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Recommended Practice

Control Center Design Guide and Terminology

ISA-RP60.2, Control Center Design Guide and Terminology

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Preface

This preface as well as all footnotes and appendices is included for informational purposes and is not part of ISA-RP60.2.

This recommended practice has been prepared as part of the service of ISA, the international society for measurement and control, toward a goal of uniformity in the field of instrumentation. To be of real value, this document should not be static but should be subject to periodic review. Toward this end, the Society welcomes all comments and criticisms and asks that they be addressed to the Secretary, Standards and Practices Board; ISA; 67 Alexander Drive; P. O. Box 12277; Research Triangle Park, NC 27709; Telephone (919) 990-9227; Fax (919) 549-8288; e-mail: standards@isa.org.

The ISA Standards and Practices Department is aware of the growing need for attention to the metric system of units in general, and the International System of Units (SI) in particular, in the preparation of instrumentation standards, recommended practices, and technical reports. The Department is further aware of the benefits to U.S.A. users of ISA standards of incorporating suitable references to the SI (and the metric system) in their business and professional dealings with other countries. Toward this end, this Department will endeavor to introduce SI-acceptable metric units in all new and revised standards to the greatest extent possible. *The Metric Practice Guide*, which has been published by the Institute of Electrical and Electronics Engineers as ANSI/IEEE Std. 268-1992, and future revisions, will be the reference guide for definitions, symbols, abbreviations, and conversion factors.

It is the policy of ISA to encourage and welcome the participation of all concerned individuals and interests in the development of ISA standards, recommended practices, and technical reports. Participation in the ISA standards-making process by an individual in no way constitutes endorsement by the employer of that individual, of ISA, or of any of the standards that ISA develops.

This recommended practice is one of a series that constitutes the control center standard, ISA-S60. The individual sections provide continuity of presentation, convenience of reference, and flexibility of revision. The complete standard consists of the following sections:

SECTION	TITLE	SCOPE
RP60.1	Control Center Facilities	Guide for preparation of engineering designs and specifications for control center facilities.
RP60.2	Control Center Design Guide and Terminology	Design methods and terminology used in the specification of control center facilities.
RP60.3	Human Engineering for Control Centers	Design concepts accommodating human physiological capabilities.
RP60.4	Documentation for Control Centers	Guide to the documentation associated with control center specifications.

†dRP60.5	Control Center Graphic Displays	Guide to the use of available graphic display techniques.
RP60.6	Nameplates, Labels, and Tags for Control Centers	Guide to the methods of identification of control center equipment and parts.
†dRP60.7	Control Center Construction	Guide to control center profiles, fabrication and finish methods, and enclosure selection.
RP60.8	Electrical Guide for Control Centers	Design concepts for control center electrical requirements.
RP60.9	Piping Guide for Control Centers	Design concepts for control center piping requirements.
†dRP60.10	Control Center Inspection and Testing	Guide to the methods of inspection and testing prior to control center acceptance.
RP60.11	Crating, Shipping, and Handling for Control Centers	Guide to methods for control center crating, shipping, and handling.

†Draft Recommended Practice. For additional information on the status of this document, contact ISA Headquarters.

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Contents

Annexes

1 Scope

This portion of RP60 is included as a guide to initiating, designing, specifying, procuring, testing, accepting, and installing a control center and its supporting facilities. The information is intended to provide a broad base upon which to draw for the development of a specific control center design using commonly accepted terminology and data. While a significant amount of rudimentary data is included, this recommended practice is not intended to be used as an instruction manual for untrained persons.

2 Terminology

For a glossary of the terms used in the RP60 series, see Annex A.

3 Introduction

The creation of a control center and its facilities requires a logical, step-by-step sequence of planned activities by and among the participating organizations. These activities, if properly undertaken from inception to start-up and in proper sequence, will significantly assist in obtaining the required control center within the budget and schedule. This design guide includes a suggested chronological order of such activities.

