}15K_{FI}G_{kj,sup}$	$0{,}90G_{kj,inf}$	$1{,}5K_{FI}Q_{k,1}$		$1{,}5K_{FI}\psi_{0,i}Q_{k,i}$
In consequence class CC2 and reliability class RC2, $K_{FI} = 1{,}0$.					

Design of structural members (footings, basement walls etc.) (STR) involving geotechnical actions and resistance of the ground (GEO) is verified using Design Approach 2 (set "A1" for actions) according to CSN EN1997-1-2006 and National Annex.

When checking against failure by uplift design values in CSN EN1997-1-2006 National Annex Table A.16 are used.

In the accidental design situation the design values are according to CSN EN1990:2004 National Annex:

Accidental design situation	Permanent actions		Leading accidental action	Accompanying variable actions	
	Unfavourable	Favourable		Main (if any)	Others
(Eq. 6.11a/b)	$G_{kj,sup}$	$G_{kj,inf}$	A_d	$\psi_{11}Q_{k1}$ 1)	$\psi_{2,i}Q_{k,i}$
1) When the main action is other than snow or wind action, the value ψ_{21} however is used.					

In the serviceability limit state the design values are according to CSN EN1990:2004:

Combination	Permanent actions		Variable actions	
	Unfavourable	Favourable	Leading	Others
Characteristic	$G_{kj,sup}$	$G_{kj,inf}$	$Q_{k,1}$	$\psi_{0,i}Q_{k,i}$
Frequent	$G_{kj,sup}$	$G_{kj,inf}$	$\psi_{1,1}Q_{k,1}$	$\psi_{2,i}Q_{k,i}$
Quasi-permanent	$G_{kj,sup}$	$G_{kj,inf}$	$\psi_{2,1}Q_{k,1}$	$\psi_{2,i}Q_{k,i}$

3.3.2 BASIC LOADS

3.3.2.1 Permanent loads

3.3.2.1.1 SELF-WEIGHT

For the purpose of accessing the self weight of the structures, the following loads are proposed as guidelines.

Density of materials

Steel	:	78,5 kN/m^3
Reinforced concrete	:	25,0 kN/m^3

Self-weight – lightweight roof

Steel sheet	:	0,1 kN/m^2
Insulation	:	0,1 kN/m^2
Cover	:	0,1 kN/m^2
Installations etc.	:	0,2 kN/m^2
		0,5 kN/m^2

Self-weight – lightweight facades

Facades/windows	:	**1,0 kN/m^2**

Self-weight – Raised floor

In areas with raised floor (electrical rooms and control room) an additional self-weight of 1,0 kN/m^2 is added.

3.3.2.2 Imposed loads

All live loads arising from traffic, cranes, users of facilities, water storage, waste storage etc. shall be calculated using relevant codes unless exceeded by the attached load summary.

Live loads from equipment are included in the distributed live loads as long as the equipment load is less than the floor live load and it is not possible to have any further imposed load in the given area.

Distributed floor live loads shall not be reduced for large floor areas.

3.3.2.2.1 GENERAL UNIFORMLY DISTRIBUTED LOADS AND CONCENTRATED LOADS

The values of ψ-factors are according to CSN EN1990:2004 National Annex:

Category of use	ψ_0	ψ_1	ψ_2
B	0,7	0,5	0,3
E2	1,0	0,9	0,8

3.3.2.2.2 ACTIONS FROM MACHINERY

Placing of and actions from machinery, silos, filter, boiler, hopper, turbine plate etc. shall result from the Contractor's mechanical design.

The values of ψ-factors for the variable actions are set to:

ψ_0	ψ_1	ψ_2
1,0	0,9	0,8

3.3.2.2.3 ACTIONS FROM TRANSPORT VEHICLES AND FORKLIFTS

Action from a transport vehicle is assumed to be 4×90 kN with a distance of respectively 1,4 m and 2,6 m. The contact area is 600×200 mm.

The static vertical axle load Q_k from a forklift is assumed to be 90 kN according to class FL 4 in CSN EN 1991-1-1:2004, clause 6.3.2.3. Including a dynamic factor $\varphi = 1,4$ for pneumatic tyres the load is 2×63 kN with a distance of 1,2 m. The contact area is 200×200 mm.

The actions mentioned above are acting together with the uniformly distributed loads in 4.2.2.1.

The values of ψ-factors are set to:

ψ_0	ψ_1	ψ_2
1,0	0,7	0,3

3.3.2.2.4 WASTE LOAD

Density of waste: 5,0 kN/m^3. Not to be used for crane system dimensioning.

The horizontal load from the waste is determined as a rest pressure coefficient $K^0 = 0,5$.

