**NUMBER: 5/034/2021**
**DATE: 03.11.2021**

# TECHNICAL SPECIFICATION

## Modernization of cooling system at Blast Furnace no. 2 in Dąbrowa Górnicza

concerns the project entitled “Development and demonstration of an intelligent cooling system for a metallurgical unit by closing and integrating water circuits, increasing the operational reliability of the metallurgical process and improving the efficiency of industrial cooling water use.” (project no. POIR.01.01.01-00-0034/18), co-financed from the funds of the European Regional Development Fund and as part of the Smart Growth Operational Program 2014-2020, sub-measure 1.1.1 (the call for proposals organized by the National Centre for Research and Development, no. 2/1.1.1/2018)

This specification is attached as Annex 4. to the request for quotation no **5/034/2021**

**Revision 1: 23.11.2021**

**ArcelorMittal Poland S.A.**

**Dąbrowa Górnicza**

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***SPECIFICATION NO.: 5/034/2021***

## 1. INTRODUCTION

ArcelorMittal Poland S.A. (AMP) operates in various branches in Poland, mainly concentrating steel production in Krakow and in Dąbrowa Górnicza and other important production units that are responsible for the production of various types of steel products in Poland.

ArcelorMittal Poland S.A. (AMP), as part of its project "Modernization of Blast Furnace No. 2" is interested in modernization of Blast Furnace No. 2 (BF#2) cooling system. Detailed scope of the works covered by this Request for Quotation is given below.

The subject matter of the contract indicated in this specification concerns the project entitled "Development and demonstration of an intelligent cooling system for a metallurgical unit by closing and integrating water circuits, increasing the operational reliability of the metallurgical process and improving the efficiency of industrial cooling water use." (project no. POIR.01.01.01-00-0034/18), co-financed from the funds of the European Regional Development Fund and as part of the Smart Growth Operational Program 2014-2020, sub-measure 1.1.1 (the call for proposals organized by the National Centre for Research and Development, no. 2/1.1.1/2018).

The subject of the contract is the design, purchase, delivery (in accordance with DDP INCOTERMS 2010), installation and commissioning of a pilot installation for new cooling system for blast furnace no 2 located in Dąbrowa Górnicza.

Due to the Company's obligation to apply the competition principle, this technical specification constitutes a detailed description of the subject matter of the contract allowing for the preparation of tenders by the Bidders.

This specification has been drawn up with the utmost care in order to provide a full, unambiguous and exhaustive description of the subject matter of the contract so as to enable economic operators to determine all their obligations and risks and to calculate the price and other elements of the offer in a responsible way.

All of the purchases, services and supplies which are the subject of this enquiry must be incorporated and cooperate with the existing infrastructure and equipment in the Company and also must meet the same technological standards. Therefore, the need to maintain the same technological conditions and the need to maintain the unification of equipment resulting from the expansion of the existing infrastructure have determined the provisions of this specification. The provisions applied are justified by the need to ensure the smooth running of the project. The provisions indicated do not impose an obligation on Economic Operators to apply the solutions indicated but only inform about minimal parameters and standards. Using certain types of solutions is not obligatory but only exemplary. The indications in relation to the expected technical parameters, as well as indications concerning specific types and manufacturers' names are of a general nature, referring only to sample indications of equivalent products and do not constitute the only acceptable solution. On this basis, the contracting authority shall accept equivalent solutions.

Bidders are expected to submit an offer taking into account the requirements of this Technical Specification

The offer must be complete in all respects and must include all components/devices necessary to achieve the sound design, operation and maintenance of the installation.

The Bidder must read this specification and ensure that the installation is technically feasible and also accept full responsibility for the guaranteed performance of the delivered installation and equipment in terms of efficiency, performance, smooth and reliable operation.

The detailed scope of the work subject to the Enquiry is presented later in this paper.

### 1.1. PROJECT OBJECTIVE

The aim of this project is to conduct industrial research and experimental development works, the result of which will be the development of an innovative technical and technological solution in the field of cooling of metallurgical production units (along with a demonstration cooling installation). This subject of the contract will be part of the cooling system. Achieving the project objectives will allow for: lowering CO2 emissions, lowering fuel consumption, lowering electricity consumption and reducing the amount of cooling water - this will minimize the impact of the process on the environment.

### 1.2. SPECIFICATION CONTENT

This specification provides the environment-related data, information on Investor's location in Dąbrowa Górnicza, required technical norms and standards, technical data, scope of Contractor's works, Customer's rights, requirements related to Contraor's technical potential, preliminary works schedule, requirements related to availability, replaceability, quality and safety and other information as required for the purposes of the Technical Offer (e.g. function guarantee).

## 2. STANDARDS, UNITS OF MEASURE, NORMS and REGULATIONS

1) All other technical requirements should comply with the standards applied by ArcelorMittal Poland S.A., and should meet engineering standards such as DIN, ASME, GOST, BS and PN.
2) For detailed & workshop designs must be prepared by Polish version of Euro code.
3) Contractor's devices and technologies will be supplied based on the Contractor's knowledge of technology and standards effective world-wide and in Poland.
4) Devices, materials and parts used for the repair and revamping works should meet all technical and safety standards required by Polish law.
5) Project information is given in units and dimensions of the international metric system.
6) List of actual legal acts is presented in appendix 1.

### 2.1. DOCUMENTATION STANDARDS

File formats - AMP standard:

1. Documents: *.doc, *.pdf, *.xls (Microsoft Word 2010, Adobe Reader, Microsoft Excel 2010 or higher);
2. Time schedules: *.mpp; (Microsoft Project 2010 or higher);
3. Mechanical documentation: *.dwg, *.dwf (AutoCAD ver. 13 or higher, Autodesk Design Review)
4. Electrical documentation: *.zw1 ; ( EPlan ver.5.5/P8);
5. Pictures, images: *.jpeg;

6. 3D model – refer to appendix 5.

## 2.2. INVESTOR'S STANDARDS

The Contractor is required to be familiar with and respect Investor's standards, in particular H&S standards and performance standards (Investor's standards are available at www.arcelormittal.com/poland, tab **"FOR CONTRACTORS").** Furthermore, Investor's standards are enclosed with the Contractor's Safety Manual and will be provided to the Contractor by the Investment Purchasing Office. The Contractor is obliged to respect and follow them at all times on a regular basis at all stages of the investment:

- ST 000 H&S Policy
- ST 001 Insulation
- ST 002 CONFINE SPACE
- ST 003 WORK AT HEIGHT
- ST 004 SECURE OF TRAIN RAILS
- ST 005 Audits
- ST 006 VEHICLES AND ROAD TRAFFIC
- ST 007 OVERHEAD CRANES AND LIFING EQIPMENT
- ST 008 Contractor
- ST 009 Alarm
- ST 010 Safety indicators
- ST 011 Incident/Accident investigation
- ST 012 WORK AT GAZ HAZARDOUS AREA
- ST 014 HIRA (ang. Hazard Identification and Risk Assessment)
- ST 015 Golden Rules
- ST 018 Loading protection
- ST 201 H&S specification
- ST 301 Mobile phones

**NOTE: In case norms/standards define different requirements for the same topic which comply with the requirements above, the stricter norms/standards should be applicable!**

# 3. ENVIRONMENT- RELATED DATA

Investor's local environmental data for Dąbrowa Górnicza location, defined for project purposes, can be found in **appendix 2 "Location and environmental data".**

# 4. TECHNICAL INFORMATION:

## 4.1. AVAILABLE BACKGROUND DOCUMENTATION

1) The investor has basic documentation prepared by Boccard. It is attached to the inquiry. The documentation is presented in the form of a 3D model in NWD, NWF format and the appropriate CAD files for the model. Schematic diagrams and single-line diagrams are in electronic form.
2) Background technical documentation of existing situation is available in softcopy (PDF, JPG). Detailed designs are available in Investor's archive. The cost of printing out the documentation necessary for Bid preparation is to be borne by the Potential Contractor.
3) Documentation provided by the Investor may not be complete, therefore it is necessary for Contractors to rely on their own stocktaking, tests of the construction, foundations and land. Documentation provided by the Investor should not restrict the launch of works.

# 5. HEALTH & SAFETY

During the implementation of specific project phases, manufacturing and delivery to ArcelorMittal Poland S.A. Dąbrowa Górnicza Unit, the supplier has to fulfill safety requirements defined in ArcelorMittal Poland S.A. documentation:

1) Works contractors, before they start work, must receive trainings in scope of OH&S and fire protection regulations effective at AMP;
2) Works must be performed according to the technical conditions for the performance and acceptance of construction and assembly works and currently effective regulations and standards, OH&S rules and fire protection rules;
3) Regulations on personnel, vehicle and material traffic effective in the premises of AMP must be followed;
4) Works site must be secured against unauthorized third party access;
5) OH&S and fire protection for the site and works must comply with the regulations effective at AMP.
6) During investment realization period at AMP site, supplier must respect and apply all H&S rules mentioned in H&S contract, including all appendix described in Investor Standards, mentioned in point 2.2.
7) In case of using forklift, jib cranes, others lifting equipment and devices, certification by Polish Technical Office UDT is a must. Others certificate are not accepted;
8) Employees, who will operate the hooks, lifting equipment must speak polish language.
9) Necessity to equip of all employees i.e. fire protection clothes, proper shoes, helmet with 4-point belt locked under the chin, safety glasses, gas detector CO and O2, in case of working at height - (individual) harness with safety ropes, shock absorber and other equipment which will be agreed during elaboration of project documentation or during execution at site.
10) **The Contractor will have a H&S inspector present on site 24h/day. The inspector will be responsible for safety of the Contractor during performance of works as well as for preparation of reports from safety audits carried out jointly with AMP representatives.**

# 6. SCOPE OF THE BIDDER'S WORKS

## 6.1. SUBJECT OF THE WORKS

In the current situation, water is supplied to BF2 from pumping station No. 7 through an energy tunnel. The current cooling system consists of 2 circuits, closed and open.