4 Activity guidelines

The following activities, in general, follow the recommended activity guideline diagram shown in Annex B. Utilization of all of the guidelines should be considered regardless of the control center size. Explanations of each of the activities and where they are considered necessary are included. All of the activities listed for the Control Center Designer (CCD) may be accomplished by the following:

1) CCD — owner(s);
2) CCD — Engineering Construction Contractor(s), (ECC); and
3) CCD — contracted individual.

The interfaces between the CCD and the other entities remain the same in all of the above.

4.1 Planning activities

Before a control center project is initiated, the owner should have a budget estimate. When the project is initiated, a qualified CCD should be designated. Certain items that should be considered early in the planning stage should be in the hands of the CCD prior to the start of the design. Many people can add significantly to the information the CCD will need, and these people should be consulted. These include personnel from production, process engineering, instrument engineering, facilities, maintenance, safety and utilities, who can assist in supplying the following information.

4.1.1 Plant type

The type of plant indicates, in general, the size of the control center; the number of control schemes; the degree of possible hazards, such as environmental, fire, explosion, or toxic materials; types of control required; and location of the process and peripheral equipment.

4.1.2 Plant location

The geographical location of the plant has a direct influence on the placement of the control center. Knowledge of seismic activity, weather, sunrise/sunset, heat/cold, and prevailing winds could, for example, have an effect on the location or orientation of the control center facility and the cubicles and consoles within it. Geographical location also will affect items in 4.1.3 and 4.1.4. The geographical location also will be a factor in the costs of engineering and installation--e.g., travel time and expenses, shipping expenses, and material availability. Reference ISA-RP60.1, Control Center Facilities.

4.1.3 Architectural preference, interior and exterior

Owner preference for style, size, shape, access, and number of floor levels and rooms plus requirements for future expansion and materials of construction will influence the final design, as will the choice of panel type (multipane or flat face) and its location relative to the process to be controlled. Area lighting (wiring, fixtures, and installation) must be considered, as well as electric power requirement for the control center.

The control center's support facilities should also be defined--e.g., instrument equipment storage areas, testing and repair facilities, equipment and rack or wire termination rooms, supervisory and administrative control equipment, filtering, heating, ventilating and air conditioning systems, and personnel facilities.

4.1.4 Operator experience

The availability or lack of experienced operators can influence the design of the control center. Affected design considerations include the following:

1) Complexity of control schemes;
2) Amount of automatic safety controls; and
3) Type and amount of graphic pictorial assistance.

Training from equipment vendors and others is available and should be provided to the operators early in the design process.

4.1.5 Type of instrumentation

The control center designer's primary choices of instrumentation types will be made from (1) electronic distributed and programmable logic control systems, (2) conventional electronic systems, and (3) pneumatic systems. Various advantages are associated with each type and must be considered.

4.1.6 Control philosophy

The owner, after deciding upon one of the above types of instrumentation, must decide upon the sophistication of the control schemes and the amount of safety controls that should be provided. Most design features will be recommended by the CCD, but some limitations and requirements should be specified by the owner. It is particularly important that the owner and CCD agree to the amount of redundancy provided in the safety systems.

4.1.7 Codes and specifications

Unique power requirements dictated by the local, state, country, or other authorities having jurisdiction are specified in the various codes and regulations. Electrical power levels, frequencies, distribution, cabling, etc., and aspects of personnel health and safety should be included in the specifications. All client and plant-specific labor agreements and installation specifications should also be referenced.

4.1.8 Budget

The owner should have a budget estimate before obtaining quotations from the CCD.

4.1.9 Schedule

A definitive schedule will be determined by the chosen CCD. Contractual restraints must be set up in the early planning stages of the project where an engineering/construction contractor is utilized.

4.1.10 Documentation

All of the foregoing information must be documented and retained by the owner and CCD, along with a project statement (purpose), to provide complete information to the CCD and to avoid confusion. These documents should be part of the project specifications.

