
Guide for procurement of power station equipment - Part 6-6: Turbine auxiliaries - Wet and wet/dry cooling towers

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Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke -- Teil 6-6: Turbinenhilfseinrichtungen - Naß- und Naß/Trockenkühltürme

Guide pour l'acquisition d'équipements destinés aux centrales de production d'électricité -- Partie 6-6: Auxiliaires de turbine - Aéroréfrigérants humides et humides/secs

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This European Standard was approved by CEN/CENELEC on 1 October 1999.

CEN/CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN/CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN/CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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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of an identical text or by endorsement, at the latest by April 2000, and conflicting national standards shall be withdrawn at the latest by April 2000.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.

According to the CEN/CENELEC internal Regulations, the following countries are bound to implement the European Standards: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

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1 Scope

*This standard gives guidance on writing the technical **specification** for the procurement of **natural draught** and **mechanical draught wet** and **wet/dry (hybrid) cooling towers** and cooling tower 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;
- **spray assembly**;
- **filling (film packing, splash grids or laths, etc.)**;
- **heat exchangers**;
- **drift eliminator**;
- winter operating equipment;
- fan and fan ancillaries;
- noise attenuation equipment;
- pipework and valves.

This Guide does not cover:

- condenser;
- **cooling water** pumps and associated auxiliaries;
- chemical and mechanical raw water treatment;
- civil work.

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*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). <https://standards.iteh.ai/catalog/standards/sist/6a5b2c52-819d-4772-a60d-c65ecd0eff94/sist-en-45510-6-6-2000>

3.2 Technical terms

3.2.1 wet cooling tower: Cooling tower in which the heat exchange between water and air is achieved by direct contact.

3.2.2 wet/dry (hybrid) cooling tower: Cooling tower with a combination of wet cooling fill and dry cooling bundles.

3.2.3 natural draught: Where the air circulation is generated by a density difference between the cold air outside the cooling tower 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 filling.

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

3.2.7 counterflow cooling tower: Where, in the filling, the air and the water flows are in opposite directions.

3.2.8 crossflow cooling tower: Where, in the filling, the air flows perpendicular to the water.

3.2.9 spray nozzle (spray assembly): Device in the distribution system which breaks up the cooling water into droplets, and effects uniform spreading over the wetted area of the tower. In an open distribution system a spray nozzle will comprise a down spout and a splash plate.

3.2.10 down spout: Short pipe or nozzle used in an open distribution system to discharge water on to a splash plate.

3.2.11 splash plate: Used in an open distribution system to receive water from a down spout and to spread water over the wetted area of the tower.

3.2.12 filling: Material placed within the wet cooling tower to increase heat and mass transfer between

the **cooling water** and the air flowing through the tower.

- 3.2.13 film packing:** All of the surfaces over which the water flows as a continuous film.
- 3.2.14 splash grid/splash lath:** Grid/oblong plate to promote the splashing of droplets and to slow down their fall in a splash filling.
- 3.2.15 heat exchanger:** Assembly of tubes in the dry part of a wet/dry cooling tower.
- 3.2.16 drift loss:** Water loss from the tower in droplet form.
- 3.2.17 drift eliminator:** System of baffles located in the air flow downstream of the **filling** designed to reduce the quantity of entrained water leaving the tower.
- 3.2.18 cooling water:** Warm water which enters the cooling tower to be re-cooled.
- 3.2.19 make-up water:** Water added to the **cooling water** system to compensate for water losses from the system by evaporation, drift, **blow down** and leakage.
- 3.2.20 blow down:** Water discharged from the system to control concentration of salts or other impurities in the **cooling water**.
- 3.2.21 concentration ratio:** Ratio of the impurities in the **cooling water** and the impurities in the **make-up water**.
- 3.2.22 cooling range:** Difference between the hot water temperature and the recooled water temperature.
- 3.2.23 heat load (thermal load):** Heat rejected from the **cooling water** within the tower.
- 3.2.24 dry bulb temperature:** Air temperature indicated by a thermometer with a dry bulb protected from any radiation effect.
- 3.2.25 wet bulb temperature:** Temperature indicated by an adequately ventilated and wetted thermometer protected from any radiation effect.
- 3.2.26 approach:** Difference between the recooled water temperature and the inlet air **wet bulb temperature**.
- 3.2.27 isolated central water distribution:** Central water distribution zone which is isolated in cold weather in order to reduce the heat exchange.
- 3.2.28 deicing pipe:** Pipe ringmain situated above the air inlet, used in cold weather to redirect the water from the **isolated central water distribution** to the periphery of the cooling tower.
- 3.2.29 louvres:** Devices installed in a tower wall, to control the air flowrate into the tower and to prevent water droplets escaping due to wind effects.
- 3.2.30 cooling tower riser:** Vertical duct connecting the warm water inlet ducts to the main water distribution system.
- 3.2.31 cell:** Smallest subdivision of a cooling tower bounded by exterior walls and partition walls which can function as an independent unit as regards air and water flow.

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, a wet **cooling tower riser** is a significant component.
- 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 cooling tower: wet cooling, wet/dry (hybrid) cooling;
- type of draught: **natural draught, forced draught, induced draught;**
- operating mode of the cooling system: once-through, closed circuit, mixed;
- cooling process: **counterflow, crossflow, cross-counterflow;**