The values of ψ-factors are set to:

ψ_0	ψ_1	ψ_2
1,0	0,9	0,8

3.3.2.2.5 CRANE LOADS

The crane loads on the runway beams shall be in accordance with CSN EN1991-3:2005 and the Construction Data.

The loads on the crane console are preliminary and include the dynamic factor. The full load shall comply with Construction Data.

F_V is the vertical load, $F_{H,1}$ is the horizontal load perpendicular to the runway beam and $F_{H,2}$ is the horizontal load along the runway beam.

The values of ψ-factors are according to CSN EN1991-3:2005:

ψ_0	ψ_1	ψ_2
1,0	0,9	0,5

3.3.2.2.6 ACTIONS FROM SERVICES

Actions from services (pipes, ducts, cable trays) are assumed to be included in the general uniformly distributed loads in 4.2.2.1.

3.3.2.3 Environmental actions

3.3.2.3.1 WIND LOAD

The wind load on the construction is determined according to CSN EN1991-1-4:2007 and National Annex.

Site location in Brno is situated in III. wind area based on the Czech republic wind areas maps according to the ČSN EN 1991-1-4:2007.

Peak velocity pressure

- basic wind speed $v_{b,0}$ = 27,5 m/s
- basic wind load q_b = 0,5043 kN/m^2

The values of ψ-factors are according to CSN EN1990:2002 National Annex:

ψ_0	ψ_1	ψ_2
0,6	0,2	0

Pressure coefficients

External pressure coefficients

For the walls the external pressure coefficients is set to $c_{pe,10}$ = *+0,8* (pressure) on windward and $c_{pe,10}$ = *-0,6* (suction) on leeward side. For the walls parallel to the wind direction the external pressure coefficients is set to $c_{pe,10}$ = *-1,2* (suction).

For the flat roof the external pressure coefficient is set to either $c_{pe,10}$ = *-1,8* (suction) or $c_{pe,10}$ = *+0,2* (pressure).

Internal pressure coefficients

For the waste bunker and the tipping hall the internal pressure coefficient is $c_{pi} = 0{,}90 \cdot c_{pe,10}$ because of the dominant openings.

For the remaining building the internal pressure coefficient is c_{pi} = *+0,2* (pressure) or c_{pi} = *-0,3* (suction).

3.3.2.3.2 SNOW LOAD

The snow load is determined according to CSN EN 1991-1-3:2005
Site location in Brno is situated in II. snow area based on the Czech Republic snow areas maps. The characteristic value of snow on the ground to be used is s_k = 1.0kNm^{-2}. The type of landscape is to be considered normal.
The exposure factor in the calculations to be used is C_e = 1.0. The thermal coefficient to be used is C_t = 1.0.
The shape factor of the snow load μ is to be determined individually according to the relevant articles and annexes of CSN EN 1991-1-3 for the given specific case.

3.3.2.3.3 ICING LOAD

The Contractor shall decide which parts or entire structures considered in the construction are sensitive to icing loads.

To determine the icing load, it is then necessary to proceed based on CSN ISO 12498:2018 and CSN 73 0034:2018.

For the Brno area, it is necessary to consider the icing class R3 according to the table in Figure 1 – Map of icing classes for the territory of the Czech Republic, according to CSN 73 0043:2018.

3.3.2.3.4 EARTHQUAKE LOAD

The earthquake load must be considered according to CSN EN 1998-1 (73 0036):2013 and the national annex NA together with the amendment Z1 of 2016.

For the Brno-město area, a reference peak acceleration a_{gR} = 0.03 g for type A bedrock is considered in accordance with CSN EN 1998-1.

The influence of local foundation conditions on the earthquake load shall be determined by the Contractor on the basis of the evaluation of the conclusions of the additional engineering-geological survey provided by the Contractor (depending on table 3.1 in Article 3 of CSN EN 1998-1:2013).

The significance class of the building must be considered as class IV (in accordance with Table 4.3 in Article 4 of CSN EN 1998-1:2013) and the significance factor γ = 1.4 (in accordance with Table NA.1 given in the national annex NA).

3.3.2.3.5 THERMAL ACTIONS

The thermal actions on the construction are determined according to CSN EN1991-1-5:2005 and National Annex.

The characteristic values for temperatures of outer environment T_{out} are determined according to National Annex.

The values of ψ-factors are according to CSN EN1990:2004 National Annex:

ψ_0	ψ_1	ψ_2
0,6	0,5	0

3.3.2.4 Geotechnical actions

Geotechnical actions on basement walls etc. are determined according to CSN EN1997-1:2006 and National Annex. Design Approach 2 (set "A1" for actions and set "M1" for soil parameters) in clause 2.7.7.3.4 is used according to National Annex.