Open circuit:
Its main task is to cool the tuyere sets. From the energy tunnel, the water is supplied to the booster pumps through DN500 pipelines. After increasing the pressure, the water is divided into two valve stations A and B located at the level of the cast house. There are manifolds in the valve stations that separate the system into individual elements of the tuyere sets.

Moreover, the open circuit serves the function of cooling some elements of the hot blast stoves, it is fed to the cast house for technological purposes and it serves as an emergency circuit for a closed circuit which is the main cooling circuit of the furnace.

Closed cooling circuit with treated water is the main cooling circuit of BF2, it covers such areas as:
- herth cooling zone with cast iron staves in rows I ÷ V,

- a zone for cooling the tap holes with cast iron staves,
- bosh cooling zone with horizontal copper plates,
- belly and shaft cooling zone with vertical copper staves in rows VI ÷ IX
- shaft cooling zone with cast iron staves in rows XI ÷ XVII,
- cooling some of the hot blast stoves elements,

The closed circuit is supplied with treated water.

In the new system, the function of cooling the tuyere sets and hot blast stoves fittings will be taken over by a new closed cooling circuit supplied with treated water. The circuit will be equipped with two types of pumps, with medium pressure for the fittings of the hot blast stoves and high pressure for the tuyere sets. The pumping station with the place for the water conditioning will be located at the level of +0.000 in the area of the hot blast stoves. The basic design provides the installation of three heat exchangers located below BF2 cast house, which will be cooled from the cold side by the current open circuit. Water collectors and valves for the elements of the tuyere sets will be located on the newly constructed structure on the BF shaft. The circuit will be equipped with a compensation tank with a capacity of 15 m3 located on the BF top.

The current open circuit will be modified. Due to the limitation of its functionality, the pumps supplying water from pumping station No. 7 will be reduced, as well as the diameters of supply and discharge pipelines. The current closed system will be reduced only by the cooling part of the hot blast stoves elements. Due to the replacement of the cast iron and copper staves inside the BF2, the project also envisages modifying the stave connections in certain areas.

The purpose of these technical assumptions is to present the scope of turnkey works for revamping BF#2 cooling system.

**Note: Prior to the submission of the bid, it is possible to carry out an on-site inspection.**

The Contractor's task shall be a complete **design and turnkey execution** of particular scopes of works described below in detail.

The contractor will analyse the base design in terms of achieving the assumed technological parameters.

## 6.2. SCOPE OF WORKS

The main scope includes detailed design works, disassembly works, supply of cooling system components specified in the documentation, erection and commissioning of the new cooling system.

As part of the project, the Contractor shall prepare detailed technical documentation for the new cooling circulation system. The Basic Engineering (BE) documentation developed by Boccard shall be the basis for the preparation of Detailed Engineering (DE) documentation. The BE documentation includes all required information on the operation of new cooling system, location of pumps, location of piping and automation.

The main components of the new cooling system are as follows:

- pump room in the area of hot stoves
- heat exchanger room in the area under the cast house
- new valve platform
- connection to the industrial water circuit
- system for cooling elements of hot stoves

As part of the project, the Contractor shall prepare as-built documentation for the entire scope including the new cooling system.

The BE documentation includes the design of a new closed cooling system for tuyeres and hot stoves consisting of:

- high-pressure pumps supplying water to tuyere sets
- medium-pressure pumps supplying water to hot stoves
- heat exchangers for exchanging heat between the new circuit and the open circuit

The Contractor's scope of work includes:

### 6.2.1. Energetic scope

**NEW SYSTEM (COOLING OF TUYERES AND HOT STOVES)**

1) Design for foundation and installation of high-pressure pumps

The design involves the foundation of two electric pumps and one pump with combustion motor.

Details of the pumps:

- Electric pump
  - Flow rate – 1150m3/h
  - Discharge pressure – 12.5 bar
  - Motor 550kW
- Pump with combustion motor (pump from BF5 in Kraków)
  - Flow rate – 960m3/h
  - Discharge pressure - 9 bar

2) Installation of medium-pressure pumps - 2 electric pumps

The design involves the foundation of two electric pumps and one pump with combustion motor.

Details of the pumps:

- Electric pump (pumps from BF5 in Kraków)
  - Flow rate – 650 m3/h
  - Discharge pressure – 4 bar
  - Motor: 110kW
- Pump with combustion motor (pump from BF5 in Kraków)
  - Flow rate – 650m3/h
  - Discharge pressure - 4 bar

3) Installation of heat exchangers in the area below the cast house

Design for foundation and installation of 3 heat exchangers in a newly prepared room in the area below the cast house.

Heat exchanger power: 12660kW

Total flow rate: 1800m3/h

4) Installation of booster pumps in the area below the cast house

In order to supply water for top spraying inside BF2, the design includes the installation of two booster pumps in the room where pressure-boosting pumps for tuyere sets are currently located.

Details of the pumps:

- Flow rate – 180m3/h
- Discharge pressure - 3bar
- Motor: 20kW

5) Design and execution of the installation for supplementing internal combustion engines with fuel
6) Detailed Engineering and installation of suction and discharge piping including pump fittings as per the Basic Engineering. The scope includes among others:
    - Circulating pumps for tuyere sets
    - Circulating pumps for hot stove fittings
    - Booster pumps
    - Piping of heat exchangers
7) Design and foundation of water circuit conditioning station. The design should include such elements as specifically designated fenced area, retaining mats, drip trays and routing of feeding tubes for each circuit. AMP shall be responsible for delivery of pumps, while the Bidder - for electrical and power connection of the system.
8) Detailed Engineering and installation of tuyere sets collectors on a newly erected structure on BF2 shaft. The Basic Engineering provides for a supporting structure along with service platforms for tuyere valves, on which 4 supply collectors for feeding tuyere elements with by-passes for adjusting the flow are to be installed.
9) Detailed Engineering and installation of pipelines connecting the main components of the system as per the design (thick pipelines) - Closed circuit
10) Connection of make-up water (softened) from CHP according to BE. Weld tie-in point at the height of hot stove chimney.
11) Installation of tuyere valves and other piping fittings as per the Basic Engineering. The design provides for the erection of a new structure on BF2 shaft together with service platforms for tuyere valves.
12) Selection of fittings in accordance with the Basic Engineering and the requirements contained in the specification
13) Disassembly and installation of flow meters on the new system of tuyere assemblies - 192 pcs
    + connection to the existing leak detection system
14) Replacement of ø150 pipeline for supplying make-up water from CHP - Pump House #7 – 1000m
15) Replacement of ø150 fittings for supplying make-up water from CHP - Pump House - 10 pcs
16) Installation of 15m3 tank together with measuring instrumentation.
    It is allowed to use the tank from BF5 cooling system in Krakow. The are two options for performing the works:
    - installation of a new tank
    - disassembly of the tank from BF5 in Krakow (with or without structure) and its adaptation to BF2 in Dąbrowa Górnicza.
    The selection of solution is at the Contractor’s discretion.
17) Purchase - as per specification --and installation of flexible connections for tuyere sets
18) Disassembly, Detailed Engineering and installation of cooling system for elements of hot stoves as per the Basic Engineering. The Contractor shall be responsible for connection of the system for hot stove elements.
    - Hot blast valves
    - Burner gate valves
    - Smoke dampers
    - Blow-off valve

+ Connection of flow meters for hot stove elements to the existing leak detection system

**OPEN SYSTEM**

1) Detailed Engineering and installation of open-circuit system for heat exchangers according to the Basic Engineering
2) Design and connection of emergency water from open circuit to closed circuit as per the Basic Engineering
3) Detailed Engineering and installation of a system for taphole guns as per the Basic Engineering
4) Detailed Engineering and installation of top spraying system as per the Basic Engineering
5) Detailed Engineering and installation of pipelines for cooling of above-burden probes as per the Basic Engineering
6) Detailed Engineering and installation of industrial water system at the Cast House - 10 water intake points (4 at tap holes, 4 at cast house walls, 2 at the tuyere platform)
7) Detailed Engineering and installation of water system for main BLT gearbox
8) Connection of modified open circuit to the existing closed emergency circuit
9) Installation of new open circuit pumps at Pump House #7
   - Circulating pumps P13, P14
     Flow rate – 1150m3/h
     Discharge pressure - 7.7 bar
     Motor: 375kW
   - Secondary circuit pumps P23, P24
     Flow rate – 1150m3/h
     Discharge pressure - 2.3 bar
     Motor: 120kW

