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Guide for procurement of power station equipment - Part 6-5: Turbine auxiliaries - Dry cooling systems

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Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke -- Teil 6-5: Turbinenhilfseinrichtungen - Trockenkühlanlagen

Guide pour l'acquisition d'équipments destinés aux centrales de production d'électricité -- Partie 6-5: Auxilliaires de turbine - Aéroréfrigérants secs et aérocondenseurs

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Foreword

This European Standard has been prepared by Technical Committee CEN/CLC JTFPE "Joint Task Force Power Engineering", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2000, and conflicting national standards shall be withdrawn at the latest by April 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This standard takes the form of a recommendation and is therefore entitled a "Guide".

This Guide for procurement has been prepared under mandates given to CEN and CENELEC by the European Commission and the European Free Trade Association.

*This Guide for procurement is a part of a series of Guides mandated to cover the procurement of power station plant and **equipment** in conformity with European Procurement Directives. The Guides are:*

*EN 45510 Guide for procurement of power station **equipment***

Part 1: Common Clauses

Part 2-1: Electrical equipment - Power transformers
Part 2-2: Electrical equipment - Uninterruptible power supplies
Part 2-3: Electrical equipment - Stationary batteries and chargers
Part 2-4: Electrical equipment - High power static converters
Part 2-5: Electrical equipment - Motors
Part 2-6: Electrical equipment - Generators
Part 2-7: Electrical equipment - Switchgear and control gear
Part 2-8: Electrical equipment - Power cables
Part 2-9: Electrical equipment - Cabling systems

Part 3-1: Boilers - Water tube boilers
Part 3-2: Boilers - Shell boilers
Part 3-3: Boilers - Boilers with fluidized bed firing

Part 4-1: Boiler auxiliaries - Equipment for reduction of dust emissions
Part 4-2: Boiler auxiliaries - Gas-air, steam-air and gas-gas heaters
Part 4-3: Boiler auxiliaries - Draught plant
Part 4-4: Boiler auxiliaries - Fuel preparation equipment
Part 4-5: Boiler auxiliaries - Coal handling and bulk storage plant
Part 4-6: Boiler auxiliaries - Flue gas desulphurisation (De-SO_x) plant
Part 4-7: Boiler auxiliaries - Ash handling plant
Part 4-8: Boiler auxiliaries - Dust handling plant
Part 4-9: Boiler auxiliaries - Sootblowers
Part 4-10: Boiler auxiliaries - Flue gas denitrification (De-NO_x) plant

Part 5-1: Turbines - Steam turbines
Part 5-2: Turbines - Gas turbines
Part 5-3: Turbines - Wind turbines
Part 5-4: Turbines - Hydraulic turbines, storage pumps and pump-turbines

Part 6-1: Turbine auxiliaries - Deaerators
Part 6-2: Turbine auxiliaries - Feedwater heaters
Part 6-3: Turbine auxiliaries - Condenser plant
Part 6-4: Turbine auxiliaries - Pumps
Part 6-5: Turbine auxiliaries - Dry cooling systems
Part 6-6: Turbine auxiliaries - Wet and wet/dry cooling towers
Part 6-7: Turbine auxiliaries - Moisture separator reheaters
Part 6-8: Turbine auxiliaries - Cranes
Part 6-9: Turbine auxiliaries - Cooling water systems

Part 7-1: Pipework and valves - High pressure piping systems
Part 7-2: Pipework and valves - Boiler and high pressure piping valves

Part 8-1: Control and instrumentation

EN 45510 part 1 contains those clauses common to all the above Guides giving the provisions of a non ***equipment*** *specific nature for use in the procurement of power station plants. EN 45510 is the responsibility of JTFPE. The so called "common clauses", as appropriate, also appear in italics in the documents specific to particular* ***equipment.***

In this Guide, words in bold type indicate that they have the meaning given in the definitions, clause 3.

In this Guide, words and sentences not in italics are specific to this Guide and refer to the particular **equipment** covered.

1 Scope

*This standard gives guidance on writing the technical **specification** for the procurement of* **natural draught** and **mechanical draught dry cooling towers, aircooled condensers** and their internals *for use in electricity generating stations (power stations). This Guide for procurement is not applicable to **equipment** for use in the nuclear reactor plant area of nuclear power stations. Other possible applications of such **equipment** have not been considered in the preparation of this Guide.*

This Guide covers:

- water distribution system;
- **heat exchangers**;
- supporting frame and footbridges;
- winter operating equipment (e.g. **louvres**, **shutters**);
- fan and fan ancillaries;
- noise attenuation equipment;
- pipework and valves;
- **exhaust steam duct**;
- **distribution ducts**;
- **air extraction system**;
- condensate system.

This Guide does not cover:

- water cooled condensers;
- **cooling water** pumps and associated auxiliaries;
- chemical and mechanical water treatment;
- civil work.