3.3.2.4.1 EARTH PRESSURE

Geotechnical parameters

The earth pressure on basement walls etc. is assumed coming from backfill of sand. The preliminary geotechnical parameters are

Parameter		Dimension	Value
Effective plane friction angle	φ'_{pl}	°	40
Weight density	γ	kN/m^3	18
Effective weight density	γ'	kN/m^3	10

Design basis

Generally, the constructions have to be checked in the ultimate limit state.

The earth pressure on the basement walls shall be calculated from the at rest state with the at rest earth pressure coefficient $K_0 = 1\text{-}sin(\varphi'_{pl}/1,1)$.

Retaining structures shall be calculated from active/passive limit state with earth pressure coefficients determined from geotechnical investigation. These structures also have to be checked in the serviceability limit state.

3.3.2.4.2 GROUND-WATER PRESSURE

The groundwater level was not found in the historical testing probes.

3.3.2.5 Accidental actions

3.3.2.5.1 VEHICULAR IMPACT

The equivalent static design force due to vehicular impact in areas with access to transport vehicles is $F_d = 150\ kN$ according to CSN EN1991-1-7:2007 clause 4.3.

The accidental action caused by a forklift truck is set to an equivalent static design force $F = 5W$ where W is the sum of the net weight and hoisting load of a loaded truck according to CSN EN1991-1-7:2007 clause 4.4.

3.3.2.5.2 FIRE

The bearing constructions shall be designed according to CSN EN1992-1-2:2006 and CSN EN1993-1-2:2006.

3.3.2.5.3 WATER FILLING OF WASTE BUNKER

In case of a bunker fire the waste bunker is assumed to be filled with water until 3 meters from the bottom. In this situation load from waste is neglected.

4. DESIGN BASIS, BUILDING SERVICES

4.1 General

The Contractor shall provide building services, as required to meet the applicable building codes and to meet the requirements set out in the part 0.h *Room Data Sheet*.

The Contractor shall be responsible for determining the amount of interior and exterior lighting needed to meet the applicable building codes and to meet the Authorities requirements.

All building services must be controlled by a common Building Management System (BMS). Alarms from parameters which is of importance to the process, must be transferred to the CMS system (e.g. high temperature in electrical rooms).

4.2 Mechanical Systems

4.2.1 SCOPE OF WORKS

The scope of works for mechanical building services comprises the following:

- HVAC
- Plumbing and Drainage

4.2.2 STANDARDS

The design shall be in accordance with the applicable Czech and European Norms and Standards.

- Harmonized EU Standards
- Relevant EU National Standards
- Relevant Acts and Regulation

4.2.3 DESIGN WORKING LIFE

The building is expected to have a design working life of 50 years.

4.2.4 AMBIENT CONDITIONS

The mechanical systems shall be designed and provided to conduct their normal operation in the ambient temperature and surrounding environment.

4.2.5 HVAC

Please refer to requirements set out in the part 0.h *Room Data Sheet*.

4.2.6 PLUMBING AND DRAINAGE

Rainfall intensity:

- Roofs: i = 0.03 l/s*m², water runoff coefficient 1.0 according to CSN 756760:2014
- All other areas: i = 161 l/s*ha
  periodicity p = 0.5 (once in 2 years)
  runoff coefficient 0.1 - 1.0 according to the type of surface, all according to CSN 756101:2012 and CSN EN 752:2019 (ČSN 75 6110:2019)
- For retention (infiltration) basins, precipitation totals according to tables A.1 and A.2 in CSN 759010:2012

4.3 Fire Protection

4.3.1 SCOPE OF WORKS

The Contractor shall provide fire protection systems for complete Contract Object, including fixed and portable water-based and inert fire suppression systems, fire pumps, fire hydrant and fire standpipe systems, fire water piping including ring headers, fire apparatus access roads and fire alarm and detection systems, all in accordance with local Legal regulation and Authorities requirements.
The basic philosophy for the fire protection solution of the construction is determined in the project (document) Principle Design. This basic philosophy will be elaborated by the Supplier in detail in the documentation for the building permit application, as bindingly required by Czech legislation, and will also be discussed with and approved by the HZSJMK.

