



ATTACHMENT C-12 PERFORMANCE GUARANTEES

The Contractor shall provide the values for each of the performance guarantees in the form provided herein.

Legal guarantee requirements for the Works must be fulfilled, i.e. the Works must comply with all applicable laws, regulations and authority requirements in Belgium and the EU valid at the date of Taking Over. Changes after the Contract Date shall be treated as Variation to the Contract.

Guarantees and warranties shall apply to the entire Works, including the deliveries of sub-suppliers. The Contractor shall take full responsibility for the appropriate modern design, correct and appropriate quality of the materials used and good workmanship of the equipment included in the Works. The Work shall be designed and built to facilitate inspection, cleaning and ease of maintenance and for operation where the continuity of service and reliable operation is the first consideration.

During the Defects Notification Period, the Contractor will have reasonable access to, but not control of the Works and all operational data related to the Works as agreed in the Contract.

All guarantees and warranties require that the Works are operated in accordance with:

- Contractor's design specifications, and operating and maintenance manual
- Performance guarantees are provided under the assumption that the Works are operated under stable load conditions
- Fuel quality is monitored on regular basis

Tests after Completion (i.e. Performance Guarantee Tests) will be carried out for the purpose of verification of the fulfilment of the guaranteed performance.

The output guarantee (power and heat output and fuel consumption) and availability guarantee are subject to liquidated damages as specified in the Contract. All other guarantees specified in this attachment are absolute technical guarantees, which mean that the Contractor is obliged at his own expense to repair the equipment or to improve the design and/or quality of the delivered equipment so that the guarantee values shall be met. Non-fulfilment of the absolute guarantee gives the Employer right to reject/terminate the delivery in limitations specified in the Contract. All the guarantee values shall be met at the same time in continuous operation and within the operation limits specified in this attachment and in Section 3, "Employer's Requirements".

General requirements about the testing procedure are specified in Section 2, "Commercial Contract documents" and in Section 3, "Employer's Requirements".

These Performance Guarantees shall be negotiated and included as part of the Contract as provided in Section 2, Schedule 4 to the Conditions of Contract, Performance Guarantees and shall be tested in accordance with Section 2, Schedule 5 of the Conditions of Contract, Tests on Completion.

PERFORMANCE GUARANTEES *[To be completed by Contractor]*

C12-1 GUARANTEES WITH LIQUIDATED DAMAGES

C12-1.1 General

The Contractor guarantees the net power output to network and the net energy efficiency when following preconditions are met:

- 1) The performance measurements are carried out according to the norms:
 - IEC 953-2: Rules for steam turbine thermal acceptance test
 - EN -12952-15:2003: Acceptance tests (Boiler)
 - IEC performance norms 34-2 for electrical equipment
 - Properties of water and steam, The Industrial Standard IAPWS-97, Springer-Verlag, Berlin, 1998
 - VDI 3986: Determination of efficiencies of conventional power stations
- 2) The tolerance for the power output test is calculated by the measuring personnel from the accuracy of the meters and of the measuring methods.
- 3) The measured output shall be corrected to the conditions specified in Table 1 according to the Contractors correction curves only in case such are submitted for the Employer's acceptance at least four (4) months before Turbine first run. Parameters to be corrected are those existing at the delivery limit, and effecting to the power output, like district heat supply temperature etc.

The fuel mixture valid for the performance test shall be in accordance with Attachment 10 "Fuel Analyses and Fuel mixtures" of Section 3 "Employer's Requirements".

