INTERNATIONAL STANDARD

IEC 62337

First edition
2006-11

Commissioning of electrical, instrumentation and control systems in the process industry – Specific phases and milestones

Reference number
IEC 62337:2006(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE U

For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSIONING OF ELECTRICAL, INSTRUMENTATION AND CONTROL SYSTEMS IN THE PROCESS INDUSTRY – SPECIFIC PHASES AND MILESTONES

FOREWORD

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International Standard IEC 62337 has been prepared by IEC technical committee 65: Industrial-process measurement and control.

This standard cancels and replaces IEC/PAS 62337 published in 2002. This first edition constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
65/384/FDIS	65/390/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

There is an increasing trend in the process industry to award the construction of whole plants to contractors on a lump-sum turnkey or similar commercial basis. Experience has shown that both the process industry (hereinafter called “the owner”) and the contractor have long and expensive discussions to lay down unambiguously the scope of activities to be taken by the contractor and the owner and their responsibilities to achieve the handover of the plant.

This standard should lead to an improvement and acceleration of the negotiation phase and to a mutual understanding about the scope of activities of each party.

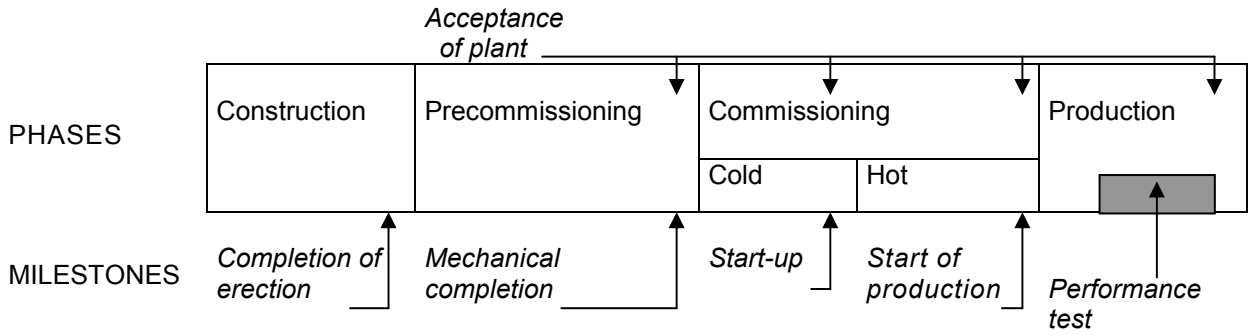
For application in the pharmaceutical or other highly specialized industries, additional guidelines (for example, Good Automated Manufacturing Practice (GAMP)), definitions and stipulations should apply in accordance with existing standards, for example, for GMP Compliance 21 CFR (FDA) and the Standard Operating Procedure of the European Medicines Agency (SOP/INSP/2003).

COMMISSIONING OF ELECTRICAL, INSTRUMENTATION AND CONTROL SYSTEMS IN THE PROCESS INDUSTRY – SPECIFIC PHASES AND MILESTONES

1 Scope

This International Standard defines specific phases and milestones (see Figure 1) in the commissioning of electrical, instrumentation and control systems in the process industry. By way of example, it describes activities following the "completion-of-erection" milestone of the project and prior to the "acceptance-of-the-plant" phase by the owner. Such activities need to be adapted for each type of process/plant concerned.

NOTE This standard assumes that the "acceptance-of-the-plant" milestone will occur after the performance test. If there is a reduced scope, this document should be adapted accordingly.



NOTE Construction and precommissioning activities could be overlapping.

Figure 1 – Definition of phases and milestones

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
precommissioning
phase during which the activities of non-operating adjustments, cold alignment checks, cleaning, and testing of machinery take place

NOTE Refer to Annex B for the detailed activities.

2.2
mechanical completion
milestone which is achieved when the plant, or any part thereof, has been erected and tested in accordance with drawings, specifications, instructions, and applicable codes and regulations to the extent necessary to permit cold commissioning

NOTE This includes completion of all necessary electrical and instrumentation work. This is a milestone marking the end of the precommissioning activities.

2.3
cold commissioning
phase during which the activities associated with the testing and operation of equipment or facilities using test media such as water or inert substances, prior to introducing any chemical in the system, take place

2.4
start-up
milestone marking the end of cold commissioning

NOTE At this stage, the operating range of every instrument loop should already be adjusted to reflect the actual working condition.

2.5
hot commissioning
phase during which the activities associated with the testing and operation of equipment or facilities using the actual process chemical, prior to making an actual production run, take place

2.6
start of production
milestone marking the end of hot commissioning

NOTE At this stage, the plant is ready for full and continuous operation.

2.7
performance test
milestone at which time the production plant runs to its design capacity

NOTE This test, carried out by the owner's personnel with the help and supervision of the contractor, serves to demonstrate the contractor's process performance and consumption guarantees as specified in the contract.

2.8
acceptance of plant
milestone in which the formal turnover of the plant from the contractor to the owner is carried out

NOTE At this stage, the contractor is relieved from any obligation, with the exception of defect liability and any other outstanding obligations which are part of the contract. The owner resumes full responsibility for running and maintaining the plant.

2.9
owner
company that hired a contractor to build a plant

2.10
contractor
company which is hired by the owner to design and build a plant

NOTE This company is responsible for all activities as described in a separate contract including, for example, the engineering design, procurement, erection of the plant as well as the implementation of all tests and acceptances that are necessary to deliver a serviceable plant. This company may also be responsible for training the owner's production as well as maintenance personnel on plant operation.

2.11
licenser
company or individual that has a process know-how which willingly provides the owner with the technology to be used in the construction, operation and maintenance of a plant, or part of the process in such a plant

2.12
vendor
manufacturer or distributor of a piece of equipment/instrument/package unit

NOTE The vendor is the expert for proper installation as well as operation of the equipment/ instrument/ package unit.

2.13
process industry
industry that uses chemical reactions, separations, or mixing techniques in order to create new products, modify existing products or treat waste and includes the following types of industries: chemical, petrochemical, waste treatment, paper, cement, etc. It does not include such industries as equipment/machine manufacturing or other similar industries. Industries which are subject to special requirements and or validation, etc. are also not included

3 General preparations before acceptance of plant

The following items shall be completed in accordance with the responsibilities as defined within the contract.

a) Documents

The documents agreed upon according to Clause A.1 shall be issued by the contractor to the owner.

b) Manpower mobilization plan

The agreed amount of manpower required both from the owner and from the contractor, including their qualification and their availability, shall be available. The organization of personnel during precommissioning, commissioning and performance testing shall be established.

c) Equipment and tools

The agreed required tools and equipment to be supplied by the owner or the contractor shall be available.

d) Raw materials and utilities

For the agreed supply of raw materials and utilities, the contractor and the owner shall agree upon a detailed time schedule and the conditions for supply within a reasonable time before the completion of erection.

e) Catalysts and consumables

For the agreed supply of required catalysts, lubricants, chemicals and other consumables, the contractor and the owner shall agree upon a detailed time schedule and conditions within a reasonable time before the completion of erection.