10) Installation of new open circuit pump collectors as per the Basic Engineering
    Disassembly of 22m collector with the diameter of DN100 and installation of new collector with the diameter of DN650 and length of 22m
11) Replacement of a supply section below BF2 - Disassembly of DN800 pipeline and installation of DN650 pipeline - 220m + replacement of fittings - 2 pcs
12) Replacement of industrial water supply and discharge gate valves from the open circuit in the area under hearth - 16 pcs DN500
13) Revamping of open-circuit cooling tower
    - Replacement of ø600 pipelines (directly at the cooling towers) - return - 100m
    - Replacement of shut-off fittings for ø600 pipeline (directly at the cooling towers) - 4 pcs
    - Replacement of ø500 pipelines (directly at the cooling towers) - Supply - 100m
    - Replacement of shut-off fittings ø500 pipeline (directly at the cooling towers) - 4 pcs
14) Replacement of 100% of DN1000 supply and return pipelines of open circuit to the cooling tower (Pump House - cooling tower) - 500rm (pipelines in the tunnel + pipelines in the ground)
15) Replacement of DN1000 shut-off fittings for tower tank - 1 pc Including design of a permanent shut-off element (plug)
16) Revamping of open circuit circulating pump assembly as per the Basic Engineering.
    - Revamping of two circulating pumps to be selected from pumps (#13, #14, #15, #16)
      - Disassembly and assembly of components
      - Replacement of hydrodynamic bearings

- Replacement of cooling system and cooling tower piping
- Replacement of bearing and gland sleeves on shafts
- Replacement of bearing shells and sleeves in the hydraulic unit
- Replacement of rings in guide vanes
- Regeneration or replacement of rotors
- Balancing of rotors
- Assembly of all parts and components of the pump
- Alignment of shafts, setting the correct hydraulic clearance

- Purchase and replacement of two circulating pumps according to the Basic Engineering
  - Flow rate 1150m3/h
  - Pressure - 7.7 bar
  - Motor – 375kW
- Replacement of shut-off fittings
  - DN600 – 2 pcs
  - DN450 – 2 pcs
- Replacement of check valves
  - DN600 – 2 pcs
  - DN450 – 2 pcs
- Replacement of butterfly valves of circulating pumps - 4 pcs
  - DN600 – 2 pcs
  - DN450 – 2 pcs
- Replacement of connection ports and reducers of circulating pumps - 15m

17) Replacement of fittings of collector for pumps with combustion motor - DN1000 butterfly valve- 1 pc
18) Modification of open circuit filtration system as per the Basic Engineering
19) Revamping of the pumping unit for cooling tower and its adaptation to Basic Engineering:

- Major overhaul of the pumps. 2 pcs to be selected from pumps #23, #24, #25, #26.
  Scope of repair:
  - Disassembly and assembly of components
  - Replacement of hydrodynamic bearings
  - Replacement of cooling system and cooling tower piping
  - Replacement of bearing and gland sleeves on shafts
  - Replacement of bearing shells and sleeves in the hydraulic unit
  - Replacement of rings in guide vanes
  - Regeneration or replacement of rotors
  - Balancing of rotors
  - Assembly of all parts and components of the pump
- Purchase and installation of two pumps according to the design
  - Flow rate – 1150m3/h
  - Pressure - 2.3 bar
  - Motor – 120kW
- Replacement of connection ports of pumps
  - Dn600 – 2 pcs
  - DN450 – 2 pcs

- Replacement of shut-off fittings
  - DN600 – 2 pcs
  - DN450 - 2 pcs
- Replacement of check valves
  - DN600 - 2 pcs
  - DN450 - 2 pcs

20) Replacement of DN1200 outlet from water tunnel from Łosień lake - 8m
21) Replacement of pipeline between intake points including SP1 gate valve - DN600 – 5m

## CLOSED SYSTEM (SHAFT COOLING, ETC...)

1) Removal of all interferences with existing systems and structures lies within the Contractor's responsibility.
2) Replacement of closed circuit supply system (passage from the area below the cast house to the tunnel) - DN700 - 50m
3) Preparation of as-built documentation and reconstruction of the system for supplying cooling staves of furnace hearth (collectors, trays), as per the Basic Engineering (interference in the area of taphole #3),

   Replacement of cooling pipelines of rows I - V and taphole staves, replacement of shut-off fittings, i.e. butterfly valves and ball valves. The scope includes replacement of all DN50 collectors as well as supply and drain pipes along with connections between staves.
   - DN50 pipelines of rows I-V and taphole staves - 7500m
   - DN40 ball valves - 600 pcs
   - DN50 flat flange to be welded - 140 pcs
   - DN40 flat flange with faying surface - 1920 pcs
   - DN200 butterfly valves – 8pcs
   - DN150 butterfly valves – 8pcs
   - DN125 butterfly valves – 8pcs
   - Pipeline ø219x6.3 – 130m
4) Design and installation of systems for other utilities
   - Nitrogen for compensation tank
   - Nitrogen manifold under the throat platform
   - Design and installation of steam system for furnace dome (connection with charge pouring system)
5) Replacement of DN400 supply and return pipelines for cooling staves in the area from level +23m to connection with risers in BF2 shaft - 375m
6) Replacement of connections of cast iron staves with flexible connections
7) Replacement of connections of copper staves with flexible connections
8) Replacement of connections of box-type staves with flexible connections
9) Replacement of valve inserts of cooling staves
   - Replacement of valve inserts shutting-off DN50 lines of cast iron staves - 558 pcs
   - Replacement of valve inserts shutting-off DN40 lines of cast iron staves - 126 pcs
   - Replacement of valve inserts shutting-off DN50 lines of copper staves - 336 pcs
   - Replacement of valve inserts shutting-off DN40 lines of box-type staves - 88 pcs
10) Replacement of ø500 butterfly valves in the area under hearth - 16 pcs

11) Replacement of DN200 shut-off fittings on quadrants of cast iron staves- 24 pcs
12) Replacement of DN200 shut-off fittings on quadrants of copper staves- 24 pcs
13) Replacement of DN125 shut-off fittings on quadrants of box-type staves - 8 pcs
14) Installation of valves on all lines of individual staves
    - DN15 valves - 854 pcs Including quick-release couplings
15) Revamping of circulating pumps #101,#102, #103
    - Replacement of DN700 butterfly valves - 3 pcs
    - Replacement of DN700 flap check valves - 3 pcs
    - Replacement of elements of pumps
        - Replacement of sleeves
        - Replacement of bearings
        - Replacement of face seals
16) Replacement of shut-off fittings for exchangers and closed circuit pumps (DN500) - 16 pcs
17) Replacement of DN200 shut-off fittings for equalising tanks
18) Replacement of DN200 shut-off fittings for storage tanks
19) Revamping of secondary circuit cooling tower
    - Replacement of shut-off fittings and ø500 pipeline for secondary circuit cooling tower - supply - 6 pcs - 150m
    - Replacement of shut-off fittings and ø600 of secondary circuit cooling tower - Return - 6 pcs - 150m
20) Welding patches on ø1000 pipelines of secondary circuit from the Pump House to the cooling tower - 80 patches 0.5m x 0.5m
21) Revamping of pumps #121,#122, #123
    - Revamping of pumps
        - Disassembly and assembly of components
        - Replacement of hydrodynamic bearings
        - Replacement of cooling system and cooling tower piping
        - Replacement of bearing and gland sleeves on shafts
        - Replacement of bearing shells and sleeves in the hydraulic unit
        - Replacement of rings in guide vanes
        - Regeneration or replacement of rotors
        - Balancing of rotors
        - Assembly of all parts and components of the pump
    - replacement of DN600 shut-off fittings - 3 pcs
    - replacement of DN600 check valves - 3 pcs.

**DISASSEMBLY WORKS**

1) Disassembly of open circuit cooling system according to the documentation.
   Disassembly includes the entire tuyere cooling circuit, i.e.:
    - Disassembly of pressure-boosting pumps
    - Disassembly of suction and discharge pipelines
    - Disassembly of collectors from distribution systems including supply pipes, valves and flow meters (flow meters to be recovered)
    - Disassembly of hoses supplying tuyere assemblies

2) Disassembly of cooling system components in Kraków to be reused for BF2:
   - Pump with combustion motor CO3
   - Electric pumps CO1 - 2 pcs
   - Pump with combustion motor C01 - 1 pc
   - Compensation tanks 15m3 – if necessary
3) Disassembly of open cooling system of hot stoves according to the design.
4) Disassembly of filtration system with filters F3, F4, F5 and making bypass of filter F1

### 6.2.2. Civil engineering and construction works

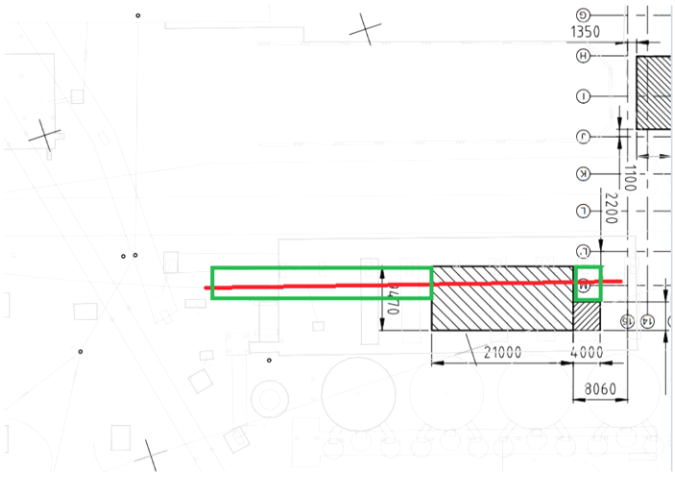
The Contractor shall be responsible for comprehensive preparation of Detailed Engineering and turnkey completion with complete deliveries for works listed below:

1) ~~Detailed Engineering and construction of a pump building~~ Pumphouse building in the area of hot stoves with fire resistance REI ~~240~~ 120, fire resistance of ~~fire~~ passages and fire resistance doors- REI ~~240~~ 120. The pumping station complex includes two cubature facilities:

   - main building consisting of a pump room and a circulating water conditioning room,
   - electrical building, located in the immediate vicinity of the pumping station.

