SLOVENSKI STANDARD
SIST EN 45510-5-1:2000

01-junij-2000

Guide for procurement of power station equipment - Part 5-1: Steam turbines

Guides for procurement of power station equipment -- Part 5-1: Steam turbines

Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke -- Teil 5-1: Dampfturbinen

Guide pour l'acquisition d'équipements destinés aux centrales de production d'électricité -- Partie 5-1: Turbines à vapeur

Ta slovenski standard je istoveten z: **EN 45510-5-1:1998**

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 45510-5-1:2000 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 45510-5-1

January 1998

ICS 27.040; 27.100

Descriptors: electric power station, turbines, steam engines, purchase, user supplier relations, invitation of tenders, specifications, technical writing

English version

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This European Standard was approved by CEN/CENELEC on 11 December 1997.

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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.

CEN/CENELEC members are the national standards bodies and national electrotechnical committees, respectively, of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN Central Secretariat:
rue de Stassart, 36 B-1050 Brussels

CENELEC Central Secretariat:
rue de Stassart, 35 B-1050 Brussels

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Foreword

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

This Guide for procurement has been prepared by the CEN/CENELEC Joint Task Force Power Engineering (JTFPE) of which the secretariat is held 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of an identical text or by endorsement, at the latest by July 1998, and conflicting national standards shall be withdrawn at the latest by July 1998.

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

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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 plant. 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****.*

Where paragraphs of "common clauses" are omitted, each paragraph omitted is indicated by the symbol *****.

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 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.

1 Scope

This standard gives guidance on writing the technical ***specification*** *for the procurement of* steam turbines driving generators *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:

- Reheat and non-reheat turbine
- Back-pressure turbine whose exhaust will be used for process heating
- Condensing turbine whose exhaust is directly connected to a condenser
- Mixed pressure turbine
- Regenerative cycle turbine
- Extraction turbine
- Combined cycle turbine

This Guide for Procurement of Steam Turbines has been prepared to be used with the existing European Standard EN 60045-1, it should, therefore, be read in addition and complementary to the European Standard.

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;*
- 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 50 (191)	*International electrotechnical vocabulary - Chapter 191: Dependability and quality of services*
IEC 1063	Acoustics - Measurement of airborne noise emitted by steam turbines and driven machines
EN 60045-1	Steam turbines, Part1 : Specifications

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 Annex A).*

3.2 Technical terms

The **purchaser** should indicate all technical terms which are not included in generally accepted engineering terminology. A list of such terms applicable to steam turbines is given in EN 60045-1.

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 steam turbine rotor 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 50 (191).*

3.3.11 ***reliability****: As defined in IEC 50 (191).*

3.3.12 ***maintainability****: As defined in IEC 50 (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, 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 the **purchaser** may specify:

a) the turbine type, e.g. reheat or non-reheat
b) method of load variation, e.g. constant pressure or sliding pressure operation.

*The **specification** may also define preferences for **equipment** types (or give information) regarding compatibility with existing equipment, if required.*

*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.*

4.5 Control and instrumentation

*The **specification** should define the general requirements for the control and instrumentation system, the level of operator intervention allowed or required, integration with other control systems, localised control loops, commonality and redundancy.*

> *NOTE: Guidance on the procurement of control and instrumentation systems for power stations, including advice on interfaces, can be found in EN 45510-8-1 (see Annex A).*

4.6 Electrical supplies and other services

*The **specification** should define the electrical supplies available for the operation of the **equipment**, their voltages and frequencies, with their range of variation, phases available and, where appropriate, the acceptable values of maximum load (kW) and short circuit level at each voltage level and the harmonic content. Requirements for terminals and terminal boxes should be stated; these should be to a recognised European or international standard.*

The **specification** should define the type and capacity of other services for the operation of the **equipment** such as compressed air and auxiliary steam.

4.7 Other interfaces

*The **specification** should define the interfaces with existing ancillary or new ancillary equipment to be supplied under separate contracts which interact directly with the **equipment**.* For example*:* civil works, cranage or temporary systems.