C12-1.2 Power Output

The Contractor guarantees that the Weighted Net Power Output (= Pe) calculated according to the Equation 1, in operation conditions specified in Table 1 shall not be less than:

Pe = _____ kW

Equation 1 - Weighted Net Power Output

$$\mathbf{Pe = (4 \times PA + 4 \times PB + 2 \times PC) / 10}$$

Where:

Pe = Weighted Net Power Output

PA = Net power output at load point "A"

PB = Net power output at load point "B"

PC = Net power output at load point "C"

C12-1.3 Energy Efficiency

The Contractor guarantees that the Weighted Net Heat Rate (= HRe) calculated according to the Equation 2, in operation conditions specified in Table 1 shall not be less than:

HRe = _____ kJ/kWh

Equation 2 - Weighted Net Power Output

$$\text{HRe} = (4 \times \text{HRA} + 4 \times \text{HRB} + 2 \times \text{HRC}) / 10$$

Where:

HRe = Weighted Net Power Output

HRA = Net heat rate at load point "A"

HRB = Net heat rate at load point "B"

HRC = Net heat rate at load point "C"

C12-1.4 Plant Availability

The Contractor guarantees the availability of the Works during the Defects Notification Period, starting from the taking over. The guaranteed average annual availability (AVB) must not be less than ____ % per year during the Defects Notification Period.

The availability guarantee covers the Works and in addition those equipment entireties, which the Contractor has performed by using a subcontractor.

During the availability guarantee period, the Contractor has one (1) period per year for maintaining the Works. This period shall be scheduled during the annual planned shutdown of the Works and shall be calculated as annual planned shutdown whether the Contractor shall use this period for maintaining or not.

The assumed annual planned shutdown period is 720 hours for calculating purposes.

The guaranteed annual availability shall be the average of yearly availabilities, which shall be calculated in accordance with the equation shown below. First year starts from the date of taking over. The annual average availability shall be calculated after the Defects Notification Period has ended.

The guaranteed average annual availability shall be calculated on percentage basis with the following equation:

$$A_{V_B} (\%) = \frac{A_{V_1} + A_{V_2}}{2}$$

The guaranteed annual availability shall be calculated on percentage basis with the following equation:

$$A_{V_{1,2}} (\%) = \frac{8760 - T_{main} - T_{unexp}}{8760 - T_{main}} \times 100$$

Where:

- 8760 = Number of hours per year ¹⁾
- A_{V1} = Availability during the first year of the Defects Notification Period
- A_{V2} = Availability during the second year of the Defects Notification Period
- T_{main} = Total time of planned outages during the year.
- T_{unexp} = Total time of unplanned outages during the year

Furthermore:

$$T_{unexp} = \left(T_{shutdown} + T_{partial} \times \frac{P_A - P_P}{P_A} \right)$$

Where:

- $T_{shutdown}$ = Recorded hours of shutdowns attributable to the Contractor
- $T_{partial}$ = Recorded hours of operation at partial load attributable to the Contractor
- P_A = Guaranteed power output at load point A
- P_P = Average power output of the Works during operation at partial load attributable to the Contractor. P_P shall be at least 60 % of P_A otherwise is considered to be 0 MW_{th}.

The Works shall be considered to be in operation:

1. If the Works can be operated within its specified operating range without any restrictions to load caused by any equipment or system forming a part of the Works and providing that the environmental requirements are met.
2. If the Works would meet the conditions set in item 1 above, but are actually not in operation or operate at partial load due to reasons not attributable to the Contractor, such as:
 - Power grid restrictions
 - Lack of fuel or no fuel available at all
 - Residue (bottom ash and fly ash) storage capacity exhausted
 - No outside electricity to start-up the Works
 - No personnel available to operate the Works (such as illness, operator not available)
 - Governmental decision or declaration not to operate or start the Works
 - Damages due to operator fault (e.g., faulty operation and maintenance, combustion of fuel other than specified in the Contract).
 - Lack of consumables or no consumables available at all

- Plant outage caused by failure in parts not included in the Works

The availability guarantee is subject to following conditions:

- The Employer shall operate the power plant to prudent practice and following to Contractors operation manuals.
- The Contractor will have reasonable access to monitor the operation of the power plant but not control of the Works, and to have access to operational records as specified in the Contract.
- The Employer shall use the fuel and sand as defined in Section 3, Employer's requirements.
- The power plant operation does not need extra operating or maintenance staff labour and consumables.