   The buildings shall constitute a separate fire zone and shall be adapted to applicable technical conditions, including technical conditions to be met by buildings and their location. Systems and networks required by the technical conditions must be provided, e.g. ventilation, heating, air-conditioning, fire-extinguishing, sewage systems etc.

2) ~~Preparation of a separate room in the newly designed pump building in the area of hot stoves for NALCO elements. Fire resistance of building - REI 240, resistance of fire passages - REI 240. The room is to be adapted to the applicable technical conditions, including, among others: technical conditions to be met by buildings and their location. Turnkey design and construction. Systems required by the technical conditions must be provided, e.g. ventilation, air-conditioning, fire-extinguishing, sewage systems etc.~~
3) Disassembly of the existing track under the hot stove bay (orientation drawing - red colour).
4) Paving of surface left after dismantled tracks (orientation drawing - green colour) - design bearing capacity of paved surface - minimum 120MPa (road slabs or aggregate)




5) Foundations for heat exchangers below the cast house and the floor around the foundations of the exchangers within the casing.

6) The casing of the heat exchangers below the cast house in a light insulated structure (sandwich panels) with gravity ventilation - in the scope of the contractor only the design - no execution and deliveries. ~~Detailed Engineering and construction of a heat exchanger building under hearth. The building is to be adapted to the applicable technical conditions, including, among others: technical conditions to be met by buildings and their location. The building shall constitute a separate fire zone. Fire resistance of building - REI 240, resistance of fire passages - REI 240. Systems required by the technical conditions must be provided, e.g. ventilation, air-conditioning, fire-extinguishing, sewage systems etc.~~
7) Detailed Engineering, delivery and installation of the supporting structure for piping platform and service platform for tuyere assembly valves
8) Detailed Engineering, delivery and installation of supporting structures for all pipelines included in the Basic Engineering or 3D model, i.e. Blast Furnace, Pump House, utilities tunnel, fan cooling tower.
9) Detailed Engineering and construction of foundations for pumps: High- and medium-pressure pumps, pumps with Diesel engine, booster pumps and heat exchangers
10) Design and installation of supporting structures for the 15m3 expansion tank with cladding made of sandwich panels on steel frame (covers protecting against weather conditions). It is allowed to use supporting structures from the Blast Furnace #5 in Kraków.
11) Design and installation of all service platforms for fittings provided in the Basic Engineering as well as service platforms.
12) Design and preparation of new passageways providing access to all fittings and control & measuring instrumentation and automation (AKPiA) included in the design.
13) ~~Design and construction of an electrical building/container for control cabinets and automation. The building shall constitute a separate fire zone. Fire resistance of building - REI 240, resistance of fire passages - REI 240. Systems required by the technical conditions must be provided, e.g. ventilation, air-conditioning and fire-extinguishing systems etc.~~
14) Design and construction works that may result from replacing pumps and fittings
15) Other civil engineering and construction works (including design) that may result from rebuilding the cooling system.
16) Preparation of documentation allowing to obtain UDT (Office of Technical Inspection) permits for lifting equipment installed in the new pump building and obtaining of UDT acceptance.

The Detailed Documentation should be prepared on the basis of Basic Engineering (Boccard) and **implementation guidelines (ZD Projekt).** Both documents constitute the basis for the development of the Detailed Engineering, but they are not complete, hence they should be verified and appropriately modified, and in the event of non-compliance, corrected or supplemented accordingly. The study aims to better illustrate the scope of the Contractor and to facilitate the valuation of the scope. **The fire protection requirements REI 120, which are a prerequisite for obtaining a building permit, are not subject to change.**

The Contractor will prepare the Detailed Engineering constituting the basis for the development of the Building Design, i.e. in the scope of the pump building (i.e. pump room, circulating water conditioning room, electric room) with equipment, power supply, drains and other necessary media entering and leaving the buildings. The Detailed Documentation necessary to obtain the permits should be submitted to the Investor **by the end of March 2022.**

### 6.2.3. Electrical works

The Contractor shall be responsible for preparation of design, delivery and commissioning of the following system and equipment:

Design works:

The task includes preparation of comprehensive Detailed Engineering (as per appendix Skład dokumentacji elektrycznej.doc [Composition of electrical documentation]), which shall be coordinated with all other works; selected parts of the documentation should be confirmed by a fire protection specialist. The entire DE must be submitted to AMP for approval prior to commencement of works. Remarks made by the Owner must be taken into account.

After the completion of works, the supplier shall provide complete as-built documentation in hard and soft copy (USB stick) in editable form (3 sets), with all corrections made - during the commissioning period RED COPY documentation should be made available.

Scope of works:

1. Supplying power to two 6kV high-pressure pumps for P11-1, P11-2 tuyeres from 6kV S107 switching station. 2 outgoing bays shall be prepared in the switching station by AMP (retrofit). The scope of works shall include:

   a. Delivery, installation of two XRUHAKXS 3x1x120/25 cable lines, control cable (interlock, AV, etc.) cable for control & measuring instrumentation and automation (control, current measurement, mapping), distance - approx. 200m on the existing cable rack, supplementing cable routes - approx. 20%.


*Fig. MV cable routing between S107 and the new pump house*

   b. Delivery, installation of two disconnector bays with MV earthing switch (limit switches, interlocks, reactance insulators etc.) - for the operation of motors, including a flexible motor feeder cable
   c. Implementation of possible modifications in S107 switching station
   d. Configuration of feeder protection (set-ups are within the Supplier's scope) and comprehensive start-up of the whole system - voltage test, effective touch voltage, post-installation reports etc.

2. Supplying power to MCC technological switching station for the needs of the new pump house located under the electrical rack near hot stoves via two YAKY 2x(5x240)mm2 cable lines with the length of 100m.

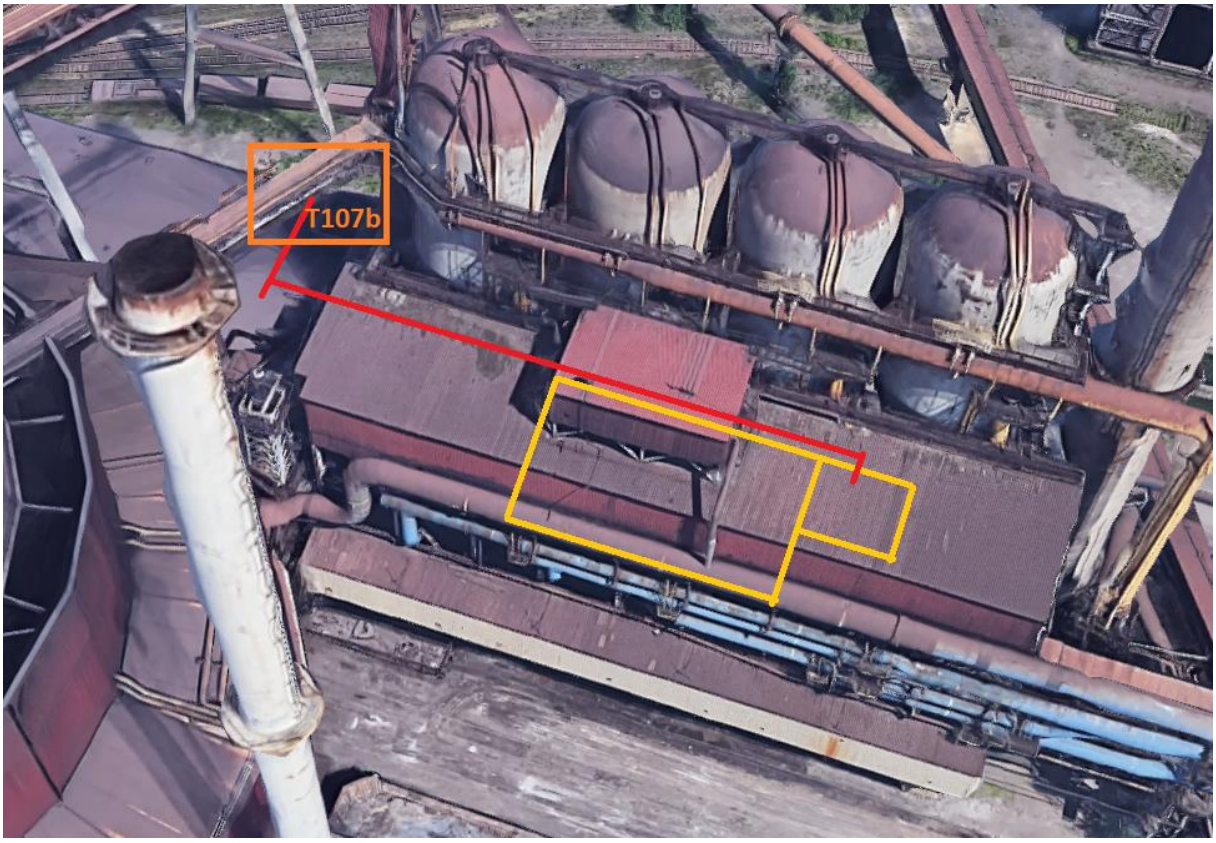



*Fig. LV cable routing between T107b and the new pump house MCC switching station*