*The **equipment** covered by this Guide is defined by its function rather than design type. Therefore, the guidance to the **specification** is stated in performance terms rather than being specified by a detailed description of the **equipment** to be supplied.*

*This Guide indicates to potential **purchasers** how their **specification** should be prepared so that:*

- *the **equipment** type and capacity interfaces correctly with other elements of the systems* such as condenser, **cooling water** supply and civil work;
- *predicted **performance** is achieved;*
- *ancillary equipment is properly sized;*
- ***reliability, availability** and safety requirements are achieved;*
- *proper consideration is given to the evaluation process and the quality measures to be applied.*

*This Guide does not determine the type of **specification** (e.g. detailed, performance, functional) or the extent of supply for any given contract which is normally decided on the basis of the **purchaser's** project strategy. It does not cover:*

- *any commercial, contractual or legal issues which are normally in separate parts of an **enquiry**;*
- *any allocation of responsibilities which are determined by the contract.*

*This Guide does not prescribe the arrangement of the documents in the **enquiry**.*

> *NOTE: As a comprehensive European environmental policy is still under preparation, this Guide does not address the environmental implications of the **equipment**.*

2 Normative references

This Guide for procurement incorporates by dated or undated reference, provisions from other publications. These normative references are cited in the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Guide only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN ISO 9001	*Quality systems - Model for quality assurance in design, development, production, installation and servicing (ISO 9001:1994).*
EN ISO 9002	*Quality systems - Model for quality assurance in production, installation and servicing (ISO 9002:1994).*
IEC 60050-191	*International electrotechnical vocabulary. - Chapter 191 : Dependability and quality of service*

3 Definitions

For the purposes of this Guide, the following definitions apply:

3.1 Organisational terms

3.1.1 ***purchaser:*** *Recipient of a product and/or a service provided by a* ***supplier.***

3.1.2 ***supplier:*** *Person or organisation that provides a product and/or a service to the* ***purchaser.***

3.1.3 ***specification:*** *Document stating technical requirements of the* ***purchaser****. It may form part of an* ***enquiry*** *issued by a* ***purchaser.***

3.1.4 ***enquiry:*** *Invitation to* ***tender*** *issued by a* ***purchaser****. It will normally include a* ***specification*** *together with the necessary contractual and commercial conditions.*

3.1.5 ***tender:*** *Offer made by a* ***tenderer*** *in response to an* ***enquiry.***

3.1.6 ***tenderer:*** *Person or organisation submitting a* ***tender*** *for the* ***equipment*** *in response to the* ***enquiry.***

3.1.7 ***site:*** *Place to which the* ***equipment*** *is to be delivered or where work is to be done by the* ***supplier,*** *together with so much of the area surrounding as the* ***supplier*** *may, with the consent of the* ***purchaser,*** *use for the purposes of the contract.*

NOTE: Further definitions of useful organisational terms may be found in EN ISO 8402 (see Bibliography).

3.2 Technical terms

3.2.1 **dry cooling tower:** Cooling tower in which the heat exchange from water to air is achieved by convection so that there are no evaporative losses.

3.2.2 **aircooled condenser (ACC):** Aircooled heat exchangers to condense the turbine exhaust steam.

3.2.3 **natural draught:** Where the air circulation is generated by a density difference between the cold air outside the dry cooling system and the hot air inside.

3.2.4 **mechanical draught:** Where the air circulation is generated by fans.

3.2.5 **forced draught: Mechanical draught** in which the fans are located between the air inlet and the **heat exchangers**.

3.2.6 **induced draught: Mechanical draught** in which the fans are located between the **heat exchangers** and the air outlet.

3.2.7 **heat exchanger:** Assembly of ducts, for the heat exchange. The **cooling water** flows inside the ducts and the air flows outside.

3.2.8 **cooling water:** Warm water which enters the cooling tower to be re-cooled.

3.2.9 **louvres, shutters:** Devices installed in a tower wall to control the air flowrate into the tower.

3.2.10 **cell:** Smallest subdivision of a dry cooling system bounded by exterior walls and partition walls

which can function as an independent unit as regards air and water (steam for **aircooled condensers**) flow.

3.2.11 heat load (thermal load): Heat rejected from the dry cooling system to the atmosphere.

3.2.12 dry bulb temperature: Air temperature indicated by a thermometer with a dry bulb protected from any radiation effect.

3.2.13 cooling range: Difference between the hot water temperature and the recooled water temperature.

3.2.14 inlet temperature difference: Difference between the **cooling water** inlet temperature (the exhaust steam temperature for **aircooled condensers**) and the inlet air **dry bulb temperature**.

3.2.15 exhaust steam duct: Ducts to lead the exhaust steam from the turbine to the **aircooled condenser**.

3.2.16 distribution ducts: Ducts on top of the **aircooled condenser** to distribute the steam to the **condenser bundles**.

3.2.17 A-frames: Roof-type frames accommodating the **heat exchanger bundles**.

3.2.18 condenser bundles: Heat exchangers, where the steam is condensed flowing in parallel with the condensate from the upper **distribution duct** to the lower **steam/condensate header pipe**.