As part of the activities of expanding the existing waste bunker, the Contractor shall install fire protection for the entire future space of the bunker, i.e. the existing and new parts.
The supply of fire water to the existing space of the bunker is ensured by back-up fire pumps powered from the water supply system. These pumps are located in the existing area of the former boiler room K1.
The Contractor shall check the possibility of using these pumps and, if necessary, provide new pumps for any increased need for fire water within the bunker.
As part of these activities, the Contractor shall provide everything necessary for the proper implementation and functionality of this system.
After the installation of the new equipment, the Contractor shall dismantle the existing water cannons and related accessories from the bunker area.
The waste bunker and hopper deck area for both the existing lines (K2+K3) and the new line (K1) shall be covered with a fire detection system based on infrared scanning with at least 2 sensors.
The fire detection system shall be connected to the firefighting equipment in the waste bunker (remote controlled water spraying cannons) so the cannons automatically are directed to the source of the fire and automatically activated after a given time. Prior to activation, the acoustic and visual alarm shall give the staff a possibility to react on the alarm.
There shall be at least three main water spraying cannons to cover the waste bunker and four smaller cannons/powerful sprinkler, one above the hoppers for each of line K2 and K3, one above the hopper for line K1 and one placed above the existing shredder to cover the input hopper. The cannons shall preferably be of foam/water type and able to cover all areas of the waste bunker including hopper decks, hoppers and shredder.
A signal will be given to the waste cranes, so they automatically can move away from the fire to the maintenance areas in case of fire.

4.3.2 STANDARDS

The design shall be in accordance with the applicable Czech and European Norms and Standards in force, hereof non exhaustive:

- CSN EN 15423:2011 Ventilation for buildings - Fire precautions for air distribution systems in buildings
- CSN EN 15998:2011 Glass in building - Safety in case of fire, fire resistance - Glass testing methodology for the purpose of classification
- CSN EN 13238:2010 Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates
- CSN EN 1366-1:2017 Fire resistance tests for service installations-Part 1: Ventilation ducts
- CSN EN 81-73:2016 Safety rules for the construction and installation of lifts - Particular applications for passenger and goods passenger lifts - Part 73: Behaviour of lifts in the event of fire

- CSN EN 145402018 Fire-fighting hoses - Non-percolating layflat hoses for fixed systems
- CSN EN 15889:2012 Fire-fighting hoses - Test methods
- CSN EN 1028-1+A1:2009 Fire-fighting pumps - Fire-fighting centrifugal pumps with primer - Part 1: Classification - General and safety requirements
- CSN EN 1028-2+A1:2008 Fire-fighting pumps - Fire-fighting centrifugal pumps with primer - Part 2: Verification of general and safety requirements
- CSN EN 12259-1+A1:2002/ Fixed firefighting systems components for sprinkler and waterspray systems - Part 1: Sprinklers
- CSN EN 12259-2:2000 Fixed firefighting systems - Components for sprinkler and water spray systems - Part 2: Wet alarm valve assemblies
- CSN EN 12259-3:2001 Fixed firefighting systems - Components for automatic sprinkler and water spray systems - Part 3: Dry alarm valve assemblies
- CSN EN 12259-4:2001 Fixed firefighting systems - Components for sprinkler and water spray systems - Part 4: Water motor alarms
- CSN EN 12259-5:2003 Fixed firefighting systems - Components for sprinkler and water spray systems - Part 5: Water flow detectors
- CSN EN 12845+A1:2020 Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance
- CSN EN ISO 19353 Safety of machinery - Fire prevention and fire protection
- CSN EN 13501-3: A1:2010 Fire classification of construction products and building elements - Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers
- CSN EN 14384:2006 Pillar fire hydrants
- CSN EN 14466: A1:2009Fire-fighting pumps - Portable pumps - Safety and performance requirements, tests
- CSN EN 14637:2008 Building hardware - Electrically controlled hold-open systems for fire/smoke door assemblies - Requirements, test methods, application and maintenance
- CSN EN 15182-12010 Hand-held branchpipes for fire service use - Part 1: Common requirements
- CSN EN 15650:2012 Ventilation for buildings - Fire dampers
- CSN EN 15767-1:2009 Portable equipment for projecting extinguishing agents supplied by fire fighting pumps - Portable monitors - Part 1: General requirements for portable monitor assemblies
- CSN EN 15767-2:2009 Portable equipment for projecting extinguishing agents supplied by fire fighting pumps - Portable monitors - Part 2: Water nozzles
- none
- CSN EN 1866-1:2008 Mobile fire extinguishers - Part 1: Characteristics, performance and test methods
- CSN EN 3-7: +A1:2008 Portable fire extinguishers - Part 7: Characteristics, performance requirements and test methods
- CSN EN 3-8:2007 Portable fire extinguishers - Part 8: Additional requirements to EN 3-7 for the construction, resistance to pressure and mechanical tests for extinguishers with a maximum allowable pressure equal to or lower than 30 bar
- CSN EN 3-9:2007 Portable fire extinguishers - Part 9: Additional requirements to EN 3-7 for pressure resistance of CO2 extinguishers
- CSN EN 3-10:2010 Portable fire extinguishers - Part 10: Provisions for evaluating the conformity of a portable fire extinguisher to EN 3-7
- CSN EN 1869:2019 Fire blankets
- CSN EN 50130-4:2012 Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and social alarm systems
- CSN EN 54-2:1999 Fire detection and fire alarm systems - Part 2: Control and indicating equipment
- CSN EN 54-3 ed.2:2017 Fire detection and fire alarm systems - Part 3: Fire alarm devices - Sounders