*Fig. 0.4kV T107b switching station*

3. Supply and installation of MCC two-section switching station for pump house with two power supplies with a coupling in the building under the hot stoves. The outgoing bays must be distributed evenly, constituting a reserve for each other. Fully equipped reserves of every kind must be provided in the switching station. Motor outgoing bays must have controls and mappings to the control & instrumentation and automation (AKPiA) system according to AMP assumptions. Each outgoing bay above 20kVA must be equipped with an ammeter and a 4..20mA transducer for continuous monitoring. Amount, type and synchronism of outgoing bays is described in Appendix 0699-620-A.xsl

   Basic details of the switching station:
   a. Wall-mounted switching station with access from the front side
   b. Rated voltage Ue: 690V AC
   c. Rated current In: 630A
   d. Short-circuit current Ik: 50kA
   e. Rated frequency fr 50Hz
   f. Protection rating IP41 - met in case of protected outgoing bays
   g. Mechanical impact resistance rating IK10
   h. Resistance to electric arc 100kA during 0.3s
   i. Distribution of 4b segments according to PN-EN 61439-1

   Each motor outgoing bay must be equipped with a local control module (IP56) containing:
   a. Emergency stop - with protection against accidental switch-on
   b. ON button - green
   c. OFF button - red
   d. Selection of control mode - local/remote
   e. Signalisation of drive operation
   f. Signalisation of permission for local control

4. Delivery of wireless UPS for powering the control & instrumentation and automation equipment with 30 min hold-up time, with manual bypass allowing for wireless switch-over to the emergency power supply (e.g. replacement of power supply unit or batteries). The power supply unit should be equipped with a communication card in the SNMP v2 standard and be incorporated in the AMP buffer power supply monitoring system

5. Delivery and installation of all electrical systems for own needs:
   a. Basic (LED) and emergency (battery-powered) lighting in the new pump house in IP54 version; illuminance should be coordinated with legal requirements
   b. Basic (LED) and emergency (battery-powered) lighting in the room under furnace hearth in IP54 version; illuminance should be coordinated with legal requirements
   c. Basic (LED) and emergency (battery-powered) lighting within the building and system area in IP54 version; illuminance should be coordinated with legal requirements
   d. Network of 400V utility sockets - in the new pumping station and in the room under hearth
   e. Primary and secondary grounding system - in the electrical room and near the equipment, a ground ring with prepared connections to the equipment should be made around the wall at a height of 80 cm from the floor using a 120mm$^2$ galvanised flat bar marked in yellow and green. All electrical equipment and pipelines (flanges) must be earthed with Lgy 16mm2 cable

6. Delivery of cabling with new cable routes in the new pump house room and for supplying power to consumers in the room under hearth.
    a. Power supply to LV motors in the new pump house should be made by means of copper cables. Disconnectors with possibility of grounding must be provided at the motors, cables between the disconnector and the drive must be flexible. Selection of type, cross-section and length of cables should be specified at the stage of design works in coordination with AMP.
    b. Cable trays are to be supplied and made of system solutions, must be certified for electrical continuity (grounding of trays at each end), made of perforated sheet metal with minimum thickness of 1 mm - steel galvanised by Sendzimir method according to PN-EN 10346:2015-09. Cable trays are to be covered along their entire length. Connections for equipment are to be made with tubes and flexible metal covers. Selection of type, size and length of cable trays should be specified at the stage of design works in coordination with AMP.
    c. Installation of necessary cabling for the control & measuring instrumentation and automation system:

    - sensors
    - valves
    - remote control system
    - local control
    - etc.

    All cabling must be installed in separate cable trays isolated from power cables.

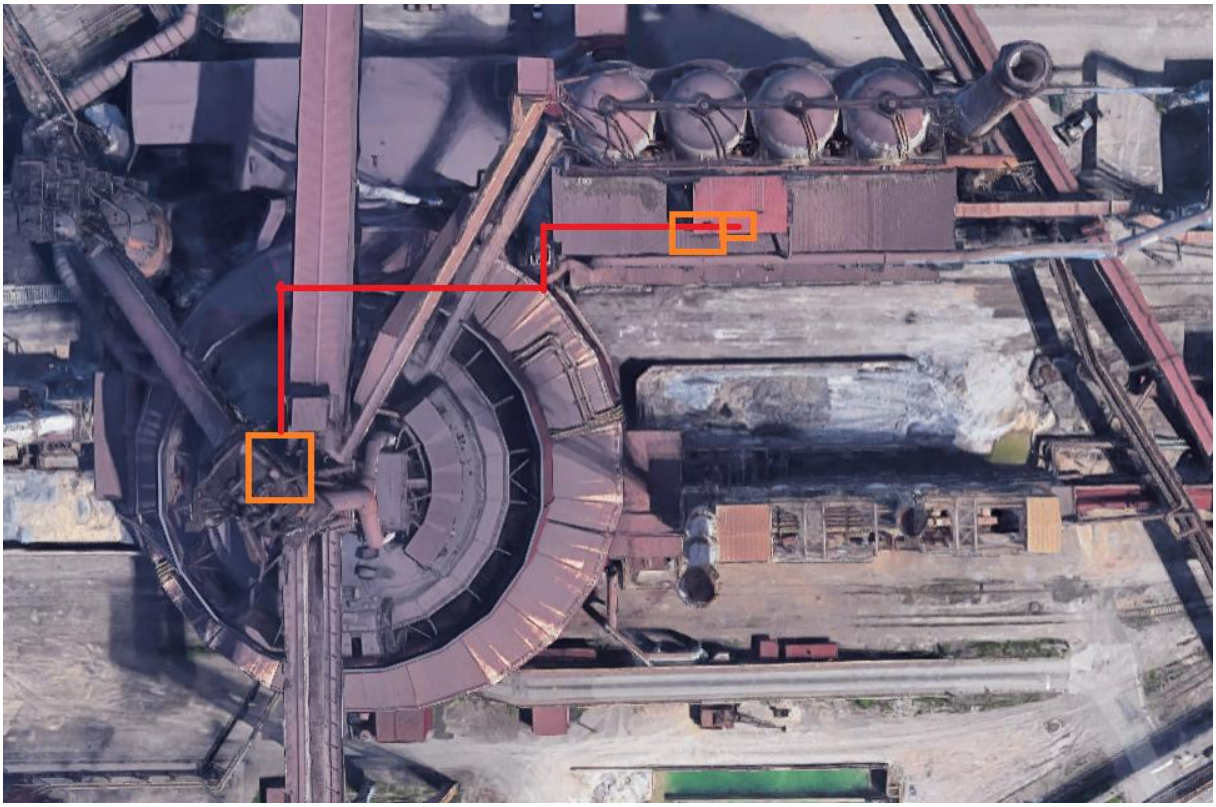


*Fig. Assumed cable route for supplying power to equipment in the area under hearth - approx. 150m*

7. The scope of works associated with the fire protection system in the room of the new pump house and in the room under hearth shall include:
    a. Installation of a fire detection system with manual call points (ROPs) meeting the requirements of the existing system on the premises of AMP Dąbrowa Górnicza, based on a design confirmed by a fire protection specialist
    b. Signals must be introduced into the existing system - modification works in the monitoring system may be performed by AMP only.
    c. Delivery, assembly and start-up of fire dampers in ventilation system as per the design

8. MV electric motors supplied by the contractor must be provided with:
    a. Winding temperature measurement (4 points)
    b. Vibration measurement
    c. IP protection rating adapted to the working conditions but not less than IP43
    d. Anti-condensation heaters
    e. Easy access to junction boxes

9. LV electric motors supplied by the contractor must be provided with:
    a. Winding temperature measurement (4 points)
    b. IP protection rating adapted to the working conditions but not less than IP43
    c. Anti-condensation heaters
    d. Easy access to junction boxes

All works associated with control and measuring instrumentation should be performed in accordance with Appendix 4 and 6.

### 6.2.4. Automation

The automation system is to ensure complete control of devices related to cooling and water circuits of Blast Furnace # 2(including the dirty water circuit)

A schematic diagram of the control system concept has been prepared for both the cooling system and dirty water circuit. It can be found in Appendix no. 6. The Contractor should ensure that all process and electrical equipment listed in this RFQ are operated by the control system.

