BRITISH STANDARD

BS EN
45510-1 : 1998

Guide for

Procurement of power station equipment

Part 1. Common clauses

The European Standard EN 45510-1 : 1997 has the status of a British Standard

ICS 27.100

National foreword

This British Standard is the English language version of EN 45510-1 : 1997 published by the European Committee for Standardization (CEN).

The UK participation in its preparation was entrusted to Technical Committee E/-/20, Power engineering steering committee, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled 'International Standards Correspondence Index', or by using the 'Find' facility of the BSI Standards Electronic Catalogue.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

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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 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of an identical text or by endorsement, at the latest by April 1998, and conflicting national standards shall be withdrawn at the latest by April 1998.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

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 convertors

Part 2-5: Electrical equipment — Motors

Part 2-6: Electrical equipment — Generators

Part 2-7: Electrical equipment — Switchgear and controlgear

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 desulfurization (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 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, sentences not in italics indicate the additional recommendations to be found in Guides specific to particular **equipment**.

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.

Contents

Introduction

This document is the first Part of a standard comprising a series of Guides for procurement (Guides) covering plant items, systems and equipment (**equipment**) that comprise a power station. The Guides were prepared to support the implementation of European Directives covering procurement in the utilities sector. Each Guide is complete in itself, but this Part 1 is designed to give an indication of the content of all of the Guides and to present those clauses which are independent of the **equipment** being purchased (the so called common clauses) as a single document. As such, this Part gives a general indication of how to prepare technical specifications for power station **equipment**. The particular issues referring to specific **equipment** items are not covered in this Part and the user can obtain these from the Parts covering the specific **equipment**. This Part 1 has the same structure and clause numbering as the Parts covering specific **equipment**. This Part also identifies where in the Guides the specific technical matters are covered. In some Guides, technical matters are included in additional positions and small changes have been made to the wording of the common clauses to make them relevant to the particular **equipment**. The printing of common clauses in italics and specific technical matters in upright type allows these differences to be identified. All the Guides are listed in the foreword.

1 Scope

*This standard gives guidance on writing the technical **specification** for the procurement of **equipment** 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 those matters that are common to all **equipment** (the common clauses). In specific Guides, the **equipment** covered by the Guide is defined here.

*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 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*

The specific guides give other relevant normative references here, if appropriate.

3 Definitions

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

3.1 Organizational terms

3.1.1 *purchaser*

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

3.1.2 *supplier*

*Person or **organization** 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 **organization** 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 **organizational** terms may be found in EN ISO 8402 (see annex A).*

3.2 Technical terms

In the specific Guides, the technical terms used in the Guide are defined here.

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. The specific Guides give examples of significant components here, if appropriate.*

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 organization 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 organizations will be appointed to carry out all or part of this function. The **enquiry** should define all organizational 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.*

The specific Guides give relevant examples of **equipment** types or layouts here, if appropriate.

*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 recognized European or international standard.*

The specific Guides give further recommendations on other services required for the operation of the **equipment** here, if appropriate.

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**.*

The specific Guides give examples of such interfaces here, if appropriate.

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 **tenderi**ng, placement of orders, access to **site**, start and completion of installation, commissioning, 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 recognized European or international system should be used.*

The specific Guides give further recommendations on identification systems here, if appropriate.

5 Extent of supply

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

The specific Guides give examples of items for inclusion in the supply here.

*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 (the specific Guides give examples of relevant interfaces here, if appropriate). 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****.*

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 (the specific Guides give examples of major components here, if appropriate) may be demonstrated to meet the requirements of the* ***purchaser****.*

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 delivery limits. 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.*

Where relevant, the **specification** *should also state the policy in the following operational areas:*

- *– risks e.g. loss of electrical supplies, loss of water supplies or cooling systems;*
- *– obligations e.g. operational staff shift patterns;*
- *– restrictions e.g. process waste disposal.*

7.2 Manning levels

The ***specification*** *should define the power station manning levels where they may influence the* ***equipment*** *supply.*

The specific Guides give further recommendations on manning levels here, if appropriate.

7.3 Normal operation

The ***specification*** *should define in broad terms the expected normal operation of the power station and of the* ***equipment****.*

The specific Guides give further recommendations on normal operation here, if appropriate.

7.4 Operating hours

The ***specification*** *should define the total life time required of the power station and the* ***equipment*** *(e.g. hours) and the required* ***operating period*** *of the* ***equipment****.*

The specific Guides give further recommendations on operating hours here, if appropriate.

7.5 Start-up and shut-down

The specific Guides give relevant recommendations on start-up and shut-down cycles and types here.

The ***specification*** *should define the expected changeover strategy where standby* ***equipment*** *or bypasses are provided.*

The specific Guides give further recommendations on change over strategy here, if appropriate.

7.6 Abnormal conditions

The ***specification*** *should provide information on the known abnormal conditions to which the* ***equipment*** *might be subjected. The* ***supplier*** *should take these into account in the design or selection of components/materials.*

The specific Guides give further relevant recommendations on abnormal conditions here, if appropriate.

7.7 Further operational requirements

Some of the specific Guides give further recommendations on **equipment** related operational requirements such as load changes, out of service conditions, extreme conditions and accidental operating conditions, etc. here, as appropriate.

8 Life expectancy

8.1 Design life

8.1.1 *General*

*This should be a specific period which takes into account the anticipated operating regime and recommended maintenance and will broadly equate to the stated operating hours (see **7.4**).*

*The **specification** should define the **design life** of components which may be subject to periodic replacement.*

The specific Guides give further recommendations on ***design life*** here, if appropriate.

*The **supplier** should define limitations on **equipment** life, if any, and these should be included in the **tender** evaluation process.*

8.1.2 *Number of start-up and shut-down cycles*

*The **specification** should include an estimate of the number of cycles to which the **equipment** will be subjected.*

The specific Guides give further recommendations on the number of start-up and shut-down cycles here, if appropriate.

8.1.3 *Equipment for monitoring remaining life*

*The **specification** may request proposals for monitoring the remaining life of components which are subject to fatigue, wear, erosion and/or corrosion. In some cases specific requirements may be stated.*

The specific Guides give further recommendations on monitoring remaining life here, if appropriate.

8.2 Components requiring periodic maintenance

*The **specification** should request the **supplier** to provide a schedule of components which require periodic maintenance or replacement. This should include the frequency of these operations. This schedule should include estimates of maintenance man-hours and cost of components. The **supplier** should identify those maintenance replacement operations which require shut-down of the process more frequently than the planned maintenance shut-downs.*

9 Performance requirements

9.1 Duty

*The **specification** should define the **performance** targets for the **equipment** at defined operating points and at other defined conditions. These may include efficiency and margins at full load operation and **availability**. The **specification** may also define the flexibility requirements over the full range of operating conditions.*

The specific Guides give further relevant recommendations on duty here, if appropriate.

9.2 Performance

*The **specification** may define the operating points and other defined conditions at which the **equipment performance** requirements are to be demonstrated immediately after commissioning and/or at other points in the life of the **equipment**.*

The specific Guides give further recommendations on **performance** here, if appropriate.

*NOTE. Performance tests are sometimes conducted off **site** and may be carried out at conditions different from the operating point. The results may require scaling according to agreed rules.*

9.3 Equipment margins

*The **specification** should identify required **equipment margins**.*

The specific Guides give further recommendations on **equipment margins** here, if appropriate.

9.4 Availability

*The **specification** may specify **availability** requirements. In order to demonstrate conformity with these requirements, the **specification** may request the **supplier** to use data on **availability**, **reliability** and **maintainability** to carry out an analysis to show that the target **availability** will be met.*

The specific Guides give further recommendations on **availability**, **reliability** and **maintainability** here, if appropriate.

9.5 Levels of component redundancy

*The **specification** may define requirements for component redundancy.*

The specific Guides give further recommendations on component redundancy here, if appropriate.

These requirements may provide either additional operational security or cover extremes of operating conditions.

The specific Guides give relevant examples of such operating conditions here, if appropriate.

*The **supplier** should only use these additional plant components in meeting **performance** requirements in the conditions defined in the specification.*

*If the **specification** does not specify levels of component redundancy, the **purchaser** may ask the **supplier** to demonstrate that the level of redundancy included is adequate to meet the **availability** requirements.*

9.6 Further performance requirements

Some of the specific Guides give further recommendations on **equipment** related **performance** requirements such as efficiency, operational flexibility, etc. here, as appropriate.

10 Design and fabrication

10.1 Specific equipment features

10.1.1 *Detailed features*

The specific Guides give a number of subclauses here giving recommendations on the detailed features relevant to the **equipment**, as appropriate.