- CSN EN 54-101002 Fire detection and fire alarm systems - Part 10: Flame detectors - Point detectors
- CSN EN 54-112002 Fire detection and fire alarm systems - Part 11: Manual call points
- CSN EN 54-17:2006 Fire detection and fire alarm systems - Part 17: Short-circuit isolators
- CSN EN 54-18:2006 Fire detection and fire alarm systems - Part 18: Input/output devices
- CSN EN 54-20:2007 Fire detection and fire alarm systems - Part 20: Aspirating smoke detectors
- CSN EN 54-21:2007 Fire detection and fire alarm systems - Part 21: Alarm transmission and fault warning routing equipment
- CSN EN 54-24:2009 Fire detection and fire alarm systems - Part 24: Components of voice alarm systems - Loudspeakers

National Annex's (NA) to be used where applicable.

4.3.3 FIRE WALL SEPARATION

Contractor's design shall indicate the various fire rated areas of the Line according to national codes and regulations

4.3.4 BUNKER FIRE DETECTION SYSTEM

The waste bunker areas shall be covered with a fire detection system based on infrared scanning. Monitors shall be placed in the control room and aside the crane operator's chair.
A visual and acoustic alarm shall be given in case of fire.

A signal shall be given to the waste cranes so that they automatically move to the maintenance areas in case of fire.

4.3.5 FIREFIGHTING EQUIPMENT

Remote control shall be possible from the crane operator's chair and from a separate portable joy-stick controller located in the control room.

The firefighting equipment shall operate independent of the overall CMS. The firefighting equipment shall be supplied with the necessary pumps connected to the emergency power supply and piping to enable use of water from the fire water storage tank.

4.3.6 FIRE DETECTION SYSTEM

Contractor shall provide an automatic fire alarm and detection systems complete with fire alarm panels, area smoke detectors, duct smoke detectors, manual pull stations, audio and visual devices and required components and accessories.

Existing Employer's facility is equipped by electronic fire detection system.
Contractor shall provide a main fire alarm panel in the Control Room, and auxiliary fire alarm panels in other buildings. The auxiliary panels shall report and communicate to the main fire alarm panel. As part of the works, Contractor shall ensure either the relocation of the existing fire alarm detection system and its extension for all new premises supplied by Contractor or supply of new fire alarm detection system in which existing premises shall be included. In both options, the fire alarm detection system will be located in the new control room.

If the relocation option is applied, following works shall be considered as minimum but not exhausting:

- Preparation of project for relocation of existing central unit Siemens FC2040 including all auxiliaries and cable routes
- Central unit Siemens relocation works itself

- Interconnection of new fire alarm detection sensors and auxiliaries (i.e. elevators etc.) to this central unit and update of existing documentation based on as-build status

Outside these works, the Contractor shall provide everything necessary for the proper implementation and functionality of this system.

Design the fire alarm panels to monitor various fire suppression systems. Coordinate the number and location of required alarm, monitoring and supervisory contacts.

Power the fire alarm panels from a DC power supply. The DC system shall utilize two power sources; an external supply, and a battery supply.

A central control station shall monitor alarm contacts from the fire alarm, smoke detection, sprinkler and the local and central process control systems and shall provide two types of audible emergency alarms to be sounded in all interior facility locations.

One alarm shall be the repetitious gong type to be sounded in response to fire associated occurrences. The second alarm shall be siren type to be sounded in response to processing emergencies.

Thermal fire detectors and manual fire alarm stations shall be provided as required. Wire the fire alarm system so that initiation by any single source will activate a common alarm throughout the Complete plant.

Smoke detectors shall be provided to supplement the thermal fire detectors.

In addition to sounding an alarm, the system shall also operate alarm lights, release magnetic smoke door holders, and shut down environmental air supply to the affected areas without interfering with the air supply to other areas.

System malfunctions shall be indicated audibly and visually on a centrally located annunciator panel. At least one fire alarm pull box shall be provided outside of each building.

4.3.7 AUTOMATIC FIRE PUMP SYSTEM

Contractor shall provide an automatic fire pump system complete to serve the Line if necessary by the design. For existing fire pump system refer to *4.3.1 SCOPE OF WORKS.*

Fire pump system should be designed adequate to provide the needed flow/pressure rise from the external water connection to the required pressure and fire flow for the minimum required duration.

4.3.8 FIRE HYDRANTS AND OTHER FIRE DEPARTMENT CONNECTIONS

Provide fire hydrants and fire department connections for the Line and Site in accordance with the local Fire Fighting Department requirements and other applicable codes and standards.