**The Contractor's scope of work shall include:**

a. Revision of the existing control system.
b. Basic Engineering based on the completed revision and documentation prepared by Boccard.
c. Detailed Engineering in the field of automation.
d. Disassembly of parts of existing automation systems.
e. Purchase of hardware and software for new automation system.
f. Installation of a new automation system including I/O and power connections.
g. Assignment of I/O signal connections to the relevant PLC. Signals from the dirty water circuit should be connected only to the PLC responsible for the dirty water circuit, and

signals from furnace cooling - only to the PLC responsible for furnace cooling. It is all mixed up at the moment.

**h.** Making all necessary connections of Profinet network (Profinet network should be made in the 'Ring' topology)

i. Implementation of PLC software (in accordance with the standard provided by AMP, or - if it is absent, in accordance with the Contractor's standard).

j. Implementation of SCADA software (in accordance with the standard provided by AMP, or - if it is absent, in accordance with the Contractor's standard).

k. Start-up of automation system.

l. Training of operators and maintenance personnel.

**Basic characteristics of the automation system**

The current automation system is based on two GE (one GE 90-30 and one GE Rx3i) PLCs and one Siemens PLC (S7-1500). GE 90-30 (SP7ZAM) controller is responsible for controlling the furnace cooling circuits (closed, open and secondary circuits). GE RX3i (SP7BRU) controller is responsible for controlling the dirty water circuit. The last Siemens S7-1500 (S2DWW) controller is responsible for detecting water leaks in the system.
The controllers (SP7ZAM and SP&BRU) are located in the electrical room 6,7 at the Pump House #7, while S2DWW controller is located in BF2 server room - its three remote modules are located in different locations of the furnace. The remote modules are connected to each other via Profinet network.

The new automation system shall be a distributed one, and its elements shall be installed in different locations on and near BF2. Its concept is shown in the diagram attached to this specification.

The Contractor shall be responsible for implementation of the following items:

a. Pump House #7 – Electrical room 6,7

   The main PLC with redundant CPU shall be located here.

   The automation system located in this room is to control the Pump House #7 - both in terms of the new and the currently used part.

b. New pump room at level 0.

   Remote module(s) of the control system are to be installed here. The system shall control the newly planned pump units and heat exchangers located about 30 meters away.

c. Leak detection system.

   BF2 is currently equipped with a leak detection system. No functional changes in this area are expected. It is planned to remove S7 1500 PLC controlling the system and transfer relevant blocks of its software to the main cooling controller. Elements of the leak detection system are located in:

- Server room: CPU and ET200 module.
- Room #8: 2x ET200 module.

– Cabinet in the bustle pipe area: ET200 module.

The Contractor shall modify the Profinet network so it could be included in the cooling system automation network ring.

d. Booster pump room at level 0.

The control system is to control the operation of two new booster pumps.

e. Compensation tank room at BF2 throat.

The control system is to control the operation of the new compensation tank.

f. Room for dirty water circuits.

The functionality of the dirty water circuit control system shall remain unchanged.

The Contractor shall be responsible for replacing the hardware and migrating/rewriting the PLC, HMI software.

**Requirements for PLC controllers**

a. Architecture based on master controllers and local stations for object-oriented data logging must be used.
b. Communication between controllers, remote modules and peripheral devices must be carried out using L0 network with the Profinet protocol.
c. The main cooling controller shall have a redundant CPU. Controller of dirty water circulation systems can be equipped with a single processor.
d. CPU with LCD display with full system diagnostics must be used. In addition, it should be possible to assign IO variables on displays to analyse key variables from the program on the display,
e. IP assignment must be possible from the CPU LCD display,
f. The controller should support such programming languages as LAD, FBD, STL, SCL, Graf,
g. The controller should support an application enabling quick diagnostics of the area in the code where the problem occurs (the area should be visualised on the HMI panel and directly connected to the PLC program - from where alarms are programmed).
h. The controller must support S7-Connection to allow the connection of other existing PLCs in the plant.
i. The CPU must have a function of CPU simulation (new modification test),
j. The controller must be able to create network topologies,
k. All PLC programming standards and program codes must be open and available to AMP services.
l. A 15'' operator panel must be provided for each PLC to enable control of the process plant in case of SCADA system failure.
m. The Operator Panel should co-operate with the process controller via Profinet network.
n. The operator panel should be equipped with software compatible with Wincc Comfort, or newer.
o. The operator panel should be equipped with licences compatible with Prodiag software.
p. The control system shall have a reserve of min. 20 % free, wired I/O.
q. 24V power supply circuits should be based on devices manufactured by renowned companies. The Bidder should propose power supply devices from the same company which manufactured PLCs. The power supply system should include a

redundant power supply unit coopering with a capacitor module and an electronic protection module. All 24V outgoing bays must be monitored by the control system.

r. Possibility of data exchange with PLCs of the main control system of BF2 must be foreseen
s. It should be possible to estimate the size of the system on the basis of BE documentation (Appendix no. 6) that will be provided to bidders.
t. The architecture of the control system must be agreed with AMP/GM2

**Requirements for the SCADA system:**

a. The SCADA system shall provide complete visualisation of BF2 cooling system and dirty water circulation system. The system should also show BF parameters which are the most important for the pump house operation.
b. The system should consist of five operator stations, equipped with min. 24" monitors. One main station should run based on a PC, while the other four stations should be based on Thin Client terminals.
c. Station programming should have an object-oriented structure, where each automation object of the SCADA system is linked to a dedicated data block of PLC controller. Standardisation of automation objects consistent with the standards (SCADA and PLC) used in the BF2 basic control system must be used.
d. The SCADA software should visualise the system of interlocks showing the operator switching and operating conditions of all process equipment.
e. SCADA software must support the Suitelink protocol.
f. The local SCADA system of the cooling system should allow for future integration with the main SCADA system of BF2.
g. Operator stations should use Thin Client stations.
h. SCADA software version must be agreed with AMP/GM2 at the design stage.
i. The measurement data shall be available for archiving in the Historian database (System Platform) of the BF2 control system.
j. The automation system contractor should provide technical support from the SCADA software distributor. By technical support, we understand the distributor's readiness for technical consultations in Polish, and cost-free updating of the supplied licenses. The technical support period cannot be shorter than two years from the moment of purchasing the license.

**Ethernet L1 network**

The Ethernet L1 network is to link all previously mentioned components of the BF2 cooling system controls. It should be made in the ring architecture. The passive part must meet AMP standards for Ethernet network (Appendix 14). The active part should consist of devices from the same company which manufactured PLCs. Configuration of the network should be stored in the PLC. Communication between elements of the control system should be carried out via the Profinet protocol.

### 6.2.5. Commissioning

As part of the project, the Contractor shall carry out commissioning and all necessary tests and technical acceptance necessary for the operation of the system. The Contractor will also perform full automation tests of system operation.

Detailed scope of acceptance:

1) Carrying out leakage tests of the system - no leakage of the cooling system is allowed, compensation tanks must maintain the level for at least 24 hours at the working pressure of the system
2) The Contractor shall submit acceptance documents for welded joints of pipelines

3) The Contractor shall carry out trial runs of installed pumps together with measurements of their parameters (capacity, head, vibrations, current consumption of electric motors)
4) The Contractor shall carry out trial runs of cooling tower fans including vibration measurement and electric power consumption by motors
5) The Contractor shall test the proper operation of the cooling system and its automation. During the tests, the Contractor shall check, among others:
   a. leakage simulation - correct operation of the make-up water circulation system in case of leakage
   b. functioning of the emergency circuit
   c. functioning of dirty water circulation system
   d. system behaviour in the event of pump failure - for all circulating pumps
   e. Primary pump switchovers
   f. Power failure test of the pump house #7
   g. Damage to the controller of pump house #7
   h. Damage to the SCADA visualization
   i. UPS tests
   j. Tests of emergency control panels
   k. Power section failures - for all sections
   l. Leak detection system on tuyere sets
   m. Functioning of 2 circuits of cooling lines at medium pressure (valve opening, change in the pump motor speed)
   n. Operation of compensation tank automation (continuous measurement of water level in the tank, fittings, water level sensors and cooling system response to each of them)
   o. Functioning of combustion motors test system

**Start-up of automation system**

FAT and SAT test will be conducted by the Contractor with the assistance of AMP team

FAT

The purpose of the FAT test (Factory Acceptance Test) for the control system is to confirm that the system is ready to be installed on site.