4 Completion of erection

4.1 Mechanical checks and tests

After erection of the plant, of each piece of equipment, facility or discrete part of the plant, mechanical checks and tests shall be carried out by the contractor.

The mechanical checks and tests shall verify that

a) the plant is erected in accordance with the piping and instrument diagram, construction drawings and the vendor's drawings;

b) the equipment is installed and mechanically functions in accordance with the project specifications;

c) applicable codes, as listed in the project specifications, are followed for materials and workmanship.

Items such as painting, thermal insulation and final clean-up which would not affect the operation or safety of the plant could be excluded. All these items shall be listed and completed after precommissioning or commissioning within a mutually agreed schedule between the contractor and the owner but before the acceptance of the plant.

4.2 Procedure

The following shall apply.

a) The contractor shall prepare and maintain on-site test forms and records which shall include the following information:
   – description of the type of test or check;
   – date and time of test or check;
   – identification of equipment and facilities;
   – test pressure if applicable, test data and results, including remarks, if any;
   – signature of the owner's personnel witnessing the data recorded, if required.

b) Check, test and records thereof shall be carried out by the contractor's personnel.

   Wherever the owner's witness or attesting for the check or test is required, the owner's personnel shall attend such check and test. For this purpose, the contractor shall keep the owner informed of the day-to-day test-plan schedule. The test-plan schedule should be constantly revised to reflect the actual progress of the work and test.

c) Any items found incomplete or requiring repair or adjustment shall be marked as such on a separate punch list and reported by the contractor to the owner's and the contractor's personnel in charge of the relevant construction area. The test records for items in the punch list will be left blank until the problem has been corrected.

d) The contractor shall expedite and follow up the termination of all incomplete, repaired or adjusted work items in the punch list and shall keep these expediting records up to date.

e) Checking procedures shall be repeated until all the items on the checklist are cleared.

f) At the completion of each test, the owner shall certify on the test records that the test has been satisfactory; otherwise, the contractor shall repeat the tests. Upon satisfactory completion of the re-test, re-certification by the owner shall be made accordingly.

g) A complete set of test records shall be handed over to the owner on completion and, at this date, the completion of the erection shall be considered as achieved.

5 Precommissioning (mechanical completion)

5.1 General

After completion of the erection, the precommissioning activities listed in the procedure defined in Annex B and the final steps listed in 5.2 shall be carried out in accordance with the contract to make the plant mechanically complete and ready for commissioning.

The documents to be utilized are listed in Annex A.

5.2 Procedure

a) The contractor's personnel responsible for the checks, tests and recording of results on the completion of erection shall be responsible for the completion of any remaining work, adjustments and repairs of the equipment marked on the test records during precommissioning and for the maintenance of appropriate records.

b) The contractor's personnel appointed for commissioning should also participate in the precommissioning work to verify the satisfactory performance of the plant.

c) During the checks and tests, the contractor's personnel are responsible for training the owner's personnel on the operation of the plant, as defined within the contract.

d) The owner or the contractor shall furnish operating and maintenance personnel, according to the manpower mobilization plan, to perform those parts of the precommissioning work, which are agreed to be the owner's responsibility in accordance with Annex D.

e) The contractor shall ensure that his personnel work in close conjunction with the owner's personnel by providing supervision and advice where necessary.

f) The contractor shall prepare detailed procedures for each precommissioning activity listed in Annex B. Procedures shall be updated or added by the contractor as necessary to support any additional work.

g) Mechanical completion shall be confirmed on each part/section/unit/facility of the plant individually.

h) A detailed schedule for the precommissioning of each part/section/unit/facility shall be submitted by the contractor to the owner before completion of the erection.

i) Upon completion of the precommissioning activities of each part/section/unit/facility of the plant, the contractor shall submit to the owner a written notice of mechanical completion, which shall include

   – identity of a part/section/unit/facility of the plant considered mechanically complete;
   – a copy of all relevant completed test reports;
   – the date on which the completion of the tests was achieved;
   – a checklist;
   – a request for acceptance of a mechanical completion certificate in respect of that part/section/unit/facility.

j) Within an agreed period from the date of receipt of the contractor's written notice, the owner shall

   – in the case of acceptance:

     sign the issued mechanical completion certificate similar to the form given in Annex C;

     or

   – in the case of objection:

     submit a rejection statement listing the remaining items to be completed or defects or deficiencies to be corrected before the mechanical completion status can be accepted.

k) When the owner rejects the contractor's notice, the contractor shall take any necessary action to complete or correct the items marked and give the owner a subsequent notice of mechanical completion.

l) The owner shall sign either a completion certificate or shall issue a rejection statement within an agreed period after the date of any subsequent notice of mechanical completion.

m) Upon acceptance of the mechanical completion certificate of the last part/section/ unit/facility of the plant by the owner, the owner shall, within an agreed period, accept the relevant issued mechanical completion certificate for the plant similar to the form given in Annex C.

6 Commissioning

6.1 General

After the owner has issued a mechanical completion certificate for a part/section/ unit/facility of the plant, the commissioning activities listed in 6.2 shall be carried out as far as possible to enable the start-up and/or start of production.

The documents to be used are listed in Annex A.

6.2 Procedure

a) Commissioning shall be carried out in the following sequence:

   – warming up or cooling down;
   – initial running using test media such as water or other inert substances;

- operability adjustment;
- feeding in;
- stable operation;
- loading up to the design capacity;
- final adjustment.

b) At all stages of the commissioning sequence, the plant shall be operated at optimum and in safe plant conditions. To ensure this, the contractor may make adjustments to the condition indicated in the operating manual and process flow diagrams as necessary.

c) The contractor shall specify for each discrete part of the plant the operational data to be recorded and the manner in which the data is to be taken.

d) All the operating data shall be recorded by the owner on the predefined forms to be mutually agreed upon. A copy of the operating log and analytical data from the initial operation through to the completion of the performance test shall be made available by the owner to the contractor for evaluation.

e) When any part of the plant is pressurized or placed in hot alignment, regular checking on thermal expansion, vibration, noise and the like shall be performed by the contractor.

f) The detailed methods and procedures for each of the commissioning tests and operations shall be specified by the contractor in the operating manual or issued to the owner as additional work procedures.

g) The contractor shall arrange for the presence of the vendor's and the licenser's representatives at the site to assist the contractor's personnel, wherever necessary.

h) The contractor's construction personnel appointed for precommissioning should remain on site to carry out any necessary adjustment and remedial work.

i) All changes and modifications applied during commissioning shall be documented.