4.3.9 STANDPIPES AND FIRE HOSES

Furnish, install and test fire standpipe systems for the Line in accordance with local codes and requirements.

Provide fire hose stations complete with hose on racks or hose reels in accordance with local codes and requirements.

4.3.10 SPRINKLER SYSTEM

Furnish, install and test the automatic fire sprinkler systems for all areas of the Line in accordance with local codes and requirements.

4.3.11 PORTABLE FIRE EXTINGUISHERS

Provide portable fire extinguishers for all areas of the Line in accordance with local codes and requirements.

Use carbon dioxide fire extinguishers for electrical and switchgear rooms, and multi-purpose dry chemical for other spaces.

4.3.12 FIRE DEPARTMENT ENTRY SYSTEM

Provide access roads around the Line buildings that will accommodate local Fire Fighting Department requirements. Minimum widths of roads shall be suitable for the local firefighting vehicles. Distances of the roads from the exterior walls of the structure shall be in accordance with the Fire Fighting Department requirements.

4.3.13 MISCELLANEOUS

All other components not specifically mentioned herein, but necessary for the proper operation and maintenance of the fire protection system equipment as required by local acts and regulations and Fire Fighting Department requirements and the applicable codes and regulations, shall be furnished and installed as part of the fire protection work.

4.4 Design basis for electrical systems

4.4.1 SCOPE OF WORKS

The scope of works for electrical building services comprises the following:

- Low voltage systems, excl. process
- Small power systems
- Lighting systems
- ICT systems (Information and Communication Technology)
- Life safety systems (fire detection, emergency exit etc.)
- BMS (Building Management System)
- Lifts
- Lighting protection
- Access control and intruder detection system
- CCTV system (Closed Circuit TeleVision)

4.4.2 STANDARDS

The design shall be in accordance with the applicable Czech and European Norms and Standards in force, hereof non exhaustive:

Electrical supply systems:

- Local grid owner requirements.
- CSN EN 50110-1ed.3:2015 Operation of electrical installations.
- CSN EN 50110-2 ed.2:2011 Operation of electrical installations - Part 2: National annexes.
- CSN EN 60076-12012: Power transformers - Part 1: General.

- CSN EN 60909-0 ed.2:2016 Short-circuit currents in three-phase a.c. systems - Part 0: Calculation of currents.
- CSN EN 60909-3 ed.2:2010 - Short-circuit currents in three-phase a.c systems - Part 3: Currents during two separate simultaneous line-to-earth short-circuits and partial short-circuit currents flowing through earth.

Medium voltage:
- CSN EN 61869-2 2013– Instrument transformers – Part 2: Additional requirements for current transformers
- CSN EN 61869-3 Instrument transformers – Part 3: Additional requrements for inductive voltage transformers
- CSN EN 60051-1 ed.2:2017 - Direct acting indicating analogue electrical measuring instruments and their accessories - Part 1: Definitions and general requirements common to all parts
- CSN EN 60255-27 2014 Measuring relays and protection equipment Part 27: Product safety requirements
- CSN EN 60073ed.2 :2003- Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators
- CSN EN 60445 ed.5:2018 - Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors
- CSN EN 605291993 - Degrees of protection provided by enclosures (IP Code)
- CSN EN 62271-1 ed.2:2018 - High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear
- CSN EN 61243-5:2001 - Live working - Voltage detectors - Part 5: Voltage detecting systems (VDS)
- CSN EN 62053-11:2003 - Electricity metering equipment (a.c.) - Particular requirements - Part 11: Electromechanical meters for active energy (classes 0,5, 1 and 2)
- CSN EN 62271-1 ed.2:2018 - High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current and controlgear
- CSN EN 62271-100 ed.2:2009 - High-voltage switchgear and controlgear - Part 100: Alternating-current circuit-breakers
- CSN EN 62271-102:2003 - High-voltage switchgear and controlgear - Part 102: High – voltage Alternating current disconnectors and earthing switches
- CSN EN 62271-200 ed.2:2012 High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

Low voltage:
- CSN EN 60204-1 ed.2:2007 - Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- CSN EN 61439-1 ed.2:2012 - Low-voltage switchgear and controlgear assemblies - Part 1: General rules
- CSN EN 61439-2:2012 - Low-voltage switchgear and controlgear assemblies - Part 2: Power switchgear and controlgear assemblies
- CSN EN 61439-3:2012 - Low-voltage switchgear and controlgear assemblies - Part 3: Distribution boards intended to be operated by ordinary persons (DBO)
- CSN EN 61439-4:2013 - Low-voltage switchgear and controlgear assemblies - Part 4: Particular requirements for assemblies for construction sites (ACS)
- CSN EN 61439-5ed.2:2015 - Low-voltage switchgear and controlgear assemblies - Part 5: Assemblies for power distribution in public networks
- CSN EN 60947-1ed.4:2008 - Low-voltage switchgear and controlgear - Part 1: General rules
- CSN EN 62040-1:2009- UninterruptiblePower Systems (UPS) - Part 1: General and safety requirements for UPS

