SLOVENSKI STANDARD
SIST EN 45510-6-9:2000

01-junij-2000

Guide for procurement of power station equipment - Part 6-9: Turbine auxiliaries - Cooling water systems

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Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke -- Teil 6-9: Turbinenhilfseinrichtungen - Kühlwassersysteme

Guide pour l'acquisition d'équipements destinés aux centrales de production d'électricité -- Partie 6-9: Auxiliaires de turbine - Systèmes d'eau de refroidissement

Ta slovenski standard je istoveten z: **EN 45510-6-9:1999**

ICS:

27.040	Plinske in parne turbine. Parni stroji	Gas and steam turbines. Steam engines
27.100	Elektrarne na splošno	Power stations in general

SIST EN 45510-6-9:2000 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 45510-6-9

October 1999

ICS

English version

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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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Ref. No. EN 45510-6-9:1999 E

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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of an identical text or by endorsement, at the latest by April 2000, and conflicting national standards shall be withdrawn at the latest by April 2000.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
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Part 3-1: Boilers - Water tube boilers
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Part 4-4: Boiler auxiliaries - Fuel preparation equipment
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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
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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* **main** and **auxiliary cooling water systems** *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:

- pump intake screening plant (**coarse** and **fine screens**) and associated cleaning systems;
- **pressure filters**;
- pipework and valves;
- **penstock gates**;
- priming and **venting equipment;**
- **dewatering facilities**;
- **surge suppression equipment;**
- cathodic protection equipment;
- chemical treatment.

This Guide does not cover:

- main cooling water pumps and associated auxiliaries;
- auxiliary cooling water pumps;
- condenser plant;
- auxiliary plant heat exchangers;
- cooling towers;
- raw water treatment plant;
- 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 cooling water pumps, condenser, etc.;
- *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 60050-91	*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 main cooling water system: System that provides cooling water to the main steam turbine condensers.

3.2.2 auxiliary cooling water system: System that provides cooling water to auxiliary plant heat exchangers. The water can be taken straight from the **main cooling water system** or can be provided by an intermediate recirculation system using "clean water", i.e. demineralised water, townwater, etc. which acts as an additional barrier to prevent contamination of the circuits to be cooled.

3.2.3 direct cooling water system: System that uses water taken directly from a natural source, i.e. sea, estuary, river or lake and which returns the heated water to the original source immediately after use, at a point minimising heat **recirculation**.

3.2.4 indirect cooling water system: System that continuously recirculates water through the system heat exchangers and uses cooling towers to cool the water prior to re-use.

3.2.5 coarse screens: Heavy duty wide mesh or vertical bar screens located at the inlet of the cooling water systems to prevent the passage of large debris, which could damage or block the cooling systems or components.

3.2.6 fine screens: Static or movable fine mesh screens located at the inlet of the cooling water systems which filter small particles and debris from the water to prevent accumulation and blockage of the cooling water systems and fouling of the heat exchanger surfaces (e.g. "drum", "band" or "smolt" screens).

3.2.7 pressure filters: Static or movable fine mesh screens on the discharge of the cooling water pumps which filter small particles from the water to prevent accumulation and blockage of the cooling water systems and fouling of the heat exchanger surfaces.

3.2.8 wash water systems: Water systems associated with **fine screens** to remove debris from the filter medium and transport it to a suitable collection point/disposal facility.

3.2.9 isolating valves: Valves provided to permit the isolation of cooling water system components or segregation of cooling water systems as necessary during operation and inspection/maintenance activities. These valves are either fully open or fully closed. Also referred to as "section valves".

3.2.10 control valves: Valves specifically installed to vary the water flowrate through the system or component. These are operated in a partially open position.

3.2.11 surge suppression equipment: Equipment installed to limit the maximal internal pressure generated during abnormal operation to a value within the design pressure rating of the cooling water systems. This equipment takes the form of controlled power closing valves, or air admission valves, or a surge tank, or chambers, or accumulators at appropriate locations within **main cooling water systems**. Alternatively, in intermediate cooling water systems the equipment may take the form of a surge tank or accumulator.

3.2.12 dewatering facilities: Access facilities or system connections which are used to drain the cooling system or pipe sections prior to inspection or preservation for long term storage.

3.2.13 venting equipment: Valve facilities installed at specific points in the cooling systems to allow the escape of air during priming or during operation.

3.2.14 hydraulic gradient: Physical height to which water would rise (or fall) in a tube connected to the system; in elevated sections where the **hydraulic gradient** is below atmospheric pressure, the system operates with a partial vacuum.

3.2.15 physical siphon height: Maximum allowable height of the cooling system above the **hydraulic gradient**; it is equal to the local atmospheric pressure less system saturation pressure.

3.2.16 siphon seal weir: Weir placed in the outlet pipe or culvert to prevent the **physical siphon height** being exceeded, to ensure that the cooling water system remains primed during normal operation and on shut-down.

3.2.17 recirculation: Transfer of hot discharge water to the cooling water inlet due to natural flow processes.

3.2.18 steady state hydraulic design: Process to determine the optimum physical configuration of the system and components with minimum pressure drop and steady continuous flow under all operating conditions. It also establishes pump delivery head and other hydraulic features, e.g. **siphon seal weir**, condenser top tube height, etc.

3.2.19 transient hydraulic design (surge study): Process of analysis of the cooling system during start-up, shut-down and abnormal operating conditions to confirm maximum internal pressures are within the system design rating, and establish need and characteristics of any **surge suppression equipment**.

3.2.20 penstock gates: Water tight barrier installed to isolate sections of cooling water systems, prior to dewatering for inspection/maintenance or preservation activities. Also referred to as "penstocks" or "bulkhead gates".

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.*

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:

- cooling water system type (**direct** or **indirect cooling water systems**);
- type and arrangement of screening and/or filter plant;