7 Performance test and acceptance of plant

7.1 General

After the initial operation of the plant, a performance test shall be carried out to demonstrate the contractor's process performance and consumption guarantees specified in the contract.

a) Detailed test procedure

The contractor shall propose detailed performance test procedures within an agreed period of time and the contractor and the owner shall agree upon the test procedures prior to starting the performance test based on the test procedure specified in the contract.

b) Type of operation

Unless otherwise specified in the contract, the performance test will be limited to one type of operation, raw material and one operation mode.

c) Measurement

The instrument, apparatus and method of measuring of the quantity and quality of individual media, consumption, etc. should be specified and used to measure such streams in relation to the process performance and consumption guarantees based on the measurement specifications described in the contract.

The measurement tolerances, loss corrections, performance for sampling methods and analytical procedures shall be specified on a project-related basis.

d) Performance test schedule

The performance test schedule shall be determined with due regard to the actual progress of the work and the condition of the plant.

7.2 Conditions for commencement of performance test

The performance test will be commenced when the following conditions are satisfied from the viewpoint of the process design requirements.

a) Plant operation

The plant shall be operated at the normal operating conditions shown on the applicable flow diagrams and in the operating manual.

Minor variations from the conditions indicated on the flow diagrams and in the operating manual to obtain optimum process performance shall be agreed upon by the owner.

b) Instruments

Verify that all plant instruments and analytical apparatus perform as expected.

c) Supply of raw materials and utilities by the owner or the contractor

The plant is supplied with adequate and uninterrupted supplies of raw materials and utilities by the owner as required at the battery limit conditions to permit a successful performance test to be completed.

d) Supply of catalysts, lubricants and chemicals by the contractor or the owner

The plant is supplied with adequate and timely supplies of catalysts, lubricants, chemicals and other consumables to permit a successful performance test to be completed.

e) Transfer of products and waste

The owner shall be responsible for the safe transfer of the plant products and waste from the battery limit of the plant.

h) Other conditions

Any other conditions necessary for the commencement of the performance test as agreed between the owner and the contractor shall be satisfied.

7.3 Execution of performance test

a) Notice of readiness to carry out performance test

When the contractor considers that the plant is ready for the performance test and that all of the conditions stated in 7.2 have been fulfilled, he shall then give the owner a notice of readiness to carry out the performance test.

Within a predefined period of the receipt of such notice, the owner shall

– acknowledge that the plant is ready for the performance test to be conducted;

or

– submit to the contractor a written statement setting forth in which respects the plant is not ready for such a test.

If the owner considers that the plant is not ready, then he shall specify in writing the conditions preventing the start of the performance test. The party responsible for such conditions shall rectify the problem.

The performance test shall be commenced as soon as the above conditions are corrected.

b) Performance test run

The performance test shall extend continuously over a period specified in the contract.

c) Two or more units

Where the plant includes two or more individual process units for which separate process performance and consumption guarantees are to be demonstrated, a performance test or tests may be carried out individually on each of the units or simultaneously with any other unit or units.

d) Operating data

Operating and analytical data recorded during the performance test shall be documented by the owner and made available to the contractor for evaluation as stated in 7.4.

e) Sampling and analysis

During the performance test, samples necessary for the evaluation of the performance of the plant shall be taken as often as the contractor and the owner mutually agree or have agreed.

The samples shall include all streams which may be necessary to check the data from which the degree of compliance with the process performance and consumption guarantees can be determined.

The locations and methods of sampling the streams shall be in accordance with those agreed between the parties under 7.1.

f) Testing

Testing of all samples shall be carried out by the owner's laboratory. The contractor's and the owner's personnel may have access to the laboratory when the samples are tested and may check the results. However, by agreement, the contractor may also carry out testing of samples.

7.4 Evaluation and report of performance test

a) Evaluation of performance test data

Evaluations of performance test data including operating and laboratory data accumulated during, or as a part of, the performance test shall be carried out by the contractor within a predefined period after the completion of the performance test.

b) Abnormal test data

Any abnormal test data, which is not compatible with other significant data, shall be taken again from the plant operating conditions.

c) Tolerances

The performance of the plant shall be evaluated on the basis of the average performance over the entire period of the performance test and after adjustment with due regard to tolerances in instrument readings according to the agreed performance test procedures.

d) Report of test results

The contractor shall submit to the owner a report on the performance test in writing, indicating whether the process performance and consumption guarantees have been met.

The report shall include

– test results;

– analysis;

– the contractor's evaluation;

– reference information supporting the evaluation (the necessary signatures, where required).

e) Reasons for failure

If the performance test results show that a test was unsuccessful, the contractor shall state probable reasons for such failure.

f) Owner's response to the report

Within a predefined time period after receipt of the performance test report, the owner shall signify in writing agreement or comments.

g) Contractor's action in the case of performance test failure

If the evaluation of performance test results show that the failure of the performance test is the contractor's fault, then the contractor shall act in accordance with the contract conditions.

Annex A
(informative)

List of documents to be used for the precommissioning and commissioning phase

A.1 Technical documents

a) Operation manual/analytical manual

b) Design document including, but not limited to, the following information:
   - P&ID;
   - equipment index;
   - instrument index;
   - equipment specification;
   - instrument specification;
   - vendor drawings;
   - technical drawings (layout, panel, loop, electrical one line, motor control centre, civil, plan, etc.);
   - software documentation;
   - operation manuals for equipment;
   - interlocking description;
   - safety study report.

c) Others
   - special tools and equipment list;
   - spare-parts list
   - lubricants/chemicals/catalyst list

A.2 Procedures

a) Mechanical testing procedure

b) Detailed precommissioning and commissioning procedure and operation manual

c) Detailed performance test procedure

A.3 General and coordination documents

a) Detailed organization charts for precommissioning and commissioning showing
   1) lines of authorities and responsibilities;
   2) functions of all key personnel.

b) The job description of the members of this team.

c) The scheduled dates of assignment of each member to precommissioning and commissioning organizations.

d) A detailed schedule showing the time sequence which the contractor anticipates to follow for the various steps in completion of erection, precommissioning and commissioning of each unit and equipment.

e) The owner's regulations for health, environment and safety.

f) The practical organization of the relationship (meetings, reports, etc.) between the contractor and the owner at the phases of precommissioning and commissioning.

g) Owner's emergency communication route.