4.8 Project programme

*The **specification** should describe the overall programme and timescale in which the project is to be carried out. This may include the principal dates associated with tendering, placement of orders, access to **site**, start and completion of installation, commissioning*, trial run*, take-over and final acceptance.*

4.9 Equipment identification systems

*The **specification** may specify the equipment identification system for use during the operating life of the plant. If applicable to the **project**, a recognised European or international system should be used.*

5 Extent of supply

*The **specification** should define the extent of supply of all the **equipment**.*

This may include:-

Main plant equipment:	rotors, cylinders, valves, insulation, bearings and supports, turning gear, safety system
Accessories:	handling and maintenance system, local instrumentation
Spare parts:	blades, valve components, bearings, seals, gaskets
Site activities:	transport, storage, installation
Tests:	commissioning,trial run, performance tests
Documentation:	plant details, operation and maintenance.

*If the **purchaser** wishes to have a contract for control and instrumentation separate from the **equipment** supply contract, the **specification** may require the **supplier** to provide information on all the necessary interfaces (e.g.* all instrumentation tapping points and instruments provided within the extent of supply*). In addition provision may need to be made in the contract to ensure the availability of information necessary to allow a satisfactory control system to be obtained. For example, this may include a requirement for cooperation between the **purchaser** and **supplier**. Alternatively, the **specification** may define the technical information on **equipment** characteristics to be provided by the **supplier** and the programme for its delivery.*

*If the **purchaser** wishes to have a contract for electrical systems, electrical equipment, cables, etc. separate from the **equipment** supply contract, the **specification** may require the **supplier** to provide information on all the necessary interfaces (electrical loads, shaft heights, motor speeds and direction of rotation, terminal boxes, etc.). Provision may need to be made in the contract for cooperation between **purchaser** and **supplier** for system(s) to be developed or the **specification** may define the technical information to be provided by the **supplier** and the programme for its delivery. Similar provisions may be made for other services, etc.*

*The extent of supply may include training, technical and layout studies, requirements for cooperation with the **purchaser** and/or other suppliers and information on necessary interfaces, if any.*

*The **specification** should define the requirements with regard to weather protection, the surface finish (e.g. painting), thermal insulation, noise insulation or cladding, etc.*

*The **specification** may require that all parts of the **equipment** should be protected at all stages of delivery, storage and installation. Subsequent to final manufacture all **equipment** items should be protected against deterioration due to corrosion.*

*The **specification** may also define exclusions, for example civil works such as buildings, foundations, structures and equipment obtained separately by the **purchaser**.*

Where different **suppliers** are involved the **specification** should make provision for the satisfactory design of the shaft line(s), method of support, foundations and common services such as the lubricating oil system. This may be achieved by giving overall responsibility for these issues to one **supplier.** The **specification** should define the technical information to be provided to the responsible **supplier** by the other **suppliers**, the programme for its delivery and requirements for technical cooperation.

*The **specification** may indicate the acceptability of alternative offers being included in the **tender**.*

6 Terminal points

*The **specification** should define the main process input and output terminal points such that the function and performance of the **equipment** and its major components may be demonstrated to meet the requirements of the **purchaser**.* Examples of the terminal points for steam turbines are given in Annex B.

*The **specification** should also define terminal points for existing or proposed services, support structures or civil works. These may, for example, include ancillary services, control and instrumentation system, heating and ventilation systems, cranage, general access arrangements and fire fighting systems.*

*It may be necessary for design and analytical work to extend beyond the physical terminal points. The **specification** should define such requirements, if any.*

7 Operational requirements

7.1 Operating environment

*The **specification** should describe the operating environment in which the **equipment** will be required to function. Factors such as temperature, humidity, extent of weather protection, dust, vibration and electromagnetic environment (this may include both emission and immunity requirements) should be included for both normal and abnormal conditions. The type of installation, whether indoor or outdoor, should be stated.*