The Contractor shall prepare a model of the control system including: controllers, operator stations, servers and other network devices used for testing communication functions

1. The Contractor shall prepare a test platform to check the correct operation of the control and visualisation system
2. The scope of FAT test includes, among others, checking the:
   a. Completeness of documentation required at this test stage
   b. Completeness of control system equipment
   c. Correct communication
   d. Correctness of the system operation in case of a single Ethernet network failure
   e. Correct operation of CPU redundancy mechanism

f. Restart the PLC and SCADA stations
g. Alarms and signals of accidents
h. Control commands
i. Level of inspection and authorisation
j. Logic and technological security measures
k. Control modes
l. Sequence of simulation of basic technological tasks
m. Registration of events and alarms
n. Archiving of measurement data
o. Presenting current and historical measurement data
p. Service of SCADA stations
q. Correct operation of communication protocols
r. Availability of system functions
s. Correct saving of internal data
t. Other

SAT

The aim of SAT test is to check the correct implementation of the control system on site, check links with the master system and readiness for final tests

The Contractor's scope of work during SAT tests includes, among others, checking:

a. Protocols from commissioning performed by the Contractor.
b. Complete documentation.
c. Completeness of the Control System equipment.
d. Assembly quality, completeness of connections within cabinets, quality and completeness of descriptions.
e. LAN connections.
f. Connections and cooperation of controllers and distributed stations.
g. Correctness of the system operation in case of a single Ethernet network failure
h. Correct communication with external systems
i. Proper operation of the CPU redundancy mechanism
j. Restart the PLC and SCADA stations
k. Operation of the alarm system
l. Control commands
m. Level of control and authorization
n. Logical and technological security
o. Control modes
p. Correctness of selected functions of the technological process
q. Registration of events and alarms
r. Archiving of measurement data
s. Presentation of current and historical measurement data
t. Service of SCADA stations
u. Correct operation of communication protocols
v. System Feature Availability
w. Correct saving of internal data
x. Others

**Electrical start-up**

The Contractor shall carry out a comprehensive electrical start-up of the entire system as well as provide 24/7 supervision after putting Blast Furnace #2 into operation in close cooperation with other companies that will be working during the repair of BF in 2023. During the start-up, all necessary tests and trials shall be carried out. The Contractor shall prepare complete quality documentation (as-built documentation, post-assembly reports, appendices, certificates, instructions etc.)

The Contractor shall submit reports confirming positive results of tests and acceptances.

**6.2.6. Additional information:**

a. The attached drawings from the conceptual documentation are indicative only; however, AMP accepts deviations from the solutions described in the study provided that the new solution will allow to achieve the project objectives and performance parameters.
b. The Contractor is required to provide services of an interpreter who should be present on site during the entire disassembly / installation / commissioning phase (24/7).
c. Storage of material. The Contractor is responsible for the storage and safety of materials supplied. AMP can provide open space based on the requirements given. The contractor may prepare a temporary storage area by mutual agreement with AMP.
d. Pre-installation and prefabrication area - to be agreed with AMP.
e. AMP has its own documentation numbering system. The Bidder is obliged to use the AMP numbering system which will be presented to the Contractor at the kick-off meeting.
f. AMP shall identify space for repair-related facilities. The arrangement of repair-related facilities is the Contractor’s responsibility.
g. Documentation for AMP approval shall be submitted via BauApp application. AMP shall assign access to the application to all required representatives of the Contractor.
h. The Contractor shall secure spare parts for the commissioning time according to the list agreed with AMP.
i. The Contractor shall propose Industry 4.0 solutions that can be implemented in the scope of the project.
j. The Contractor will make the markings: flow direction, direction of rotation, type of media, evacuation routes, etc. According to the user's instructions. The contractor will also mark all the pipes of tuyere sets and furnace staves in accordance with the numbering adopted in the project, using engraved or cut metal hangers.
k. Corrosion protection should cover the entire structure and energetic installations and should enable operation in highly corrosive environments, corrosion protection of steel, mechanical structures in class "C5 very high" in accordance with PN-EN ISO 12944-2 and a guarantee for anti-corrosion protection of min. 10 years. Metal sheets for the cover and vestibule made of galvanized and coated trapezoidal sheet metal in class "RC5" according to PN-EN ISO 10169).

### 6.2.7. Responsibility matrix

The Contractor is obliged to prepare and deliver to the Owner proposed responsibility matrix to be accepted by the design team.

## 7. OFFER-RELATED REQUIREMENTS

1) Technical offer should include:
   a. General description and information about the service offered;
   b. Scope of works under the bid (with defined quantity);
   c. List of elements/works and quantity;
   d. Exclusions (work to be performed by the buyer);
   e. The offer will include a detailed responsibility matrix between AMP and the contractor with a breakdown into documentation, material delivery, demolition, assembly, trials and tests, start-up of the installation for individual chapters in the offer in order to verify the understanding of the inquiry / offer by the parties
   f. Contractor is obligated to secure all necessary heavy equipment (cranes; forklifts; excavators; etc.)
   g. Contractor is obligated to deliver logistics plan and layout of works including all crane operations. Possible crane location areas will be defined by AMP.
   h. Necessary drawings
   i. Submission of at least 1 reference letter issued by the entity for which the cooling installation of industrial facilities was performed with the use of welded joints, min. 10,000 linear meters of steel pipes DN0 - DN500 in the last 10 years (name of the buyer, location, year, description). If it is not possible to provide a reference letter, the Tenderer shall submit a statement containing a reference list with a list of completed industrial facilities cooling installations using welded joints, min. 10,000 m of steel pipes with a diameter of DN0 - DN500 in the last 10 years The list must include: name of the buyer, location, year, description and contact details of the buyer's representative (name and surname, e-mail address, telephone number) enabling AMP to confirm the information contained in the reference letter.
   j. Works schedule on a weekly basis with the milestones;
   k. Warranty parameters;
   l. Procedure for checking compliance with guaranteed parameters (proposal for AMP approval before signing the contract).
   m. Quality control plan
   n. List of potential subcontractors for AMP approval
   o. List of utility requirements with parameters (nitrogen, oxygen, compressed air, instrument air, service water, steam etc.)
   p. List of spare parts for at least two years of normal operation and for commissioning;
   q. Declaration that Contractor's knowledge, experience and site visit are sufficient to perform the whole scope of work;
   r. Declaration that the whole scope of work will comply with good construction practices and with the effective law;
   s. Bid validity period;
   t. References for similar scopes
   **u. Other information disclosed by the Contractor which does not include any cost data that could influence the quality of the offer.**
2) Supplier will present in detail all the elements of their offer which vary from the technical conditions set forth here if they are not able to fully meet all conditions.
3) The offer must contain a description of how the work will be organized, together with the anticipated human resources, heavy equipment for specific work groups. The

contractor will present a plan for the organization of works, including places of work and storage of structural elements

4) The offer in the final part must contain an index of all changes that will appear in the content as a result of technical meetings, arrangements. The index must contain a brief description of the change and the locations of the change in the offer text.
5) Indication of subcontractors or partners in the case of a consortium, together with an indication of the relevant work packages
6) The commercial part will have a price breakdown consistent with the breakdown of the request for quotation, including additionally for the supply of materials and labor.

## 8. REQUIRED CONTENT OF THE TECHNICAL DOCUMENTATION SUPPLIED BY SERVICE PROVIDER:

1) Works schedule;
2) Detailed risk analysis for all the investment stages for the required scope of works (technical risk, OH&S risk) indicating preventive measures to be taken in order to eliminate or significantly reduce the risk. It must be agreed with and finally validated by the Investor before the repair and revamping works start.
3) Health and Safety plan;
4) Works organization plan;
5) Quality Assurance Plan for Investor's approval;
6) Manufacturing inspection documentation.
7) Division of works into tasks being the responsibility of the Contractor and Customer;
8) Bi-Weekly progress reports prepared according to the Customer's guidelines and defining the percentage of works done relative to the plan;
9) Detailed and as-built documentation of the designed installations
10) List of fittings
11) List of pumps
12) Commissioning documents
13) Detailed 3D model of the entire designed installation
14) Spare parts list for 2 years of normal system operation.
15) Final report.

## 9. SUPERVISION, ASSEMBLY, TESTS AND COMMISSIONING

1) Contractor will deliver all materials, tools and specialized equipment required for work completion. The Contractor undertakes to perform the commissioned work according to the arrangements made at the contract finalization stage. The contractor will provide a construction and civil Works Manager who will take over the duties of the Works Manager for the entire scope of the cooling system in accordance with the Polish construction law. The contractor will provide branch works managers in accordance with the requirements of the specificity of the project. The Contractor will provide also H&S inspector present on site during the entire period of works performance.
2) Supplier undertakes to install and set all devices, commission, hand over the equipment for use and train AMP employees.
3) Commissioning
   a. Cold commissioning

   Cold commissioning (partial) for equipment will be performed after works at a given point are completed, possible defects and faults removed, additional works that may turn out to be necessary to perform during the investment execution are completed, after the

Buyer's safe work requirements are met, after the Contractor reports their readiness for cold commissioning and its conditions and date are agreed with the Buyer.

b. Hot commissioning

Hot commissioning for equipment will be performed after all works are completed, after cold (partial) commissioning of equipment is done, possible defects and faults removed, additional works that may turn out to be necessary to perform during the investment execution are completed, after the Buyer's safe work requirements are met, after the Contractor reports their readiness for hot commissioning and its conditions and date are agreed with the Buyer.

4) The project will be put into use after PAC is signed for specific equipment groups and/or entire investment project.
5) Welding procedure:
   a. The welding procedures should be submitted to the leader for previous approval before starting manufacturing. As per this specific technical condition for standards and drawing, the contractor will follow all the needed requests and will inform the welders and the responsible accordingly.
   b. All the welders should submit their own welding qualifications through contractor to AMP before starting manufacturing.
   c. The contractor should perform these welding tests as per the mentioned drawings and standards indications. The AMP has the right to check the welding at any moment. The contractor assistance to these controls (polishing, scaffoldings) is indispensable.