Annex B
(informative)

Description of precommissioning activities

B.1 General

This checklist defines the activities and responsibilities of the contractor and the owner and the achievement of the mechanical completion. The allocation of responsibility, i.e. whether the cross is in the left or the right column is a recommendation which is based on practical experience, but no enforcement in a given situation is required. The work responsibility should be defined in accordance with actual project requirements. Some of the activities below might not occur during erection but are nevertheless included in this list for the sake of completeness.

Table B.1 lists the general procedure and also outlines the work to be performed by the contractor and by the owner.

Table B.2 lists the procedure applicable to specific systems or equipment including outline of the work to be performed by the contractor and by the owner.

In any case, the owner will oversee all the activities of the contractor.

Table B.1 – General procedures
(The allocation of responsibility shall be in accordance with the actual project requirements and contractual definitions.)

			Recommended work responsibility	
			Contractor	Owner
1.1	**Manufacturer or vendor service assistance**			
		Where responsibility is not indicated in Clause 2:		
	a)	obtain the assistance of the manufacturer or vendor, when necessary, to make a satisfactory installation as agreed on by the contractor and the owner	X	
	b)	obtain the assistance of the manufacturer or vendor, as required, for technical assistance during run-in by the owner's operating and maintenance personnel, for training, or for informational and operating purposes	X	
	c)	furnish names and telephone numbers, including emergency contracts, or manufacturers' and vendors' technical service representatives for use by the owner	X	
1.2	**Permits**			
	a)	Assist the owner in procuring all necessary permits and certifications required to be secured by the owner for initial use of the plant	X	
	b)	Make applications for all necessary permits issued in the owner's name that are required for plant use, occupancy, and operation	X	
	c)	Apply for all necessary authority approval		X
1.3	**Instructions**			
	a)	Provide an adequate vendor instruction file so that information may be readily retrieved throughout plant commissioning	X	
	b)	Transmit to the owner all applicable vendor's or manufacturer's instructions and drawings	X	
	c)	Provide the owner with any special instructions, such as the required procedures for drying liners	X	
1.4	**Removal of rust preventives**			
	a)	Remove all rust preventives and oils used to protect the equipment during the construction period	X	
	b)	Provide the owner with a record of work completed	X	

Table B.1 *(continued)*

		Recommended work responsibility	
		Contractor	**Owner**
1.5	**Lubricants**		
a)	Provide a list of the manufacturer's recommended lubricants for use in the plant	X	
b)	Approve the lubricant list		X
c)	Provide all lubricants post installation		X
d)	Flush systems and install initial charge of all lubricants. Dispose of all flushing oil in accordance with the owner's instructions		X
e)	Maintain lubrication after initial charge		X
1.6	**Packing and seals**		
a)	Install mechanical seals and accessories, as required	X	
b)	Install permanent packing and accessories, as required	X	
c)	Adjust and replace mechanical seals, packing, and accessories, as necessary, during commissioning period		X
1.7	**Removal of temporary bracing**		
a)	Remove all temporary supports, bracing, or other foreign objects that were installed in vessels, ducts, piping, transformers, machinery, or other equipment to prevent damage during shipping, storage, and erection and repair any damage sustained	X	
b)	Remove other items as specified in items 2.7 h) and 2.9 c) for the appropriate equipment type	X	
1.8	**Rotation and alignment**		
a)	Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting the driver	X	
b)	Perform cold alignment to the manufacturer's tolerances and record data	X	
c)	Perform hot alignment		X
d)	Perform any doweling required	X	
e)	Obtain the services of a factory representative to witness installation of equipment, as required	X	
1.9	**Tie-ins at unit limits**		
a)	Prepare all systems for safe tie-ins	X	X
b)	Obtain approval and make the necessary tie-ins at the unit limits, as required by the specifications and as directed by the owner		X
c)	Remove blinds, car seals, and so forth, as required and as directed by the owner	X	
1.10	**Leak and pressure tests**		
a)	Notify the owner of the schedule for non-operating field leak tests or field pressure tests on piping field fabricated equipment, unless otherwise directed by the owner	X	
b)	Provide any special media for test purposes		X
c)	Conduct all tests in accordance with applicable codes, specification, regulations, and the owner's instructions	X	
d)	Witness tests		X
e)	Provide records, as required	X	
f)	Dispose of all test media in accordance with the owner's Instructions	X	
g)	Conduct all operational tightness tests	X	
NOTE Individual items of equipment of the following types, if pressure-tested in the fabricator's shop, will not require re-testing in the field, unless specified by the owner.			
a)	Vessels		
b)	Shell and tube exchangers		
c)	Air-cooled exchangers		

Table B.1 *(continued)*

		Recommended work responsibility	
		Contractor	**Owner**
1.11	**Inspection**		
a)	Provide inspection of the plant to verify that erected facilities conform to flow diagrams, construction drawings, vendor prints and specifications	X	
b)	Verify that specified materials have been installed in the plant and document verification to the extent required by the owner	X	
c)	Verify and approve the plant inspection. Note any exceptions on a separate work order list (punch list)		X
d)	Provide for special inspections, such as those required by insurance or governmental agencies		X
e)	Perform and report routine shop inspection	X	
f)	Perform shop inspection and witness tests, as desired	X	
g)	Witness final shop inspections, as specified		X
NOTE Shop-inspected equipment will not be re-opened for inspection in the field except as specified by the owner or as specifically noted in 2.1.			
1.12	**Pressure/Vacuum safety-relief devices**		
a)	Provide the owner with a list of proper pressure settings	X	
b)	Transfer relief devices for adjustment to and from the owner's testing facility	X	
c)	Test and adjust all devices and seal wherever necessary or desirable. Witness pressure tests on invitation	X	
d)	Install all devices after testing, adjusting and tagging	X	
e)	Maintain records, as required	X	
f)	Testing		X
1.13	**Flushing and chemical/mechanical cleaning**		
	Except as noted in 1.14, 2.4, 2.5, 2.9, 2.11, and 2.13:		
a)	conduct all flushing, blowing, and chemical/mechanical cleaning operations where such operations can be accomplished without using permanently installed equipment	X	
b)	conduct all flushing and blowing operations where permanently installed equipment must be used to obtain proper line velocities		X
c)	provide any special media for flushing and/or cleaning purposes		X
d)	dispose of all media in accordance with the owner's instructions	X	
e)	Turn systems over to the owner free of trash, construction debris and welding slag	X	
f)	Maintain records, as required	X	
1.14	**Temporary screens, strainers and blinds**		
a)	Provide and install all required temporary strainers	X	
b)	Clean strainers, as required during circulation	X	
c)	Remove strainers when the system is adequately cleaned	X	
d)	Provide, install and remove all blinds required for flushing	X	
e)	Provide, install and remove all blinds required for isolation	X	
f)	Maintain records, as required	X	
1.15	**Purging/Inerting**		
a)	Install purge/inerting connections	X	
b)	Provide purge materials and conduct necessary purge operations	X	X
c)	Provide inerting materials and introduce where specified	X	X

