
Part III

Commissioning Guide

--Specifications--

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Version 2.04 was distributed by Peci in 1997 and by USDOE in 1998, with USDOE referenced in the footer of each file. Since that version, changes and additions have been made by Peci without review by USDOE; subsequently in Version 2.05 the reference to USDOE has been removed from the footers. Individual files may have been updated without changing the overall version number. An update history of changes is found in the file history.____.

Commissioning Guide Specifications

Overview

1. General Overview

These commissioning guide specifications contain recommended language that describes both the requirements and the process to incorporate commissioning into larger construction or renovation projects. Significant process language is required because commissioning is new to many construction professionals. The specifications generally follow the ASHRAE document, *The HVAC Commissioning Process*, ASHRAE Guideline 1-1989R, final draft 1996, though significant additional detail, clarification and interpretation has been made.

The guide specifications are intended to be modified by the architect and design engineers (A/E) in consultation with the design phase commissioning authority, the project manager and the facility engineer, if known. The A/E shall modify other specification sections as necessary to reflect commissioning requirements applicable to the current project.

Abbreviations are used in the Specifications and are defined in Section 01040 and 17100, Part 1.

2. Management Scenarios

The specifications were developed for the construction management protocols of GSA, Region 10, which include:

1. The construction manager (CM) is a subcontractor to the owner and represents the owner in the day-to-day activities and job coordination for the entire construction project.
2. The Owner's staff project manager (PM) manages the CM.
3. The A/E's role during construction consists of the basic services of submittal review and periodic site observation. The A/E team is not significantly involved in performance verification or quality control. Therefore, its role in commissioning is limited to dealing with design and other problems identified during commissioning, attending selected commissioning team meetings, reviewing clarifications to the control sequences by the commissioning authority, reviewing selected functional test procedures, providing as-built design intent for the O&M manuals, and presenting at the first owner personnel training.

Other notable management and process information:

1. The specifications are applicable to a variety of commissioning authority (CA) hiring scenarios: CA hired by the CM, directly by the Owner, by the general contractor (GC) or by the A/E.
2. The CA is the person directly coordinating and directing all commissioning activities on a day-to-day basis.

3. If the CA is hired by the GC or A/E, the CM will verify that the CA is properly executing the commissioning as per specification. In this case the CA reports directly to the CM.
4. If the CA is hired by the CM or directly by the Owner, the verification of the CA's commissioning work in (3) is eliminated.
5. The subcontractors (under the GC) direct, execute and document their own startup and initial checkout, incorporating the CA's prefunctional checklists and the CA's review comments of their start-up procedures.
6. The CA develops the functional testing procedures and the subcontractors execute them under the direction, observation and approval of the CA. The CA documents the functional testing.

Specification Section 17100 provides some graphic illustrations of various management scenarios. Appropriate name substitutions can be made for the various parties involved, allowing the specifications to be applicable to other agencies or groups.

Test Engineer Scenario. There are guide specifications in the industry that use this scenario. These specifications do not. The following is a short explanation to prevent confusion. In the test engineer scenario, the contractor hires a test engineer who writes and executes the commissioning tests, etc. A person designated as the "commissioning authority" is hired by or is on the owner's staff. This commissioning authority is the line supervisor for the test engineer and acts as the owner's representative for commissioning issues. For comparison, the test engineer in the test engineer scenario, performs virtually all the tasks that the commissioning authority does under the *Model Commissioning Plan and Guide Specifications*. The commissioning authority in the test engineer scenario is analogous to the construction manager in the *Model Plan and Specs*. However, in the test engineer scenario, the commissioning authority must have considerably more commissioning experience than does the construction manager in the *Model Plan and Specs* scenario.

3. Scope

This draft of the commissioning specifications covers HVAC and automatic control systems for larger buildings. Future versions will cover electrical and other mechanical systems. However, Section 17100 describes the common requirements and processes that are applicable to all commissioned systems, not just HVAC and controls. The A/E can add systems to be commissioned without making any modifications to Section 17100, except for adding references to added systems. In general, these specifications assume that clear and complete design intent documentation was developed during the design phase. However, some language is included to handle cases when it is not.

4. Specification Sections and Responsibilities

The following describes the approach that was used to incorporate commissioning into the standard specification format.