4.1.11 Other considerations

The owner may have several other items that are important to the project but have not been included above. The earlier the CCD is informed of these special requirements, the more accurate the schedule and the budget will be.

4.2 Owner — CCD meetings

Prior to the start of CCD activities, meetings should be held to review the control center requirements and to clarify the owner's requirements and preferences. As a minimum, the following items should be reviewed:

1) Owner and CCD interface — Exact interface responsibilities should be apportioned. The extent of owner engineering, review, and approval cycles should be set, if not already defined in the job specifications.

2) Layout — Overall general layout requirements and owner preferences should be established.

3) Codes — Local, national, and international codes should be available and adhered to as applicable.

4) Unique items — Unique items in the specifications should be discussed and understood. Long lead time items should be particularly considered here.

5) Spare parts — The philosophy of recommended spare parts and storage requirements should be established.

6) Training — Training requirements of operators and maintenance personnel should be established.

7) Documentation — As each owner's document requirements are unique, the types of drawings, manuals, and other data required should be included. Additionally, the methods of transmission and to whom documentation is to be addressed should be decided.

8) Cost estimates — Alternative designs and the budget should be reviewed, and close liaison should be maintained between the owner and the CCD during the life of the project. Cost and schedule control of changes, regardless of origination, must be evaluated in terms of final cost and schedule effect versus the proposed benefit. The aggregate costs and schedule effects should be regularly discussed with the owner. It is recommended that revisions, particularly overruns, be justified as they occur rather than as one large total at the end of the project.

9) Other considerations — Any unusual requirements should be discussed--for example, international trade requirements.

4.3 Engineering and design

4.3.1 Engineering specifications

During the early stages of the job, the CCD should develop preliminary information and data as the job specifications become increasingly firm. Once the CCD has confidence that the design changes will be minimal (that is, instrumentation has been finalized as to type and the project instrument flow diagrams reflect the control philosophy and hardware) then final documentation for the control center procurement can begin. This would include the following:

1) Control center construction specifications

2) Hardware and instrumentation specifications

3) Layout drawings

4) Cost estimate

It is important to consider early in the project what equipment the control center manufacturer (CCMFR) is to furnish so that the cost allocations can be applied correctly. Documentation, spare parts, and training requirements also significantly affect the cost.

4.3.2 Other considerations

In addition to the drawing and design interfaces, the free-issue instrumentation must also be considered. If the CCMFR is to furnish any instrumentation with the control center, it is to be clearly defined prior to and included with the invitation to bid (ITB). In most cases the CCMFR should be required to provide all of the hardware, relays, and switches; uninterruptible power

supplies (UPS), power distribution panels, and termination panels. This material must be identified in the ITB.

4.3.3 Owner review

It is important for the CCD to review all the prepared documentation with the owner prior to proceeding with the procurement phase of the project. The changes made at this point will minimize cost escalations and will have a minimum effect upon the schedule. Once the procurement phase begins, in most cases, changes will affect not only the CCD, but also the CCMFR and CCMFR suppliers, thereby increasing the cost and extending the schedule.

4.4 Procurement

4.4.1 Choosing acceptable bidders

Choosing bidders with acceptable credentials is one of the most important criteria of a successful project. The bidder's input into the finer details of design can often save the owner money and conserve schedule time.