- CSN EN 62208 ed.2:2012 - Empty enclosures for low-voltage switchgear and controlgear assemblies - General requirements

Cables:

- CSN EN 50174-1 ed.2:2010 - Information technology - Cabling installation -- Part 1: Installation specification and quality assurance

Rotating electrical machines:

- CSN ISO 8528-5:2020 - Reciprocating internal combustion engine driven alternating current generating sets – Part 5: Generating sets.

Electro Magnetic Compatibility (EMC):

- CSN EN 55011:2017 - Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
- Replaced by CSN EN 55032 Ed. 2:2017 Electromagnetic compatibility of multimedia equipment – Emission Requirements
  CSN EN 50561-1: 2014 Power line communication apparatus used in low-voltage installations- radio disturbance characteristics- Limits and methods of measurement – Part 1: Apparatus for in-home use
- CSN EN 61000-6-1 ed.2 :2007 - Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments
- CSN EN 61000-6-2 ed.3:2006 - Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
- CSN EN 61000-6-3 ed.2:2007 - Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
- CSN EN 61000-6-4 ed. 2:2007 - Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

Machine safety:

- Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) (Text with EEA relevance) (with later amendments).
- CSN EN ISO 14118:2018 - Safety of machinery - Prevention of unexpected start-up
- CSN EN ISO 13849-1:2017 - Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
- CSN EN ISO 13849-2:2013 - Safety of machinery - Safety-related parts of control systems - Part 2: Validation
- CSN EN ISO 13850:2017 - Safety of machinery - Emergency stop function - Principles for design
- CSN EN ISO 13849-2:2013- Safety of machinery - Safety-related parts of control systems - Part 2: Validation
- CSN EN ISO 12100:2011 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)
- CSN EN 60204-1 ed.2:2007 - Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- CSN EN 60445 ed.5 :2018 - Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals and conductor terminations
- CSN EN 605291993- Degrees of protection provided by enclosures (IP Code)

Earthing:

- CSN EN 50310 ed.4 :2017 - Telecommunications bonding networks for buildings and other structures

Documentation and calculations:

- The CE Identification Directive 93/68/EC with later amendments.

- CSN EN 60909-0 ed.2:2016- Short-circuit currents in three-phase a.c. systems - Part 0: Calculation of currents.
- CSN EN 60909-3 ed.2:2010 - Short-circuit currents in three-phase a.c systems - Part 3: Currents during two separate simultaneous line-to-earth short-circuits and partial short-circuit currents flowing through earth
- CSN EN 61082-1 ed. 3:2015 - Preparation of documents used in electrotechnology -- Part 1: Rules
- CSN EN 81346-1:2010 - Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 1: Basic rules
- CSN EN 81346-2:2010 - Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 2: Classification of objects and codes for classes
- KKS standard

4.4.3 DESIGN WORKING LIFE

The building is expected to have a design working life of 50 years.

4.4.4 AMBIENT CONDITIONS

The electrical systems shall be designed and provided to conduct their normal operation in the ambient temperature and surrounding environment. Electrical systems shall be designed according to the requirements on CSN 33 2000-3 (332000) - Study on External Environmental Effects.

4.5 Workmanship and components

4.5.1 MECHANICAL INSTALLATIONS

4.5.1.1 Heating

In the operating rooms, heating or tempering will be provided by means of hot air units connected to hot water distribution.
In other rooms, heating or tempering will be provided by radiators connected to the HW system, or by electric heaters.

4.5.1.2 Ventilation

Natural ventilation with additional forced ventilation by means of strengthening fans will be designed in the boiler room. In other operating rooms, ventilation will be designed in accordance with the technological needs or in accordance with Act No. 258/2000 Coll. and related laws.

4.5.1.3 Air-conditioning

In rooms where it will be necessary for technological or hygienic reasons to keep the air temperature in the required range with a maximum air temperature of 30°C, air conditioning will be designed. To create a microclimate during the stay of workers, the design of air conditioning will be based on the requirements of Act No. 262/2006 Coll. (Labor Code) as amended by Act No. 285/2020 Coll., Act No. 258/2000 Coll. and related laws.

4.5.1.4 Sanitary technical installations

Sanitary technical installations in the boiler room shall deal with

- internal drinking water distribution

- internal hot water distribution
- internal distribution of fire water to internal hydrants
- internal sewage system
- internal rainwater drainage
- internal industrial sewerage

Sanitary technical installations will supply water to individual fixtures and drain wastewater from them, including water from floor drains and from the roof of the building. There will be no large washroom in the building, employees will use the facilities in building C. In the building, we assume the use of sinks in the daily room, sinks or washbasins, toilets and safety or eye showers in places where required by the operation.