## 10. WORKS PERFORMANCE DEADLINE

The start of the BF2 shutdown is planned from beginning of March 2023. The contractor will start design works immediately after receiving the order. The preparatory work that can be done before the BF2 shutdown and deliveries of main materials must be completed within 42 weeks from signing the contract. The contractor will have **90 days** at his disposal to carry out the works during the BF2 shutdown. The assembly works will be carried out in a 2 or 3 shift system and will last 24 hours a day, taking into account all days as working.

**Main milestones:**

a. Delivery of detailed engineering: 6 months from signing the contract (indicative deadline, time must be assumed to allow for the timely completion of the next milestones)
b. Completion of preparatory work: 42 weeks from signing the contract
   - • Execution of civil works
   - • Delivery of main materials
c. Industrial start-up of installations: 90 days from the start of BF2 shutdown
d. Provision of documentation necessary to apply for an occupancy permit: 2 weeks after the industrial start-up of the installation
e. Reliability test for 72 hours: 1 month after start the industrial commissioning
f. Verification of the achievement of the guaranteed parameters: 1 month after BF2 blow-in
g. Signing the PAC protocol: 1 month after BF2 blow-in (after verifying that the guaranteed parameters are achieved)

## 11. WORKS SCHEDULE

The Contractor should deliver the draft works schedule for Investor's consultation and approval.

Note 1: 2 or 3-shift work system must be planned. Work to be performed 24h/day
Note 2: Detailed works schedule will be coordinated with the potential Contractor implementing other revamping works.

### 11.1. PRELIMINARY SCHEDULE

The offer should include a preliminary schedule with specific time slots in which the Contractor will provide the Investor with drawings, documents and other materials, as well as time slots for the implementation of the specific Investment phases. Schedule dates will be guaranteed by the Contractor and will be subject to specific commercial clauses in the Commercial Offer.

### 11.2. DETAILED SCHEDULE

Detailed schedule of the works scope should be provided for approval by the Investor as part of Contractor's work performance, taking into consideration the stages of organization and securing of the site/works , arranging all the matters related to getting Investor's OH&S Office clearance for the works to be done on their premises, purchasing and prefabrication, erection, tests and commissioning, and putting into operation. This schedule should also include the description (specification) of the so-called critical path tasks and the so-called investment milestones.

## 12. RIGHTS OF THE CUSTOMER

1) All valuable materials /scrap/objects of archeological value recovered or found during works performance are the customer’s property and will be handed over to them.
2) Customer reserves the right to restrict access to the plant for any person associated with the Contractor found to be e.g. under the influence of alcohol or in a condition that may create a threat to themselves and other people performing work or a group of people. Detailed information will be presented in Health & Safety Policy applied at ArcelorMittal. This policy shall constitute an integral part of the contract concluded with the Contractor.

## 13. DELIVERY AND QUALITY GUARANTEE

1) Delivered solutions will be free of any defects being the result of faulty engineering, materials and/or poor quality of manufacturing. The Contractor will guarantee the delivery by the date and in the form as defined in the order.
2) The Contractor will guarantee the use of the state-of-the-art solutions.
3) The Contractor will guarantee high quality of the structural solutions, high quality of materials in the proposed solutions and high quality of performance for all individual and assembled elements of equipment parts, specific machines and equipment, offered by them on the basis of the required performance guarantees defined in the specification of the offer.
4) Performance guarantee will cover all individual elements and weighing and metering systems, as far as their accuracy, nominal values/capacity and integrated operation are concerned.
5) The minimum warranty period expected by the Investor is 24 months from the moment of signing the Preliminary Acceptance Certificate.

## 14. PARAMETERS AND CONDITIONS FOR SIGNING PAC (PROVISIONAL ACCEPTANCE CERTIFICATE)

**Guaranteed parameters:**

| No. | Performance parameter | Guaranteed value | Acceptable limit |
|---|---|---|---|
| 1 | Positive leakage test result on full pump parameters for all circuits. No water loss for tuyere set, hot blast stobes and shaft circuits, minimum 72h. | 72h | 48h |
| 2 | Reduction of electricity consumption by min. 10% compared to the existing state. | 10% | 10% |
| 3 | Temperature difference (delta T) on the heat exchnagers | 5,5°C | 5,5°C |
| 4 | Nominal flow of the tuyere set circuit | 1150m3/h | 1100 m3/h |
| 5 | Nominal flow of the hot blast stoves circuit | 545m3/h | 520m3/h |
| 6 | Nominal flow of the open circuit | 2300m3/h | 2200m3/h |
| 7 | Thermal load of heat exchangers | 12660 kW | 12000 kW |
| 8 | Nominal flow of burden spraying circuit | 360m3/h | 300m3/h |
| 9 | Nominal flow on new taphole copper staves | 74m3/h | 74m3/h |

**Other conditions for PAC signing:**

1) Compliance of the works and systems with the documentation, including the construction of pump house, supply and return piping, manifolds for each circuit, power supply stations, automation equipment part.
2) Positive result of functional test of control and automation of all cooling system units (pumps, valves) with achievement of design thermal efficiency
3) Positive emergency test result for cooling system automation.
4) Visual assessment of the correctness of all works by both parties.
5) Positive result of all necessary technical inspections by Office of Technical Inspection (UDT) and Transport Technical Inspection (TDT).
6) Submission of complete as-built documentation.
7) Submission of documents necessary to apply for an occupancy permit for the system.
8) Completion of all construction works including provision of access to all cooling system fittings.
9) Conducting trainings for operating and maintenance personnel.
10) Keeping the work areas in good order.

## 15. CONTACT PERSONS

| No. | Name | Responsibility | Plant/Dept. | Phone / e-mail |
|---|---|---|---|---|
| 1 | Jakub Stawowy | Technical Leader – BF Plant | ArcelorMittal Poland S.A.<br>Al. J. Piłsudskiego 92 | + 48 882 172 292<br>Jakub.Stawowy@arcelormittal.com |
| 2 | Michał Kolasa | Project Manager - Engineering | | +48 32 776 87 30 / +48 668 850 792<br>Michal.Kolasa@arcelormittal.com |

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|---|---|---|---|---|
| 3 | Michał Kocot | Project Leader – BF Plant | 41 – 308 Dąbrowa Górnicza | +48 32 776 89 49 / +48 608 360 025<br>Michal.Kocot@arcelormittal.com |
| 4 | Marta Bodnar | Lead Buyer - Purchasing Office | EPO<br>Al. J. Piłsudskiego 92<br>41 – 308 Dąbrowa Górnicza | +48 668 562 376<br>Marta.Bodnar@arcelormittal.com |

# 16. OTHER TOPICS (NOT DISCUSSED ELSEWHERE)

## 16.1. WASTE DISPOSAL

Contractor is responsible for the disposal of waste generated as a result of investment works. All waste products, which will be produced during the works, should be removed to the industrial waste storage area.
The only exception is scrap of non-ferrous materials and iron scrap which must be sorted so that it can be suitable for transport and loaded onto the means of transport provided by the investor: trucks and / or wagons.
Total cost of preparation scrap for transportation and loading will be borne by the Contractor.
Below you can find the list of waste codes (according to Polish law), referring to the most frequent types of waste to be generated in the course of the Investment:

- Scrap of ferrous metals — waste code 160117, 170405, 191001.
- Scrap of non-ferrous metals — waste code 160118, 170401, 170402.
- Scrap of mixed metals — waste code 170407.
- Ceramic waste — waste code 161103, 161104.
- Concrete and debris waste — waste code 170101.
- Electrical cables — waste code 170411, 170604.
- Oils, greases — waste code 130110, 130208.
- Electric motors scrap — waste code 160216.
- Other waste — individual waste codes.

## 16.2. ANALYSES AND MEASUREMENTS

Below you can find the analyses and measurements to be done by the Contractor, at their own expense, as part of the investment project:

- Steel structures strength analysis within the work site.
- Inventory-taking geodetic measurements.
- Working geodetic measurements.
- As-build geodetic measurements (geodetic surveys).
- Installation measurements

## 16.3. CONTRACTOR'S PROPERTY SECURITY

In the course of the Investment's duration, the Contractor is responsible for securing their own property and the property of their subcontractors, parts, subassemblies and entire equipment stored in the Investor's premises and planned for project purposes in the period of commissioning and hand-over to the Investor.

# 17. APPENDIXES

1. Appendix – Legal acts
2. Appendix - Location and environmental data
3. Appendix - AIM Addendum to tender - TLS EN V3

4. Appendix - AIM Addendum to tender - automation system requirements EN V16
5. Appendix - AIM Addendum to tender - 3D EN V2
6. Appendix – Technical documentation
7. Appendix - Requirements for detailed design and as-built documentation
8. Appendix - Author Supervision Card PL EN_01
9. Appendix - Partial commissioning protocol PL EN_01
10. Appendix - Document transmittal protocol PL EN_01
11. Appendix - Material card PL EN_01
12. Appendix - Concreting log PL EN_01
13. Appendix - Inspection and test plan for earthworks and foundation works PL EN_00.
14. Appendix - GMN - Wytyczne dla wykonawców 2021 – pasywa
15. Appendix – Drawing numbering system
16. Appendix – Schedule milestones EN
17. Appendix – New pumphouse – implementation guidelines EN