4.4.1.1 Some of the factors that should be included in bidder selection follow:

1) The bidder's past experience with the CCD or the owner
2) The bidder's known expertise in the industry for this particular type of control center
3) Advertisements in industry literature
4) Recommendations by industry peers
5) The bidders' response to a previously requested qualification listing which could include experience, resumes, and references

4.4.1.2 It is very important that the CCD make at least one visit to the bidders' plants and engineering facilities to check for the following:

1) Plant size — Is it large enough (adequate floor space)?
2) Equipment — Do they have adequate tools to do the work?
3) Engineering facilities and personnel — Do they have qualified people to do the work assigned, and do they have adequate facilities for them?
4) Quality control — Is a comprehensive system in place, and is adequate testing equipment available to ensure that errors in design, manufacturing, and materials are caught and corrected before the control center is shipped?
5) Storage area — Is a secure, clean, and dry area provided to store the free-issue instruments and equipment?
6) How much of the project must be subcontracted by the bidder? A visit to subcontractors may be in order, for the same reasons listed above.

4.4.2 Invitations to bid (ITB)

Documentation for the ITB is covered in detail in ISA-RP60.4, Documentation for Control Centers.

4.4.3 Quotation review

Bottom line cost, particularly on a large, complicated control center, is not always readily apparent. Each quotation usually will have alternatives to save the owner capital expenditure or schedule time. Savings could include standard designs or equipment that the bidder can offer or design innovations that were not included in the ITB specifications. It could be helpful to set up a chart or matrix on which each quote is listed with all of the salient features listed by that bidder and their associated costs. This chart could consist of a vertical listing of bidders, with the alternatives listed along the top and columns below for each alternative. In this way, if more than one bidder provides the same alternative, they can be easily compared. The chart should have at least the following data:

1) Bidder — Full company name, address, telephone number, and person to contact

2) Cost — This should be the total cost for the control center as specified in the ITB, without shipping costs or alternatives. This should also include costs for documentation, training, and spare parts.

3) Shipping and crating costs — It should be checked that all bidders have quoted the same — e.g., Free on Board (FOB) and Port of Entry (POE). Reference ISA-RP60.11, Crating, Shipping, and Handling for Control Centers.

4) Specification deviations and their cost effect

5) Alternates and relevant costs

6) Special features listed in the quotations that are included in the cost but not particularly specified. This could include more expensive hardware finishes or equipment.

7) Unacceptable features of the quotation

8) Schedule compliance

9) Total bottom line cost with all bidders made as equivalent as possible. This may require requotes from bidders if their quotes were not adequately comprehensive or if another bidder offered an alternative, and a comparison price is required. A formatted bid response issued with the ITB may help to assure consistent proposals.

4.4.4 CCD recommendation

Once the CCD has completed the bidder comparison chart, it should be relatively easy to select the recommended CCMFR. Once this selection is made by the CCD, a meeting should be held with the owner. At this meeting, using the comparison chart as a guide, all of the relevant data should be discussed with the owner. It is imperative that the owner be made aware of all of the options available. An option that is particularly important to the owner may change the recommended CCMFR and cause readjustment of the budgeted cost allowance and schedule.

4.4.5 Precommitment meeting

This meeting is to finalize any details that may not have been covered in the specifications and the quotation. Additionally, the bidder is informed at this time which quotation alternatives have been chosen. Some of the items that may be discussed follow:

1) CCMFR project engineer — It is important that one person be available to relay all of the communications between the CCMFR and the CCD. It should be noted that direct communication between the owner and the CCMFR without the CCD involved should be avoided. It is the CCD's responsibility to control cost and schedule; no changes to the control center should be made or approved without the CCD's knowledge.

2) Specification deviations

3) Quotation alternates

4) Typical costs for changes

5) Major schedule events, such as the following:

   a) Bidder drawing release (see ISA-RP60.4, Documentation for Control Centers, for various releases)

   b) Start of manufacturing

   c) Control center framework -- fabrication and finishing

   d) Installation of instruments

   e) Completion of piping and wiring (ready for inspection)

   f) Crating and shipping

6) Revision and change procedures — It is important to document and issue change orders as they happen and as soon as they happen. Justifying cost escalations and the consequential schedule changes to the owner is simpler if changes are made known as they happen, rather than trying to justify one huge change to the cost and schedule at a later time. Cost or schedule changes should be approved by the owner prior to their execution.