C12-1.5 Consumables

Not applicable as a guarantee but the Contractor shall provide the information as requested in Attachment T-19, bullet g.

C12-1.6 Guarantee Points

Table 1: Guarantee Points

Guarantee Point (GP)	Description	Operating Mode	Ambient temperature	Ambient pressure	Relative Humidity	Cos Phi
A	200MW _e gross MCL	Condensing	+16	1013	70	0.90
B	MCL	Condensing	-5	1013	90	0.90
C	75% MCL	Condensing	+16	1013	70	0.90

(MCL = Maximum Continuous Load of the power plant)

The Contractor shall provide the predicted plant performance in in form of heat balance diagrams for all the guarantee points (GP). The fuel mixture to be used for these guarantee points is Guarantee Fuel 1 (GF1) as per Attachment 10 of Section 3 "Employer Requirements".

C12-1.7 Liquidated Damages

Table 2 below show the Liquidated Damages for failing to reach the Guarantees. Cost is per full unit of deviation.

Table 2 – Liquidated Damages

Item	Quality of Guarantee	Cost	Cap (as % of contract price)
Net power output	Liquidated damage	3975 € / kW	5 %
Net heat rate	Liquidated damage	100'000 € / (kJ/kWh)	10 %
Availability	Liquidated damage	300'000 € / 0,1%-unit	5 %
Project Delay	Liquidated damage	see Section 2 – “Contract Conditions” – “Particular Conditions” – Sub-Clause 8.7 “Delay Damage”	12.6 %
Overall Cap	-	-	20 %

C12-2 ABSOLUTE GUARANTEES

C12-2.1 Fuel Mix

The Contractor guarantees that the boiler operates with the fuel mixtures GF1 and GF2, shown in section 3 “Employer Requirements”, Appendix 10.

C12-2.2 Flue Gas Emissions

The Contractor guarantees that the flue gas emissions at stack outlet within the operating range of 40 – 100 %-BMCR, and with the design fuel quality (including range) as specified in Section 3 Employer’s Requirements, Appendix 10 “Fuel Analyses and Fuel mixtures”, and within the combustion diagram shall meet the requirements set in the future Flemish legislation “Vlarem-trein 2012” on large combustion plants (Nominal condition 0 °C and 101,3 kPa, reference oxygen content 6,0 %-vol in dry flue gas), excluding the start-up and shutdown periods.

Nominal condition is 0 °C and 101.3 kPa, reference oxygen content 6 %-vol in dry flue gas.

The Contractor shall note that the environmental permit (to be defined prior to the Contract signing) may specify more stringent requirements.

Table 3 – Guaranteed Flue Emission Limits

		Monthly average	Daily average	Hourly average
Dust (1)	mg/Nm ³	5	< 7.5	< 15 ¹⁾
SO ₂	mg/Nm ³	50	< 75	< 150 ¹⁾
NO _x (as NO ₂)	mg/Nm ³	55	< 82.5	< 165 ¹⁾
CO	mg/Nm ³	200	< 220	< 400 ¹⁾
NH ₃ slip	mg/Nm ³	5		
Cd + Tl	mg/Nm ³	0,075		
TOC (gas and vapour)	mg/Nm ³	15		
HCl	mg/Nm ³	15		
HF	mg/Nm ³	1.5		
Hg	mg/Nm ³	0,075		
Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V	mg/Nm ³	0,75		
Dioxins and furans	mg/Nm ³	0,15		
1) valid for 95% of the hourly average samples.				



(1) The guaranteed dust emission limit shall be met with any of the bag filter chambers not in operation at 100%-BMCR.

C12-2.3 Steam Quality

The Contractor guarantees that the live steam quality meets.

• Silica as SiO ₂	µg/kg	< 5
• Sodium (Na)	µg/kg	< 5
• Iron (Fe), total	µg/kg	< 5
• Copper (Cu), total	µg/kg	< 1
• Acid Conductivity	µS/cm	0,10

Quantities are to be measured from the condensed samples, and the steam quality shall be reached after 400 operational hours with 100 % BMCR load or after 700 operational hours with 70 % BMCR load. Samples are to run until the value reaches equilibrium before evaluation.