1. The intent was to minimize redundancy and repetition whenever possible, and yet still have as many requirements for a given trade, in the trade's normal specification

division and section. Specific commissioning *requirements* for a given trade are all listed in one place. However, the commissioning *procedures* to execute the requirements, many of which are common to all trades, are necessarily found in other sections. Cross references are used extensively to provide access to all procedures and requirements.

2. In all divisions with requirements that relate to commissioning, there are references to the specific commissioning requirements in other divisions.
 - a. In Division 1, Section 00800, Supplementary Conditions, there is language providing a penalty for not completing commissioning on time.
 - b. In Section 01040, Coordination, there is an introduction to commissioning, the commissioning authority and a reference to Division 17.
 - c. Section 01300 Submittals, Section 01700 Project Close-out and Section 01730 O&M Data also contain references to Division 17.
 - d. The trade sections of 15010 Mechanical General, Section 16010 Electrical General contain references to Division 17 and to the special commissioning sections within their respective divisions (15995; 16995).
3. The commissioning process details, the commissioning requirements that apply to all parties, and the specific responsibilities of the commissioning authority and non-trades, (construction and project manager) are included in a special Division 17, Commissioning.
4. A special commissioning section of Division 15, Section 15995 is used to specify common and specific commissioning requirements of all Division 15 contractors. In addition, the specific, unique responsibilities of Division 15 contractors are included in appropriate sections of Division 15 and 16 (e.g., 15950 controls, 15990 TAB).
5. Specific functional testing requirements are found in the Sections 15997 and 16997, Mechanical and Electrical Testing Requirements.
6. Specific prefunctional checklists are found in Sections 15998 and 16998.
7. Sample functional test procedures are found in Sections 15999 and 16999.

The following lists the sections included in the commissioning (Cx) guide specifications. Refer to Figure 1 for a graphical layout of the specification sections. A detailed table of contents is provided at the beginning of the major sections (15995, 17100).

00800 Supplementary Conditions Provides for a penalty if commissioning is not completed by the Functional Completion milestone.

* If the commissioning authority is hired by the owner or construction manager, 01040a applies:

01040a Coordination Introduces commissioning and refers to Division 17.

* If the commissioning authority is hired by the general contractor, 01040b applies:

01040b Coordination	Introduces commissioning, refers to Division 17 and requires that the GC hire a qualified CA.
01300 Submittals	Alerts all parties that additional detail in submittals may be required and directs to Division 17.
01700 Project Close-out	Defines Substantial Completion and Functional Completion milestones, relative to commissioning.
01730 O&M Data	Alerts all parties that O&M documentation may be more detailed and directs to Division 17.
15010 Mechanical General	Alerts the mechanical contractor of Cx responsibilities in 15995.
15950 Automatic Controls	Lists special requirements and alerts the controls contractor of the special requirements of the control contractor and control system in 15995.
15990 TAB	Alerts the TAB of Cx responsibilities in 15995.
15995 Mechanical Cx	Describes the Cx responsibilities of the mechanical, controls and TAB contractors and the prefunctional testing and start-up responsibilities of each. Points to 15997 for functional testing requirements.
15997 Mechanical Testing Requirements	Describes the specific functional testing requirements Division 15 equipment in the project.
15998 Mechanical Prefunctional Checklists	Provides the prefunctional checklists for use on this project, including items for Div. 15 and Div. 16.
15999 Mechanical Functional Tests—Examples	Provides example functional test procedures and formats for mechanical equipment.
16010 Electrical General	Alerts the electrical contractor of Cx responsibilities in 16995.
16995 Electrical Cx	Describes the Cx responsibilities of the electrical contractor.
16997 Electrical Testing Requirements	Describes the specific functional testing requirements for Division 16 equipment in the project.
16998 Electrical	Points to Section 15998 prefunctional checklists.
16999 Electrical Functional Tests—Examples	Provides example functional test procedures and formats for electrical equipment.
17100 Commissioning	Describes the commissioning process, responsibilities common to all parties, responsibilities of the A/E, CA, CM, PM, GC and Suppliers, focusing on the CA. The unique mechanical contractor, controls contractor, TAB and electrical contractor responsibilities are included in Div. 15 and 16.

5. Electronic Format

All sections have been included as separate files on diskette in Word 6.0 for Windows 3.1 with the following file name format. The version number refers to the specific file or section version, not the entire Guide Specification version.

[Section #. Version #] For example: file 15995.V02 is Section 15995 Version 2.

A complete listing of files is found in the overview of the entire document prior to Part I (file: all_ovr.v10).

Figure 1.

Specification Structure