7) Warranties and guarantees

8) Lines of communication, tests, and status reports

9) Cost and payment schedule -- This schedule should include the percentage of the total cost of the control center paid at each particular chosen scheduled event.

4.4.6 Final quotation — review and approval

The final quotation should include all cost and design changes agreed to during the precommitment meeting.

4.4.7 Purchase order release

The purchase order release should include all of the ITB documentation and drawing and specification changes agreed to during the precommitment meeting.

4.4.8 Document review

The CCMFR's manufacturing drawings must be reviewed by the CCD and the owner. Normally, the CCD will comment on the drawings prior to sending them to the owner.

4.4.9 Cost changes

A review and approval of any cost changes caused by the schedule should be given.

4.4.10 Free-issue material

Receipt of the free-issue material at the CCMFR's location should be verified.

4.4.11 Inspections and reviews

Inspections and reviews should be made in accordance with the prearranged schedule.

4.4.12 Final inspection and testing

The final inspection and testing should be in accordance with ISA-RP60.10, Control Center Inspection and Testing.

4.4.13 Final drawings

The final drawing should be received from the CCMFR.

4.4.14 Crating and shipping

Crating and shipping should be in accordance with ISA-RP60.11, Crating, Shipping, and Handling for Control Centers.

4.5 Installation

4.5.1 Field receiving inspection report

If possible, this inspection should be made in the presence of the carrier and should be signed by the carrier so that damage claims, if any, can easily be verified at a later date.

4.5.2 Packing list

Utilizing the packing list, it should be confirmed that all shipped equipment has been received.

4.5.3 Storage

If an installation site is not yet suitable for the control center, adequate storage facilities should be provided.

4.5.4 Spare parts

Spare parts should be issued immediately to the owner.

4.5.5 Documentation

Documentation should be issued to the owner and designated construction manager for proper distribution.

4.5.6 Install and connect

Modern construction techniques usually can provide for quick and easy installation of the field connections to the control center with plug-in cables between control center units and plug-in cabling from the field terminations to the control center.

4.5.7 Test and calibration

As the installation techniques allow a quick hook-up, it should be relatively easy to calibrate and test entire loops at once rather than one component at a time.

4.5.8 As-built documents

Control center documentation should be marked with changes and corrections as they are incurred so that final "as-built" documents can be made.

4.5.9 Start-up

Where changes are necessary, strict document control is required. Maintenance will be significantly easier if the control center is installed as the "as-built" documents indicate.

Annex A — Terminology

air: For the purposes of this document, air implies use of any suitable and normally clean, dry, safe gas. (Definition from ISA-RP60.9.)

air ride: An air suspension system installed on some moving van trailers to provide shock and vibration control for handling delicate equipment. (Definition from ISA-RP60.11.)

apron: The part of the control center that encloses the area below the console mounting panel. (Definition from ISA Draft RP60.7.)

as built: A document revision that includes all modifications performed as a result of actual fabrication or installation. Various issues of "as built" documents may exist that reflect various milestones such as "as purchased", "as manufactured", "as insured", and "as commissioned". (Definition from ISA-RP60.4.)

checkout: A generalized term encompassing both inspection and testing. (Definition from ISA Draft RP60.10.)

clinched: The bending of the excess length of a nail so that the sharp, protruding point is forced back into the nailed material. (Definition from ISA-RP60.11.)

commercial quality angle or channel: Hot formed carbon steel or stainless steel, or extruded aluminum shapes generally available as standard material. (Definition from ISA Draft RP60.7.)

console: A control center, or part of a control center, having one or more inclined surfaces for mounting instruments and controls within a range for convenient viewing and manipulation. (Definition from ISA Draft RP60.7.)

container: A special-purpose, reusable enclosure for shipping cargo via truck, rail, and ship. (Definition from ISA-RP60.11.)