C12-2.4 Noise Level

C12-2.4.1 Far field noise

The Contractor guarantees that the A-weighted noise pressure level produced solely from the operation (excluding e.g. background noise) of the plant and its systems at any point in the corresponding zone (see below table) is not more than corresponding values for day, evening and night time as per below table, when measured at a height of 4 meter above the ground level.

Table 4 – Guaranteed Far Field Noise Levels

Zone / Measuring Point	Distance from site border	Day (07 – 19) dB(A)	Evening (19 – 22) dB(A)	Night (22 – 07) dB(A)
Industrial area	200 m	60	55	50
Living - rural and/or agricultural area \leq 500m from industrial area	200m or at the closest dwelling, if dwelling is less than 200m from the border	50	45	40
MP1 (Langerbruggekaai 22)	Approx. 300 m	52 (L _{A95, 1h})	50 (L _{A95, 1h})	47 (L _{A95, 1h})
MP2 (Desteldonkstraat 11)	Approx. 600 m	51 (L _{A95, 1h})	49 (L _{A95, 1h})	44 (L _{A95, 1h})
MP3 (Slockstraat 13)	Approx. 1'160 m	48 (L _{A95, 1h})	52 (L _{A95, 1h})	44 (L _{A95, 1h})





C12-2.4.2 Plant internal noise

The plant shall be designed to achieve all the relevant local noise standards and laws. The Contractor guarantees that the plant internal noise meet the following requirements set out as follows:

- The A-weighted surface sound pressure level averaged over the measurement surface at one (1) meter from the machine enclosure/contour, and 1,5 meters above the ground level or personnel platforms, shall not exceed 85 dB(A).
- For those machine rooms where employees have their regular working place or a long term visit (≥ 8 hrs) by employees are necessary the A-weighted surface sound pressure level averaged over the measurement surface at one (1) meter from the machine enclosure/contour, and 1,5 meters above the ground level or personnel platforms, shall not exceed 80 dB(A).
- The A-weighted surface sound pressure level averaged over the measurement surface at one (1) meter from any of the power plant buildings and 1,5 meters above the ground level shall not exceed 70 dB(A).
- Within the main control room (excluding printer, computer and alarm noise but including noise from ventilation), the average A-weighted sound pressure level at a minimum distance of one (1) meter from any equipment, and a height of 1,5 meter above the floor level shall not exceed 45 dB(A).
- Within the offices (excluding printer, computer and alarm noise), the average A-weighted sound pressure level at a minimum distance of one (1) meter from any equipment, and a height of 1,5 meter above the floor level shall not exceed 50 dB(A).
- For periodic noise caused by start-up vent valves and safety valves the following maximum allowable sound pressure levels will apply measured at one (1) meter distance from the source of noise:
 - Safety valves 120 dB(A)
 - Start-up vent valves 100 dB(A)

Environmental permit (to be defined prior to the Contract signing) may specify more stringent requirements, which shall be treated as a Variation to the Contract.

The noise emission of the installations of the plant shall be measured in accordance with ISO 8297 and/or ISO 3746. According ISO 9613 the particular far field noise levels shall be calculated and evaluated to the Flemish environmental noise limits (see table 6). The internal noise shall be measured in accordance with ISO 1120. Noise is measured during Tests after Completion, if possible, when the plant is operating at full load.