The drinking water supply will be connected to the outdoor water supply lines. The connection will also be common for the distribution of fire water to the internal hydrants. The distribution of drinking water will be made of polypropylene piping PPr. Fire water will be distributed from steel pipes. Sanitary technical installations do not include special fire equipment (mounts, sprinklers, etc.).
Hot water can be prepared centrally, or electric heaters can be installed at the individual outlets, which is more advantageous if the individual fixtures are at great distances from each other and it would be necessary to build long hot water distribution and circulation.
The sewage system will drain waste water from fixtures used for the hygienic needs of employees and will be connected to the outdoor sewage system. Plastic pipes will be used for soundproofed sewers.

Industrial water sewerage will drain wastewater from technological equipment and from floor washing in Line. It will be connected to an outdoor industrial sewer, leading to a retention basin.
The design of rainwater drainage is closely related to the type of roof. A green roof is designed, in which the outflow of rainwater will be reduced, but in the event of a sudden high-intensity collision, a safety overflow will be set up.

STANDARDS:
CSN 756760:2014 Drainage systems inside building and on private ground
CSN EN 12056-1:2001 Gravity drainage systems inside buildings – Part 1: General and performance requirements
CSN EN 12056-2:2001 Gravity drainage systems inside buildings – Part 2: Sanitary pipework, layout and calculation
CSN EN 12056-3:2001 Gravity drainage systems inside buildings – Part 3: Roof drainage, layout and calculation
CSN 755455:2014 Calculation of water installations inside buildings
CSN 755409: 2013 Water installations inside buildings
CSN EN 806-1:2002 Specifications for installations inside buildings conveying water for human consumption – Part 1 General
CSN EN 806-2:2005 Specification for installations inside buildings conveying water for human consumption – Part 2 Design
CSN EN 806-3:2006 Specification for installations inside buildings conveying water for human consumption – Part 3 Pipe sizing – Simplified

4.5.2 ELECTRICAL INSTALLATIONS

4.5.2.1 Motors

Motors for building services shall be supplied as standard air-cooled 3 phase squirrel-cage induction motors in accordance with IEC. Motors shall have an energy-efficiency, which is better than or equal to the EU efficiency class EFF2.

All motors shall be supplied with class F insulation and be designed for temperature rise class B.

4.5.2.2 Frequency converters

Frequency converters for building services shall be installed in low voltage room or in other clean and ventilated areas, classified for electrical equipment. The frequency converters shall be mounted free-standing or fixed on the wall enclosed in the manufacturer's standard cabinet.

The frequency converters shall be designed for momentary interruption of the power supply to the motors. The efficiency of the frequency converters shall be verified in accordance with IEC 60146-1-1. Frequency converters shall be designed in accordance with the applicable EMC requirements. du/dt filters shall be applied in order to minimize the harmonics.

The frequency converters shall be provided with filed bus adapter modules and field bus connections for the BMS system.

4.5.2.3 Enclosure Classes

For requirements regarding Enclosure Classes please refer to Appendix A6 *Technical Specifications for Electrical Equipment*.

5. NOISE

Contractor shall conduct noise study for Complete plant as a part of building permit documentation to validate compliance with the Authorities requirements according to the valid legislation requirements according but not limited to the Act No. 183/2006 Coll. (Building Act) and Regulation 499/2006 Coll. Noise study shall assess complete Contract Object under this Contract and final design of new Line within Complete plant and overall compliance with Authorities requirements.

5.1 Specific requirements

Please refer Appendix A14.3 *Acoustic Noise and Vibrations.*

6. DOCUMENTATION

6.1 General

All parts of the relevant project documentation shall be prepared by persons who are authorized for such activities, according to Czech legislation, especially according to Act No. 183/2006 Coll. (Building Act) and Act No. 360/1992 Coll. as amended. All parts of the documentation, including annexes, which are subject to approval by the Czech authorities, must be prepared exclusively in the Czech language.

In addition, all documentation for authorities shall be prepared in full accordance with the requirements of the Regulation 499/2006 Coll. on Construction documentation as amended.

Further details and requirements on documentation are described in part III. Appendix A14.7 *Documentation* and in part III. Appendix C1 – Reviewable project and design data.

<u>CAD system</u>
Drawings shall be prepared in a fully functional 3D–model and all necessary 2D drawings.

Drawings have to be forwarded in both open and pdf format.

<u>Transmittal of drawings</u>
All transmittal of drawings shall be covered by an agreed letter of transmittal included within Contractor's Dokumentation clearly stating documents transmitted and purpose of transmittal.