control center: An equipment structure or group of structures from which a system is measured, controlled, and/or monitored. (Definition from ISA-RP60.4, ISA-RP60.11, ISA Draft RP60.5, and ISA Draft RP60.7.)

control center facility: A combination of the services, protective enclosures, and environmental treatment necessary for the proper functioning of the control center. (Definition from ISA-RP60.4.)

crate: A temporary enclosure used to provide protection of an item during shipping, handling, and storage. (Definition from ISA-RP60.11.)

cubicle: An enclosed control center with front, rear, top, and sides -- with or without a bottom. (Definition from ISA Draft RP60.7.)

drawings: Graphic representations of the control center, which also may include bills of material, hard copies of video display tube (VDT) displays, photographs, and tables (e.g., wire and cable lists). (Definition from ISA-RP60.4.)

direct process piping: That piping between the process and the control center which contains process fluid. (Definition from ISA-RP60.9.)

dunnage: Loose material used around an item to prevent damage during shipment. (Definition from ISA-RP60.11.)

enclosure: A framework or shell, or a combination of these, that provides the environment for containing the control equipment and instrumentation that constitutes a control center. (Definition from ISA Draft RP60.7.)

equipment test: A test to verify that individual instrument items operate in accordance with the assembly drawings. *See Note 1.* (Definition from ISA Draft RP60.10.)

field piping: That piping connecting the control center to items external to the control center. (Definition from ISA-RP60.9.)

free-issue: Free issue material is that issued by the owner and CCD to the Control Center Manufacturer for installation into the control center.

free-standing: A control center or enclosure that will be stable in its normal position without external bracing or bolting to other structures. (Definition from ISA Draft RP60.7.)

functional test: A test performed on a subsystem or loop to verify proper instrument or equipment response to stimulated inputs and outputs. Individual "loop" drawings, electrical ladders, and wiring diagrams are usually the basis for this test. *See Note 2.* (Definition from ISA Draft RP60.10.)

graphic lines: Representations of process and signal lines in a pictorial display. (Definition from ISA Draft RP60.5.)

graphic symbols: Simplified, representations of process components and instruments in a pictorial display. (Definitions from ISA Draft RP60.5.)

ground resistance test: Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester. For personnel safety, tests should show resistance to ground, in 120 volt systems, to be 125 ohms or less. (Reference National Electrical Code, latest revision.) The choice of allowable ground resistance will depend upon the specific system requirements and the system interruption restrictions. It is recommended that five ohms or less be utilized for general equipment and one ohm be used for instrument grounds. (Definition from ISA Draft RP60.10.)

hi pot test: An insulation ac current-limited wherein a 0-600 volt rated wire insulation is tested for 1000 v + (2 X nominal voltage rating) for a test time of 60 seconds. *See Note 6.* (Definition from ISA Draft RP60.10.)

hygroscopic: Material that will readily absorb and retain moisture. (Definition from ISA-RP60.11.)

inspection, in process: A periodic check to verify schedule conformance or quality control. When prearranged, it may also permit a visual inspection or a special test of items that cannot be checked or inspected when the system is completely assembled. (Definition from ISA Draft RP60.10.)

inspection, visual (static): A check with no power or continuity equipment, normally intended to verify: (a) dimensions, (b) layout arrangement, (c) nameplate inscriptions, (d) general adherence to specifications, (e) quality of workmanship, and (f) accessibility. (Definition from ISA Draft RP60.10.)

insulation resistance test: An insulation dc resistance test usually at a test voltage of 500 v dc and a test time of one minute for a minimum acceptable resistance of one megohm. *See Notes 4 and 5.* (Definition from ISA Draft RP60.10.)

label: Used to inform of detailed instructions about item identified. (Definition from ISA-RP60.6.)

manuals: A compilation of electrical and mechanical specifications, parts lists, operating or service instructions, calibration procedures, test logs, performance requirements, and pertinent technical data required for the specific project. (Definition from ISA-RP60.4.)