3.2.19 air cooler bundles: Heat exchangers where the steam generally flows upwards (counter-flow) from the **steam/condensate header pipe**. The counter-flow bundles are also called dephlegmator bundles. The combination of **condenser** and **air cooler bundles** ensures that steam is in direct contact with condensate keeping the condensate's temperature at the temperature of the steam and hence avoiding condensate subcooling and freezing.

3.2.20 steam/condensate header pipe: Pipe to collect the condensate and to transfer steam to the **air cooler bundles**.

3.2.21 condensate tank: Tank to collect the condensate coming from the **steam/condensate header pipe**.

3.2.22 air extraction system: System to remove incondensible gases from the **aircooled condenser**. The evacuation system is connected to the outlet of the **air cooler bundles**.

3.2.23 windwalls: Walls in a **mechanical draught** system to minimise the effect of wind on fan operation and the recirculation of warmed up air.

3.3 General terms

3.3.1 equipment: *Plant, component, system and/or associated service to be provided in response to the* ***enquiry****.*

3.3.2 conformity: *Fulfilment of specified requirements by a product, process or service.*

3.3.3 performance: *Obligations verified by specified tests.*

3.3.4 operating period: *Time between planned outages or maintenance periods during which the* ***equipment*** *is in operation and/or does not restrict operational requirements of the power station.*

3.3.5 life expectancy: *Time period over which the* ***equipment*** *might be expected to operate with planned maintenance but without replacement of a significant component.* For example, **heat exchangers** are significant components.

3.3.6 design life: *Operating hours of the* ***equipment*** *on which design calculations are based.*

3.3.7 acceptability: *Compliance with criteria defined by the* ***purchaser*** *for assessing the suitability of* ***equipment****.*

3.3.8 equipment margins: *Allowance for design, fabrication or operating contingency defined in the* ***specification****. These are separate to those normally included by the* ***supplier*** *for his own purposes.*

3.3.9 proven equipment: Equipment *which may be demonstrated to be similar to that offered and has operated for a sufficient time to have demonstrated performance and availability.*

3.3.10 availability: *As defined in IEC 60050-191.*

3.3.11 reliability: *As defined in IEC 60050-191.*

3.3.12 maintainability: *As defined in IEC 60050-191.*

4 Brief overall project description

4.1 Role and organisation of purchaser

*The **enquiry** should define the **purchaser's** role in the project, including whether the **purchaser** will assume responsibility for the planning and technical coordination of the project, or whether other organisations will be appointed to carry out all or part of this function. The **enquiry** should define all organisational interfaces and the procedures to be employed for managing the contract and the **site**.*

4.2 Site location

*The **specification** should describe the geographical location of the **site** which may include surveying points, the previous use of the **site** and any local features such as impact of industrial or military activities and planning restrictions.*

*Where applicable, the **specification** should indicate **site** datum on **specification** drawings and specify **site** and drawing orientation and define co-ordinate axes (x, y, z) and numbering order to ensure consistency between suppliers of connected equipment.*

*Where appropriate, the **specification** should define the permitted ground loading, dimensional and time restrictions on access routes up to but not including public roads or railways.*

*The **specification** should identify, where appropriate, the environment of the **site** in which the **equipment** will operate. The following factors may normally be included if appropriate:*

- *climatic e.g. atmospheric pressure, annual variation of air and cooling water temperature, relative humidity, rain fall, icing, snow, wind velocity (normal and maximum), lightning;*
- *geological e.g. seismic conditions and characteristics of subsoil (e.g. caverns, gliding stratifications, load bearing capability of subsoils);*
- *geographic e.g. elevation, influence of local topography and structures;*
- *hydrological e.g. flooding and tides.*

4.3 Equipment task

*The **specification** should describe in general terms the function, task or role of the **equipment** to be purchased, e.g. whether it is part of a new power generating plant, a modification to an existing power generating plant, or replacement **equipment**.*

*Where appropriate, the **specification** should define the function and the known limitations, if any, in the **equipment** connected to that which is being supplied so that the **equipment** may avoid imposing adverse conditions or the **supplier** may suggest modifications to connected equipment which would ensure satisfactory operation.*

4.4 Equipment to be purchased

*The **specification** may define the **equipment** type or arrangement to be purchased,* for example:

- type of dry cooling system: **dry cooling tower** or **aircooled condenser**;
- type of draught: **natural draught**, **forced draught**, **induced draught**;
- shape of cooling tower: hyperbolic, circular, cellular.

*The **specification** may also define preferences for **equipment** types (or give information) regarding compatibility with existing equipment, if required.* For example, the **specification** may specify the design, dimension and material of **heat exchangers**, noise attenuation or fan type.

*The **specification** should define the intended methods or local practice for maintenance, inspection and operation.*

*The **specification** should define requirements with regard to the general appearance of the **equipment** (e.g. dimensions, shape or colour) to meet local planning requirements or specific criteria, where such requirements exist.*

NOTE: Attention is drawn to European, national and/or local legislation which may place restrictions in this area.