Table B.1 *(continued)*

		Recommended work responsibility	
		Contractor	**Owner**
1.16	**Drying out**		
	a) Dry-out facilities, as specified by the owner, to prevent contamination of catalysts, operating materials and/or product		X
	b) Dry-out systems, refractories, and linings when this drying operation is to be accomplished with temporary facilities	X	
	c) Dry-out systems, refractories, and linings when this drying operation is to be accomplished by means of permanently installed equipment		X
1.17	**Vessel packing and fixed beds**		
	a) Install all inert materials such as sand, gravel, balls, rings, and saddles	X	
	b) Install all materials, such as chemicals, resins, desiccants, and catalysts		X
	c) Install all mixed beds involving combinations of materials covered by a) and b) above		X
	d) Inspect the vessel interior before and during loading to ensure proper installation	X	
	e) Maintain records, as required	X	
1.18	**Housekeeping**		
	a) Before commencement of commissioning, remove excess materials, temporary facilities, and scaffolding, rough sweep or rake the area, and pick up trash. Perform washing or further clean-up, as required	X	
	b) During commissioning and performance test, maintain adequate housekeeping practices, as required for safe operation		X
1.19	**Maintenance, spare parts and special tools**		
	a) After precommissioning is complete, protect equipment from normal weather conditions, corrosion or damage		X
	b) After precommissioning is complete, provide adequate maintenance for equipment, including the cleaning of strainers and the repairing of steam traps		X
	c) Provide the owner with spare-parts lists, as recommended by the manufacturer	X	
	d) After precommissioning is complete, maintain adequate spare parts and supplies		X
	e) Control and storage of spare parts until overall mechanical completion is achieved	X	
1.20	**Noise survey**		
	a) Conduct individual equipment noise surveys, as required by the Occupational Safety and Health Administration or the owner's specifications	X	
	b) Document all survey data	X	
1.21	**Plant safety inspection**		
	a) Conduct safety inspection walk-through surveys, as required by the Occupational Safety and Health Administration and the safety department or the owner's specifications	X	X
	b) Document all survey data	X	
	c) Perform any necessary changes to comply with the safety regulation rule through the advice of the safety department personnel	X	

Table B.2– Specific procedures

			Work responsibility	
			Contractor	Owner
2.1	**Vessels**			
	a)	Open the vessel after erection and put in place any internals requiring field installation. These internals will be inspected before and after installation	X	
	b)	Open both internal and external man-ways for inspection of the vessel by the owner, unless otherwise specified	X	
	c)	Witness inspections to the extent desired		X
	d)	Dry out, if required, open vessel, and install materials that are designated in 1.17	X	
	e)	Close after proper execution of closure permits	X	
2.2	**Shell and tube exchangers**			
	a)	Perform field inspection, if required, of exchangers that have previously been shop-inspected	X	
2.3	**Air-cooled exchangers**			
	a)	Inspect exchangers to ensure that temporary shipping supports and erection materials have been removed	X	
	b)	Adjust fan assemblies to obtain specified tip clearance and test motor power	X	
	c)	Check operation of louvers and operating linkage	X	
2.4	**Fired heaters**			
	a)	Perform the pressure test in accordance with the applicable codes, specifications, and the owner's instruction, if required	X	
	b)	Provide all non-operating prefiring checks in accordance with the manufacturer's instructions	X	
	c)	Blow fuel lines, check them for cleanliness, and connect burner piping	X	
	d)	Check operation of registers and dampers and verify position of indicators	X	
	e)	Check operation of air preheaters, blowers, and soot blowers	X	
	f)	Dry refractories during initial firing by following the manufacturer' s temperature cycles		X
	g)	Conduit chemical cleaning, and flushing operations, as required. Dispose of wastes and cleaning media in accordance with the owner' s instructions	X	
	h)	Obtain and charge liquid heat transfer media, if required		X
	i)	Conduct light-off, drying, and purging operations		X
	j)	Obtain the assistance of a service engineer for technical advice during installation or start-up, if desired	X	
2.5	**Pumps, compressors and drivers**			
	a)	Level base-plates and sole-plates and grout all bearing surfaces	X	
	b)	Alleviate any excess piping stresses that may be imposed on pumps, compressors and drivers	X	
	c)	Witness stress-free pump connection		X
	d)	Chemically clean any completed lube and seal oil system, when specified. Dispose of waste and cleaning media in accordance with the owner' s instruction	X	
	e)	Charge the lube oil, seal oil, and oil cooling systems with flushing oil and circulate for cleaning purposes. Dispose of any flushing oil in accordance with the owner's instructions	X	

Table B.2 *(continued)*

			Work responsibility	
			Contractor	**Owner**
2.5	f)	Charge the lube oil, seal oil, and oil cooling systems with the operating oil recommended by the manufacturer	X installation	
	g)	While equipment is operating, make vibration, trip, governor, and safety-device checks and any operating tests and adjustments, as required	X	
	h)	Obtain the assistance of a service engineer for technical advice during installation or start-up, if desired	X	
	i)	Maintain record, as required	X	
2.6	**Tanks**			
	a)	After erection and installation, install any internals which require field installation	X	
	b)	Test tank and internals, as required. Dispose of test water in accordance with the owner's instructions	X	
	c)	Conduct chemical cleaning or flushing operations, as required. Dispose of wastes and cleaning media in accordance with the owner's instructions	X	
	d)	Witness test and inspections to the extent desired		X
	e)	Close after proper execution of closure permits	X	
2.7	**Piping systems**			
	a)	Notify the owner of the test schedule	X	
	b)	Hydrostatic, pneumatic, helium, dye penetration and X-ray test for all piping, as required by codes, specifications and the owner's instructions	X	
	c)	Witness field tests, when notified		X
	d)	Flush and drain system and install orifice plates. Orifice plates shall not be installed before hydrostatic testing (see 2.9 for the removal or isolation of other in-line components)	X	
	e)	Drain system, remove blinds, and perform tightness tests with helium, as required	X	
	f)	Insulate or paint flanges, threaded joints, or field welds after the specified testing of each system has been completed, unless instructed otherwise by the owner	X	
	g)	All welded joints (longitudinal, girth, and nozzle) in underground piping that have not been shop-tested shall be left exposed (free of paint, dope, and wrap) until the specified testing has been completed.	X	
	h)	Check pipe-hangers, supports, guides, expansion joints, and other pipe specialties for the removal of all shipping and erection stops and for the correctness of cold settings for the design service. Also, provide the owner with instructions for hot settings	X	
	i)	Check pipe-hangers, supports, guides, and specialties for hot settings and make minor adjustments, as necessary		X
	j)	Install permanent filter elements, as required	X	
	k)	Verify, to the extent required by the owner, that specified valve packing has been provided in valves installed in the plant	X	
	l)	Install car seals on valves, where necessary	X	
	m)	Check and record the positions of all car-sealed valves; paint or identify valves, as required		X
	n)	Correct support, vibration, and thermal expansion problems detected during commissioning		X
	o)	Require all hot and cold service bolting during commissioning and start-up, as required		X