nailing and blocking clip: A special fastener for joining fiberboard sheet material to wood framing. (Definition from ISA-RP60.11.)

nameplate: Used to display basic information, including function. (Definition from ISA-RP60.6.)

panel: Any of the flat mounting surfaces of a control center. (Definition from ISA Draft RP60.5 and ISA Draft RP60.7.)

piping: For the purpose of this document, the term "piping" includes metal or plastic tube, pipe fittings, valves, and similar components, and the practice of assembling these items into a system. (Definition from ISA-RP60.9.)

pneumatic supply: Air at a nominally constant pressure used to operate pneumatic devices. (Definitions from ISA-RP60.9.)

point-to-point test: A continuity-test (i.e, with bell ringer ohmmeter or equivalent) to verify electrical continuity from "Point A" to "Point B" as indicated on an "assembly" drawing. A minimum of wires to be lifted. Caution must be used to protect equipment from electrical damage. (Definition from ISA Draft RP60.10.)

process simulation test: An advanced system test wherein the test equipment includes a device designed to respond as the actual process would to an upset or change. This test provides a check on the system design itself and is an advanced method of operator training. *See Notes 2 and 3.* (Definition from ISA Draft RP60.10.)

signal air: Air at varying pressure used to represent process or control information. (Definition from ISA-RP60.9.)

signal piping: That piping interconnecting instruments, instrument devices, or bulkhead fittings. (Definition from ISA-RP60.9.)

specifications: Written data, drawings, and instructions that form the complete requirements the system must meet. This may include equipment lists, approved vendor lists, applicable company standards, and references to published standards (e.g., the National Electric Code and ISA Standards). (Definition from ISA-RP60.4.)

staging test: A comprehensive checkout wherein all feasible components of programs of a system, with the field transmitter and valve, are electrically or pneumatically simulated. (Definition from ISA Draft RP60.10.)

system test: A comprehensive "staging or functional" test performed on several loops simultaneously to verify interaction. Cascade loop drawings, interlock ladder diagrams, or operational specifications are the basis for this test. (Definition from ISA Draft RP60.10.)

tagged item: An item that has been assigned a unique identification. Items appearing on piping and instrument diagrams (P&IDs) are usually tagged in accordance with ISA-S5.1, "Instrumentation Symbols and Identification." Items that do not appear on a P&ID may be assigned unique identifications that do not conflict with previously assigned tag numbers. (Definition from ISA-RP60.4.)

tags: Used to display specific information about item identified. (Definition from ISA-RP60.6.)

unit load devices (uld): A special-purpose, reusable enclosure for shipping cargo via aircraft. (Definition from ISA-RP60.11.)

untagged item: Any system, equipment item, or accessory that may be initially specified, listed, or referenced in quantity by model number, catalog number, part number, etc., for general identification and for ordering or handling purposes. These items are completely interchangeable and could be uniquely identified with an assigned tag number after installation in the control center. (Definition from ISA-RP60.4.)

visual slope: A forward sloping top section of a control center. (Definition from ISA Draft 60.7.)

writing surface: A smooth, horizontal or slanted surface attached to the control center front vertical panel at a convenient height for writing. (Definition from ISA Draft RP60.7.)

NOTE 1: This test does not include signal direction or calibration.

NOTE 2: Some malfunctions found during this test may be attributed to documentation errors.