Excluded are the following operational situations:

- Start-ups
- Shut-downs
- Disturbance situations (plant trips, safety valve blow off, etc.)
- Safety and start-up valves in operation
- Sootblowers in operation
- Pneumatic ash transmitters in operation
- Control and blow down valves with high pressure drop in operation
- Fire-fighting station in operation
- Emergency feedwater pump in operation
- Emergency diesel generator set in operation
- By-pass operation of the steam turbine
- Operation below minimum load
- Construction and installation of the plant
- Commissioning
- Areas within acoustical enclosures and rooms considered as enclosures (e.g. main cooling water pump room, feedwater pump room, combustion air and flue gas fan rooms, lube oil tank room, fuel conveyor transfer towers and emergency diesel generator container)
- Maintenance and cleaning works
- Operation of noisy machine tools (saw, grinders, compressed air operated tools, etc.)
- Equipment not included in Contractor's scope of supply
- Background noise (applies for far field noise only)

C12-2.5 Start-up Time

After emergency shutdown of the boiler, the boiler pressure shall remain at the level that preceded the emergency shutdown and the pressure is decreased only in consequence of heat losses (includes thermal losses due to ventilation of the furnace).

At the beginning of a cold start-up, the boiler pressure is 1 bar(a) and filled with feedwater (20°C), the bed temperature is below 300 °C and auxiliary steam is available for heating of the feedwater tank and combustion air.

Table 5 – Guaranteed Start-up Times

Standby time	Max. time from ignition to 100 %-MCL	Feedwater temperature
< 2 h (hot)	_____ h	_____ °C
< 10 h (warm)	_____ h	_____ °C
≥ 36 h (cold)	_____ h	20 °C

The start-up time is counted from the ignition of the start-up burner.

During the start-up, the construction material stresses shall not exceed the design values.

C12-2.6 Load Change Rate

The Contractor guarantees that at least the following power plant rates of load change between 40 % and 100 %-BMCR are met:

- Load increase rate %/min ≥ _____
- Load decrease rate %/min ≥ _____

The load increase and decrease rates are defined based on MCL.

During the load changes, the drum level shall remain within trip limits and live steam pressure fluctuation shall be within ±5 bar and temperature fluctuation shall be within ±10°C.

C12-2.7 Pressure losses

Not applicable.

C12-2.8 Vibrations

- The turbine, gear and generator bearing vibrations are guaranteed not to exceed "Zone A/B" limit according to standard ISO 10816-2. In addition to this the steam turbine, gear and generator shaft vibration is guaranteed not to exceed level "Zone A" limit according to standard ISO 7919-2.
- For all other rotating equipment on site with nominal power > 15kW the vibration shall not exceed the maximum vibration level (R.m.s.



displacement and R.m.s. velocity values) according to Zone boundary A/B (for both rigid and flexible Support class) as specified in the standard ISO 10816-3; 1998, applicable Tables in Annex A.

- Vibration evaluation shall follow the principles of standard ISO 10816 “Mechanical vibration – Evaluation of machine vibration by measurements on non-rotating parts”.

C12-2.9 Bag Filter Bags

Defects liability covers also the bag filter bags. The share of the bag filter bags that may be replaced annually over the Defects Notification Period is _____ %. During this period, the Contractor is responsible to replace each defective filter bag. Such share of the bag filter bags are considered as wear and tear parts.

C12-2.10 Vacuum Tightness

Design of equipment under vacuum and the vacuum the pumps shall be according to VGB-R 126L.

C12-2.11 Generator Temperature

The Contractor guarantees that the insulation class of the generator rotor and stator winding insulation fulfil the requirements of Class F requirements of relevant IEC norms.

The Contractor guarantees that the temperature rise of the generator will not exceed the temperature rise level "Class B" according to IEC norms.

C12-2.12 Thermal Insulation

The surface temperature of thermal insulation is guaranteed not to exceed by more than 20 °C of ambient temperature measured at one (1) meter's distance from the insulation surface while the plant is in operation. The guarantee does not apply to surroundings of the openings and lead-troughs.

The guarantee does not apply immediate surroundings of manholes, access doors, furnace view ports and other equal areas. Accidental touching of hot surfaces shall be prevented by suitable means (e.g. cage around the hot spot).

The maximum allowable surface temperature is 60 °C.

C12-2.13 Process waste water quality

The quality of process waste water discharged from the power plant to Gent-Terneuzen canal shall comply with the values included in Appendix 10 of Section 3 Employer's Requirements, “Requirements for Waste Water”.