Table B.2 *(continued)*

			Work responsibility	
			Contractor	Owner
2.8	**Electrical power and electrical reticulation**			
	a)	Notify the owner of the test and factory acceptance test (FAT) schedule	X	
	b)	Witness all tests and factory acceptance tests (FAT) when notified and record test data, as required		X
	c)	Perform the factory acceptance test (FAT) for LV (motor control centre), MV and HV switchgear and provide owner with the corresponding test certificates	X	
	d)	Make insulation tests on all wiring except lighting wiring (specific test certificates to be provided)	X	
	e)	Make insulation tests on motor and transformer windings from phase to phase and phase to ground (specific test certificates to be provided)	X	
	f)	Make grounding system tests to determine the continuity of connections and the value of resistance to ground (specific test certificates to be provided)	X	
	g)	Make insulation test on all lightning protection to determine the conductivity of the connections and the value of resistance to ground	X	
	h)	Check motor control centre (LV-switch gear) installation including busbar connections and incoming connection	X	
	i)	Check installation and connections between transformer and all switchboards and among each other and of the main feed	X	
	j)	Check installation of emergency power and lighting systems including light intensity and all electrical networks	X	
	k)	Tests on all wiring of the electrical instrumentation interface cabling	X	
	l)	Functionality test of LV, MV and HV switchgears and circuit-breakers (specific test certificate to be provided)	X	
	m)	Test and set switchgear and circuit-breaker relays for proper coordination	X	
	n)	Check uninterruptable power supply and/or control power supply installation and cabling	X	
	o)	Charge electrical gear with oil and/or other media, as required		X
	p)	Perform trails and adjustments on all switchgears, motor control equipment and generators	X	
	q)	Check of power supply distribution (motor control centre room, equipment room, control room and in the field)	X	
	r)	Test of electrical safety control circuits including emergency board switch (specific test certificates to be provided)	X	
	s)	Test and adjustments of frequency converter (specific test certificates to be provided)	X	
	t)	Test of electrical heat tracing (if applicable)	X	
	u)	Test of lifts and lifting devices (if applicable)	X	
	v)	Perform a complete electrical loop check for every electrical equipment (for example, motor) in accordance and by creating the mutually agreed loop check certificates including wire check of all connections	X	
	w)	Check phases sequence, polarity and motor rotation	X	
	x)	Check of power factor and compensation capacity	X	
	y)	Obtain local inspector's approval, where required	X	
	z)	Generating of a punch list during all inspection and witnesses (to be rectified by the contractor)		X

Table B.2 *(continued)*

			Work responsibility	
			Contractor	**Owner**
2.8	aa)	Provide the company with a record of the corresponding test/check certificates of at least all above-mentioned activities	X	
	ab)	Remove all temporary power distribution system required within the erection phase	X	
2.9	**Instrument systems**			
	a)	Notify the owner of the test and factory acceptance test (FAT) schedule	X	
	b)	Witness all tests and factory acceptance tests (FAT) when notified and record test data, as required		X
	c)	Conduct any non-operating checks to ensure instrument operability; that is, remove all shipping stops, check pointer travels, and verify instrument capability to measure, operate, and stroke in the direction and manner required by the process application	X	
	d)	As dictated by the owner's practice, bench or field calibrate instruments with standard test equipment and make all required adjustments and control point settings	X	
	e)	Clean all transmission and control tubing by blowing with cooled and filtered clean air before connecting to instrument components	X	
	f)	Clean all air-supply headers by blowing with clean air and check them for tightness	X	
	g)	Leak test pneumatic control circuits in accordance with ISA-S7.0.01 Quality Standard for Instrumentation Air	X	
	h)	Check piping from instruments to process piping for tightness	X	
	i)	Install and connect all system components and verify their conformance to specifications and design criteria for function and range using dummy transmission signals, as needed	X	
	j)	Check all electrical signals and alarm wiring for continuity, correct source of power and polarity	X	
	k)	Check thermocouples for proper joining of wires, position of elements in wells, proper polarity and continuity of receiving instruments	X	
	l)	Isolate or remove components for flushing, chemical/mechanical cleaning operations and reinstall them on the completion of these operations	X	
	m)	Isolate or remove, if necessary, in-line components such as control valves, positive displacement meters, and turbine meters for pressure testing. Reinstall these items after testing the system with the components removed or isolated	X	
	n)	Install any sealing fluids, as required		X
	o)	Fully pressurize and energize the transmitting and control signal system(s) by opening process connections at primary sensors and final regulators and by making control mode settings for automatic operation of equipment as the process unit is charged and brought on stream	X	
	p)	Make safety grounding, high-quality grounding and electromagnetic protection tests to assure the continuity of connections and protections and the value of resistance to ground. Check of the correct installation (for example, screen grounding)	X	
	q)	Check of uninterruptable power supply and control power supply distribution (a.c. 115, a.c. 230 V, d.c. 24 V) installation and cabling in the equipment room, control room and in the field	X	
	r)	Perform a complete loop check for every sensor and actuator (inclusive of all related interlocks and control functions) in accordance with and by creating the mutually agreed loop check certificates, including wire check of all connections	X	