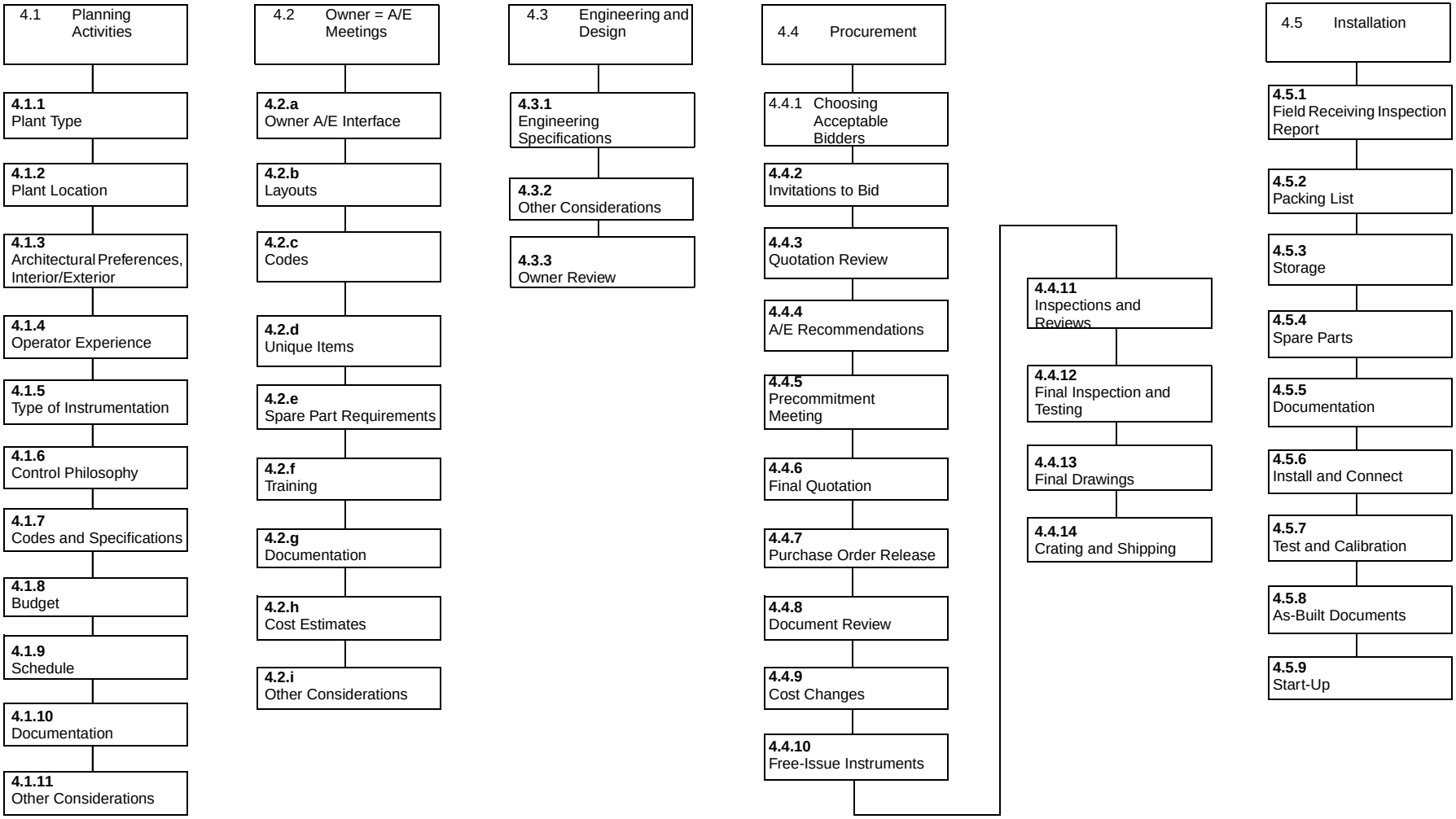
NOTE 3: This test may be precluded by a higher level or a subsystem test.

NOTE 4: All wires to be tested must be disconnected from all electronic instruments and ground connections.

NOTE 5: This test is not suggested unless the installation of wiring is such that the wire insulation could be damaged.

NOTE 6: This test is not generally required within a control center and should not be performed unless specified.

Annex B — Activity guide line diagram



NOTE: For applicable sections of RP60 series Recommended Practices, see preface to RP60.2.

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