10.1.2 *Maintenance features*

The specific Guides give recommendations on maintenance features here, if appropriate.

10.1.3 *Measuring and sampling points*

*The **specification** may define where measuring and sampling points for tests during the lifetime of the **equipment** should be provided.*

*The **specification** should indicate the type of* **performance** *tests (see clause **17**) and routine tests to be carried out, but the **supplier** should use experience of similar **equipment** supplied to ensure that adequate provision is made for testing in the design of the **equipment**.*

10.1.4 *Legislation measurement points*

*The **specification** should normally define the legislation and codes of practice for which operating data are required and the provision for measurement and/or sampling points to allow these data to be obtained.*

NOTE. Emissions, noise, vibration and temperature measurement are frequently required for this purpose.

10.2 Design justification

*The **supplier** should provide **equipment** descriptions as part of the justification of selection, description of the basic principles employed, extent of extrapolation, degree of innovation, references to the options considered, economic implications and conformity with the **purchaser's** requirements. In addition, the **specification** may define requirements for justification of specific design features.*

The specific Guides give further recommendations on design justification here, if appropriate.

10.3 Material selection

*The materials of construction should normally be selected by the **supplier**. The **specification** may, however, define the preferred materials selection and request an alternative offer using these materials.*

*Where the **supplier** has made the selection of materials, the **supplier** should provide justification for the selection of materials and proposed fabrication methods. This should be done with reference to operating conditions, **life expectancy**, inspection strategy, maintenance methods, final disposal and economic factors.*

*The material selection by the **supplier** should also take into account the potential material degradation modes during manufacturing, storage, assembly, testing, start-up, operation and shut-down periods.*

10.4 Safety

10.4.1 *General*

*The **equipment** should comply with international, national and local safety requirements during installation and operation. The **supplier's** personnel on **site** should also comply with such requirements.*

The specific Guides give further relevant recommendations on safety here, if appropriate.

10.4.2 *Equipment protection*

*The **specification** may request information regarding the measures taken to confine the **equipment** within safe operating limits, prevention of fire, protection against lightning, protection against rain water ingress, etc.*

The specific Guides give further recommendations on **equipment** protection here, if appropriate.

10.5 Interchangeability

*The **purchaser** may wish to secure interchangeability or commonality (use of identical components) within the **site** or between **site**s operated by the **purchaser**. This may be achieved either by specifying the type of components or supplying the components for incorporation into the plant.*

The specific Guides give examples of relevant interchangeability features here, if appropriate.

*NOTE. If the **purchaser** wishes to specify a particular **supplier** the requirements of relevant European and national legislation should be noted.*

10.6 Fabrication methods

*Welding, electrical connections, tube expansion, plate forming, heat treatment etc. should be in accordance with specified standards (see **13.2**). The **specification** may include supplementary requirements for qualification of personnel, non-destructive testing, etc.*

The specific Guides give further recommendations on fabrication methods here, if appropriate.

11 Maintenance requirements

11.1 Planned maintenance

*Where relevant, the **specification** should define the frequency and duration of major and intermediate shut-downs for planned maintenance and indicate on-load maintenance requirements.*

11.2 Personnel safety

*The **specification** should identify the procedures that will be employed for ensuring safety of personnel during on-load and off-load maintenance. This should include electrical isolation, the extent of isolation of work areas from the operating plant* (the specific Guides give examples of safety features here, if appropriate) *and the permit to work system.*

11.3 Requirements for access

*The **specification** should define whether permanent access is required for all operation and maintenance of the **equipment** or whether temporary staging or scaffolding is acceptable for specific operational and maintenance activities. Where permanent platforms are to be installed, the **specification** should define the maximum distance of any point on the platform to stairs, the requirement for landings on the stairs, if any, and whether it is permissible for platforms to be closed at one end. Requirements for platform width, load carrying capacity, handrails, etc. should be stated. Where possible, these requirements should comply to European or International Standards.*

11.4 Lifting requirements

*The **specification** should define in the extent of supply (see clause **5**) whether permanent lifting devices are to be installed and where mobile cranes, fork lift trucks, etc. are permitted for some operations. The **specification** should define whether the permanent **equipment** should be provided by the **supplier** and, if not, the information exchange required for its design and installation.*

All items likely to be required to be removed for maintenance should be provided with appropriate lifting points.

11.5 Special tools

*The **specification** should request the **supplier** to identify where special tools are required for operation and maintenance and to recommend the number to be supplied.*

*The **specification** should define whether special tools intended for long term use may be employed during installation.*

11.6 Test equipment

*The **specification** should request the **supplier** to identify test **equipment** required for routine testing of the **equipment**. If specific, this may be offered by the **supplier** as a separate item in the supply.*

11.7 Spare parts strategy

*The **specification** should request the **supplier** to make recommendations for holdings of spare parts based on estimated replacement rates and delivery times.*

*The **purchaser** may modify the **suppliers** recommendation on the basis of understanding of the maintenance needs of the **equipment** and possible effects on **availability**.*

*Where the **enquiry** includes **availability** targets, the **supplier** should state the estimated holdings and delivery times of replacement items required to ensure that this **availability** is achieved.*

*The **specification** should describe the conditions under which spare parts will be stored. Spare parts should be protected and preserved in a manner appropriate to these storage conditions and clearly marked with reference numbers.*

The specific Guides give further relevant recommendations on spare parts here, if appropriate.

11.8 Special precautions

*The **supplier** should be asked to identify special precautions required during maintenance operations.*

The specific Guides give examples of relevant special precautions here, if appropriate.

12 Technical documentation

12.1 Tender documentation

*The **specification** should request **tenderer**s to provide sufficient information in the **tender** to:*

- *– facilitate system studies;*
- *– demonstrate that the **tender** matches the **purchaser's** requirements set out in the **enquiry**;*
- *– allow evaluation by the **purchaser**.*

This information may include design parameters, drawings, schedules, schematic functional and instrumentation diagrams, type test certification and reference installations.

The specific Guides give further recommendations on **tender** documentation here, if appropriate.

12.2 Contract documentation

*The **specification** should define a list of documents to be provided by the **supplier**. This should include a definition of when or at what stage the documents should be made available. In particular the **supplier** should provide all drawings giving information on interfaces and terminal points.*

*The **specification** may request general layout drawings, detailed arrangement drawings and assembly drawings.*

*The **specification** may request supporting information regarding the construction programme, major civil works, design submissions, design studies, construction studies, **reliability** studies, test procedures, commissioning procedures, operating and maintenance instructions and quality control information.*

*The **specification** may specify the general layout of all documents (to be transmitted or made available) and provide specific schedules for completion by the **supplier**.*

*The **specification** should define the method of data transfer (software compatibility), its form (paper, microfiche, electronic), the addresses to which they should be sent, the number of copies and status notation (i.e. provisional, definitive, final).*

The specific Guides give further recommendations on contract documentation here, if appropriate.

13 Applicable legislation, regulations, standards and further requirements

13.1 Legislation and regulations

*The international, national and local legislation and regulations having significant influence on design of the **equipment** should be identified in the **enquiry**. These may include health and safety requirements, environmental protection and waste disposal and planning constraints. The **enquiry** should also identify specific construction features and **site** activities covered by local legislation.*

*The **enquiry** should state that such information is not necessarily exhaustive and does not modify the legal obligations of the **supplier**.*

13.2 Standards

*The **specification** should identify those standards whose use is obligatory and other standards or codes with which the **equipment** should comply, if any.*

*The **purchaser** may ask the **tenderer** to define other standards or codes, in addition to those identified in the **specification**, applicable to the **tender**.*

13.3 Further requirements

*The **purchaser's** own guidelines for design, manufacture and construction may be specified.*

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

*The **specification** should define the units of measurement to be employed in the **tender** and the contract.*

14 Evaluation criteria

14.1 General

NOTE. European legislation designed to promote the Single Market identifies some criteria on which the contracting parties may base the award of contracts. Provision is also made for auditing evaluations.

*The **enquiry** should advise the **tenderer** of the method of **tender** evaluation.*

*With the complexity of **equipment** covered by this Guide, the most economically advantageous **tender** evaluation will normally be applied.*

Criteria, such as the following, should be considered, depending on the contract in question:

- *delivery or completion date;*
- *running costs;*
- *cost-effectiveness;*
- *quality;*
- *aesthetic and functional characteristics;*
- *technical merit;*
- *after-sales service and technical assistance;*
- *commitments with regard to spare parts;*
- *security of supplies;*
- *price.*

14.2 Technical criteria

*The **enquiry** should define the method of incorporation of the following factors, where appropriate, in the evaluation.*