Table B.2 *(continued)*

			Work responsibility	
			Contractor	Owner
2.9	s)	Test of the emergency shut-down system and burner management system (BMS) including all interfaces to other systems/units. Obtain local inspector's approval if required (specific test certificate to be provided)	X	
	t)	Test of safety measures. Obtain local inspector's approval if required (specific test certificates to be provided)	X	
	u)	Test of package unit control systems/units including all interfaces to other systems/units (if applicable)	X	
	v)	Test of fire alarm system (if applicable). Obtain local inspector's approval if required (specific test certificates to be provided)	X	
	w)	Test of intercommunication system (if applicable)	X	
	x)	Obtain local inspector's approval, where required	X	
	y)	Generating of a punch list during inspection and all witnesses (to be rectified by contractor)		X
	z)	Provide the owner with a record of the corresponding test/check certificates of at least all above mentioned activities	X	
2.10	**Process control systems (DCS)**			
	a)	Notify the owner of the factory acceptance test (FAT), site integration test (SIT) and site acceptance test (SAT) schedule	X	
	b)	Witness all tests and factory acceptance tests when notified and record test data, as required		X
	c)	Perform a complete factory acceptance test (FAT) as a complete functionality test by every process control function in accordance with the process function description. Test of complex functions by using appropriate software process simulation. Provide specific test certificates for every process control function.	X	
	d)	Witness test during factory acceptance test (FAT) in accordance with the process function description. Generating of a punch list which has to be rectified by the contractor		X
	e)	Perform a complete process control system SIT (inclusive of all separate process information systems including integration of DCS into higher factory-level structures and other process data control units) at the factory. Provide specific test certificates for the main item (for example, performance test of the I/O modules, process stations or operator stations, screen response time, etc.)	X	
	f)	Witness SIT and record a punch list which should be rectified by the contractor		X
	g)	Perform a complete SAT of the process control system and all associated systems inclusive all bus connections and wiring (for example, process information system, etc.)	X	
	h)	Check all measures with respect to electrical safety and electromagnetic compatibility including grounding	X	
	i)	Witness SAT and record a punch list which should be rectified by the contractor		X
	j)	Test of interface to hardware back-up systems (if applicable) and all other HW control units (for example, hardware controller, package unit systems)	X	
	k)	Check of failure characteristics and start-up/restart performance of the process control system (DCS)	X	
	l)	Check of data processing and archiving performance	X	
	m)	In the case of integrated ESD functionality, perform a safety performance test as specified by vendor	X	
	n)	Obtain local inspector's approval, where required	X	
	o)	Generating of a punch list during all inspection and witnesses (to be rectified by contractor)		X
	p)	Provide the owner with a record of the corresponding test/check certificates of at least all the above-mentioned activities	X	

Table B.2 *(continued)*

			Work responsibility	
			Contractor	Owner
2.11	**Boiler**			
	a)	Make a non-operating boiler pressure test in accordance with applicable codes, specifications, and the owner's instructions, if required	X	
	b)	Inspect the boiler for completeness and correctness of installation and make other non-operating prefiring checks	X	
	c)	Check operation of air preheats, dampers, soot bowers, and other equipment for proper positioning and travel	X	
	d)	Dry refractories during initial firing by following the manufacturer' s temperature cycles	X	
	e)	Purge, flush, and drain steam mains, as necessary	X	
	f)	Obtain and charge treated water for boil-out and initial operation, as required		X
	g)	Commission auxiliaries as detailed elsewhere under the appropriate equipment type	X	X
	h)	Conduct boil-out, chemical cleaning, and flushing operations, as required. Dispose of wastes and cleaning media in accordance with the owner's instructions	X	X
	i)	Conduct initial light-off, making the associated checks and adjustments		X
	j)	Obtain the assistance of a service engineer for technical advice during installation or start-up, if desired	X	
	k)	Conduct all operating tests and obtain the required certification		X
	l)	Recheck and set pressure-relief valves		X
2.12	**Water treatment plants**			
	a)	Inspect for completeness and correctness of installations and make any non-operating checks that may be required	X	
	b)	Provide and install the initial charge of ion-exchange resins and inert bed material	X	
	c)	Provide all water treatment chemicals except the initial charge of ion-exchange resins		X
	d)	Obtain the services of a water consultant to advise and monitor the water treatment operation, as required by the owner	X	
	e)	Make the necessary operating tests and adjustments to water treatment systems		X
	f)	Purify potable water systems		X
2.13	**Water systems (service wells, cooling towers, fire water systems and sea water systems but not including the water for injection (WFI) part of a project)**			
	a)	Inspect for completeness and correctness of installations and make any non-operating checks that may be required	X	
	b)	Clean the cooling tower basin and install screens in the suction pit before water circulation	X	
	c)	Provide test pump for wells, test well delivery, and flush wells as they are made available	X	
	d)	Flush, drain, and clean the cooling tower basins	X	
	e)	Clean intake screens	X	
	f)	Adjust cooling tower fans to obtain specified tip clearance and test motor power	X	
	g)	Operate fire pumps to check the performance of systems		X
	h)	Head up reservoirs, vessels, tanks, and other water system equipment, as required, fill with water, check for leaks and flush to clean	X	

Table B.2 *(continued)*

			Work responsibility	
			Contractor	**Owner**
2.13	i)	Provide insurance company inspection of the fire systems, as required		X
	j)	Obtain and install all required fire-fighting chemicals and portable equipment, such as hoses, fire extinguishers, and related equipment		X
	k)	Establish the water-treatment programme		X
	l)	Obtain the services of a water consultant to advice and monitor the water treatment, as required by the owner	X	
2.14	**Waste disposal**			
	a)	Inspect facilities for completeness and correctness of installation and make any non-operating checks to ensure their conformance to specifications	X	
	b)	Operate all equipment and supply all chemicals and agents related to waste treatment		X
	c)	Obtain the services of a waste treatment consultant to advise and monitor the system operation, as required by the owner	X	
2.15	**Buildings and accessories**			
	a)	Check installation of buildings and accessories, including all heating, ventilating, and air-conditioning equipment, to ensure their completeness and conformance to specifications	X	
	b)	As required, obtain certification that all plumbing, electrical, fire protection, elevator, and special material-handling installations comply with local government regulations		X
	c)	Operate heating, ventilating, and air-conditioning units and make all performance tests		X
	d)	Obtain certificate for occupancy and use, if required		X
2.16	**Miscellaneous equipment (agitators, mixers, rotary filters, weight scales and material-handling equipment)**		**X**	
	a)	Fully assemble rotary filters except for final filter media (cloth, precoat, or screen)	X	
	b)	Install final filter media	X	
	c)	Level and calibrate weight scales with the assistance of the manufacture's representative and set tare weights wherever possible	X	
	d)	Manually check material-handling equipment for freedom and direction of movement	X	
	e)	Check clearances on material-handling equipment, as directed by the owner	X	

Annex C
(informative)

Mechanical completion certificate

To: Contractor

Gentlemen

Pursuant to Article (Completion) of the contract entered into between our respective companies dated ..... relating to the .... plant, we hereby notify you that the following unit/facility of the plant was mechanically complete on the date specified below.

1. Plant/Unit/Facility : .....

2. Date of mechanical completion: .....

However, you are required to complete the outstanding items listed in the attachment as soon as practicable.

This letter does not relieve you of your obligation to execute the works in accordance with the contract.

Very truly yours,

_____

Title

(the owner)

Annex D
(informative)

Description of commissioning activities

Table D.1 lists activities to be performed during the commissioning stage. Some of the activities below might not occur during commissioning but are nevertheless included in this list for the sake of completeness.