14.2.1 *Quality*

***Availability**, **reliability** and **maintainability** are a measure of total quality and the **purchaser** may evaluate the **tender** in these terms.*

14.2.2 *Functional characteristics*

*This may be based not only on information declared by the **supplier** but also on independent information obtained by the **purchaser**. The evaluation may take into account the **performance** requirements given in clause **9** including plant capacity, **equipment margins**, flexibility, **maintainability**, operational security and ease of operation taking into account the anticipated number of operators and maintenance staff.*

14.2.3 *Technical merit*

*Where the **specification** calls for **proven equipment**, the demonstration should be in the form of either documentation, which may be audited, and/or **site** visits. The **purchaser** may evaluate the **tender** in terms of whether the **equipment** is novel or has been used extensively for similar applications.*

14.2.4 *Running costs*

The main technical factors for running costs are absorbed power and consumables at defined operating conditions and additional outages, where off load maintenance is required between scheduled outages.

14.2.5 *Technical assistance*

*The **purchaser** may assess the technical competence and resources at the disposal of the **supplier** and the **supplier's** record of technical fulfilment of similar contracts.*

15 Quality measures

15.1 General

*The **enquiry** may specify minimum requirements relating to the quality system of the **supplier**. The **enquiry** may refer to the European standards series EN ISO 9000 and particularly EN ISO 9001, which covers design, development, production, installation and servicing and/or to EN ISO 9002, which does not cover design or development, as appropriate.*

*The **enquiry** should define the audit requirements between the parties, if applicable. If there are any, the audit programme should be agreed between the **purchaser** and the **supplier** and adequate access should be given by the **supplier** for audit.*

15.2 Approvals procedure

*The **enquiry** may define the requirements for submission of drawings, calculations and manufacturing procedures for approval. The **supplier** may submit a quality plan (or equivalent document) for the supply and the **enquiry** may indicate hold points, beyond which work may not be continued without informing or obtaining the agreement of the **purchaser**.*

*The **supplier** should give adequate notice to the **purchaser** when hold points are reached. Adequate time should be allowed for the **purchaser** to examine submissions and the notification by the **purchaser** of approval or rejection should be in sufficient time reasonably to avoid delays in the **project**.*

15.3 Inspection requirements

*The **enquiry** should state the inspection requirements, if any. In that case, the inspection programme should be agreed between the **purchaser** and **supplier** and adequate access to carry out inspection should be given by the **supplier**.*

15.4 Non-conformity

*The **enquiry** should define policy with respect to non-conformity and rectification of defects.*

16 Site factors

16.1 Access

*The **enquiry** should define the location of immediate access to the **site** and dimensional, time, weight and other restrictions.*

*The **enquiry** may indicate (subject to verification) where access from the main rail, road and water transport systems is available and define the dimensions, time, weight and other restrictions for transport from these locations.*

16.2 Facilities

16.2.1 *General*

*The **enquiry** should define the facilities to be made available to the **supplier** at the **site** during installation and commissioning of the **equipment**. Such facilities may include the following:*

16.2.2 *Accommodation*

*If the **purchaser** provides accommodation on **site** for the **suppliers** personnel, the extent of this accommodation, its location and the facilities provided should be stated in the **enquiry**, for example, **site** huts, heating, lighting, telephones, car parking, first aid, toilets and canteen.*

16.2.3 *Site services*

*The **enquiry** should state the location and conditions of use of **site** services, such as connections for electricity, water and other services provided for **site** construction. The supply voltages and maximum capacity of the supplies should be stated. Information on the capacity of lifting **equipment**, anchorage points, etc. should be given where appropriate, together with other **site equipment** which is available for use by the **supplier**.*

16.2.4 *Disposal of waste*

*The **enquiry** should identify **site** waste disposal requirements and disposal points and provisions for maintenance of cleanliness in working areas.*

16.2.5 *Storage and handling*

*The **enquiry** should identify the areas where the **supplier** may store materials, components, etc. and provide information on storage conditions.*

16.2.6 *Working hours*

*The **enquiry** should identify any **site** specific restrictions placed on the times of working, for example normal allowable hours of work, week-end working, etc.*

16.3 Site specific requirements

*The **enquiry** should state **site** specific requirements for installation and commissioning. These may include:*

*– sequence of works that may be necessary for the installation of other **equipment** or the continued operation of plant, particularly in cases of retrofit operations;*

*– detailed plans for tests of integration of **equipment**;*

– components and systems which have to be operable for commissioning of other plant;

– definition of the commissioning process and the necessary documentation required.

17 Verification of specified performance

17.1 General

*Tests will, in general, be required on the **equipment** at various stages of the contract to verify its **performance**. The **specification** should define the tests required and their conditions and **organization**. This may include definition of the provision of **site** services, personnel, etc.*

17.2 Works tests

*Tests during manufacture may include type tests, special tests and routine tests. Test requirements are identified in the reference standards, where these exist, with special tests being carried out only when required by the **specification**.*

*The **specification** should define the tests to be carried out during the manufacturing process for the verification of **performance** and the **supplier** should give adequate notice to allow witnessing of the tests.*

Repetition of type tests is usually not required.

The specific Guides give a note on works tests here, if appropriate.

*The **supplier** should recognize the need for testing in the programme of work and define when and how (i.e. what testing methods or standards) the tests are to be conducted.*

17.3 Tests during installation and commissioning

*The **specification** should define the requirements (methods and criteria) for tests during installation and commissioning together with a list of the testing standards.*

*The test **equipment** required for demonstration of design requirements should be agreed between the **purchaser** and **supplier**.*

*The **supplier** should provide a schedule of tests for components and systems during the installation and commissioning period. This should be agreed by the **purchaser**. The necessary services to allow the tests to be carried out should be agreed between the parties.*

The specific Guides give further relevant recommendations on tests during installation and commissioning here, if appropriate.

*NOTE. The contractual consequences of the outcome of the tests during installation and commissioning should be stated in the **enquiry**, where appropriate.*

17.4 Technical conditions for trial run

*Upon initial start up of the **equipment**, the date of which should be agreed with the **purchaser**, the **supplier** should carry out the continuous trial run if specified. The purpose of the trial run is to prove the functional capability of the **equipment** and to show that it will, with high probability meet its **performance** targets. During the run, therefore, all significant components should be in operation.*

*The **specification** may define in what circumstances breakdown of a significant component will constitute an interruption of the trial, with the start of operation after reinstatement of the component becoming the trial commencement. The **purchaser** may also give concessions criteria for breakdowns of a very short period, for example simply extending the period of the trial by the outage time. The **purchaser** may consider that multiple breakdowns occurring during the trial run are unacceptable and therefore define the circumstances in which concessions will be withdrawn, for example giving the number and duration of breakdowns that may not be exceeded.*

*The conditions that have to be met for the successful completion of the trial run should be defined in the **specification**. These may include fulfilment of minimum **performance** requirements, fulfilment of legal and safety requirements applicable to the **site** and obligations to make minor corrections and changes and rectify minor defects, etc. within a specified time.*

*NOTE. The contractual consequences of the outcome of the trial run should be stated in the **enquiry**, where appropriate.*

17.5 Functional and performance tests

*The **specification** should define the minimum requirements for both functional and **performance** tests, the applicable standards, if any, and the criteria against which the test results will be assessed. The **supplier** should provide a schedule of the tests to be conducted for approval by the **purchaser** who should be given adequate notice to allow witnessing of the tests.*

*Functional tests are carried out to demonstrate the ability of the **equipment** to satisfy the operational requirements, such as automatic start-up and shut-down, modulating capabilities and subsystem suitability.*

The specific Guides give further relevant recommendations on functional tests here, if appropriate.

*Performance tests are conducted at agreed predefined operating points. Where appropriate, the **supplier** should provide correction curves to allow the interpretation of results.*

*In addition to the **performance** tests, the **specification** may also define a period of operation during which additional tests may be required.*

The specific Guides give examples of relevant additional tests here, if appropriate.

*The **specification** may also define a period during which the **equipment** should operate to specified levels of, for example, target efficiency and/or target **availability** (the specific Guides give other target **performance** parameters here such as target total absorbed power and usage of consumables, if appropriate). The nature and frequency of testing to verify the relevant requirements, if applicable, should be defined in the **specification**. The **specification** should define the level of maintenance that may be carried out before tests.*

*NOTE. The contractual consequences of the outcome of **performance** tests should be stated in the **enquiry**, where appropriate.*

Annex A (informative)
Bibliography

EN ISO 8402 *Quality management and quality assurance — Vocabulary* (ISO 8402 : 1994)

EN 45510-8-1 *Guide for procurement of power station equipment — Control and instrumentation*

The specific Guides give relevant references in the bibliography.

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