Table D.1 – Activities to be performed during the commissioning stage

		Work responsibility	
		Contractor	Owner
1	**Rotating equipment – General**		
	a) Do perform hot alignment		
	b) Maintain and check lubrication		
	c) Complete check-out of control circuits and safety devices and make adjustments where necessary		
	d) Final check for interlock system, bearing temperature and vibration, etc.		
2	**Steam drivers**		
	a) Make necessary adjustments		
	b) Check steam condensate system		
	c) Check speed controller		
3	**Pumps**		
	a) Make necessary adjustments		
	b) Install necessary filter instead of temporary strainers		
4	**Compressors**		
	a) Make necessary adjustments		
	b) Check oil cleanliness of lubricant oil system and temperature control of bearing		
5	**Miscellaneous mechanical equipment (agitators and material-handling equipment**		
	a) Complete run-in of equipment in accordance with the vendor's instructions where this cannot be done before feedstock is admitted to the plant		
	b) Make final adjustments to equipment		
6	**Furnaces**		
	a) Adjust air registers and dampers to obtain satisfactory firing		
	b) Adjust burner for fully loaded condition		
	c) Check abnormal noise and vibration		
	d) Check abnormal temperature of equipment		
7	**Shell and tube**		
	a) Hot bolt flanges as necessary		
8	**Piping**		
	a) Make hot tightness test if required by project specifications		
	b) Hot bolt flanges as necessary		
	c) Periodically clean temporary strainers and remove when rate of accumulation of debris becomes negligible		
	d) Check heat expansion		

Table D.1 *(continued)*

		Work responsibility	
		Contractor	**Owner**
9	**Instrumentation**		
	a) Make final adjustments to control point settings which were not set in precommissioning and place control systems into manual as necessary		
	b) Open process connections to instruments, start purges, and commission heat tracing, etc.		
	c) Transfer controllers from manual to automatic, make control mode adjustments, and finally commission shutdown systems, etc., as plant is brought on stream		
	d) Commission analysers, sample handling systems, and other special instruments		
	e) Check zeros, purge rates, air-supply pressures and ambient temperatures, etc. at normal operating conditions		
	f) Adjustment of controller's PID value as necessary, as well as other parameters and constants of more complex control structures for APC and optimization		
10	**Insulation and painting**		
	a) Minor painting and insulation work remaining after mechanical completion		
	b) Finish insulation after hot bolting		
11	**Document modifications applied during commissioning**		

Annex E
(informative)

Acceptance of plant certificate

To: Contractor

Gentlemen

Pursuant to Article (Acceptance) of the contract entered into between our respective companies dated ..... relating to the ..... plant, we hereby notify you that the Process Performance Guarantees/Consumption Guarantees of the following unit/facility of the plant were satisfactorily attained and we accept the unit/facility, together with the responsibility for care and custody thereof, on the date specified below..

1. Plant/Unit/Facility : .....

2. Date of acceptance : .....

This letter does not relieve you of your obligations for defect liability and other outstanding obligations under the Contract.

Very truly yours,

_____

Title

(the owner)

Annex F
(informative)

Project-specific items

Table F.1 lists the project-specific items that need to be discussed and agreed upon between the contractor and the owner. Some of the items may even be listed specifically in the contract, as deemed necessary.

Table F.1 – Project-specific items to be discussed and agreed upon

Item		Reference
1	Required documents to be issued pursuant to Clause A.1	**Clause 3**
2	Manpower mobilization plan – for precommissioning, commissioning and performance test	**Clause 3**
3	Required tools and equipment to be supplied by the owner or the contractor	**Clause 3**
4	Time schedule and conditions for supply of the raw materials and utilities	**Clause 3**
5	Supply of required catalysts, lubricants, chemicals and other consumables	**Clause 3**
6	Defining of precommissioning activities listed in Annex B	**5.1**
7	Define the allowable time period from the date of receipt of the contractor's written notice that the owner shall have to accept or reject the request for mechanical completion certificate	**5.2**
8	Contractor shall propose detailed performance test procedures	**7.1**
9	Define the allowable time period from the date of receipt of the contractor's written notice stating readiness for the performance test that the owner shall have to either acknowledge readiness for the performance test or submit to the contractor a written statement setting forth in which respects the plant is not ready for such a test	**7.3**
10	Define the allowable time period the contractor shall have to evaluate the performance test data including operating and laboratory data accumulated during, or as a part of, the performance test, and provide the test report to the owner	**7.4**
11	Define the allowable time period the owner shall have to signify in writing agreement or comments after receipt of the performance test report	**7.4**

Standards Survey

The IEC would like to offer you the best quality standards possible. To make sure that we continue to meet your needs, your feedback is essential. Would you please take a minute to answer the questions overleaf and fax them to us at +41 22 919 03 00 or mail them to the address below. Thank you!

Customer Service Centre (CSC)

International Electrotechnical Commission
3, rue de Varembé
1211 Genève 20
Switzerland

or

Fax to: **IEC**/CSC at +41 22 919 03 00

Thank you for your contribution to the standards-making process.

Nicht frankieren
Ne pas affranchir

Non affrancare
No stamp required

A Prioritaire

RÉPONSE PAYÉE

SUISSE

Customer Service Centre (CSC)
International Electrotechnical Commission
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1211 GENEVA 20
Switzerland

Q1 Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: *(e.g. 60601-1-1)*

.....

Q2 Please tell us in what capacity(ies) you bought the standard *(tick all that apply).* I am the/a:

purchasing agent ❑
librarian ❑
researcher ❑
design engineer ❑
safety engineer ❑
testing engineer ❑
marketing specialist ❑
other.....

Q3 I work for/in/as a: *(tick all that apply)*

manufacturing ❑
consultant ❑
government ❑
test/certification facility ❑
public utility ❑
education ❑
military ❑
other.....

Q4 This standard will be used for: *(tick all that apply)*

general reference ❑
product research ❑
product design/development ❑
specifications ❑
tenders ❑
quality assessment ❑
certification ❑
technical documentation ❑
thesis ❑
manufacturing ❑
other.....

Q5 This standard meets my needs: *(tick one)*

not at all ❑
nearly ❑
fairly well ❑
exactly ❑

Q6 If you ticked NOT AT ALL in Question 5 the reason is: *(tick all that apply)*

standard is out of date ❑
standard is incomplete ❑
standard is too academic ❑
standard is too superficial ❑
title is misleading ❑
I made the wrong choice ❑
other .....

Q7 Please assess the standard in the following categories, using the numbers:
(1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
(6) not applicable

timeliness.....
quality of writing.....
technical contents.....
logic of arrangement of contents .....
tables, charts, graphs, figures.....
other .....

Q8 I read/use the: *(tick one)*

French text only ❑
English text only ❑
both English and French texts ❑

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

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ISBN 2-8318-8880-8

ICS 25.040.01

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND